Paradise Valley Corridor Planning Study

US 89 (Gardiner to Livingston)

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Final Report

Prepared for:

Montana Department of Transportation

Helena, MT

MONTANA MDT DEPARTMENT OF TRANSPORTATION

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ABBREVIATIONS/ACRONYMS

ADA	Americans with Disabilities Act
AADT	Average Annual Daily Traffic
AAGR	Average Annual Growth Rate
ACI	Alligator Crack Index
ARM	Associated Rules of Montana
ATR	Automatic Traffic Recorder
CAPS	Crucial Area Planning System
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DNRC	Department of Natural Resources and Conservation (Montana)
EA	Environmental Assessment
EO	Executive Order
FHWA	Federal Highway Administration
FLAP	Federal Lands Access Program
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
GIS	Geographic Information System
G.O.	General Obligation Bonds
HRDC	Human Resources Development Council
HSIP	Highway Safety Improvement Program
I-90	Interstate 90
IRI	Ride Index
LOS	Level of Service
LUST	Leaking Underground Storage Tank
LWCFA	Land and Water Conservation Fund Act
MAAQS	Montana Ambient Air Quality Standards
MAP-21	Moving Ahead for Progress in the 21st Century Act
MBMG	Montana Bureau of Mines and Geology
MCA	Montana Code Annotated
MCI	Miscellaneous Crack Index
MDEQ	Montana Department of Environmental Quality
MFWP	Montana Fish, Wildlife, and Parks

MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MHP	Montana Highway Patrol
mph	Miles per Hour
MRL	Montana Rail Link
MSAT	Mobile Source Air Toxics
MSU	Montana State University
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPP	National Highway Performance Program
NHS	National Highway System
NPS	National Park Service
NRCS	Natural Resource Conservation Service (U.S. Department of Agriculture)
NRHP	National Register of Historic Places
NRIS	Natural Resource Information System (State of Montana)
OPI	Overall Performance Index
PAIP	Public and Agency Involvement Plan
PM	Particulate Matter
PvMS	Pavement Management System
RI	Rut Index
RHRS	Rockfall Hazard Rating System
RP	Reference Point
RV	Recreational Vehicle
S-540	Secondary Route 540 (East River Road)
SAMP	Special Area Management Plan
Section 4(f)	Section 4(f) of the 1966 Department of Transportation Act
Section 6(f)	Section 6(f) of the 1964 National Land and Water Conservation Fund Act
SOC	Species of Concern (Montana)
SRMZ	Special River Management Zone
STP	Surface Transportation Program
STPP	Surface Transportation Program Primary Highways
STPS	Surface Transportation Program Secondary Highways
SUV	Sport Utility Vehicle

TA	Transportation Alternatives (Program)
T&E	Threatened and Endangered (Species)
TMDL	Total Maximum Daily Load
TWLTL	Two-Way, Left-Turn Lane
USACOE	U.S. Army Corps of Engineers
UPN	Uniform Project Number
U.S.C.	United States Code
USDOI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USNPS	U.S. National Park Service
UST	Underground Storage Tank
US 89	US Highway 89
vpd	Vehicles per Day
YNP	Yellowstone National Park

EXECUTIVE SUMMARY

The Montana Department of Transportation (MDT), in partnership with the Federal Highway Administration (FHWA) and in coordination with Park County, initiated the *Paradise Valley Corridor Planning Study* to assess the US Highway 89 (US 89) corridor between Gardiner and Livingston. The US 89 corridor provides the primary surface transportation link between Livingston and Yellowstone National Park (YNP) and is one of the major routes in Montana used to access YNP through Gardiner.

The purpose of the study is to determine potential improvement options to address safety and operational concerns within the transportation corridor based on needs identified by the public, the study partners, and resource agencies. The study authors examined geometric characteristics, crash history, land uses, physical constraints, environmental resources, and existing and projected operational characteristics of the US 89 corridor.

The study area included a 0.75-mile buffer on each side of US 89 beginning at Reference Point (RP) 0.0 at the YNP boundary in the town of Gardiner. The area extended north through the communities of Corwin Springs and Emigrant to RP 52.5 just south of the City of Livingston.

The study is a corridor planning document; not a design project. MDT, Park County, and FHWA used a collaborative process to develop the study, as well as focused outreach efforts to the public, key stakeholders, and resource agencies. The partners also evaluated known and publically available resource information. Activities completed for development of the study include the following:

- Research and analysis of existing US 89 roadway conditions
- Research and synthesis of known environmental resources and applicable regulations in the study area
- Identification and documentation of future conditions
- Identification of corridor issues and areas of concern
- Consultation and coordination with local officials, stakeholders, resource agencies, and the public
- Identification of corridor needs and objectives
- Development of corridor improvement options with consideration of costs, available funding, feasibility, public input, and known environmental resource constraints
- Documentation of potential funding mechanisms for improvement options

ES.1. Corridor Issues

Assessment of existing conditions within the study area and public and stakeholder input enabled the identification of roadway issues and areas of concern. The issues identified included existing roadway geometrics (widths, steepness of the road, sight distance at intersections, etc.), wildlife conflicts, vehicle speeds and speed limits, and access density. The major issues identified are presented below:

ES.1.1. Transportation System

The following transportation system areas of concern were noted:

Level of Service

- Numerous segments of US 89 are either currently, or projected, to operate at a LOS of C or worse. The design target LOS for this facility is a LOS B.

Horizontal Alignment

- Eight horizontal curves do not meet current standards.

Vertical Alignment

- Four vertical curves do not meet current standards.
- Two locations have grades that do not meet current standards.

Safety

- Numerous animal-vehicle collisions occurred between January 2002 and December 2012.

Passing

- Seven passing zone locations do not meet current standards based on length.
- One passing zone does not meet standards based on proximity to public approaches.

Surfacing

- US 89 from RP 1.1 to the end of the study area (RP 52.5) has a 32-foot roadway width, which is less than the suggested standard of 40 feet.

Access Points

- Eleven approaches do not meet current standards based on intersection angles.

Parking

- Locations with on-street parking in the town of Gardiner do not meet current standards.

Geotechnical

- Three landslide cluster areas were identified within the study area.
- Twelve rockfall hazard sites were identified, including three “top 100” sites on the state highway system.

ES.1.2. Environmental Considerations

The following environmental considerations were noted:

Prime Farmland

- Areas of prime farmland are located within the study area.

Geologic Resources

- Three designated faults are located within the study area.

Surface Waters

- A Special River Management Zone exists for the Yellowstone River from Emigrant to Springdale.

Hazardous Substances

- One leaking underground storage tank (LUST) is designated as having a priority ranking assigned by the Montana Department of Environmental Quality (MDEQ) within the study area.
- Abandoned and inactive mine sites were identified within the study area.

Wildlife

- Three endangered, threatened, proposed, or candidate species occur in the study area.
- Fifteen species of concern have the potential to occur in the study area.

Recreational, Cultural and Archaeological Environment

- There are multiple Section 4(f) (1966 Department of Transportation Act) and Section 6(f) (1964 National Land and Water Conservation Funds Act) resources located within the study area.
- Eight historic properties were identified within the study area.

ES.2. Corridor Study Needs and Objectives

The following needs and objectives were established based on the analysis of existing and future conditions, local plans, and input from resource agencies, stakeholders, and the public. These needs and objectives were used to develop the improvement options that meet, to the extent practicable, financial constraints, public preference, and environmental constraints within the corridor.

Need 1: Improve the safety of US 89 in the study area for all users.

Objectives (To the Extent Practicable):

- Improve roadway elements to meet current design standards.
- Review signing and passing opportunities based on current design standards.
- Evaluate best practice mitigation strategies as appropriate to reduce potential animal-vehicle conflicts.
- Evaluate existing access density impacts.

Need 2: Improve the operations of US 89 within the study area.

Objectives (To the Extent Practicable):

- Accommodate existing and future capacity demands within the corridor.
- Minimize future access density impacts.
- Consider access to recreational sites in the corridor.

Other Considerations

- Minimize the environmental resource impacts of improvement options.
- Limit disruptions during construction as much as practicable.
- Provide appropriate speeds within the study area per statutory and special speed zones established by the Montana Transportation Commission.
- Review maintenance practices.
- Recognize the environmental, scenic, cultural, recreational, and agricultural nature of the corridor.
- Consider local planning efforts.
- Consider availability and feasibility of funding.
- Consider feasibility of construction.

ES.3. Improvement Options and Strategies

Recommended improvement options for US 89 were identified and are based on the evaluation of several factors. These factors include, but are not limited to, field review, engineering analysis of as-built drawings, crash data analysis, consultation with various resource agencies, and information provided by the public. Small-scale improvement options have been identified and may be as simple as installing advisory signs. Larger, more complex improvements have also been identified. These include installing passing lanes at intermittent locations between Gardiner and Livingston and reconstructing existing roadway for 3 miles to a three-lane section with a two-way, center-turn lane near Livingston. Improvement options should be considered with respect to wildlife and aquatic impacts. Strategies to mitigate potential impacts would be more fully explored during project development activities. The following table contains a summary of the potential improvements along with planning level cost estimates.

Recommended Improvement Options Summary

Improvement Option		Location	Description	Implementation Timeframe	Cost Estimate
GEOMETRICS					
1	**Shoulder Widening**	Corridor-wide	Consider constructing 8-foot shoulders incrementally as projects develop along the corridor.	As needed	$910,000 per mile
2(a)	**Maiden Basin Road Intersection Advance Warning Signs**	RP 5.15	Install advance intersection warning signs along US 89.	Short-term	$600 EA
2(b)	**Maiden Basin Road Intersection Right-turn Lane**	RP 5.15	Construct a northbound right-turn lane along US 89 when appropriate warrants are met.	Mid-term	$270,000
4	**East River Road Intersection Turn Lanes**	RP 19.8	Construct a southbound left-turn lane and a northbound right-turn lane along US 89 when appropriate warrants are met.	Mid-term	$650,000 (both turn lanes)
5	**Mill Creek Road Intersection Right-turn Lane**	RP 37.2	Construct a northbound right-turn lane along US 89 when appropriate warrants are met.	Mid-term	$280,000
6(a)	**Advance Warning Signs**	RP 49.10 to 49.35	Install horizontal curve warning signs for the horizontal curves located at RP 49.10 and RP 49.35.	Short-term	$600 EA
15	**Turn Lane Evaluation**	Multiple Locations	Complete left- and right-turn lane evaluations at the following locations: RP 7.70; RP 26.4; RP 31.95; RP 33.20; and RP 41.50.	Mid-term	$15,000 (for turn lane warrant evaluation); $650,000 (for construction of two turn lanes); $325,000 (for construction of an individual turn lane)
VEHICLE CONGESTION AND PASSING OPPORTUNITIES					
7(a)	**Evaluate No-passing Zones**	Corridor-wide	Evaluate existing no-passing signing and striping for compliance with current standards.	Short-term	$45,000
7(c)	**Passing Lanes**	Potential Spot Locations	Potential locations for passing lanes along the corridor include: RP 16.6 to 19.8; RPs 25.6 to 28.4; RPs 40.0 to 42.0; and RPs 44.4 to 47.9.	Long-term	$12,400,000 EA
ACCESS MANAGEMENT					
9	**Livingston Rural/ Urban Interface**	RP 49.8 to 52.5	Extend a three-lane typical section of US 89 from Merrill Lane to East River Road. Include right-turn lanes at major intersections if appropriate warrants are met.	Mid-term	$8,500,000
ALTERNATIVE TRAVEL MODES					
10	**Multi-use Trail**	Corridor-wide	Investigate opportunities for the development of a multi-use trail between Gardiner and Livingston.	Long-term	$390,000 per mile
11(a)	**Gardiner Area On-street Parking**	RP 0.0 to 1.0	Modify existing on-street parking in the Gardiner area based on MDT guidelines.	Short-term	Labor
11(b)	**Gardiner Area Lighting Improvements**	RP 0.0 to 1.0	Coordinate with Gardiner Gateway Project partners to evaluate the need to upgrade existing street lighting to reflect lighting consistency with other phases of the project and to increase night-time visibility.	Short-term	To be determined
WILDLIFE-VEHICLE CONFLICTS					
13	***Grade Separated Crossing Structures-overpasses***	As needed	Consider grade separated crossing structures (overpass) on a case-by-case basis during project-level design.	As needed	$2,800,000 EA (overpass)
	Grade Separated Crossing Structures-underpasses	As needed	Consider grade-separated crossing structures (underpass) on a case-by-case basis during project-level design.	As needed	$750,000 EA (underpass)
	Animal Detection System (At-grade Crossing)	As needed	Consider animal detection system installation on a case-by-case basis during project-level design.	As needed	$220,000 per mile
	Wildlife Signage	As needed	Consider additional wildlife signing on a case-by-case basis during project-level design.	As needed	$600 EA

ES.4. Conclusion

The results of the study indicate that once funding has been identified there will be no major impediments to developing any of the recommended improvement options. This study provides a diverse list of recommendations for improvement options and strategies that may be considered as funding becomes available.

The ability to develop projects based on the recommended improvement options to US 89 depends on the availability of existing and future federal, state, local, and private funding sources. At the current time, no funding has been identified to complete the recommended improvement options contained in this study. To continue with the development of a project (or projects) the following steps are needed:

- Identify and secure a funding source or sources.
- For MDT-led projects, follow MDT guidelines for project nomination and development, including a public involvement process and environmental documentation.
- For projects that are developed by others and may impact MDT routes, coordinate with MDT via the System Impact Action Process (SIAP).

Recommended improvement options identified in this study may lead to future projects. The purpose and need statement for any future project should be consistent with the needs and objectives contained in this study. However, not all of the needs and objectives at the corridor level have to be included in a project-level purpose and need statement. For example, an “advisory curve” signing project may have little or no effect on access density objectives, thus rendering compliance with the intent of that particular objective unnecessary.

Should this *Paradise Valley Corridor Planning Study* lead to a project or projects, compliance with the National Environmental Policy Act (NEPA) will be required if federal funding is used and the Montana Environmental Policy Act (MEPA), will be required if the state takes an action. Private or county funded projects do not require compliance with the MEPA process. Further, this Corridor Planning Study will be used as the basis for determining the impacts and subsequent mitigation for the improvement options in future NEPA/MEPA documentation.

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Chapter 1
Introduction

The Montana Department of Transportation (MDT), in partnership with the Federal Highway Administration (FHWA) and coordinating with Park County, initiated the *Paradise Valley Corridor Planning Study* to assess the US Highway 89 (US 89) corridor between Gardiner and Livingston. The US 89 corridor provides the primary surface transportation link between Livingston and Yellowstone National Park (YNP) and is one of the major routes in Montana used to access YNP through Gardiner. The highway passes through Paradise Valley, situated between Livingston and Yankee Jim Canyon in Park County, and it generally parallels the Yellowstone River.

The purpose of the study is to determine potential improvement options to address safety and operational concerns within the transportation corridor based on needs identified by the public, the study partners, and resource agencies. The study examines geometric characteristics, crash history, land uses, physical constraints, environmental resources, and existing and projected operational characteristics of the US 89 corridor.

The study area included a 0.75-mile buffer on each side of US 89 beginning at Reference Point (RP) 0.0 at the YNP boundary in the town of Gardiner, and it extends north through the communities of Corwin Springs and Emigrant to RP 52.5 just south of the City of Livingston. **Figure 1.1** provides a vicinity map of the corridor, which is located entirely within Park County.

The study includes a package of short- and long-term recommendations intended to address the transportation needs of the highway over the planning horizon (year 2035). These recommendations will help the study partners target the most critical needs and allocation of resources.

1.1. PROCESS

The *Paradise Valley Corridor Planning Study* is a pre-National Environmental Policy Act (NEPA) and Montana Environmental Policy Act (MEPA) study that allows for early planning-level coordination with the public, stakeholders, environmental resource agencies, and other interested parties. The NEPA/MEPA environmental review process is an approach to balance transportation decision-making that takes into account the need for safe and efficient transportation and the impacts on the human and natural environment.

The study does not replace the NEPA/MEPA process. The results of the study may be used to help determine the level and scope of environmental review required should a project be forwarded into a subsequent NEPA/MEPA process. The study will assist in facilitating a smooth and efficient transition from transportation planning to future project development/environmental review, if a project is moved forward. This study identifies both known technical issues and environmental conditions within the corridor, and it identifies reasonable and feasible improvements to increase safety and efficiency for the traveling public. Additionally, it defines potential impacts on the surrounding environment resulting from various improvement options. The pre-NEPA/MEPA process discloses potential environmental impacts and technical constraints, identifies potential mitigation measures that can be implemented, and documents the information for the public and decision-makers before decisions are made and carried forward. This study is a planning-level study to determine various improvement options to US 89. It is not a design or construction project.

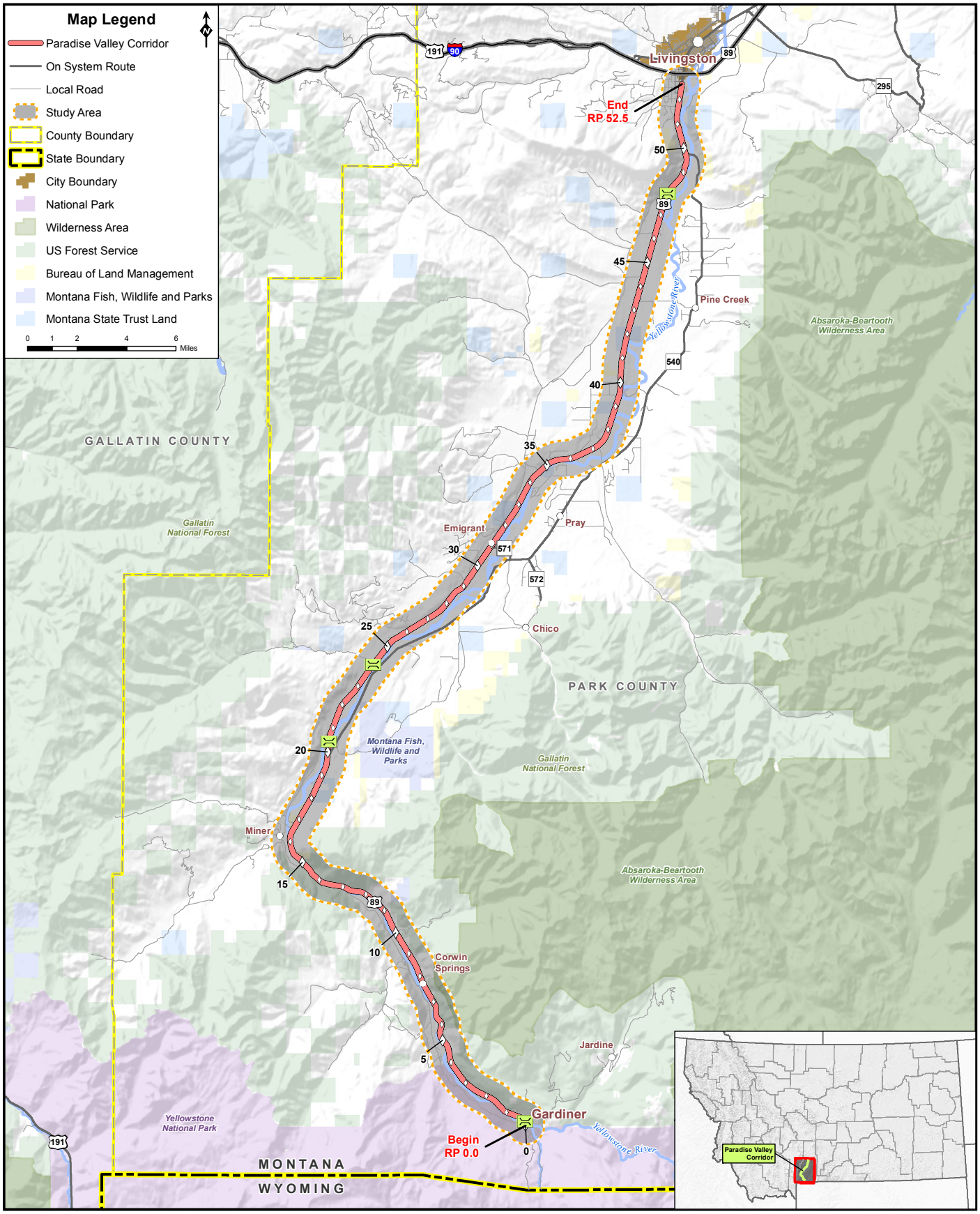

Figure 1.1: Vicinity Map

Chapter 2

Public and Stakeholder Outreach

An important aspect of the planning study process is to provide opportunities for ongoing and meaningful public involvement. Education and public outreach are essential parts of achieving this goal. A *Public and Agency Involvement Plan* (PAIP) was developed to identify public involvement activities needed to gain insights on and to seek consensus about existing and future transportation needs. The purpose of the PAIP was to ensure a proactive public involvement process that provided opportunities for the public to be involved in all phases of the planning study process. Specific public outreach measures are noted in this chapter. Meeting content, such as press releases, advertisements, agendas, presentations, minutes, etc., are provided for all of the described activities in **Appendix 1** (Consultation, Coordination, and Public Involvement).

2.1. PUBLIC INVOLVEMENT

Two series of public informational meetings were scheduled and held over the course of the study process. The meetings were held in both Gardiner and in Livingston. Press releases were distributed to area media outlets, and meeting announcements were advertised in local newspapers (Livingston Enterprise and Gardiner Community Newsletter) twice before each meeting series (at 1-week and 3-week intervals). The ads announced the meeting location, time and date, purpose of the meeting, and the locations where documents could be reviewed.

2.1.1. Informational Meeting Number 1

First Informational Meeting–Gardiner

Eighteen members of the public signed the attendance sheet for the first informational meeting held on July 24, 2013, at the Gardiner Community Center in Gardiner. Ten others were present, but they did not sign in, bringing the estimated total attendance to 28 individuals. The purpose of the meeting was to inform interested parties about the scope and purpose of the corridor planning study, present the findings of the existing conditions analysis, and solicit input on the existing conditions and concerns within the study area that may be relevant to the corridor planning effort. The meeting began with a PowerPoint presentation, which included the study process, purpose, and existing conditions. The presentation was followed by a question-and-answer period.

First Informational Meeting–Livingston

Thirteen members of the public signed the attendance sheet for the first informational meeting held on July 25, 2013, in the Community Room at the City/County Building in Livingston. Five others were present but they did not sign in, bringing the estimated total attendance to 18 individuals. The purpose of the meeting was the same as that in Gardiner: to inform interested parties about the scope and purpose of the corridor planning study, present the findings of the existing conditions analysis, and solicit input on the existing conditions and concerns within the study area that may be relevant to the corridor planning effort. The meeting began with a PowerPoint presentation, which included the study process, purpose, and existing conditions. The presentation was followed by a question-and-answer period.

Comments from the Public

Comments were received at the informational meetings, and subsequent to the meeting through e-mail, telephone conversations, and standard postal mail. The following summarizes the public comments received:

- **Wildlife:** The public expressed concern over the amount of wildlife/vehicle collisions throughout the corridor.
- **Additional Lanes:** The public expressed concern over the lack of passing lanes and dedicated turn bays at major intersections.
- **Speeds:** Comments were related to high vehicle speeds, particularly in the existing 35-mile-per-hour (mph) and 45-mph zones entering and leaving Gardiner.
- **Access:** Concerns were expressed over the lack of a continuous two-way, left-turn lane (TWLTL) between Livingston and the intersection with East River Road.
- **Multi-modal Use:** Comments expressed a concern over the lack of bicycle facilities along the entire corridor.

2.1.2. Informational Meeting Number 2

Second Informational Meeting–Livingston

Thirteen members of the public signed the attendance sheet for the second informational meeting held on February 24, 2014, in the Community Room at the City/County Building in Livingston. Four others were present, but they did not sign in, bringing the estimated total attendance to 17 individuals. The purpose of the meeting was similar to that in Gardiner: to present the needs and objectives identified during the study and the various improvement option concepts developed for the corridor, as well as to gather public feedback on the draft corridor planning study report. The meeting included a PowerPoint presentation, which was followed by a question-and-answer period.

Second Informational Meeting–Gardiner

Twelve members of the public signed the attendance sheet for the second informational meeting held on February 25, 2014, at the Gardiner Community Center in Gardiner. Two others were present, but they did not sign in, bringing the estimated total attendance to 14 individuals. The purpose of the meeting was to present the needs and objectives identified during the study and the various improvement option concepts developed for the corridor, as well as to gather public feedback on the draft corridor planning study report. The meeting included a PowerPoint presentation, which was followed by a question-and-answer period.

Comments from the Public

Comments were received at the informational meetings, and subsequent to the meeting through e-mail, telephone conversations, and standard postal mail. The following summarizes the public comments received:

- **Left- and Right-turn Lanes:** The public expressed concern over the lack of left- and right-turn lanes at high-volume intersections. Specific areas referenced include the primary approaches to the Glastonbury subdivision at South Dry Creek Road and Trail Creek Road, two fishing access sites (Mallards Rest and Grey Owl), and the new Corwin Springs Bridge.
- **Financial Accountability:** Participants made several comments about spending millions of dollars on non-motorized facilities when traffic congestion relief projects should be the priority.
- **Eminent Domain:** Participants made some comments relative to MDT using eminent domain to take land for the recommended improvements. Specifically, questions were posed as to how much land would be taken from private property.

- **School Bus Turn-outs:** Comments were made concerning the need for school bus turn-outs on each side of US 89 between East River Road and the interchange at Interstate 90 (this location is outside of study area).
- **Wildlife:** The public expressed concern over the lack of specific wildlife mitigation projects throughout the corridor.
- **East River Road:** Participants indicated that highlighting East River Road as a slower, alternate route to US 89 may be desirable by using increased signage and other wayfinding measures.
- **Traffic Congestion:** Participants stated concerns that traffic queuing during the summer causes some drivers to become frustrated and perform unsafe vehicle maneuvers.

2.1.3. Other Public Involvement Efforts

Two newsletters were distributed that described the work in progress, results achieved, preliminary improvement options, and other topics. These newsletters were made available at the informational meetings and they were posted to the study website. In addition, copies were mailed to the following stakeholders:

- City of Livingston
- Gardiner Chamber of Commerce
- Greater Gardiner Community Council
- Northern Rocky Mountain Economic Development District
- MSU Extension
- Governor's Upper Yellowstone River Task Force
- Montana State Highway Patrol-District 7
- Gallatin Valley Land Trust
- Montana Land Reliance
- Rocky Mountain Elk Foundation
- The Nature Conservatory
- Montana Wild Sheep Foundation
- Montanan's for Safe Wildlife Passage
- Northern Plains Resource Council
- Trout Unlimited-Joe Brooks Chapter

A website (http://mdt.mt.gov/pubinvolve/paradisevalley) provided up-to-date information regarding the study, as well as an opportunity to provide comments on the study. Draft documents were posted for public review and comment during the study process. Informational announcements were posted on the website to encourage public involvement in the study.

An email distribution list was created and maintained over the duration of the study. Advance notice of the informational meetings was sent to those on the email distribution list before the meeting date.

2.2. STAKEHOLDER PARTICIPATION

A stakeholder contact list was developed to include individuals, businesses, or groups identified by Park County, MDT, and/or the Consultant, based on knowledge of the study area. The intent of developing the stakeholder list was to identify individuals and groups to actively seek out and engage in the various phases of the study (**Appendix 3**, Public and Agency Involvement Plan). An individual stakeholder meeting was held at MDT Headquarters on October 7, 2013, to discuss wildlife/vehicle collision concerns, with Montanas for Safe Wildlife Passage (MSWP). Member groups of MSWP that were present included the following:

- Center for Large Landscape Conservation
- Future West
- National Parks Conservation Association
- Wildlife Conservation Society

2.3. RESOURCE AGENCY WORKSHOP

A resource agency workshop was held on August 7, 2013, at MDT Headquarters in Helena. A remote location was also made available in Bozeman and Livingston for those unable to attend in Helena. The resource agency workshop was held to provide an overview of the study and process and to confirm content and accuracy of the *Environmental Scan* document. Each agency was sent a draft *Environmental Scan* before the workshop to set the stage for further discussion. The following agencies were invited to participate, and those noted in bold were those agencies that attended the workshop:

- **Montana Department of Environmental Quality (MDEQ)**
- **Montana Fish, Wildlife and Parks (MFWP)**
- **Montana Department of Natural Resources and Conservation (DNRC)**
- **Montana Department of Transportation (MDT)**
- **Park County Planning Department**
- U.S. Environmental Protection Agency (USEPA)
- **U.S. Army Corps of Engineers (USACOE)**
- U.S. Bureau of Land Management (USBLM)
- **U.S. Federal Highway Administration (USFHWA)**
- **U.S. Forest Service (USFS)**
- U.S. Fish and Wildlife Service (USFWS)
- **U.S. National Park Service (USNPS)**

An open discussion was held on various resource areas that the agencies thought should be further identified, supplemented, or considered, as well the purpose of the study in general. The following comments were made at the resource agency workshop:

- **Access to Recreational Lands:** US 89 is an important route for access to a variety of recreational lands. These include numerous fishing access sites, trailheads, and YNP. The road provides access to the Yellowstone River at both permitted and non-permitted access points. Because of low-water conditions on other area rivers, commercial outfitter use has been increasing on the Yellowstone River. This change in use should be considered in any improvements contemplated in the study.
- **Wildlife/Vehicle Conflicts:** Wildlife/vehicle collisions are a concern. Mitigation strategies should be analyzed if speeds are increased as a result of any project(s) identified from the study.
- **Gardiner Gateway Project Coordination:** Improvements contemplated within the Gardiner area should be coordinated closely with Park County and YNP officials. The Gardiner Gateway Project is a multi-year, multi-phase project that will change operating and aesthetic conditions at the park entrance.
- **Vehicle Composition and Seasonal Influence:** The corridor experiences seasonal characteristics not just for traffic, but also weather and wildlife. Recommendations should take into consideration the seasonal variations, specifically seasonal use peaks. A high number of amateur drivers operate RVs and large vehicles. There has been an increase in interest in developing RV campgrounds within the study area. An increase in RV campgrounds will have an effect on travel along the corridor. The Gardiner entrance to YNP has seen a higher growth rate than the other entrances to the Park.

- **Passing Opportunities:** Passing opportunities in the form of passing lanes should be evaluated. A passing lane may be desirable between Livingston and the northern East River Road intersection.
- **Bridge Deck Drainage:** If a new bridge is considered anywhere within the corridor, impacts resulting from drainage off a new bridge deck should be considered. Bridge deck drainage should be channeled off the bridge and possibly detained/retained before discharge.
- **Bridge Span:** If a new bridge is constructed anywhere within the corridor, the largest span practicable should be utilized to minimize impacts within the floodplain.

2.4. PLANNING TEAM MEETINGS

A study planning team was established with representatives from Park County, MDT, and FHWA. The team met regularly (approximately every three weeks) during the twelve-month study to discuss study progress, analysis methodologies and results, draft technical memorandums and reports, and other issues and concerns. The planning team served in an advisory role and reviewed study documentation before publication.

2.5. PUBLIC AND AGENCY COMMENT PERIOD

The public and agency comment period for the draft planning study report extended from February 21, 2014 to March 14, 2014. One hundred eighteen written comments were received during the comment period. Written comments and responses are presented at the beginning of **Appendix 1** (Consultation, Coordination, and Public Involvement).

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Chapter 3

Existing and Projected Conditions

This chapter presents the existing and projected conditions and the environmental factors for the US 89 corridor study area. These conditions and factors were used in the planning analysis to identify known issues and areas of concern. If an option is forwarded from this study to project development, this general information may be used to support future, detailed, project-level analysis.

3.1. PLANNING WITHIN THE US 89 CORRIDOR

Numerous documents exist that help guide planning activities for lands in the study area. Planning is primarily the responsibility of Park County, USFS (Gallatin National Forest), and NPS (for lands in YNP at Gardiner). The planning documents listed below were reviewed to provide context for the study. The *Existing and Projected Conditions Report* (**Appendix 3**) contains more information from these planning documents and considerations that may be important to the development of improvement options for US 89.

- Park County Comprehensive Plan (1998)
- Park County Growth Policy (2008)
- Gallatin National Forest Plan (1987; Amended September 2009)
- National Park Service North Entrance & Park Street Improvement Plan/Environmental Assessment (2011)
- National Park Service Finding of No Significant Impact (FONSI)–North Entrance & Park Street Improvement Plan/Environmental Assessment (October 2011)
- Gardiner Gateway Project Preliminary Engineering Report (March 2013)

3.2. TRANSPORTATION SYSTEM

US 89 from Gardiner to Livingston follows the upper Yellowstone River through the Paradise Valley. The road's origins date back to the 1880s when a miner from Cooke City built the first road between Gardiner and Livingston. The original road was abandoned, and portions were taken over by Yankee Jim George and operated as a toll road. Park County acquired much of the roadway in 1893 after the public became dissatisfied with its condition. In 1915, YNP opened to automobile traffic. Through the efforts of the Yellowstone Trail Association at approximately the same time, an automobile route from Livingston to Gardiner was built along and over the Yankee Jim Toll Road. The roadway was constructed or improved at various times, beginning in 1924.

US 89 is classified as a Rural Principal Arterial Highway on the Non-Interstate National Highway System (NHS) within the study area. The highway is an integral part of the regional rural transportation network connecting local population and commerce to the NHS. Most of the land adjoining the corridor is undeveloped. However, cultivated and ranch lands, year-round and seasonal businesses, outdoor recreation sites, and residences also exist within the study area. US 89 connects Interstate 90 (I-90) at Livingston to YNP at Gardiner. Gardiner is situated at the original entrance to YNP and is the only year-round vehicular entrance into the park. The Gardiner Entrance (also known as the North Entrance) is one of the most heavily used entrances into the park. The entrance provides access to the northern portion of YNP and year-round access to the Cooke City/Silver Gate communities.

3.2.1. Existing Roadway Users

Users of the roadway consist of residents, commuters between Gardiner and Livingston, recreationists on lands and waters in the Paradise Valley, tourists visiting YNP and other attractions in the region, and commercial users. Land uses in the study area are mixed. They include commercial, industrial, crop/pasture, mine/quarry, mixed urban, and recreational uses. Numerous recreation sites exist along US 89, and others are accessed from the highway. These sites include public fishing access sites, picnic areas, and campgrounds.

3.2.2. Traffic Data

MDT collects annual traffic count data at seven locations on US 89 within the study area. At the location approximately 17 miles north of Gardiner (RP 16.8) data is collected by an Automatic Traffic Recorder (ATR). The ATR collects traffic year-round from sensors imbedded in the roadway. Data from the other six traffic count sites are collected periodically for limited times by using pneumatic tube counters.

MDT provided historic data for the traffic count sites. The average annual daily traffic (AADT) for year 2012 ranges from approximately 4,000 vehicles per day (vpd) near the communities of Gardiner and Livingston, to as low as 1,700 vpd near RP 17.

In addition to providing traffic volume data, the ATR counter located at RP 16.8 provides large-truck volume percentages (some RVs maybe considered large trucks). For 2012, large trucks accounted for 2.4 percent of the traffic at this location. Between 1993 and 2012, large trucks accounted for an average of 1.8 percent of the traffic.

3.2.2.1. Future Traffic Projections

Projected transportation conditions were analyzed to estimate how traffic volumes and characteristics may change compared to existing conditions. The analysis was based on known existing conditions, and extended out to 2035. Average annual growth rates (AAGRs) were calculated at each of the seven traffic count locations during multiple periods based on historic traffic data. Weighted AAGRs were calculated based on recent AADTs. The weighted AAGRs provide a representative picture of traffic growth on US 89 within the study area. Traffic volumes fluctuate throughout the study area, resulting in both positive and negative growth rates.

AAGRs were estimated for low-, medium-, and high-growth scenarios. The low-growth scenario (0.35% AAGR) represents average conditions experienced over the past 20 years. The medium-growth scenario (1.5% AAGR) reflects conditions experienced during the early 2000s, and the high-growth scenario (3.3% AAGR) describes the traffic growth during the 1990s. These growth scenarios were used to project AADT values for 2035, as seen in **Figure 3.1**.

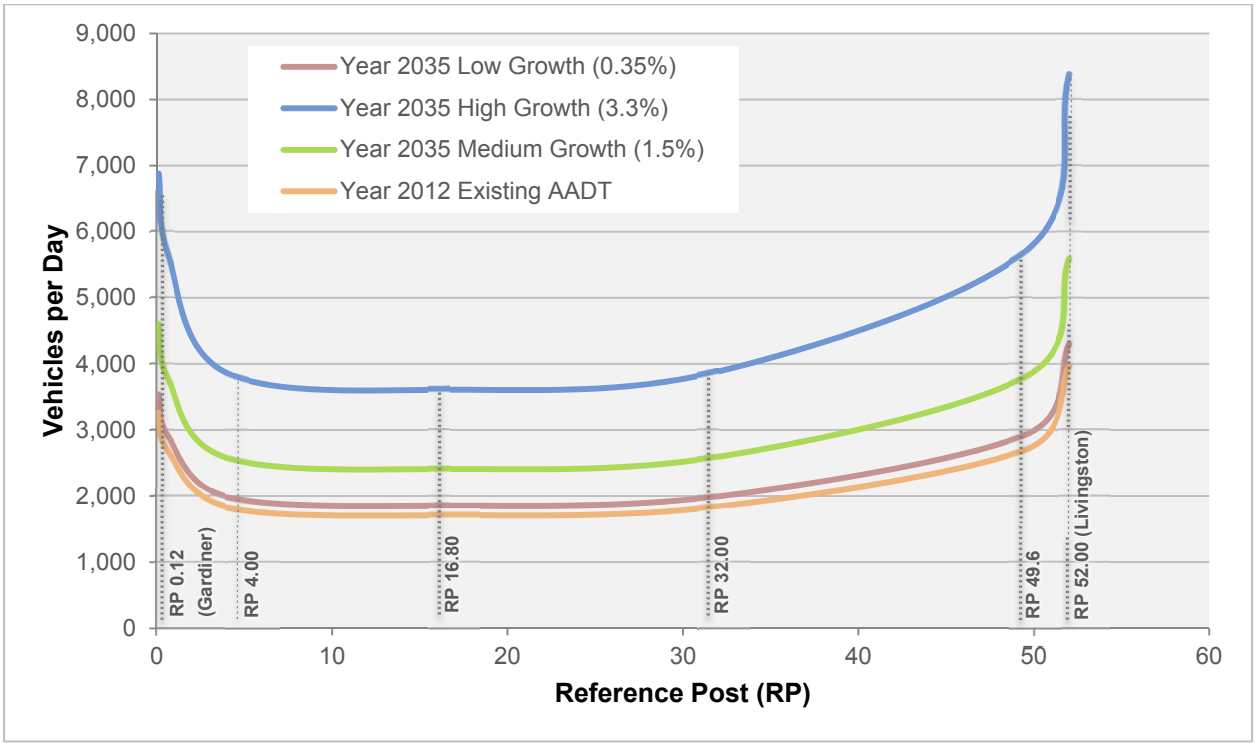


Figure 3.1: Projected (Year 2035) AADT Volumes by RP

3.2.2.2. Seasonal Variations in Traffic

Due to the high recreational use of lands in the area and the access the route affords to YNP, notable seasonal peaks in traffic volumes occur due to recreational travel. **Figure 3.2** shows the variation in traffic on US 89 at ATR Station A-020 by month for 2000 and 2012. The highest traffic volumes of the year occur from June through August. The lowest amount of travel occurs in January and December. Traffic volumes for July are nearly double those of the AADT volume at the ATR site. In 2012, the peak average volume was approximately 175 percent of the AADT. During the lowest travel months, the volumes were slightly more than half of the AADT volume at the ATR site.

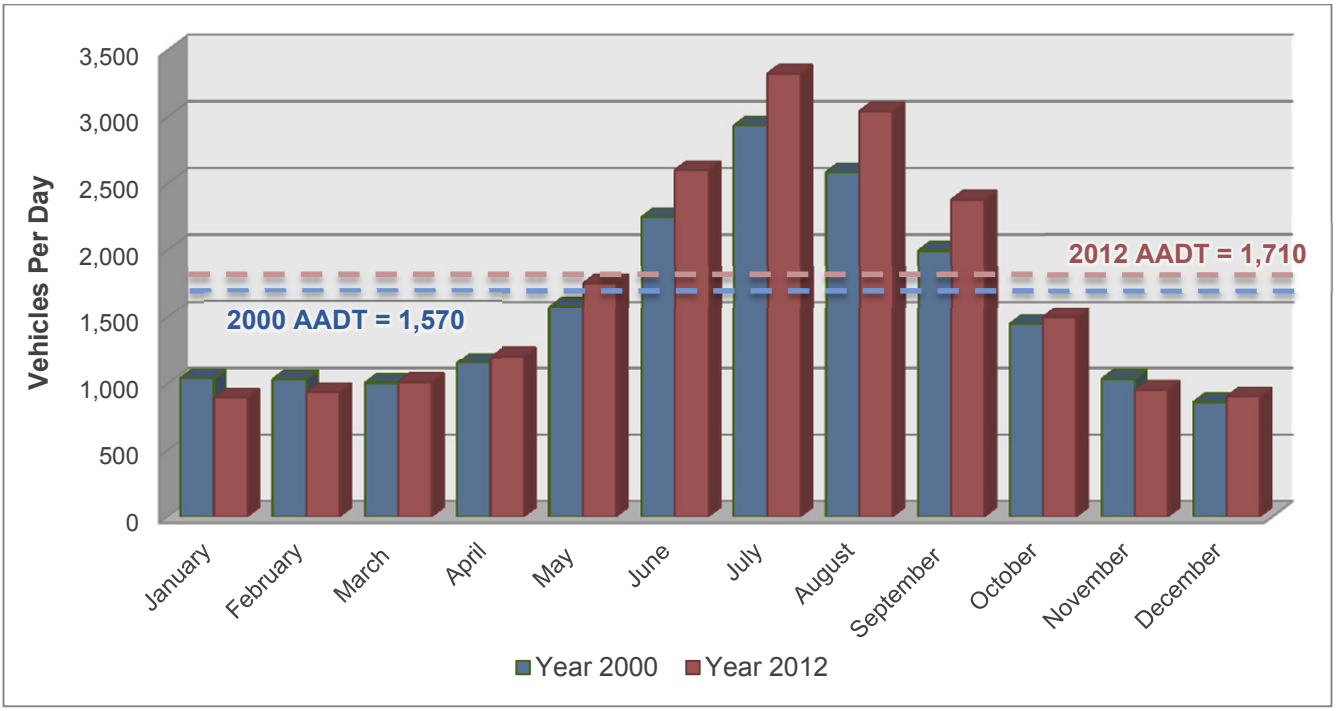


Figure 3.2: Monthly Variations in Traffic at ATR Station A-020

3.2.2.3. Highway Capacity and Level of Service

Capacity and Level of Service (LOS) are two terms used to describe traffic conditions and corridor operation. Capacity represents the theoretical ability of the roadway to handle a defined amount of traffic. LOS describes the performance of the roadway from the driver's perspective. Both of these parameters are reviewed when comparing corridor performance. Individual roadway capacity varies greatly, and it is calculated based on the procedures identified in the *Highway Capacity Manual*.

Roadway LOS provides a comparison value to represent the driver's perception of the roadway performance. The LOS is based on a combination of factors, which play a part in the driver's perception of how the roadway is performing. When drivers experience delays due to reduced travel speeds, lack of passing opportunities, heavy vehicles in the traffic stream, and steep roadway grades, the roadway LOS deteriorates. The following is a description of each LOS as defined by the *Highway Capacity Manual.*

- **LOS A:** Represents free-flow conditions. Motorists experience high operating speeds and little difficulty in passing. Platoons of three or more vehicles are rare.
- **LOS B:** Passing demand and passing capacity are balanced. The degree of platooning becomes noticeable. Some speed reductions are present but are still relatively small.
- **LOS C:** Most vehicles are traveling in platoons. Speeds are noticeably curtailed.
- **LOS D:** Platooning increases significantly. Passing demand is high, but passing capacity approaches zero. A high percentage of vehicles travel in platoons, and the time-spent-following is quite noticeable.
- **LOS E:** Demand is approaching capacity. Passing is virtually impossible, and the time-spent-following is more than 80 percent. Speeds are seriously curtailed.
- **LOS F:** Exists whenever demand flow in one or both directions exceeds the capacity of the segment. Operating conditions are unstable, and heavy congestion exists.

An LOS analysis was conducted using *Highway Capacity Software 2010* for two-lane highways. The results of the analysis are shown in **Table 3.1**. More detailed data are contained in the *Existing and Projected Conditions Report* (**Appendix 3)**.

Table 3.1: Highway Segment Level of Service

US 89 Segment	LOS			
	Average Annual		Peak Season	
	2012	2035	2012	2035
RP 0.0 to RP 0.4	C	C	C	D
RP 0.4 to RP 2.4	B	B	C	C
RP 2.4 to RP 10.4	C	C	D	D
RP 10.4 to RP 24.4	C	C	C	D
RP 24.4 to RP 40.7	B	C	C	C
RP 40.7 to RP 50.6	C	D	D	D
RP 50.6 to RP 52.4	C	C	C	D

The MDT *Traffic Engineering Manual* lists a design target LOS of B for an NHS Non-Interstate with level/rolling terrain. Based on the analysis shown in **Table 3.1**, numerous segments of US 89 are either currently, or projected, to operate at a LOS of C or worse.

The LOS of the highway can be improved by reducing vehicular traffic and/or increasing roadway capacity. The capacity can be increased by providing additional passing opportunities and/or by reducing access density. Additional passing opportunities may be provided by decreasing the no-passing zones (through pavement striping), or by constructing dedicated passing lanes.

3.2.3. Right-of-Way and Jurisdiction

Land ownership in the corridor is a mix of private and public. Various state and federal entities hold public land. There are also many areas held in easement for non-governmental conservation groups such as the Gallatin Valley Land Trust, Montana Land Reliance, the Rocky Mountain Elk Foundation, and the Nature Conservancy. Montana Fish, Wildlife & Parks (MFWP) also holds easements along the corridor. Adjacent to the highway, much of the land is in private ownership with low to moderate intensity development. Right-of-way widths vary within the corridor, typically ranging from 160 to 200 or more feet.

3.2.4. Crash Analysis

The MDT Traffic and Safety Bureau provided crash data for US 89 between RPs 0.0 and 52.5 from July 1, 2007, through June 30, 2012. Records show 286 crashes occurring on this section of roadway during the crash analysis period. One crash resulted in a fatality, 19 crashes produced incapacitating injuries, 35 crashes produced non-incapacitating injuries, and 11 crashes produced possible injuries. An incapacitating injury is defined as an injury, other than a fatality, which prevents the injured person from walking, driving, or normally continuing the activities they were capable of performing before the injury.

Table 3.2 provides a comparison of the crash rate, crash severity index, and crash severity rate on US 89 within the study area to the statewide averages for Non-Interstate NHS Routes. Information in the table comes from the Traffic and Safety Bureau. The crash data presented in the table are based on crashes occurring between the five-year period of 2007 and 2012.

Crash rates are defined as the number of crashes per million vehicle miles of travel. For the US 89 corridor, the calculated crash rate was 1.27 crashes per million vehicle miles travelled. By comparison,

the statewide crash rate for Non-Interstate NHS Routes in Montana was 1.01 crashes per million vehicle miles.

The crash severity index is the ratio of the sum of the level of crash degree to the total number of crashes. A crash severity index of 1.84 was calculated for the US 89 corridor, compared to the statewide average severity index of 2.05.

Crash severity rate is determined by multiplying the crash rate by the crash severity index. The US 89 corridor was determined to have a crash severity rate of 2.34, as compared to the statewide average rate of 2.07.

Table 3.2: Crash Data Analysis (2007 to 2011)

Crash Data Location	Crash Rate	Crash Severity Index	Crash Severity Rate
US 89 (RP 0.0 to 52.5)	1.27	1.84	2.34
Statewide Average for Non-Interstate NHS Routes	1.01	2.05	2.07

Source: MDT Traffic and Safety Bureau, 2013

3.2.4.1. Crash Trends, Contributing Factors, and Crash Clusters

An average of 57 crashes occurred each year during the crash analysis period. Most of the crashes involved single vehicles (82 percent) and occurred on dry roads during clear or cloudy weather conditions. More than half (53 percent) of the crashes occurred in darkness or during low-light conditions (dawn or dusk). About 18 percent of the crashes during the analysis period happened when roads were icy, snowy, or wet. The primary contributing factors listed in crashes during the analysis period included alcohol or drug involvement (8 percent of crashes), driving too fast for conditions (6 percent of crashes), careless driving (5 percent of crashes), and failure to yield (5 percent of crashes).

Most of the crashes (95 percent) involved passenger vehicles (automobiles, pickups, SUVs, etc.). Records show seven crashes involving motorcycles, four involving trucks with trailers, and one each involving a bicycle and bus.

The main observed crash trend was wild animal encounters (142), of which 119 were deer, and 16 were elk. The second observed crash trend was single-vehicle, run-off-the-road crashes (77). Of the single-vehicle, run-off-the-road crashes, 34 resulted in overturning. There have been 15 sideswipe crashes, 8 right-angle crashes, 9 rear-end crashes, and 9 domestic animal crashes.

About 6 percent of the reported crashes resulted in rollovers. The locations of these incidents were reviewed, and it was determined that these crashes were not concentrated in specific areas of the corridor.

MDT Safety Engineering Section personnel reviewed the section of US 89 from RP 1.2 to RP 49.7 in 2010. As a result, a corridor-wide, shoulder-rumble-strip improvement was developed. The project is currently being completed under project SF 110–Rumble Strips; UPN 7760000.

The section from RP 23.5 to RP 24.1 was identified as a crash cluster in 2012. As a result, the MDT Safety Engineering Section recommended installing a left-turn lane at the location. This modification is being advanced under project SF 129–Lft Turn Ln Emigrant RA, UPN 8024000.

Several other sections were identified as crash clusters over the 2009 through 2012 period, based on crash records. These areas are identified as follows:

- RP 13.623 to RP 14.124
- RP 24.95 to RP 25.51

- RP 33.3 to RP 33.8
- RP 39.7 to RP 40.25

After further review and analysis, the MDT Safety Engineering Section determined there were no specific crash trends at these locations.

3.2.4.2. Animal Carcasses

A review of the MDT Carcass Database indicates 1,659 animal carcasses were collected on the corridor between January 2002 and December 2012. The carcass information from the database represents the number of animal carcasses recovered from the roadway and differs from Montana Highway Patrol (MHP) crash records presented in section 3.2.4. The MHP crash records are based on a 5-year data period from July 1, 2007 through June 30, 2012. The carcass information is based on an 11-year data period. Also, the number of carcasses recovered is higher than the number of reported crashes involving animals, as not all animal-vehicle collisions are reported to MHP and not all carcasses are a result of a wildlife-vehicle collision. **Table 3.3** summarizes the large mammal species identified in the carcass database query.

Table 3.3: Large Mammal Carcasses

Large Animal	Carcasses Collected	% by Species
Antelope	1	0.06%
Bighorn Sheep	6	0.36%
Bison	2	0.12%
Black Bear	1	0.06%
Elk	94	5.67%
Moose	1	0.06%
Deer (unknown species)	21	1.27%
Mule Deer	1,116	67.27%
White-tailed Deer	417	25.13%
TOTAL	**1,659**	**100%**

Source: MDT Carcass Database, Jan 01, 2002 to Dec 31, 2012

Deer accounted for more than 93 percent of the carcasses collected within the US 89 study area, with mule deer being the most common species. **Figure 3.3** shows the deer carcass density, per half-mile segment, along the corridor. Peaks in recorded deer carcass density occur between RPs 3 and 6, RPs 7 and 14, RPs 24 and 25, RPs 27 and 29, and near RPs 36, 40, and 52.

Other large mammal carcass data for the 11-year period are shown on **Figure 3.4**. Six bighorn sheep carcass locations were collected between November and July, near RPs 1.8, 4.8, 6.7, 12.8, and 14.2. There are also two bison carcasses noted on **Figure 3.4**, collected near RPs 5 and 11. To limit bison movements to the area south of Yankee Jim Canyon, bison guards have been installed in the US 89 roadway, as well as in the county road on the west side of the Yellowstone River. Fencing was constructed adjacent to the bison guards, with gates that can be opened when bison are not present in Gardiner Basin. The bison guards are installed, and adjacent gates are closed, from November through May. Outside of this period the bison guards are removed and replaced with a smooth concrete driving surface. MFWP has an EA currently in progress proposing to allow bison to roam freely year-round. Refer to the MDT *Environmental Scan* (**Appendix 2**) for more detailed information on animal carcass data and large mammal migration routes and habitat.

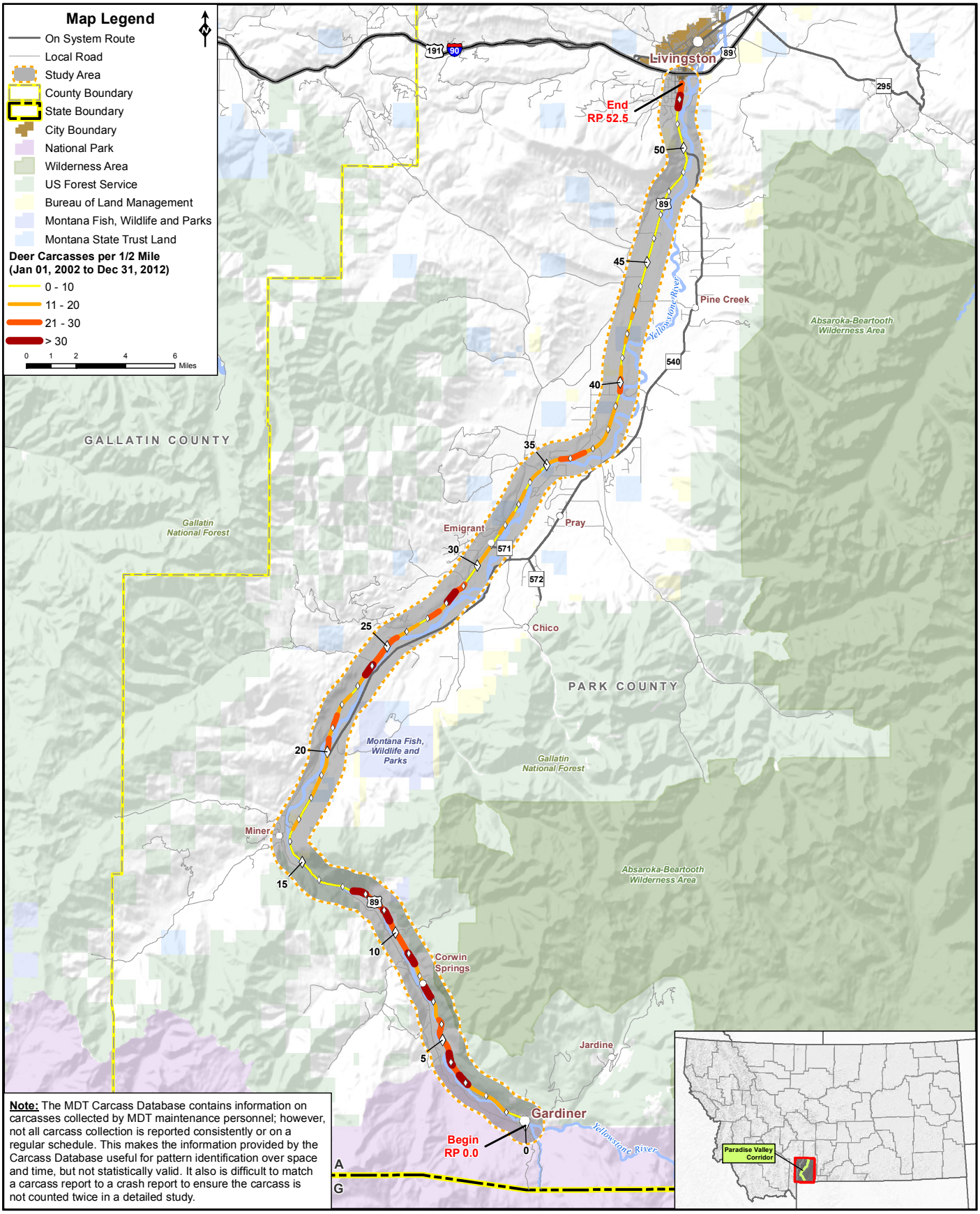


Figure 3.3: Deer Carcass Density Per Half-mile

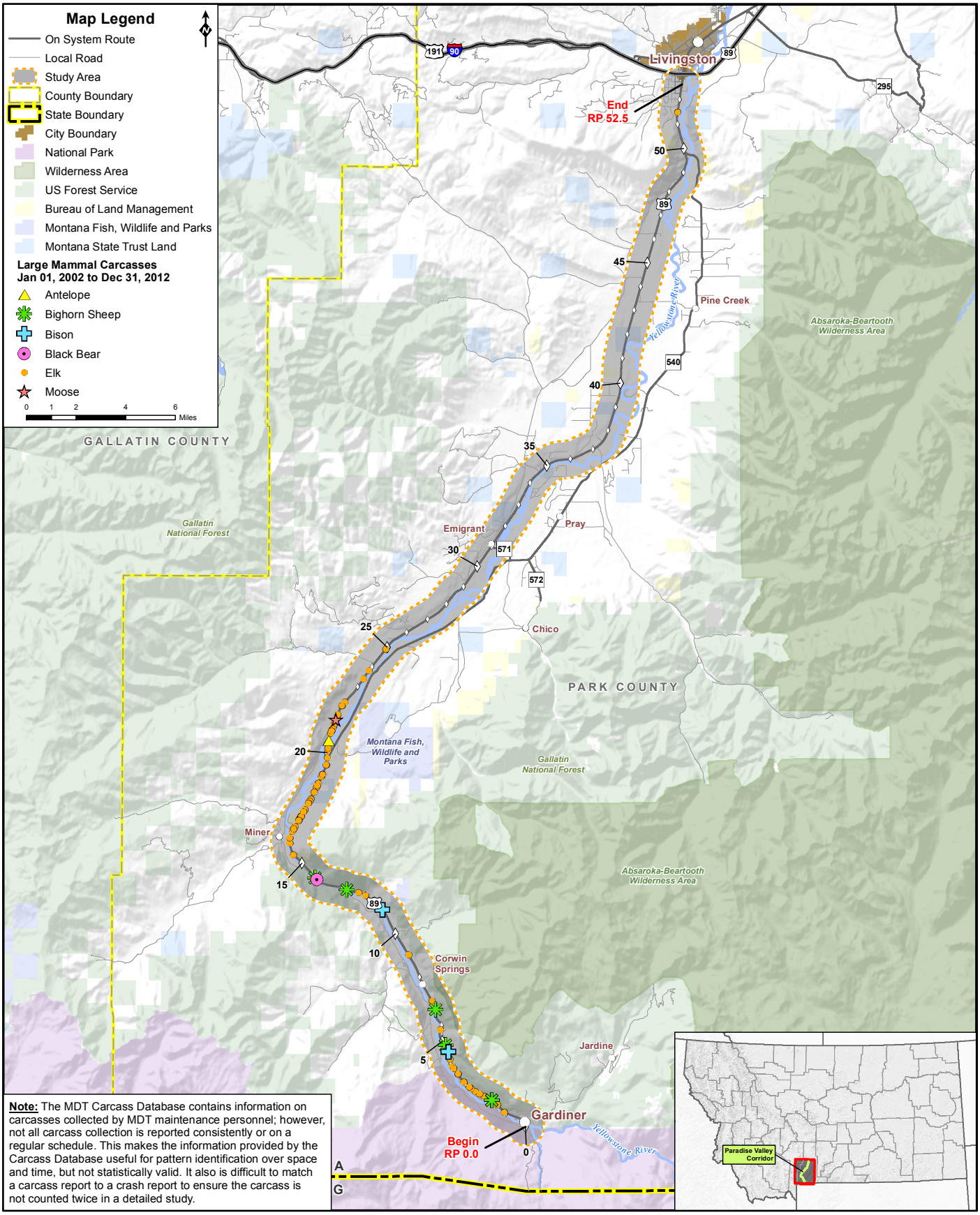


Figure 3.4: Large Mammal Carcasses

3.2.5. Design Standards

The MDT *Road Design Manual* specifies general design principles and controls that determine the overall operational characteristics of the roadway and enhance its aesthetic appearance. The geometric design criteria for the study corridor are based on the current MDT design criteria for a "Rural Principal Arterials (National Highway System-Non-Interstate) Highway." Arterial highways are characterized by a capacity to move relatively large volumes of traffic quickly and a restricted-access-point function to serve adjoining properties. In both rural and urban areas, the principal arterials provide the highest traffic volumes and the greatest trip lengths.

Most of the study area appears to be level terrain, with some areas of rolling terrain. However, a determination of terrain type (i.e., level or rolling) has not been made for the study corridor as that is a project level determination if and when a project commences. For the purposes of this study, areas that do not meet MDTs minimum design standards for level terrain were considered areas of concern.

3.2.6. Roadway Geometrics

Existing roadway geometrics were evaluated and compared to current MDT standards. The analysis was conducted based on a review of public information, MDT as-built drawings, Geographic Information Systems (GIS) data, and field observations. As-built drawings were available and were reviewed for most of the study corridor. Current as-built drawings were unavailable for the sections between RP 0.0 and RP 5.6, RP 10.7 and RP 16.6, and RP 49.9 and RP 52.5. Field reviews of the study corridor took place in May 2013 and July 2013 to confirm and to supplement information contained in as-built drawings, as well as to identify additional areas of concern within the study area.

3.2.6.1. Horizontal Alignment

Elements comprising horizontal alignment include curvature, superelevation (i.e., the bank on the road), and sight distance. These horizontal alignment elements influence traffic operation and safety and are directly related to the design speed of the corridor. MDTs standards for horizontal curves are defined in terms of curve radius, and they vary based on design speed. For a 70-mph design speed (level terrain) the maximum recommended radius is 1,810 feet. The minimum recommended radius for a 60-mph design speed (rolling terrain) is 1,200 feet.

Horizontal curve radius was determined based either on as-built drawings, or, for areas where current as-built drawings were unavailable, on estimates made by using aerial photography (Google Earth, 2014 Digital Globe, imagery date 08/06/2012). Eight horizontal curves were identified that do not meet current MDT standards. **Table 3.4** provides a summary of the eight substandard horizontal curves.

Table 3.4: Substandard Horizontal Curves

RP	Element	Value (ft)	Standard(s) Not Met
0.24	Radius	450 [(i)]	Level, Rolling, Mountainous
5.75	Radius	1,146	Level, Rolling
6.50	Radius	1,637	Level
13.85	Radius	1,000 [(i)]	Level, Rolling
14.35	Radius	1,200 [(i)]	Level
15.42	Radius	1,200 [(i)]	Level
49.10	Radius	1,433	Level
49.35	Radius	1,433	Level

[(i)] Current as-built drawings not available; values were estimated based on aerial photography.

3.2.6.2. Vertical Alignment

Vertical alignment is a measure of elevation change of a roadway. The length and steepness of grades directly affect the operational characteristics of the roadway. The MDT *Road Design Manual* lists recommendations for vertical alignment elements such as grade, rate of vertical curvature (K-value), and stopping sight distance. Recommendations are made based on roadway classification and terrain type.

According to the *Road Design Manual*, the maximum allowable grades are 3 percent for level terrain and 4 percent for rolling terrain. For vertical curves, stopping sight distance and K-values are controlling design criteria. K-values are defined as a function of the length of the curve compared to the algebraic change in grade, which comprises either a sag or a crest vertical curve. **Table 3.5** provides a list of substandard vertical alignment areas based on current as-built drawings. Vertical alignment was not analyzed for areas where current as-built drawings were unavailable.

Table 3.5: Substandard Vertical Alignment Areas

RP	Element	Value	Standard Not Met
8.33	Vertical Curvature	149.4	Level
8.33 - 8.56	Grade	4.06%	Level, Rolling
8.97 - 9.37	Grade	-3.82%	Level
9.37	Vertical Curvature	162.5	Level
18.94 - 19.17	Grade	3.06%	Level
49.19	Vertical Curvature	138.9	Level
	Stopping Sight Distance	574.7	Level

3.2.6.3. Roadside Clear Zone

The roadside clear zone, starting at the edge of the traveled way, is the total roadside border area available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a recovery area. The desired clear zone width varies depending on traffic volumes, speeds, and roadside geometry. Clear zones are evaluated individually based on the roadside cross section. According to the MDT Design Manual, the clear zone should be attained by removing or shielding obstacles, if costs are reasonable.

In certain instances within the study area, it may be impractical to protect or remove certain obstacles within the clear zone. Roadside clear zones should be determined, to a practical extent, to meet current MDT design standards as improvement options are forwarded.

3.2.7. Passing Zones

Passing opportunities can be provided along the corridor in areas where roadway geometrics allow. Passing areas are designated by broken yellow center pavement markings. No passing zones are established in areas where there is insufficient passing sight distance, or near public approaches with enough volume that may present operation and/or safety concerns. The following information summarizes the guidelines for no-passing zones as contained in the MDT *Road Design*[1] *Manual*:

- For determining a no-passing zone, the distance along a driver's line-of-sight is measured from a 3.5-foot height of eye to a 3.5-foot height of object.
- For 2-lane rural highways on the NHS, the no-passing zone design speed will be 70 mph.
- The minimum passing sight distance required for a 70-mph no-passing zone design speed is 1,200 feet.
- The minimum length for a no-passing zone is 500 feet.

[1] MDT Road Design Manual, Section 13.3, November 2007.

- If the length between successive no-passing zones in the same direction of travel is less than 1,000 feet, then the gap between the no-passing zones should be closed.
- A no-passing zone should be marked in advance of certain high volume intersections at a minimum distance of 500 feet.

Figure 3.5 shows the passing zones along the corridor as documented through on-site field review, aerial imagery from July 2011, and *Google Street View* imagery from August 2011. An analysis of the existing passing zones reveals that there are seven locations where passing zones are less than 1,000 feet long, and there is one location where passing is allowed in front of a public approach.

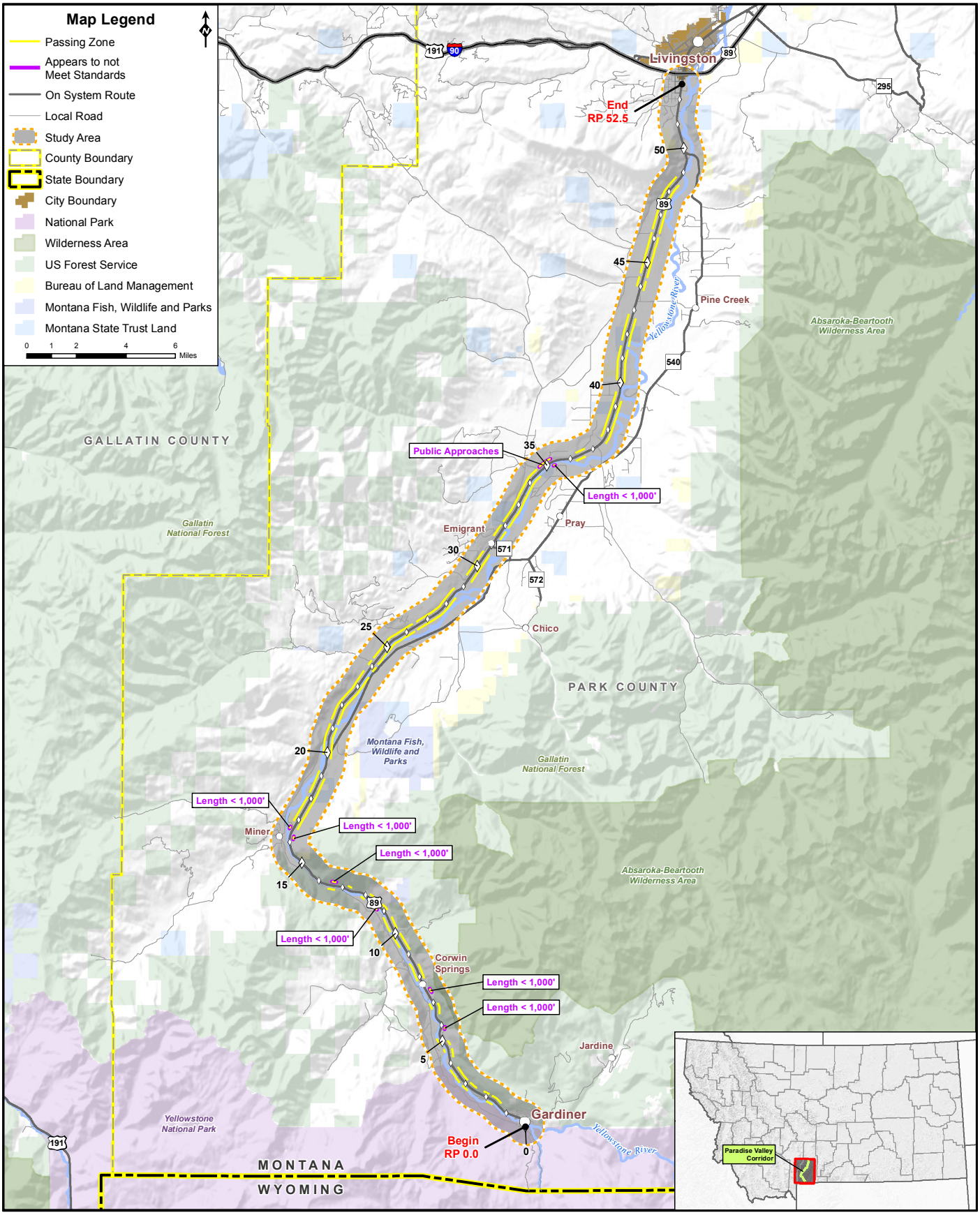


Figure 3.5: Existing Passing Zones

3.2.8. Roadway Surfacing

The corridor consists of paved roadway of varying widths, from 44 to 32 feet. Existing roadway surfacing characteristics were determined from MDTs *Montana Road Log* and on-site field review. The *Road Log* contains information for surface width, lane width, shoulder width, surfacing thickness, and base thickness.

The MDT *Road Design Manual* requires a minimum travel lane width of 12 feet. The MDT *NHS Route Segment Plan* suggests a width of 40 feet or greater for the corridor. However, the *NHS Route Segment Plan* no longer defines the standard roadway width. The MDT Roadway Width Committee is responsible for determining the appropriate width during future project development. According to the *Road Log*, US 89 has a road width less than 40 feet from RP 1.1 to RP 53.

3.2.9. Pavement Condition

MDT annually measures pavement condition in the corridor. The collected data is analyzed within MDT's Pavement Management System (PvMS). To evaluate the level of distress in the pavement, indices are calculated to identify the degree of cracking, rutting and road smoothness (ride). MDT uses the PvMS to identify timing and types of treatments needed to extend pavement life. The pavement condition indices reported are based on a 0 - 100 scale, where 100 represents “in new” condition.

The pavement condition indices for US 89 within the study area indicate a well-maintained corridor. The ride index is “fair” to “good” for most of the corridor, except for the first 1.1 miles in Gardiner. The overall performance index (OPI), which is a comparison index that combines and weighs multiple distresses, is another tool used to compare segments. For the majority of the corridor, the segments are in the “good” category except the first 1.1 miles in Gardiner.

3.2.10. Access Points

Access points were identified through a review of available GIS data gathered in June 2011 and aerial photography from July 2011. Based on this review, there are approximately 341 access points along the corridor. Most of the access points are private/farm field approaches.

The angle of approach is the angle at which the approaching road intersects the major road. Desirably, approaching roadways should intersect at or as close to 90° as practical. Intersection skews greater than 30° from perpendicular are undesirable, as the driver’s line of sight for one of the sight triangles becomes restricted. Accordingly, based on MDT standards[2], the approach angle should be between 60° and 120°. **Table 3.6** provides a summary of access points grouped in incremental segments along the study area.

[2] Montana Department of Transportation, *Approach Standards for Montana Highways*, 1983

Table 3.6: Access Points

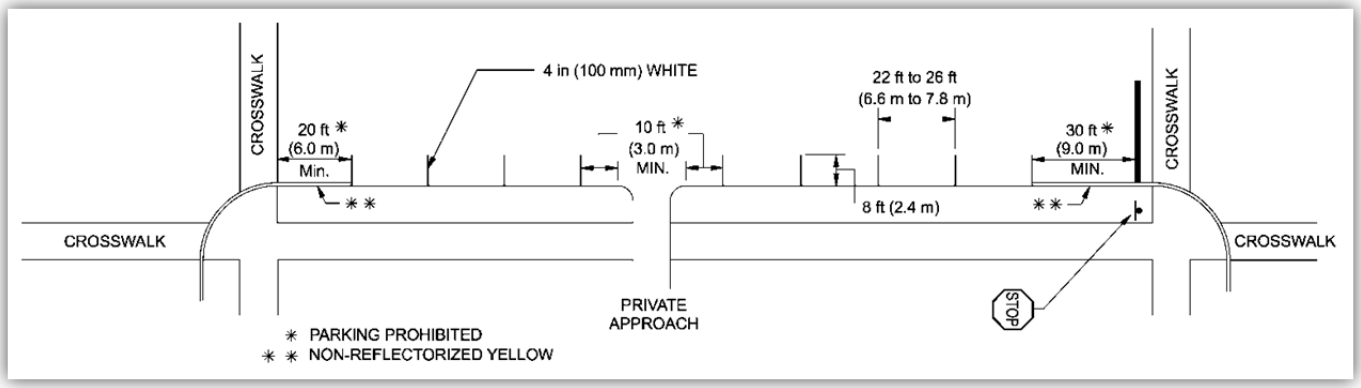
Location (RP) Begin	Location (RP) End	Length (mi)	Access Points	Density (Access / mi)	Skewed < 60° Angle	Comments
0	4	4.0	67	16.8	2	Gardiner
4	8	4.0	30	7.5	3	Gardiner to Corwin Springs
8	12	4.0	50	12.5	0	North of Corwin Springs
12	17	5.0	9	1.8	0	Yankee Jim Canyon
17	23	6.0	19	3.2	0	East River Road
23	29	6.0	32	5.3	1	None
29	35	6.0	16	2.7	0	Emigrant
35	42	7.0	25	3.6	0	Mill Creek
42	49	7.0	24	3.4	5	Pine Creek
49	52.5	3.5	69	19.7	0	South of Livingston
TOTAL		52.5	341	6.5	11	

3.2.11. PARKING

On-street parking is provided within the town of Gardiner. The MDT *Traffic Engineering Manual* provides guidelines for on-street parking facilities. The guidelines are shown in **Figure 3.6** and are summarized below[3]:

- Prohibit parking within 20 feet of any crosswalk.
- Prohibit parking at least 10 feet from the beginning of the curb radius at mid-block approaches.
- Prohibit parking from areas designated by local traffic and enforcement regulations.
- Prohibit parking within 30 feet from end of curb return on the approach leg to any intersection with a flashing beacon, stop sign, or traffic signal.
- Prohibit parking on bridges.
- Eliminate parking across from a T-intersection.

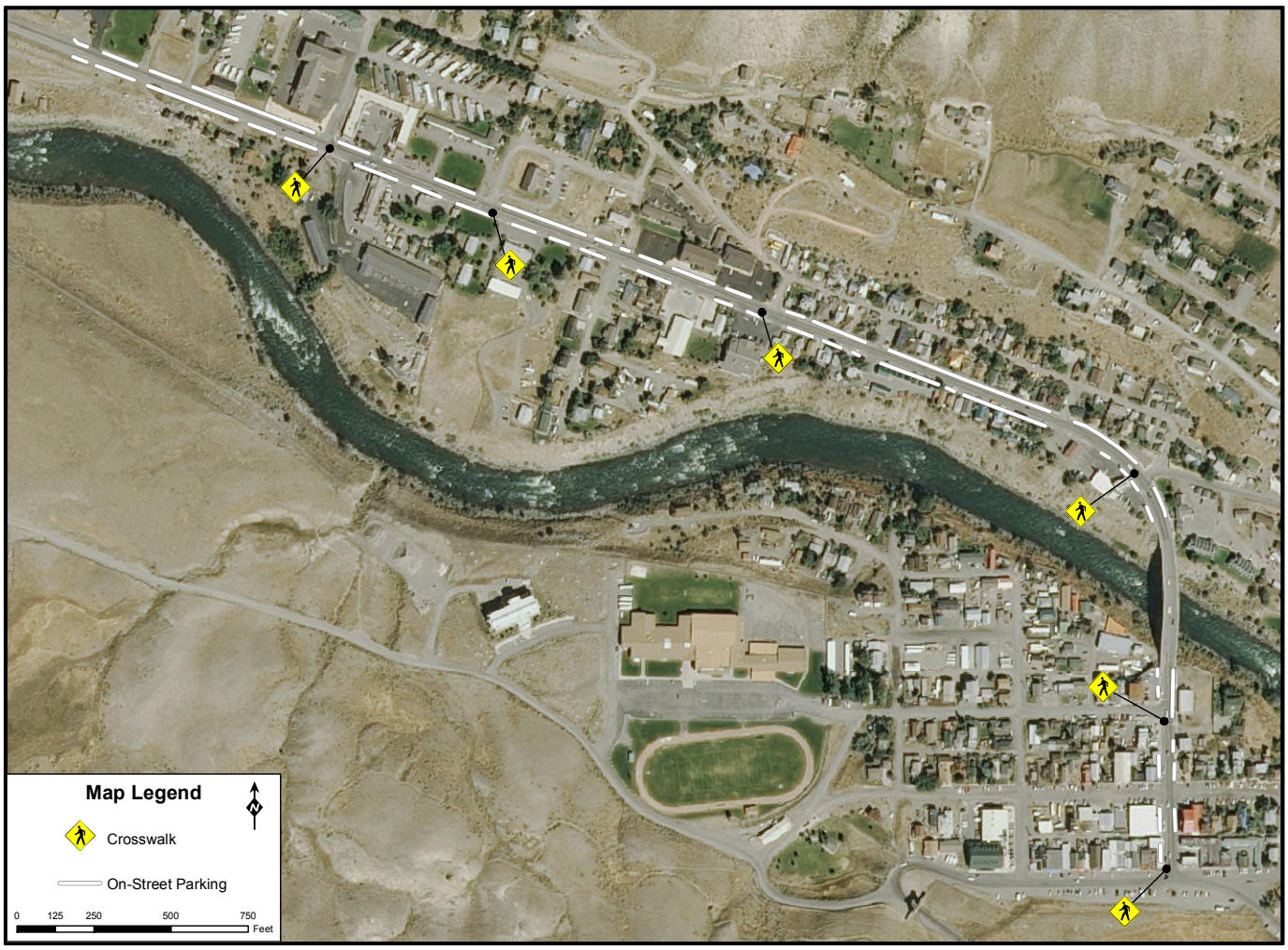
Figure 3.6: Typical Markings for On-Street Parking[4]



An inventory of existing on-street parking areas and crosswalk locations was conducted through on-site field review, aerial photography from July 2013, and *Google Street View* imagery from August 2011. **Figure 3.7** shows the existing parking areas and crosswalks in the Gardiner urban area.

[3] MDT Traffic Engineering Manual, Section 31.4.1.3, November 2007
[4] MDT Traffic Engineering Manual, Figure 19.5i, November 2007

Figure 3.7: Existing On-Street Parking and Crosswalks in the town of Gardiner



3.2.12. Special Speed Zones

Speed zones were reviewed by comparing on-the-ground speed limit signage with adopted statutory and special speed zones on record with MDTs Traffic and Safety Bureau. The intent of this review was to confirm that speed limit signage on US 89 within the study area matches special speed zone beginning and ending reference posts. To perform this review, Google aerial imagery and field observations were used to confirm speed limit sign compliance with termini points of the special speed zones, as documented by past Montana Transportation Commission resolutions. This review found that all special speed zones were signed in compliance with the Montana Transportation Commission resolutions. **Table 3.7** shows the locations of the special speed zones and the statutory speed areas, by reference post range.

Table 3.7: Statutory and Special Speed Zones

Location (RP)		Length (mi)	Area Name	Speed Limit
Begin	End			
0.00	0.66	0.66	Gardiner	25 MPH
0.66	0.87	0.21	Gardiner	35 MPH
0.87	1.21	0.34	Gardiner	45 MPH
1.21	1.45	0.24	Gardiner	55 MPH
1.45	7.42	5.97		70 MPH
7.42	7.90	0.48	Corwin Springs	60 MPH
7.90	30.78	22.88		70 MPH
30.78	31.17	0.39	Emigrant	55 MPH
31.17	49.17	18.00		70 MPH
49.17	52.36	3.19	Livingston	55 MPH
52.36	52.65	0.29	Livingston	45 MPH
52.65	53.74	1.09	Livingston	35 MPH

Source: MDT Traffic and Safety Bureau, August 29, 2013.
Note: Corridor study terminus is RP 52.50. Speed information is shown to RP 53.74 to show continuity of 45-mph to 35-mph step-down through Livingston.

3.2.13. HYDRAULICS

Drainage Conditions

US 89 crosses the Yellowstone River at two locations within the study area. The corridor also crosses 11 named streams and several unnamed drainages. Runoff from the highway typically is directed to shoulders and subsequently conveyed to outfall locations via graded roadside slopes and constructed roadside ditches. A review of as-built plans identified more than
50 locations along the corridor where culverts were installed to convey runoff beneath US 89.

Bridges

Three bridge crossings and an arch culvert are located along the corridor according to the MDT *Bridge Management System*. All structures have recent inspection reports available. **Table 3.8** shows each structure and lists the location, type, size, year constructed, and feature crossed. All of the structures are open to full legal loads.

Table 3.8: Bridge Locations and Type

Bridge Information	
	**P00011000+01651 - GARDINER** **Location:** RP 0.16 **Type of Bridge:** 3-span steel truss structure **Dimensions:** 38' wide x 409' long **Year Constructed:** 1930 **Feature Crossed:** Yellowstone River
	**P00011020+04171 - 11 MI SW OF EMIGRANT** **Location:** RP 20.36 **Type of Bridge:** 4-span steel girder structure **Dimensions:** 28' wide x 455' long **Year Constructed:** 1958 **Feature Crossed:** Yellowstone River
	**P00011024+00721 - 7 MI SW OF EMIGRANT** **Location:** RP 24.02 **Type of Bridge:** 3-span concrete T-beam structure **Dimensions:** 28' wide x 90' long **Year Constructed:** 1960 **Feature Crossed:** Big Creek
	**P00011047+09001 – 6.2 MI S LIVINGSTON** **Location:** RP 47.74 **Type of Bridge:** Steel Culvert **Dimensions:** 32' wide x 15' long **Year Constructed:** 1964 **Feature Crossed:** Farm Access

Source: MDT Bridge Management System, 2012

Table 3.9 shows the performance measure rankings, for the four structures within the study area. None of the bridges within the study is structurally deficient.

The three bridges in the study area rank "good" for the Structure Condition performance measure, indicating they are candidates for continued preservation. The bridge decks (riding surfaces) are candidates for preservation treatments ranging from crack sealing to resurfacing.

Table 3.9: Bridge Sufficiency Rating

Criteria	Bridge at RP 0.16	Bridge at RP 20.36	Bridge at RP 24.02	Culvert at RP 47.74
Based on Inspection Form	04/18/2013	10/02/2012	01/02/2013	08/23/2011
Structure Condition Performance Measure	Good	Good	Good	N/A*
Deck Condition Performance Measure	Fair-2	Fair-1	Good	N/A*

** The Performance Measures are not applicable to culverts. This culvert is considered to be in "Good" condition.*
Source: MDT Bridge Management System, 2012

The Yellowstone River Bridge in Gardiner is a steel truss. Truss bridges are “fracture critical”, meaning if one part of the truss should fail, the entire bridge span may fail. The bridge requires special fracture critical inspections to help safeguard against the possibility of a failure.

3.2.14. Geotechnical Considerations

Landslide Areas

The Montana Bureau of Mines and Geology (MBMG), in cooperation with MDT, completed a study and compilation of landslide data for MDTs Butte District (District 2) during 2002. The study identified more than 4,600 landslides within the district through field mapping, aerial reconnaissance, aerial photograph interpretation, and literature references. MBMG produced a database for identified landslide areas with key characteristics like location, type, geologic aspect, and size. A priority rating system was developed and assigned to areas with landslide clusters. The rating system (using values ranging from 1 to 5) helped determine areas with the highest priorities for more detailed landslide hazard investigations.

The study indicated that formations containing volcanic materials (due to the ash and clay content) and areas with poorly consolidated sediments are particularly prone to landslides. Causes of and factors contributing to landslides are steep topography, previous glaciations, orientation of bedding, human activities, and stream undercutting. Landslide triggers can include earthquakes, increased moisture or water, and toe excavation. There was also a strong relationship between the locations of faults and landslides in the Butte District.

A portion of the study included examination of landslide occurrences and conditions in the Livingston and Gardiner areas. Landslides in the Livingston area are most often associated with debris flows, debris slides, and earth slides. In the Gardiner area, landslides include both debris and rockslides, as well as earth, debris, and rock flows. The Landslide Report identifies three landslide cluster areas adjoining US 89 within the study area. These cluster areas are discussed below.

- **Gardiner–Area 7**: Includes an area where landslides are located along tributaries of the Yellowstone and Gardiner Rivers. The area contains a large earth flow, debris slides, and very large debris flows. US 89 from RP 0 to approximately RP 5 lies within this cluster area, which contains numerous faults and intrusive volcanic dikes that contribute to landslides. The earth flow and a debris slide are located immediately east of US 89, and the remaining landslides are on or near tributaries of the Yellowstone River. New or renewed movement could affect any or all of these features. This cluster area was assigned a medium priority (Priority 3) for more detailed study and risk assessment.

- **Gardiner–Area 1**: Parallels the Yellowstone River Valley, and landslides occur on both sides of the valley. The cluster area contains a large debris slide/flow complex, large debris flows, and debris slides. US 89 from approximately RP 10 to RP 24 is located in the central portion of this landslide cluster area. New or renewed movement in this slide area could affect Big Creek, Tom Minor Creek, the Yellowstone River, and US 89. This cluster area was identified as a medium-high priority (Priority 2) for more detailed study and risk assessment.

- **Livingston–Area 12**: Includes the portion of US 89 from RP 47 to RP 51, and most of the landslide cluster is located west of the highway. Numerous faults and tight fold structures are present,and there are debris slides and flows, as well as earth slides and flows found within the area. This cluster area was assigned a high priority (Priority 1) for more detailed study and risk assessment.

Rockfall Hazard Areas

MDT completed a Rockfall Hazard Classification and Mitigation System research project in September 2005[5]. As a result of the project, MDT implemented the Rockfall Hazard Rating System (RHRS) to provide the information needed to help make informed decisions on where to invest the limited funding available for rockfall mitigation.

As part of the research project, an initial review of the state highway system (including US 89) was conducted, and more than 2,600 potential rockfall sites were identified using MDTs extensive photo log system. Input on the rockfall history and behavior information was then solicited from MDT maintenance staff for each site. All identified sites were visited and categorized as being "A," "B," or "C" sites, denoting

a high, moderate, or low potential to develop a hazardous rockfall situation. The project categorized 1,869 sites on the road system as either "A" or "B" sites, indicating their moderate to high potential to develop a hazardous rockfall situation. Sites in the "C" category were eliminated from further consideration due to their low rockfall hazard threat. Additional and more detailed ratings were conducted on the 869 "A" sites to narrow the list of sites and ultimately identify the top 100 A-rated sites on the state highway system.

The US 89 corridor contains 12 "A" or "B" rockfall hazard sites that were examined in the Rockfall Hazard Classification and Mitigation System research project and were incorporated into MDT's RHRS Database. **Table 3.10** identifies the RHRS sites that occur in the study area. Three of the sites along US 89 were included in the top 100 A-rated sites identified through the project.

Table 3.10: Rockfall Hazard Rating System Sites

RP Start	RP End	Side of Road	Maintenance Rating	Preliminary Rating	Type
6.01	6.06	Right	B	B	B
6.57	6.96	Right	A	A	A
12.2	12.46	Right	A	B	B
13.22	13.32	Right	A	B	B
13.32	13.66	Right	A	A	A (TOP 100)
13.66	13.84	Right	A	B	B
13.84	13.96	Right	A	A	A (TOP 100)
13.96	14.61	Right	A	A	A (TOP 100)
15.03	15.71	Right	--	B	B
15.71	15.84	Right	A	A	A
48.99	49.17	Left	B	B	B
49.32	49.38	Left	B	B	B

Source: Rockfall Hazard Classification and Mitigation System, Final Report, September 2005

3.2.15. Other Transportation Modes

Pedestrians and Bicyclists

A pedestrian/bicyclist path exists along the west side of US 89, from the roadway's intersection with East River Road (S-540) at RP 49.8, north past the end of the study area at Merrill Lane (approximately RP 52.5). A sidewalk was installed along US 89 north of Merrill Lane. Within the town of Gardiner, sidewalks are provided along US 89 from approximately Hellroaring Street (RP 0.8), across the

[5] Landslide Technology, *Rockfall Hazard Classification and Mitigation System, Final Report*, FHWA/MT-05-011/8174, prepared for the State of Montana, Department of Transportation Research Programs, September 2005.

Yellowstone River Bridge, to RP 0.0 at Park Street. In the rural portions of the corridor, no dedicated pedestrian facilities exist along US 89. Pedestrians and bicyclists use the roadway shoulder for travel.

Recreational opportunities, including fishing access sites, trailheads, and proximity to YNP, bring pedestrians and bicyclists to this corridor. The communities of Gardiner, Corwin Springs, and Emigrant are located along US 89, and activities within these areas may also generate some pedestrian and bicyclist use of the highway.

When the rail line from Livingston to YNP was abandoned, adjoining landowners generally acquired the easement for the line. USFS maintains a portion of the former rail easement for use as a walking path in Yankee Jim Canyon north of Gardiner.

Portions of US 89 within the study area are on the route of the Cycle Greater Yellowstone tour, a seven-day, fully supported bicycle tour of the Greater Yellowstone area in Montana and Wyoming. The 2013 tour occurred in August, and participants began in Livingston and travelled to Gardiner via US 89 and S-540 on one day of the tour (August 19, 2013). Other communities along the tour include West Yellowstone, Ennis, Silver Gate/Cooke City, Cody, and Red Lodge. The event accommodates up to 1,000 riders.

Transit

Between Livingston and Bozeman, five-day-per-week commuter bus service is available from the Human Resource Development Council (HRDC)/Streamline. Attempts by HRDC/Streamline to expand public transportation options into the study area have been unsuccessful.

Angel Line Transportation provides transportation to Senior Citizens (over 60) and disabled persons (all ages) needing special care in Park County. Angel Line transports people for various purposes that include medical appointments, recreation, shopping, and work. Transportation services typically are available Monday through Friday (except holidays) from 8:00 am to 4:30 pm. Services are available one or two days per month for Gardiner. This service must be requested at least one business day in advance.

The study area experiences considerable seasonal use by local, regional, and national tour bus and charter bus operators between April and October. Karst Stage and Rimrock Stages charter transportation for seasonal visitors to YNP from Livingston. Karst Stage also offers daily trips into YNP from Livingston. The trips depart from Livingston at 6:30 a.m. daily and travel to Bozeman, West Yellowstone, and through YNP before exiting at Gardiner and returning to Livingston 12 hours later.

At least one company offers private wildlife and scenic tours originating from Gardiner.

Air Service

There are two landing strips/airports within the study area: the Gardiner Airport and the Flying Y Ranch Airport. Gardiner Airport is a public-use airport located 2 miles northwest of the community. The Gardiner Airport is located west of US 89 and is accessed via Airport Road at RP 1.9. Approximately 7,600 annual operations (takeoffs or landings) occur at the airport. They consist of itinerant general aviation (53 percent of the operations), local general aviation (39 percent of the operations), and air taxi (8 percent of the operations).[6]

The Flying Y Ranch Airport is a private airport, and permission is required before using the landing strip at the airfield. The facility is located approximately 14 miles south of Livingston (0.3-mile northwest of the Mill Creek Road intersection with US 89 at RP 37.2).

[6] AirNav, LLC, 2012, www.airnav.com

Rail

Montana Rail Link (MRL) owns and operates the railroad facilities at Livingston. A rail spur, located along the west side of US 89, begins north of Merrill Lane (at RP 52.5) and continues northward along US 89 to join the MRL main line in Livingston. A spur line to a lumber company crosses US 89 at RP 52.7. Railroad crossing warning signals with appropriate roadway signing and pavement markings exist at the spur line crossing. While the crossing is beyond the northern boundary of the study area, it was noted due to its proximity.

3.2.16. Utilities

Park Electric Cooperative and NorthWestern Energy Electric provide power. Overhead power lines are present intermittently along both sides of the highway within the study area and occasionally cross over the roadway. Large electrical substations exist east of the highway north of Gardiner at RP 1.6 and southwest of the intersection of US 89 and Tom Miner Creek Road near RP 16.6. NorthWestern Energy also provides natural gas service within the study area. Century Link provides telecommunication services to the study area and has intermittently been installing fiber-optic cable to upgrade the communications infrastructure for Yellowstone National Park and the community of Gardiner. Individuals outside the community of Gardiner obtain water and sewer service by using wells and septic tanks, respectively.

3.3. ENVIRONMENTAL SETTING

This section summarizes the *Environmental Scan* (**Appendix 2**). The primary objective of the *Environmental Scan* is to determine potential constraints and opportunities within the study area. As a planning-level scan, the information is obtained from various publicly available reports, websites, and other documentation. This scan is not a detailed environmental investigation. Refer to the MDT *Environmental Scan* for more detailed information.

3.3.1. Physical Environment

3.3.1.1. Soil Resources and Prime Farmland

Information on soils was obtained to determine the presence of prime and unique farmland in the study area to demonstrate compliance with the Farmland Protection Policy Act (FPPA). FPPA (Section 4201) defines farmland as including prime farmland; prime if irrigated farmland; unique farmland; and farmland, other than prime or unique farmland, that is of statewide or local importance. Soil map units found within the study area have been classified as prime and important farmlands.

If a project is forwarded and lands are acquired from these areas, and the project is funded with federal funds, MDT would complete a CPA-106 Farmland Conversion Impact Rating Form for Linear Projects and coordinate with the National Resource Conservation Service (NRCS). NRCS uses information from that form to keep an inventory of the prime and important farmlands within the state. Projects planned and completed without the assistance of a federal agency are not subject to the FPPA.

3.3.1.2. Geologic Resources

There are three designated faults within the study area, the Northern Section of the Emigrant Fault, the Southern Section of the Emigrant Fault, and the East Gallatin–Reese Creek Fault System. Improvements brought forward from the study should be developed based on enough borings to evaluate soils where work is proposed to ensure suitability for the planned project. If unsuitable soil is encountered, increased costs for excavation, haul-off, and import of materials should be expected.

3.3.1.3. Surface Waters

The main surface water in the study area is the Yellowstone River. Additionally, various surface waters, including streams, natural drainages, and wetlands, are also present in the area. Impacts on these surface waters may occur from project improvements such as culverts under the roadway, or rip rap armoring of banks. If a project proceeds, impacts should be avoided and minimized to the maximum extent practicable.

Total Maximum Daily Loads Information

Information on the Yellowstone River and its tributaries was obtained from MDEQs website. Section 303, subsection "d," of the Clean Water Act requires the State of Montana to develop a list, subject to U.S. 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, MDEQ determines the causes and sources of pollutants in a subbasin assessment and sets maximum pollutant levels, called total maximum daily loads (TMDLs).

A TMDL sets maximum pollutant levels in a watershed. TMDLs become the basis for implementation plans to restore the water quality to a level that supports its designated beneficial 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.

The Upper Yellowstone Watershed is listed in the 2012 Integrated 303(d)/305(b) Water Quality Report for Montana by MDEQ. The waterbodies within the Upper Yellowstone Watershed that are located in the study area are Category 5 and Category 4C. Category 5 waterbodies are waters where one or more applicable beneficial uses have been assessed as being impaired or threatened, and a TMDL is required to address the factors causing the impairment or threat. Category 4C waterbodies are waters where TMDLs are not required as no pollutant-related use impairment is identified. TMDLs have not yet been written for waterbodies in this watershed. When TMDLs are prepared, and implementation plans are in place, any construction practices would have to comply with the requirements set forth in the plan, should a project be moved forward.

Upper Yellowstone River Special Area Management Plan

USACOE is responsible for issuing permits for work in the upper Yellowstone River in accordance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. The Yellowstone River is considered Section 10 water from Emigrant to its confluence with the Missouri River.

The Upper Yellowstone River Special Area Management Plan (SAMP) covers the 86-mile stretch from the boundary of YNP to approximately seven river miles upstream of Springdale. The SAMP directs the USACOE to evaluate how a project may affect the entire watershed, floodplain, and valley before approving a permit.

The SAMP process created a Special River Management Zone (SRMZ), which is intended to provide enhanced protection within the 48-mile reach that is most susceptible to forced morphology. The SRMZ extends from approximately four river miles upstream of Emigrant (river mile 531.8) to approximately seven river miles upstream of Springdale (river mile 483.6). If a project is forwarded, impacts on Waters of the United States associated with the projects' development would require USACOE permitting. Impacts on Waters of the United States within the SAMP/SRMZ would require specialized USACOE permitting. The USACOE will evaluate proposed transportation projects and potential impacts in detail, possibly making it more difficult to secure a Section 404 Permit. This difficulty and the potential increase in permitting time should be considered if improvements are forwarded from the study.

Wild and Scenic Rivers

Congress created the Wild and Scenic Rivers Act in 1968 to provide for protection of certain selected rivers and their immediate environments that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. The NPS website was accessed for information on river segments that may be located within the study area with a wild and scenic river designation. At this time, neither the Yellowstone River, nor any one of its tributaries, carries the wild and scenic designation.

Groundwater

There are 5,444 wells currently on record in Park County, and some of these wells exist within the study area. The wells in Park County have many different uses, with domestic use being the most common. If a project is forwarded from the study, impacts on existing wells would have to be considered.

Wetlands

The USACOE 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.

Most of the wetland areas occur within the riparian bottomlands associated with the Yellowstone River, its tributaries, and the major draws coming out from the mountains. A notable amount of potential wetland area occurs in the valley, adjacent to the current highway alignment. Any project forwarded from this study has the potential to impact wetland areas, riparian areas, and streams.

If projects that could impact wetlands are forwarded from the study, formal wetland delineations would have to be completed. Future projects in the corridor would have to incorporate project design features to avoid and minimize adverse impacts on wetlands to the maximum extent practicable.

Floodplains (EO 11988) and Floodways

Executive Order (EO) 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. EO 11988 and 23 Code of Federal Regulations (CFR) 650 Part A requires an evaluation of project alternatives to determine the extent of any encroachment into the base floodplain. The base floodplain (100-year flood) is the regulatory standard used by federal agencies and most states to administer floodplain management programs. A floodplain is defined as lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, with a 1 percent or greater chance of flooding in a given year. As described in FHWAs floodplain regulation (23 CFR 650 Part A), floodplains provide natural and beneficial values serving as areas for fish, wildlife, plants, open space, natural flood moderation, water quality maintenance, and groundwater recharge.

Irrigation

Irrigated grazing land exists in Park County adjacent to US 89 within the study area. Impacts on irrigation facilities should be avoided to the greatest extent practicable. However, depending on the improvement option(s) identified during the study, there is a potential to impact irrigation facilities. Irrigation canals, ditches, or pressurized systems that require modifications to the existing facilities will be redesigned and constructed in consultation with the owners to minimize impacts on agricultural operations. Additional expenses could be created if projects carried forward from the study create impacts on irrigation facilities.

3.3.1.4. Air Quality

USEPA designates communities that do not meet National Ambient Air Quality Standards (NAAQS) as “non-attainment areas.” States are then required to develop a plan to control source emissions and

ensure future attainment of NAAQS. The Paradise Valley corridor is not located in a non-attainment area for particulate matter (PM-2.5 or PM-10) or carbon monoxide (CO). Additionally, there are no nearby PM-2.5, PM-10, or CO non-attainment areas. As a result, special considerations will not be required in future project designs to accommodate NAAQS non-attainment issues.

Depending on the scope of future projects being considered along this corridor, an evaluation of mobile source air toxics (MSATs) may be required. MSATs are compounds emitted from highway vehicles and off-road equipment that are known or suspected to cause cancer or other serious health and environmental effects.

3.3.1.5. Hazardous Substances

The Montana Natural Resource Information System (NRIS) database was searched for 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 in the vicinity of the study.

There is a cluster of the before-mentioned sites around the City of Livingston and the unincorporated town of Gardiner. These sites can be found intermittently throughout the entire study area. The following is a brief synopsis of the three main types of sites within the study area identified with potential contamination impacts that should be avoided, if possible. If a project is forwarded, and UST, LUST, or contaminated soils are encountered, removal and cleanup are required. These activities would increase costs.

Underground Storage Tanks

Approximately 29 USTs were identified. Most of the USTs are from agricultural farms with limited site assessment data and imprecise GIS location data. In agricultural situations, such as those seen in the study area, the USTs usually are located within the farm, near the shop, and away from the highway. Additional investigation of the precise locations of the USTs may be warranted if a project progresses.

Leaking Underground Storage Tanks

Approximately 29 LUSTs were identified. Most of the releases from these LUST sites have been resolved, or have been characterized during previous investigations. Only one LUST site is designated as having a high priority ranking assigned by MDEQ, and it is not located directly adjacent to the study area. Therefore, it is not anticipated that LUST sites would adversely impact future projects that may advance from the study. However, further review and potential investigation may be necessary if the highway alignment changes.

Abandoned and Inactive Mine Sites

Abandoned and inactive mine sites were identified. Most of the mine sites are underground mines, and they could cause subsidence issues underneath or on the embankment above the highway if the horizontal alignment shifts considerably. Some of the mines have been reclaimed by the MDEQ Abandoned Mine Section. It is not anticipated that mines identified during the environmental scan will adversely impact highway expansion, but additional investigation may be necessary if a project progresses.

3.3.2. Noise

Traffic noise may have to be evaluated if improvements to US 89 are forwarded within the study area. Noise analysis is necessary for Type I projects. If the roadway improvements are limited (e.g., the horizontal and vertical alignments are not changed, and the highway remains a two-lane facility), then the project would not be considered a Type I project. If the improvement includes a substantial shift in the

horizontal or vertical alignments, an increase in the number of through-lanes, passing lanes, or turning lanes, or an increase in traffic speed and volume, then the project would be considered a Type I project.

A detailed noise analysis would be required if the forwarded project is considered a Type I project. The analysis would include measuring ambient noise levels at selected receivers and modeling design-year noise levels using projected traffic volumes. Noise abatement measures would be considered for the project if noise levels would approach or substantially exceed the noise abatement criteria. The noise abatement measures must be considered reasonable and feasible before implementation.

3.3.3. 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.

The landscape throughout the study area contains an array of biological, scientific, historic, wildlife, ecological, geologic, and cultural resources mixed with a remote location. The Roosevelt Arch marks the entrance to YNP near RP 0.0. YNP creates a large draw for many visitors to travel US 89 along the edge of the scenic Yellowstone River. The area along US 89 is a blended landscape that has been mildly developed, while retaining the natural beauty. Evaluation of the potential effects on visual resources would have to be conducted if improvement options are forwarded from this study.

3.3.4. Biological Environment

Biological resources in the study area were identified by using maps; aerial photographs; the endangered, threatened, proposed, and candidate species list for Montana counties (June 2013) from the U.S. Fish and Wildlife Service (USFWS); Montana Natural Heritage Program data; and windshield surveys of the project site. This limited survey is not intended to be a complete and accurate biological survey of the study area. If a project is forwarded from the improvement option(s), consultations with MFWP and USFWS field biologists on techniques to perpetuate the riparian corridor, promote fish passage, and accommodate wildlife movement and connectivity would occur, and a complete biological survey of the study area would have to be completed. Project costs may be higher than typically expected due to potential mitigation measures. Such potential costs should be budgeted in the planning process.

3.3.4.1. Wildlife

The information reflects a baseline natural resource condition of the study area. Depending on the level of detail available through the high-level baseline scan, some of the information has been provided at the county level, some at the corridor level (US 89 from RP 0.0 to RP 52.5), and some within the study area.

Mammals

The study area is home to a variety of mammal species, including whitetail deer, mule deer, elk, moose, bison, bighorn sheep, black bear, mountain lion, gray wolf, mountain lion, and coyote. A herd of bighorn sheep occupy habitat in and around Corwin Springs and are frequently observed on or adjacent to US 89, especially during winter. Other common mammals potentially occurring in the project area include porcupine, raccoon, striped skunk, badger, bobcat, red fox, beaver, muskrat, Richardson's ground squirrel, deer mouse, vole species, and a variety of bat species.

A migratory population of bison resides within YNP during the summer months. The bison migrate to lower elevation wintering range within and adjacent to the Park during winter. Bison have a tendency to use road systems for travel. During winter months, they frequently are observed on or immediately

adjacent to US 89 south of Yankee Jim Canyon. In order to limit bison movements to the area south of Yankee Jim Canyon, bison guards have been installed along US 89, as well as on the county road on the west side of the Yellowstone River. Fencing was constructed adjacent to the bison guards, with gates that can be opened when bison are not present in Gardiner Basin. Currently the bison guards are installed, and adjacent gates are closed, from November through May. Outside of this period the bison guards are removed and replaced with a smooth concrete driving surface. MFWP is exploring a plan to allow bison to roam freely year-round.

A bighorn sheep herd exists in the study area. Bighorn sheep can be found on both sides of US 89 from RP 4.0 to RP 23.0, but especially during the winter months in three areas: 1) from RP 0.0 to RP 2.0 (Gardiner area), 2) RP 4.0 to RP 9.0 (Corwin Springs area), and 3) between RP 14.0 and RP 21.0 (Tom Miner Basin area).

Amphibians and Reptiles

According to the Montana Natural Heritage Program's Natural Heritage Tracker database, which records and maps documented observations of species in a known location, amphibian species known to occur in Park County and potentially occurring in the study area include, but are not limited to, the Columbia spotted frog western toad, boreal chorus frog, northern leopard frog, barred tiger salamander, and plains spadefoot. More than a dozen invertebrate species, some listed as Montana Species of Concern (SOCs), have also been observed in the study area.

Birds

According to the Natural Heritage database, a few hundred different species of birds documented in Park County have the potential to occur and nest in the study area. These species include representative songbirds, birds of prey, waterfowl, owls, and shorebirds, including several state SOCs. Most avian observations occur in the riparian draws and hillsides associated with the numerous drainages within the study area.

There are multiple bald and golden eagle nests located within the study area. Bald and golden eagles are protected under the Migratory Bird Treaty Act and are managed under the Bald and Golden Eagle Protection Act. Any improvements forwarded from this study should consider potential constraints that may result from nesting times of migratory birds and the presence of bald and golden eagles' nests.

Threatened and Endangered Species

USFWS maintains the federal list of Threatened and Endangered (T&E) Species. Species on this list receive protection under the Endangered Species Act. An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. USFWS also maintains a list of species that are candidates or are proposed for possible addition to the federal list. According to USFWS, six threatened, endangered, or candidate species are listed as occurring in Park County (see **Table 3.11**).

Table 3.11: T&E Species in Park County

Common Name	Status
Canada Lynx	Listed threatened, critical habitat
Grizzly Bear	Listed threatened
Greater Sage-Grouse	Candidate
Sprague's Pipit	Candidate
Wolverine	Proposed
Whitebark Pine	Candidate

A search of the Montana Natural Heritage Program's National Heritage Tracker database revealed that three of the six T&E species potentially in Park County have occurrence buffers overlapping the study area. These species are listed in **Table 3.12**.

Table 3.12: T&E Species within the Study Area

Common Name	Status
Canada Lynx	Listed threatened, critical habitat
Grizzly Bear	Listed threatened
Wolverine	Proposed

An evaluation of potential impacts on all endangered, threatened, proposed, or candidate species will have to be completed during the project development process.

Species of Concern

Montana species of concern (SOCs) are 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 to address conservation needs proactively. Each species is assigned a state rank that ranges from S1 (greatest concern) to S5 (least concern).

A search of the Montana Heritage Program was conducted for Park County (March 14, 2013). Fifteen species of concern identified in Park County had the potential to occur in the study area, based on the presence of suitable habitat and occurrence.

If a project is forwarded, a field investigation for the presence and extent of these species should be conducted during the project design phase. If present, special conditions for project design or construction should be considered to avoid or to minimize impacts on these species.

3.3.4.2. Fish

The Yellowstone River is the major waterbody that parallels and is crossed by US 89 within the study area. Multiple tributaries to the Yellowstone River also are crossed by the highway. The Montana Fisheries Information System database was reviewed for the Yellowstone River and numerous tributaries within the study area. The following fish species were noted as historically or currently occurring in the various waterbodies:

- Brook trout
- Brown trout
- Rainbow trout
- Mottled sculpin
- Longnose dace
- Longnose sucker

- Mountain whitefish
- White sucker
- Yellowstone cutthroat trout
- Rainbow trout

Fish passage and/or barrier opportunities should be considered at affected drainages if a project is forwarded from this study. Permitting by regulatory and resource agencies would likely require incorporation of design measures to facilitate aquatic species passage.

3.3.4.3. Vegetation

A combination of predominantly coniferous forests and sagebrush steppe habitat dominates the hillsides and foothills. Riparian woodland and shrub land line the riparian corridors of the drainages, especially the Yellowstone River. Practices outlined in both Standard Specification 201, and any related supplemental specifications, should be followed to minimize adverse impacts on vegetation.

3.3.4.4. Noxious Weeds

Noxious weeds can degrade native vegetative communities, choke streams, 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, like highway rights-of-way, are at particular risk of weed encroachment. The Invaders Database System lists 114 exotic plant species and 15 noxious weed species documented in Park County, some of which may be present in the study area.

The study area will have to be surveyed for noxious weeds. County Weed Control Supervisors should be contacted regarding specific measures for weed control during project development if a project is forwarded.

3.3.4.5. Crucial Areas Planning System

The Crucial Areas Planning System (CAPS) is a resource intended to provide useful and non-regulatory information during the early planning stages of development projects, conservation opportunities, and environmental review. The finest data resolution within CAPS is at the square-mile section scale or waterbody. 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. CAPS was consulted to provide a general overview of the study area. CAPS results are presented in the *Environmental Scan*.

CAPS provides general recommendations and recommendations specific to transportation projects for both terrestrial and aquatic species, as well as habitat. These recommendations can be applied generically to possible project locations carried forward from the study.

3.3.5. Recreational, Cultural and Archaeological Environment

3.3.5.1. Recreational Resources

The Yellowstone River and its tributaries provide a variety of recreational opportunities for floaters and fishers. These recreational areas may be protected under federal law. Section 4(f) of the U.S. Department of Transportation Act of 1966 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 these properties unless there are no feasible and prudent avoidance alternatives, and all possible planning to minimize harm has occurred.

Before 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 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. Section 4(f) resource information was gathered by review of MFWP resources list for Park County.

There are possible Section 4(f) recreational resources within the study area. These resources will have to be thoroughly evaluated if improvements will affect these locations. The following camping and picnic areas were identified within the study area:

- Yankee Jim Picnic Area
- La Duke Picnic Area
- Cinnabar Picnic Area
- Sphinx Creek Picnic Area
- Canyon Campground
- Gardiner Community Park

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 land and water conservation funds. The U.S. Secretary of the Interior must approve any conversion of LWCFA-encumbered property to a use other than public, outdoor recreation. At this time, there are Section 6(f) resources identified in the study corridor, with most being fishing accesses (refer to the *Environmental Scan* [**Appendix 2**] for a complete list of Section 6(f) resources). Impacts on Section 6(f) resources should be avoided; approval of Section 6(f) use is a lengthy process involving mitigation requirements and approvals from several resource agencies.

3.3.5.2. Cultural and Archaeological Resources

If a project is federally funded, MDT will conduct a cultural resource survey of the area of potential effect for the project, 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 any adverse effects on historic properties. Special protections for these properties are also afforded under Section 4(f) of the Transportation Act.

The study area contains several known cultural resources. Cultural resources will not likely be a substantial issue, but the issue is important to address if planning progresses.

A file search of the Montana State Historic Preservation Office revealed eight historic properties located within the study area. **Table 3.13** lists the properties, their approximate locations, and National Register of Historic Places (NRHP) eligibility. All of the sites have been previously recorded, and their NRHP status has been established. In addition, 13 NRHP historic and archaeological properties are located within 1 mile of US 89, but are likely outside the impact area for this study.

Table 3.13: Historic Properties

Site	Site No.	NRHP Eligibility	RP±
Roosevelt Arch	24PA0765	Listed	N/A
Yellowstone River Bridge at Gardiner	24PA0790	Yes	0.1
Electric Mines/Electric Historic District	24PA0483	Yes	7±
Ordo Templi Orientalis (OTO) Homestead and Dude Ranch	24PA1227	Listed	15±
Carbella Bridge	24PA1237	Listed	15±
Emigrant Crossroad Arch	24PA0969	Yes	
Park Branch Canal	24PA1114	Yes	40±
Carter Bridge	24PA0817	Listed	S-540

If a project is forwarded from the study, a cultural resource survey for unrecorded historic and archaeological properties within the area of potential effect will be completed during the project development process. Flexibility in design will be important to avoid and/or minimize impacts on historically significant sites.

3.4. AREAS OF CONCERN AND CONSIDERATION

This section provides a list and description of areas of concern and consideration within the study area. These areas were identified through review of as-built drawings, field review, public databases, and other resources. More discussion has been provided in the previous sections, and it is reiterated here, as appropriate. The list of areas of concern and consideration is not in any priority order.

3.4.1. TRANSPORTATION SYSTEM

The following transportation system areas of concern were noted:

Level of Service

- Numerous segments of US 89 are either currently, or projected, to operate at a LOS of C or worse. The design target LOS for this facility is a LOS B.

Horizontal Alignment

- Eight horizontal curves do not meet current standards.

Vertical Alignment

- Four vertical curves do not meet current standards.
- Two locations have grades that do not meet current standards.

Safety

- Numerous animal-vehicle collisions occurred between January 2002 and December 2012.

Passing

- Seven passing zone locations do not meet current standards, based on length.
- One passing zone does not meet standards based on proximity to public approaches.

Surfacing

- US 89 from RP 1.1 to the end of the study area has a 32 -foot roadway width, which is less than the suggested standard of 40 feet.

Access Points

- Eleven approaches do not meet current standards based on intersection angles.

Parking

- Locations with on-street parking in the town of Gardiner do not meet current standards.

Geotechnical

- Three landslide cluster areas were identified within the study area.
- Twelve rockfall hazard sites were identified, including three top 100 sites on the state highway system.

3.4.2. Environmental Considerations

The following environmental considerations were noted:

Prime Farmland

- Areas of prime farmland are located within the study area.

Geologic Resources

- Three designated faults are located within the study area.

Surface Waters

- A Special River Management Zone exists for the Yellowstone River from Emigrant to Springdale.

Hazardous Substances

- One leaking LUST is designated as having a priority ranking assigned by MDEQ within the study area.
- Abandoned and inactive mine sites were identified within the study area.

Wildlife

- Three endangered, threatened, proposed, or candidate species occur in the study area.
- Fifteen species of concern have the potential to occur in the study area.

Recreational, Cultural and Archaeological Environment

- There are multiple Section 4(f) and Section 6(f) resources located within the study area.
- Eight historic properties were identified within the study area.

Chapter 4

Corridor Needs and Objectives

Needs and objectives for the *Paradise Valley Corridor Planning Study* were developed based on a review of existing data, local plans, and input from resource agencies, stakeholders, and the public. The needs and objectives explain why an improvement option, or options, may be necessary. The process includes analyzing the social, environmental, and engineering conditions described in the *Existing and Projected Conditions Report* (**Appendix 3**) and recognizing the character of the corridor.

The following needs and objectives were used to develop improvement options. Improvement options identified in this study may lead to future transportation projects that improve safety and operations or address infrastructure concerns. The purpose and need statement for any future project should be consistent with the needs and objectives contained in this study. However, not all of the needs and objectives at the corridor level have to be included in a project-level purpose and need statement. For example, an "advisory curve" signing project may have little or no effect on access density objectives, rendering compliance with the intent of that particular objective unnecessary.

Should this Corridor Planning Study lead to a project or projects, compliance with NEPA (if federal funding is used) and MEPA (if a state action occurs) will be required. Further, this corridor planning study will be used as the basis for determining the impacts and subsequent mitigation for the improvement options in future NEPA/MEPA documentation. Any project developed will have to be in compliance with CFR Title 23 Part 771 and ARM 18, sub-chapter 2, which set forth the requirements for documenting environmental impacts on highway projects.

4.1. IDENTIFIED NEEDS AND OBJECTIVES

NEED 1: IMPROVE THE SAFETY OF US 89 IN THE STUDY AREA FOR ALL USERS.

US 89 provides a crucial link between Gardiner and Livingston and is the primary route into YNP. US 89 serves local residents, commuters between Gardiner and Livingston, recreationists on lands and waters in the Paradise Valley, tourists visiting YNP and other attractions in the region, and commercial users. In the future, US 89 may experience increased passenger and vehicular traffic.

Need 1 recognizes that the roadway must be safe and efficient to meet the travelling needs of the public, both for through and local traffic. To address this need, improvement options and management strategies are necessary for the corridor to achieve a higher level of safety. This need can be accomplished by improving the roadway to meet current design standards (to the extent practicable), providing adequate clear zones, providing suitable passing opportunities, improving drainage conditions, providing consistent road and bridge widths, and identifying opportunities for reducing animal-vehicle conflicts on a project-by-project basis.

Objectives (To the Extent Practicable)

- Improve roadway elements to meet current design standards.
- Review signing and passing opportunities, based on current design standards.
- Evaluate best practice mitigation strategies, as appropriate, to reduce potential animal-vehicle conflicts.

- Evaluate existing access density impacts.

NEED 2: IMPROVE THE OPERATIONS OF US 89 WITHIN THE STUDY AREA.

Coincident to improving safety, the unique vehicular composition and increasing traffic demands along US 89 suggest that improving traffic operations of the roadway will be beneficial. Accommodating future traffic demands in terms of turn bays, periodic passing lanes, access density management, and other roadway enhancements will serve to improve traffic flow and overall operations.

Objectives (To the Extent Practicable)

- Accommodate existing and future capacity demands within the corridor.
- Minimize future access density impacts.
- Consider access to recreational sites in the corridor.

4.2. OTHER CONSIDERATIONS

US 89 has high scenic value, and it provides access to agricultural, residential, and recreational lands. Because of the corridor's location, those making improvements should be sensitive to the historic, cultural, and archaeological integrity of the area. All improvements should be reviewed for their potential impact on the environmental, scenic, cultural, recreational, and agricultural aspects of the corridor.

Future improvements should be developed with recognition given to the rural and recreational nature of the corridor and the agricultural, recreational, and tourism-based operations along the route. The presence and effect of YNP at the southern end of the corridor, the high seasonal traffic demands in the summer months, and the stated desire of the Park County Growth Policy to preserve the county's rural nature are noted. Improvement options should be sensitive to the day-to-day operations of adjacent local landowners, while recognizing the needs of visitors to the area.

Last, improvement options should be sensitive to the availability of funding for construction, as well as to recurring maintenance costs. Limiting disruptions to adjacent properties and seasonally based businesses during construction would be desirable, especially during peak summer tourism months.

- Minimize the environmental resource impacts of improvement options.
- Limit disruptions during construction to the extent practicable.
- Provide appropriate speeds within the study area per statutory and special speed zones established by the Montana Transportation Commission.
- Review maintenance practices.
- Recognize the environmental, scenic, cultural, recreational, and agricultural nature of the corridor.
- Consider local planning efforts.
- Consider availability and feasibility of funding.
- Consider construction feasibility.

Chapter 5

Improvement Options

Recommended improvement options considered in this report reflect input from stakeholders and the public, as well as a thorough evaluation of the existing conditions of US 89 within the study area. Three steps are applied to develop improvement options:

- Identify roadway issues and areas of concern based on field review, engineering analysis of as-built drawings, crash data analysis, consultation with resource agencies, and information provided by the public.
- Identify overall corridor needs and objectives.
- Analyze the information gathered to develop a range of improvement options that address the roadway issues and areas of concern, as well as satisfying corridor needs and objectives.

Implementation of improvement options depends on funding availability, right-of-way needs, and other project delivery elements. **Table 5.1** and **Figure 5.2** at the end of this chapter summarize the recommended improvement options based on implementation timeframes. Recommended timeframes for implementation are defined as follows:

- **Short-term:** Implementation is recommended within a 0- to 5-year period.
- **Mid-term:** Implementation is recommended within a 5- to 10-year period.
- **Long-term:** Implementation is recommended within a 10- to 20-year period.
- **As needed:** Implementation could occur based on observed need throughout the planning horizon.

The following sections discuss recommended improvement options, associated planning level cost estimates, and potential implementation timeframes.

5.1. ESTIMATE OF IMPROVEMENT COSTS

Planning level cost estimates are listed in 2013 dollars for each improvement option. The planning level costs include estimates for right-of-way, preliminary engineering, construction engineering, construction, and indirect and incidental costs. In addition, an inflationary factor of 3 percent per year was applied to the planning level costs to account for the estimated year of expenditure. Cost ranges are provided in some cases, indicating unknown factors at the particular planning level stage. **Appendix 3** (Corridor Planning Study Documentation) contains planning level cost estimates, including all assumptions.

5.2. RECOMMENDED IMPROVEMENT OPTIONS

This section contains descriptions of the recommended improvement options developed for the US 89 corridor, including how the improvement options address previously defined issues or areas of concern. The improvement options are intended to satisfy the corridor needs and objectives. For ease of identification, the improvement options receive unique identifiers via a numbering scheme. Improvement options that were initially considered, but not advanced as a recommendation, are also presented (section 5.3).

Five general strategies for developing improvement options were identified in response to previously defined areas of concern. The various improvement options based on each general strategy are

discussed in the following sections. The strategies explored were derived from full assessment of the previously developed needs and objectives for the corridor, and the needs are presented below:

Need 1: Improve the safety of US 89 in the study area for all users.

- Improve roadway elements to meet current design standards.
- Review signing and passing opportunities, based on current design standards.
- Evaluate best practice mitigation strategies, as appropriate, to reduce potential animal-vehicle conflicts.
- Evaluate existing access density impacts.

Need 2: Improve the operations of US 89 within the study area.

- Accommodate existing and future capacity demands within the corridor.
- Minimize future access density impacts.
- Consider access to recreational sites in the corridor.

5.2.1. GEOMETRICS

Roadway geometrics were compared to current MDT standards. A list of areas that do not meet current standards was developed previously in the *Existing and Projected Conditions Report* (**Appendix 3**). The analysis identified potential strategies that correct some of the identified issues and may minimize potential effects. In some circumstances, it may not be cost-effective to address minor geometric issues unless there are safety concerns directly attributable to roadway geometry. Some of the strategies examined are listed below:

- Expand roadway widths via shoulder widening.
- Modify sub-standard curves with future improvements to meet current standards.
- Install advisory signs at sub-standard horizontal curves.
- Improve intersections by adding turn bays and enhanced signage.
- Improve clear zones.

Improvement options that arise from this strategy tie directly to Need 1: Improve the safety of US 89 in the study area for all users.

1. Shoulder Widening

The corridor generally consists of 12-foot travel lanes with 4-foot shoulders. Recreational and bicycle tourist traffic occurs along the corridor. Incrementally widening roadway shoulders to 8 feet as projects develop along the corridor would increase both available space for bicyclists and roadside clear zones. A recent safety project resulted in installation of rumble strips along the shoulders of the corridor, which reduced the available shoulder space for bicyclists.

ESTIMATED COST: $910,000 per mile

IMPLEMENTATION TIMEFRAME: As needed, depending on future project development and location limitations (assessed on a case-by-case basis during project-level design)

2. Maiden Basin Road Intersection (RP 5.15)

The intersection of Maiden Basin Road with US 89, located at RP 5.15, serves local residents and the Yellowstone Basin Inn. The intersection currently has poor sight distance for northbound motorists on US 89 due to intersection geometrics and a hillside along the east side of the highway. A pull-off area just south of the intersection serves a mailbox facility and is a local bus stop, both of which add to the potential for conflicts with through traffic.

2(a). Advance Warning Signs (RP 5.15)

This improvement option would result in the installation of advance intersection warning signs in both directions along US 89 at the intersection with Maiden Basin Road. Advance warning signs would increase driver awareness of the intersection; however, they would not resolve intersection geometrics and sight distance limitations.

ESTIMATED COST: $600 EA

IMPLEMENTATION TIMEFRAME: Short-term

2(b). Right-turn Lane (RP 5.15)

A northbound right-turn lane along US 89, when appropriate warrants are met, would allow turning vehicles to exit from the traffic stream, thereby improving safety.

ESTIMATED COST: $270,000

IMPLEMENTATION TIMEFRAME: Mid-term

4. East River Road Intersection – Turn Lanes (RP 19.8)

East River Road (S-540) serves as a parallel route to US 89, and it provides access to recreational areas and local residences. The intersection of East River Road with US 89, located at RP 19.8, was reconstructed recently to eliminate the skewed approach where East River Road joins US 89. There are currently no dedicated turn lanes at this intersection. Constructing a southbound left-turn lane and northbound right-turn lane at this intersection would allow turning vehicles to exit from the traffic stream. The two turn lanes could be constructed at the same time or separately, depending on traffic volumes and when turn lane warrants are met.

ESTIMATED COST: $650,000 (both turn lanes); $370,000 (southbound left-turn lane only), $280,000 (northbound right-turn lane only)

IMPLEMENTATION TIMEFRAME: Mid-term

5. Mill Creek Road Intersection – Right-turn Lane (RP 37.2)

The intersection of Mill Creek Road with US 89, located at RP 37.2, serves local residents, provides access to recreational areas, and connects to East River Road (S-540). The intersection currently has a southbound left-turn lane. A northbound right-turn lane along US 89, when appropriate warrants are met, would allow turning vehicles to exit from the traffic stream.

ESTIMATED COST: $280,000

IMPLEMENTATION TIMEFRAME: Mid-term

6. Geometric Improvements (RP 49.0 to RP 49.8)

This location consists of two horizontal curves and a vertical curve that do not meet current standards. Substandard roadway elements may pose safety concerns if left unaddressed.

6(a). Advance Warning Signs (RP 49.10 and RP 49.35)

Horizontal curves at RP 49.10 and RP 49.35 were identified as having radii that do not meet current MDT design standards. Currently there are no advance warning signs for the curves. Installing advance warning signs for the horizontal curves located at RP 49.10 and RP 49.35 will serve to inform drivers to reduce speed along the curves, increase driver awareness, and increase safety. Advance warning signs do not address underlying geometric issues or concerns.

ESTIMATED COST: $600 EA

IMPLEMENTATION TIMEFRAME: Short-term

15. Turn Lane Evaluation

As a result of the second series of informational meetings and subsequent dialogue and analysis with the planning team, additional locations were identified for potential left- and right-turn lanes. Turn lanes at these locations can only be implemented if and when turn-lane warrants are met. Realized traffic volumes highly affect turn-lane warrants. The areas identified herein for future turn-lane considerations should be reviewed periodically through a warrant analysis to determine if thresholds have, or likely have, been met. Warrant evaluation and eventual turn lane construction may be implemented by parties other than MDT. The locations identified for further consideration are as follows:

- Corwin Springs Bridge access (RP 7.70): northbound left-turn lane and southbound right-turn lane
- South Dry Creek Road (RP 26.40): northbound left-turn lane and southbound right-turn lane
- Trail Creek Road (RP 31.95): northbound left-turn lane and southbound right-turn lane
- Grey Owl Fishing Access Site (RP 33.20): northbound right-turn lane and southbound left-turn lane
- Mallards Rest Fishing Access Site (RP 41.50): northbound right-turn lane and southbound left-turn lane

ESTIMATED COST: Varies: (1) $15,000 (for turn lane warrant evaluation); (2) $650,000 (for construction of two turn lanes) & $325,000 (for construction of an individual turn lane)

IMPLEMENTATION TIMEFRAME: Mid-term

5.2.2. VEHICLE CONGESTION AND PASSING OPPORTUNITIES

A "Highway Capacity and Level of Service Analysis" for both current and future year conditions was previously completed to document congestion and levels of service. Relevant information from this analysis is located in the *Existing and Projected Conditions Report* (**Appendix 3**).

Improvement options that arise from this strategy address a myriad of concerns, and tie directly to Need 1: Improve the safety of US 89 in the study area for all users and Need 2: Improve the operations of US 89 within the study area.

7. Passing Opportunities

Passing opportunities are currently provided by passing zones designated with dashed yellow centerlines. Passing zones typically are located where there is adequate sight distance and away from public approaches. Passing opportunities are limited by terrain and the volume of opposing vehicles. As traffic volumes increase, the effectiveness of passing zones decreases.

In addition to passing zones, dedicated passing lanes can be constructed in the form of additional travel lanes. Passing lanes allow for unobstructed passing without having to cross into the opposing travel lane, and they can help reduce long platoons behind slow-moving vehicles. Passing lanes should be installed at incremental locations along the highway to maximize their effectiveness.

7(a). Evaluate No-Passing Zones

An engineering study to evaluate passing zones to determine if removal or addition of no-passing zones is warranted should be completed and recommendations implemented.

ESTIMATED COST: $45,000

IMPLEMENTATION TIMEFRAME: Short-term

7(c). Passing Lanes

Dedicated passing lanes provide opportunities to pass slower-moving vehicles without the need to cross into the opposing travel lane. Passing lanes can be constructed as three, four, or five-lane roadway sections with a center TWLTL and left-turn bays at major intersections.

The location and length of passing lanes are determined based on vehicle demand, roadway geometrics, and known constraints. Ideally, passing lanes would be constructed at regular intervals throughout the corridor. Further study is needed to determine the appropriate locations for passing lanes. The following are potential locations for passing lanes based on preliminary review of roadway geometrics, terrain, known environmental resource constraints, and public approaches:

- RP 16.6 (Tom Miner Creek Road) to 19.8 (East River Road)
- RP 25.6 to 28.4
- RP 40.0 (Inverness Road) to 42.0
- RP 44.4 (Old Yellowstone Trail) to 47.9 (Farm Access Overpass)

ESTIMATED COST: $12,400,000 EA

IMPLEMENTATION TIMEFRAME: Long-term

5.2.3. ACCESS MANAGEMENT

The safety and operational benefits of controlling access points are well documented. As access density (or the number of access points per mile) increases, there is generally a corresponding increase in crashes and travel times. Appropriate management of access within a highway corridor can improve traffic flow and reduce driveway related crashes.

Reasonable access should be maintained for all existing parcels adjacent to the highway, but some existing direct accesses could be relocated, combined, or eliminated if alternate reasonable access is available or can be provided. Turning lanes and/or medians are one access management technique that can assist in improving access concerns. Dedicated left- and right-turn lanes prioritize the flow of through traffic. TWLTLs and non-traversable, raised medians are effective ways to regulate access and reduce crashes. The Livingston area has a higher density of approaches than the rest of the corridor.

Improvement options that arise from this strategy address a myriad of concerns and tie directly to Need 1: Improve the safety of US 89 in the study area for all users and Need 2: Improve the operations of US 89 within the study area.

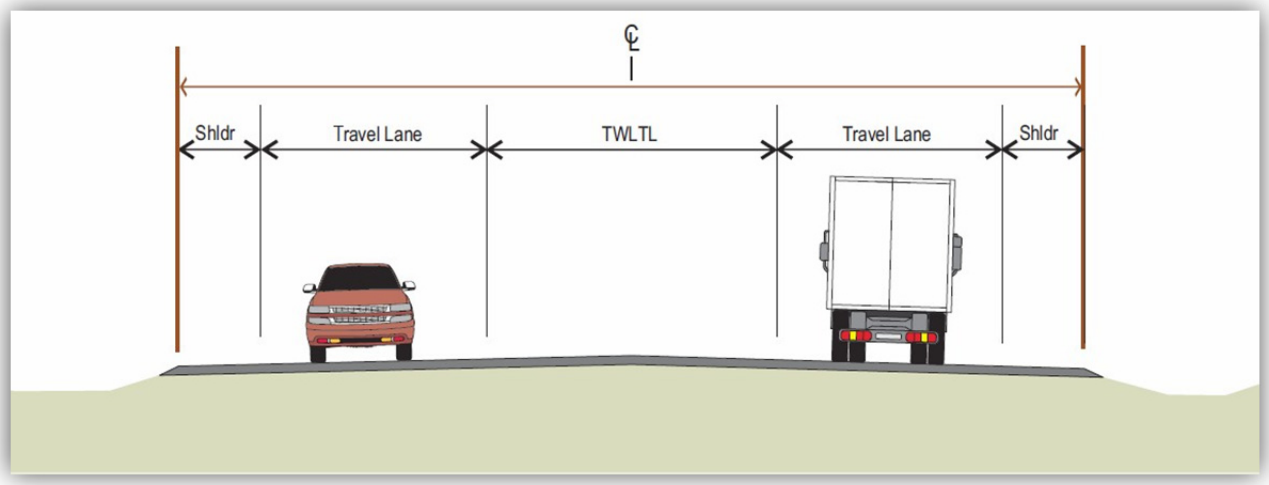
9. Livingston Rural/Urban Interface (RP 49.8 to RP 52.5)

This section of US 89 has a high density of public approaches and access points. It is desirable to construct a three-lane roadway section beginning at the intersection with East River Road (RP 49.8) north to Merrill Lane (RP 52.5). This area has numerous public and private approaches, particularly on the east side of the highway. A multi-use path exists along the west side of the roadway north of East River Road. North of Merrill Lane (RP 52.5) US 89 consists of a three-lane typical section (one travel lane in each direction and a center TWLTL). South of Merrill Lane, the roadway transitions to a standard two-lane section. A three-lane facility would allow left-turning vehicles to exit from the traffic stream along the mainline. In addition, right-turn lanes at major intersections (Wineglass Road, Cedar Bluffs Road, and Shamrock Lane) would provide further reduction in conflicts resulting from turning vehicles. The termini of this improvement at RP 52.5 would match the existing roadway geometry traveling north into Livingston. At RP 49.8 (the intersection with East River Road), both a southbound left-turn lane and a northbound

right-turn lane would be considered as part of the project. Guardrail warrants should be evaluated on the east side of the road where homes and garages are close to the edge of the roadway.

The speed limit for US 89 is currently posted at 45 mph from RP 52.5 to RP 52.36 and at 55 mph from RP 52.36 to RP 49.17. If a three-lane section is constructed (**Figure 5.1**), a speed study should be conducted to determine the appropriate speed limit following improvements.

Figure 5.1: Three-lane Typical Section Concept



ESTIMATED COST: $8,500,000

IMPLEMENTATION TIMEFRAME: Mid-term

5.2.4. ALTERNATIVE TRAVEL MODES

Stakeholder input indicates the desire to improve safety and accommodate alternative (non-motorized) travel modes within the US 89 corridor. Park County's long-term vision for trails within the corridor includes a separated path between the current termini of the existing path south of Livingston all the way to Gardiner. Preliminary concepts for such a path recommend the path leaving the US 89 corridor near Yankee Jim Canyon and crossing the Yellowstone River by heading west. Strategies applicable to alternative travel modes initially reviewed for the corridor included the following:

- Developing a separated multi-use path
- Increasing shoulder widths along the roadway
- Installing appropriate signage

Improvement options that arise from this strategy directly tie to Need 1: Improve the safety of US 89 in the study area for all users. A long-term recommended improvement, to be implemented by others, is described further in **Section 5.3**.

A cursory examination of transit opportunities that may connect Livingston to Gardiner was conducted. Transit options could include, but are not limited to, vanpool/carpool programs; park and ride facilities; and fixed route bus service. Currently charter bus service within the corridor is provided by various tour operators accessing YNP. Development of viable transit options within the corridor was dismissed from further consideration due to lack of potential commuter transit riders and limitations on funding.

11. Gardiner Area (RP 0.0 to RP 1.0)

The Gardiner area experiences large seasonal peaks in traffic due to recreational use and access to YNP. The US 89 corridor through Gardiner provides access to a multitude of local businesses and residents. The Gardiner Gateway Project identifies a desire for improvements along US 89 entering Gardiner in terms of better lighting along the corridor and traffic calming for pedestrians.

11(a). On-street Parking

Modify existing on-street parking in the Gardiner area, based on MDT guidelines, during a future resurfacing project. On-street parking is provided along US 89 in the Gardiner area. There are locations where on-street parking appears to have been delineated by adjacent property owners and is not in compliance with the MDT Traffic Engineering Manual. Areas that do not meet compliance should be marked as no-parking locations to adhere to existing standards and increase safety. After achieving compliance, heightened enforcement may be required by Park County to ensure compliance with signage and curb markings.

ESTIMATED COST: Labor

IMPLEMENTATION TIMEFRAME: Short-term

11(b). Lighting Improvements

Coordinate with Gardiner Gateway Project partners to evaluate the need to upgrade existing street lighting to reflect lighting consistency with other phases of the project and to increase nighttime visibility. Pedestrian traffic is common during seasonal peaks. While corridor lighting exists between RP 0.0 and RP 1.0, the Gardiner Gateway Project partners have expressed a desire to evaluate new, decorative lighting concepts along US 89 in Gardiner to coincide with lighting planned for the various other phases of the Gardiner Gateway Project. Funding over and above standard MDT street lighting would be provided by non-MDT entities.

ESTIMATED COST: To be determined

IMPLEMENTATION TIMEFRAME: Short-term

5.2.5. WILDLIFE-VEHICLE CONFLICTS

Mitigation strategies to reduce wildlife-vehicle collisions were assessed through a variety of measures. Carcass data between January 2002 and December 2012 were obtained for the corridor and were reviewed to identify areas with concentrations of animal mortalities. **Figure 3.3** and **Figure 3.4** provide graphical depictions of animal carcass locations throughout the corridor. This information was measured against formal crash report data between July 2007 and June 2012, which was provided by law enforcement agencies, via MDT. Extensive data is available on animal and vehicle crash trends and wildlife carcass locations along US 89 within the study area. **Section 3.2.4.2** provides further information on carcass clusters. Additional information is provided in **Appendix 2** (*Environmental Scan*). This information, along with various other data and best available science, will be further analyzed to assist in determining the feasibility and best-fit locations for wildlife mitigation strategies as projects are nominated within the highway corridor.

Comments received from the resource agencies were used to augment potential improvement options to benefit wildlife and help reduce collision potential for the travelling public. The publication, titled *Wildlife-Vehicle Collision Reduction Study*[7], was reviewed for applicable mitigation strategies. Wildlife connectivity

[7] Western Transportation Institute (WTI), *Wildlife-vehicle Collision Reduction Study: Best Practices Manual*, DTFH61-05-D-00018, prepared for the Federal Highway Administration, Office of Safety Research and Development, June 2008.

was also reviewed on a high level by examining carcass locations and comparing them to available mapping of individual species ranges. Mitigation strategies attempting to reduce wildlife-vehicle collisions can be grouped into four distinct categories, as follows:

- Influence driver behavior.
- Influence animal behavior.
- Reduce wildlife population size.
- Physically separate animals from the roadway.

Any improvement option relevant to wildlife mitigation should be reviewed on a project case-by-case basis; i.e., as part of the normal transportation project development process, wildlife connectivity issues and concerns should be reviewed, site specific data should be analyzed, and specific recommendations should be made during project-level development and design.

Improvement options that arise from this strategy directly tie to Need 1: Improve the safety of US 89 in the study area for all users.

13. Reduce Wildlife-vehicle Conflicts

Wildlife-vehicle conflicts commonly occur throughout the study area and present a danger to human safety, as well as to wildlife survival. Improvements were explored to help reduce the number and severity of these types of collisions. Grade separation, fencing, advance animal detection, signing, or speed reduction strategies may have merit in areas of the corridor. Due to the complexities and numerous variables to consider when evaluating the feasibility of wildlife mitigation strategies, these should be explored in sufficient detail during project-level design as part of the project development process.

After an initial review of potential strategies to reduce wildlife-vehicle conflicts, the following were identified as being possible counter-measures to consider at locations where wildlife vehicle conflicts represent a higher contributor to crash trends. The feasibility of potential counter-measures will be evaluated during the nomination process for possible future projects.

- **Grade-separated Crossing Structures–Overpasses:** Grade-separated structures are a feasible strategy to physically separate animals from the road environment. Wildlife overpasses are designed primarily to provide connectivity for wildlife species, especially ungulate prey species, at critical locations. Their use is often combined with wildlife fencing. When combined with wildlife fencing, they reduce wildlife movements into the road corridor as animals are provided with a crossing opportunity above the roadway, thereby decreasing wildlife-vehicle conflicts.

  Costs for overpasses can range between $1.5 million and $3.0 million, depending on the width and length of the structure. For purposes of this corridor planning study, a planning level cost of $2,800,000 was estimated for an overpass structure with associated amenities.

  Topography can present a challenge to overpass placement, in that enough relief must be available to provide a structure within the confines of adjacent development and access points. Fencing is almost always used to guide animals to and over the structure, increasing its effectiveness. Fencing can alter natural animal movements, change pedestrian travel movements, impact adjacent landowners, and in some cases negatively impact scenic views.

- **Grade-separated Crossing Structures–Underpasses:** A wildlife underpass is another form of grade-separated crossing structure. Underpasses can be provided underneath bridge structures, or via a variety of culvert shapes and sizes. Wildlife underpasses typically are constructed at locations where the roadway is relatively high compared to the surrounding terrain. This reduces the need to raise the roadbed or to lower the approaches to the underpass. Somewhat unique to underpasses as compared to overpasses is that animals prefer to see through to the other side,

do not want to descend into a "cave" that would create a tunnel effect, and do not want to have to climb out on the other side. This is why, depending on its dimension, an underpass may be a more effective strategy for predator species. However, if large enough to provide sufficient clearance and clear line of sight, underpasses can be an effective means to pass ungulate prey species beneath the roadway, especially when combined with wildlife fencing.

The cost of a wildlife underpass depends highly on the type considered (i.e., under a bridge, within a concrete box culvert, within a corrugated steel pipe, etc.) and the width and length of the structure. Costs can range from $500,000 to $1,000,000 for an underpass structure. For purposes of this corridor planning study, a planning level cost of $750,000 was estimated for an underpass structure with associated amenities. Topography can dictate where an underpass may be placed and animals' level of success in using it. The potential for flooding within the underpass and the need for increased maintenance can be drawbacks. The fencing considerations described for the wildlife overpass are also applicable to the wildlife underpass.

- **Animal Detection System (At-grade Crossing):** Animal detection systems use sensors to detect animals near roadways. When an animal is detected, warning signals and/or signs are activated to alert drivers that an animal may be on or near the roadway. Wildlife fencing is usually considered in tandem with animal detection systems. The animal detection system and fencing guide the animals to a known crossing location and influence driver behavior through real-time warning. These measures may serve to reduce wildlife-vehicle collisions. Animal detection systems may be less restrictive to wildlife movement than grade-separated crossing structures. They allow animals to use existing paths to the road or to change them over time, whereas grade-separated structure locations may depend on adjacent topography and road grade, rather than the actual locations of animal movement patterns. The cost of an at-grade animal detection system with appropriate fencing is estimated to be $220,000 per mile.

  There are limitations to animal detection systems. They do not physically separate the animals from the highway, and they rely on driver response to the warning signs. They are, therefore, only effective if drivers reduce their speed and increase their awareness based on the warning. Animal detection systems only detect large animals (e.g., deer, elk, or moose). Small animals are hard to detect, so drivers may not be warned about their presence on or near the road. Also, animal detection systems usually require the presence of poles and equipment in the right-of-way, sometimes within the clear zone, presenting a safety hazard of their own. Animal detection systems may have complicated maintenance requirements for both function and effectiveness over time.

- **Wildlife Signage:** Signage indicating the regular presence of wildlife in the area is intended to alert drivers regarding potential animal conflicts. Deer occur throughout the corridor, while elk commonly are seen between RP 1.0 and RP 5.0 and between RP 15.0 and RP 25.0. Bighorn sheep also frequent the area between RP 4.0 and RP 15.0. Static signage has proved to be relatively ineffective at reducing wildlife-vehicle collisions (as compared to mitigation strategies that actually separate animal and roadway or present real-time detection and warning). As with the other mitigation strategies previously described, wildlife fencing may or may not be used in conjunction with wildlife signage. The limitations previously described with respect to fencing also apply if used in conjunction with signing. The cost of signage is modest; it is estimated at $600 per sign.

5.3. RECOMMENDED IMPROVEMENT OPTIONS TO BE IMPLEMENTED BY OTHERS

The following improvement options were identified as recommended, but likely to be implemented by others.

10. Multi-use Trail

This improvement option recommends the extension of the existing multi-use trail near Livingston to connect to YNP in Gardiner. The abandoned railroad bed within the corridor presents an opportunity to develop a multi-use trail. A multi-use path exists along the west side of US 89 between RP 49.8 and RP 52.5. In addition, sidewalks are located in the urban areas of Gardiner and Livingston. In rural portions of the corridor, no dedicated pedestrian or bicycle facilities exist along the highway. Pedestrians and bicyclists commonly use the roadway shoulder for travel. Funding for this improvement option is limited. One potential source is through MDT's Transportation Alternatives (TA) Program. A recently approved TA grant project was given secured funding. It is called the "Park County Pedestrian Access Connector Trail." It is estimated to cost $652,894 (all state and Federal with no local match). The estimated cost includes slope stabilization measures to ensure the long-term integrity of the trail. It will extend the existing multi-use trail south from where it ends today near the East River Road turnoff at Carters Bridge to the intersection with Old Yellowstone Trail. It is anticipated to be constructed in 2016. Park County or others would have to pursue future funding from the TA Program.

13. Wildlife Conservation Assessment

A wildlife conservation assessment was recommended by project stakeholders for consideration to help identify usage and potential wildlife-vehicle conflicts in the area. Extensive wildlife data exists along the highway which documents wildlife-vehicle collisions and the location of animal carcasses. The data is routinely updated, and allows MDT and others to evaluate wildlife mitigation opportunities related to impacts to traveler safety and wildlife connectivity. Based on the available data and coarse-level analysis completed through the corridor study process, the study partners agreed that wildlife-vehicle conflicts warrant further consideration, and are committed to evaluating wildlife mitigation opportunities along the US 89 corridor through the examination of best-practice, wildlife mitigation strategies.

An important distinction in scale is necessary between the US 89 highway corridor and the larger Paradise Valley ecosystem. US 89 is a linear transportation corridor of limited width located within the valley bottom. Within the highway corridor, extensive data is available on animal-vehicle crash trends, patterns of carcass locations, and general wildlife movements across the highway. Data pertaining to the regional habitat use, daily movements, seasonal occupations, and larger wildlife migrations within the Paradise Valley ecosystem, coupled with land use, future development plans, and landowner willingness to cooperate in proposed mitigation strategies along the highway corridor, would provide information useful in the identification of constraints and opportunities relative to potential wildlife mitigation strategies.

Park County and MDT support the development of a valley-wide wildlife conservation assessment as a value-added enhancement to understand larger-scale wildlife occupation, movements, and management goals which contribute to planning sound long-term wildlife mitigation strategies. The goal of such an assessment would be to define overall wildlife connectivity in the valley, with special focus on land use considerations and public outreach to area landowners. The highway corridor is only one piece of a much larger landscape puzzle. Other pieces that fit next to the highway corridor, such as adjacent land use, fencing configurations, agricultural practices, subdivision development, and conservation easements factor into planning feasible and economically viable wildlife mitigation strategies for highways.

A valley-wide wildlife conservation assessment would provide useful information to landowners, resource agencies, and Park County and MDT staff. Such an assessment could be undertaken by other parties

such as non-governmental conservation groups, citizen groups, or natural resource agencies. MDT and Park County are not in a position to contribute financially to a valley-wide wildlife conservation assessment, but may be able to provide "in-kind" services in terms of mapping, review, and/or data contributions, and would consider any available data or information that arises from such a study in the analysis and recommendations for wildlife mitigation strategies as projects are developed along the US 89 corridor.

5.4. OTHER IMPROVEMENT OPTIONS CONSIDERED

A number of additional improvement options were considered for the corridor but ultimately are not considered formal recommendations emerging from this corridor planning study. This section provides a description of the other improvement options considered, including the rationale for not furthering them as a recommendation from this study.

2. Maiden Basin Road Intersection (RP 5.15)

2(c). Slope Flattening (RP 5.15)

Sight distance is limited from Maiden Basin Road looking north along US 89 due to cut slopes on the east side of the highway. This improvement option suggested flattening the roadside cut slopes on the east side of US 89, just north of the intersection with Maiden Basin Road, to increase sight distances. After review, it was determined that it would be unlikely that sight distances could feasibly be increased to meet existing standards given existing topography constraints and roadway geometrics.

3. Rockfall Hazards (RP 13.3 to RP 14.6)

3(a). Rockfall Hazard Section #307 (RP 13.32 to RP 13.66)

This location was identified in the Rockfall Hazard Classification and Mitigation System research project administered by MDT. The report identified mitigation for this location that would include excavating rock using controlled blasting, installing guardrail and rockfall barrier, and construction of a mechanically stabilized earth wall. This improvement option was not advanced for further consideration due to the disproportionate cost of this mitigation effort relative to the likely safety benefits. MDT normal maintenance practices respond to any ongoing rockfall concerns at this location. Crash characteristics pointing to safety concerns were not identified at this location.

3(b). Rockfall Hazard Section #309 (RP 13.84 to RP 13.96)

This location was identified in the Rockfall Hazard Classification and Mitigation System research project administered by MDT. The report identified mitigation for this location that would include slope scaling, draped cable nets, and rock bolts. This improvement option was not advanced for further consideration due to the disproportionate cost of this mitigation effort to the likely safety benefits. MDT normal maintenance practices respond to any ongoing rockfall concerns at this location. Crash characteristics pointing to safety concerns were not identified at this location.

3(c). Rockfall Hazard Section #310 (RP 13.96 to RP 14.61)

This location was identified in the Rockfall Hazard Classification and Mitigation System research project administered by MDT. The report identified mitigation for this location that would include installing draped mesh with a catch fence. This improvement option was not advanced for further consideration due to the disproportionate cost of this mitigation effort relative to the likely safety benefits. MDT normal maintenance practices include responding to any ongoing rockfall concerns at this location. Crash characteristics pointing to safety concerns were not identified at this location.

6. Geometric Improvements (RP 49.0 to RP 49.8)

6(b). Geometric Reconstruction (RP 49.0 to RP 49.8)

Two existing horizontal curves do not meet standards based on curve radii. In addition, the vertical curve at RP 49.2 does not meet standards for both stopping sight distance and rate of curvature. This improvement option envisioned the total reconstruction of the roadway in this area to meet current standards for horizontal and vertical curvature.

This improvement option was not advanced for further consideration. The cost of reconstruction of this section of the corridor would likely exceed the overall benefit. There was no identified safety trend associated with the substandard geometrics at this location. A total reconstruction in this area would potentially impact adjacent waterbodies and the hillside on the west side of the roadway, and it would require additional right-of-way. Appropriate advance warning signage would likely increase driver awareness in the area at a much lower cost.

7. Passing Opportunities

7(b). Pullouts for Slow-moving Vehicles

Pullouts for slow-moving vehicles were identified as a potential mechanism to improve traffic flow. Pullouts can be found along various types of roadways to allow vehicles to exit the traffic stream quickly as queues form behind them. Pullouts already exist in Yankee Jim Canyon along US 89.

The following were potential locations reviewed for pullouts based on preliminary review of roadway geometrics, terrain, and known use areas. In some cases, informal pullouts are starting to become established at river access points.

- RP 5.7 (west side of Yellowstone River)
- RP 6.8 (east side of Yellowstone River)
- RP 28.6 (east side of Yellowstone River)
- RP 38.6 (east side of Yellowstone River)
- RP 48.8 (east side of Yellowstone River)
- RP 49.3 (east side of Yellowstone River)

This option was not advanced for further consideration. The posted speeds along much of US 89 do not allow for quick and safe ingress/egress to periodic pullouts along the corridor. Those already in place in Yankee Jim Canyon are located in lower posted speed areas. Although pull-outs may increase safety for thru-movement vehicles as RVs and slow-moving vehicles could exit the thru-travel lane thereby improving flow characteristics for other vehicles, they also may decrease safety due to vehicle speed differentials when vehicles exit or enter the mainline traffic stream.

7(d). Four- or Five-lane Typical Section

This improvement option sought to increase highway capacity by providing a four- or five-lane roadway. The addition of a center TWLTL or dedicated left-turn bays would result in areas with a five-lane typical section. This option allowed for higher capacities and increased unopposed passing opportunities.

This option was not advanced for further consideration. Traffic volumes during most of the year do not warrant a full four- or five-lane facility. This option would require substantial new right-of-way acquisition and would result in greater environmental impacts than other options. In addition, a four- or five-lane highway would be considered out of context with the scenic nature of the corridor.

7(e). Alternating Passing Lanes

This improvement option would result in alternating sections of the highway being reconstructed to add an additional passing lane in one direction. This type of facility, known as a "Super 2 Highway," would create directional passing areas along the corridor. This option would require a narrower roadway than a four-lane facility, but would have fewer passing opportunities and a lower capacity.

This improvement option was not advanced for further consideration. This option would result in a reduction in overall passing opportunities, because no passing zones would exist for traffic on the opposite side of the passing zone. In addition, this option would likely result in greater environmental impacts than other options.

8. Access Management Plan

This improvement option recommended development of a long-term Access Management Plan to explore ways to eliminate, reduce, or combine access to individual properties. In addition, the plan could identify opportunities to realign driveways and approaches, regulate the size and operations of driveways, and identify appropriate access for planned future development in the corridor in compliance with local land use planning regulations.

This improvement option was not advanced for further consideration. During the subdivision review process, Park County already coordinates with MDT when new development occurs that either directly accesses MDT routes or could substantially impact MDT routes via public or private roadways. MDT will continue to comment and recommend potential mitigations for impacts to Park County when requested.

12. Vegetation Management Plan

Areas of unmaintained or dense vegetation were identified due to decreased sight distances and clear zones. The goals of the Vegetation Management Plan would include improved sight distance for driver detection of animals in the clear zone, thereby improving safety. Additionally, a Vegetation Management Plan may identify and provide for: maintenance of quality wildlife habitat along the corridor, providing cover for animal movements across the highway in appropriate locations; maintenance of riparian zone integrity and wetland function; and sediment/runoff control along the Yellowstone River and its tributaries adjacent to the highway.

This option was not advanced for further consideration. Vegetation concerns are not a corridor-wide issue and can be assessed on a case-by-case basis during project-level design. Additionally, MDT maintenance personnel perform routine vegetative maintenance within the corridor periodically throughout each year, in accordance with established protocol.

14. Wash-out Area (RP 8.7)

A long-term improvement option was evaluated for the wash-out area at the lower end of Horseshoe Gulch near RP 8.7. A large rain event occurred on July 17, 2013, and it carried debris across US 89 and blocked the existing culvert underneath the roadway, resulting in a temporary road closure. The storm event was estimated to be in excess of a 100-year event. MDT maintenance crews removed debris from the roadway, cleaned out the culvert and reshaped the inlet and outlet drainage channel. The emergency repair work occurred predominately within the MDT right-of-way and the roadway was reopened in less than 24 hours.

The feasibility of a long-term improvement at this location requires work outside of MDT right-of-way on adjacent private land. The drainage downstream of the existing culverts underneath US 89 has been filled in, thus affecting the ability of the road culverts to convey the 50-year design flood event. MDT design procedures do not design for a flood event as large as that experienced in 2013. Removing fill downstream of the culverts in the historic drainage would require work outside of MDT right-of-way, which requires the willing participation and financial contribution of the adjacent landowner.

5.5. IMPROVEMENT OPTIONS SUMMARY

This chapter identifies improvement options for the US 89 corridor between RP 0.0 and RP 52.5. The improvement options were based on the evaluation of several factors, including but not limited to field review, engineering analysis of as-built drawings, crash data analysis, consultation with resource agencies, and information provided by the public.

The improvement options identified for advancement are intended to offer a range of potential mitigation strategies for corridor issues and areas of concern. Small-scale improvement options were identified and may be as simple as adding advance warning signs at intersections. Larger, more complex reconstruction improvements are also envisioned. The potential may exist to combine improvement options during project development for ease of implementation and other efficiencies.

Wildlife collisions have been noted to occur throughout the corridor. The recommended improvement options recognize the associated impacts on driver safety and wildlife resources and offer potential mitigation strategies that may be candidates for further exploration during project development activities. These include grade-separated crossing structures, at-grade animal detection systems, wildlife signing and/or wildlife fencing, as warranted and determined feasible. A more comprehensive analysis of available data and additional coordination with natural resource managers and wildlife biologists is required to determine the appropriate wildlife mitigation strategy and specific locations for further consideration along the corridor. This analysis will be performed in association with project development activities as transportation projects are nominated along the corridor. Numerous variables, constraints, and opportunities must be considered in determining whether a proposed wildlife mitigation strategy at any given location is feasible for implementation. For example, topography, adjacent land use, and landowner cooperation are elements outside of MDT's control, and they are just a few of the variables that must be considered and evaluated during project development. If both warranted and feasible, wildlife mitigation strategies will be considered independently or in conjunction with other highway projects on a case-by-case basis during project-level design.

Tabular summaries of the recommended improvement options are included in **Table 5.1**. The improvement options recommended for advancement are also shown graphically in **Figure 5.2**.

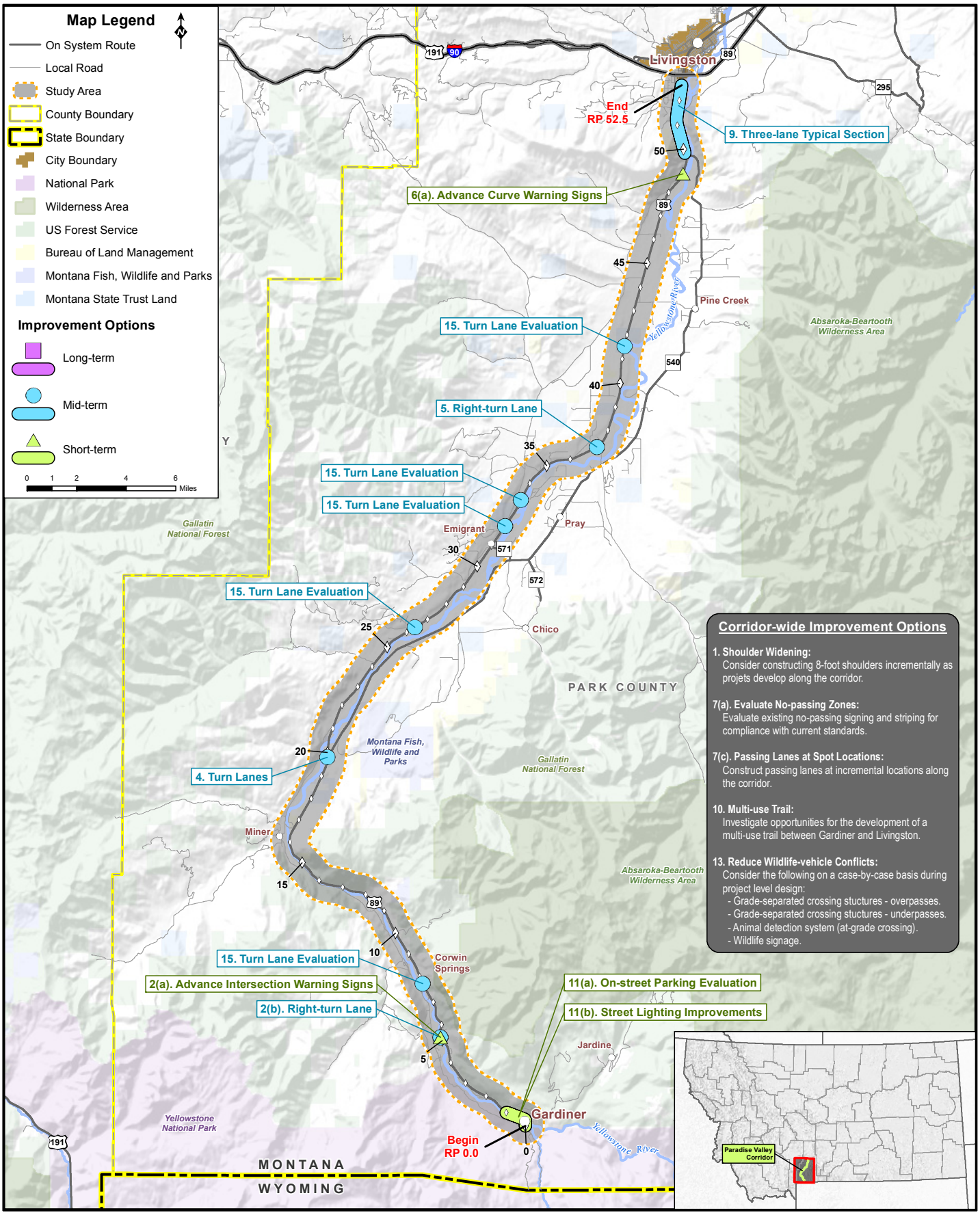


Figure 5.2: Recommended Improvement Options

Table 5.1: Recommended Improvement Options

	Improvement Option	Location	Description	Implementation Timeframe	Cost Estimate
GEOMETRICS					
1	**Shoulder Widening**	Corridor-wide	Consider constructing 8-foot shoulders incrementally as projects develop along the corridor.	As needed	$910,000 per mile
2(a)	**Maiden Basin Road Intersection Advance Warning Signs**	RP 5.15	Install advance intersection warning signs along US 89.	Short-term	$600 EA
2(b)	**Maiden Basin Road Intersection Right-turn Lane**	RP 5.15	Construct a northbound right-turn lane along US 89 when appropriate warrants are met.	Mid-term	$270,000
4	**East River Road Intersection Turn Lanes**	RP 19.8	Construct a southbound left-turn lane and northbound right-turn lane along US 89 when appropriate warrants are met.	Mid-term	$650,000 (both turn lanes)
5	**Mill Creek Road Intersection Right-turn Lane**	RP 37.2	Construct a northbound right-turn lane along US 89 when appropriate warrants are met.	Mid-term	$280,000
6(a)	**Advance Warning Signs**	RP 49.10 to 49.35	Install horizontal curve warning signs for the horizontal curves located at RP 49.10 and RP 49.35.	Short-term	$600 EA
15	**Turn Lane Evaluation**	Multiple Locations	Complete left- and right-turn lane evaluations at the following locations: RP 7.70; RP 26.4; RP 31.95; RP 33.20; and RP 41.50.	Mid-term	$15,000 (for turn lane warrant evaluation); $650,000 (for construction of two turn lanes); $325,000 (for construction of an individual turn lane)
VEHICLE CONGESTION AND PASSING OPPORTUNITIES					
7(a)	**Evaluate No-passing Zones**	Corridor-wide	Evaluate existing no-passing signing and striping for compliance with current standards.	Short-term	$45,000
7(c)	**Passing Lanes**	Potential Spot Locations:	Potential locations for passing lanes along the corridor include: RPs 16.6 to 19.8; RPs 25.6 to 28.4; RPs 40.0 to 42.0; and RPs 44.4 to 47.9.	Long-term	$12,400,000 EA
ACCESS MANAGEMENT					
9	**Livingston Rural/Urban Interface**	RP 49.8 to 52.5	Extend a three-lane typical section of US 89 from Merrill Lane to East River Road. Include right-turn lanes at major intersections if appropriate warrants are met.	Mid-term	$8,500,000
ALTERNATIVE TRAVEL MODES					
10	**Multi-use Trail**	Corridor-wide	Investigate opportunities for the development of a multi-use trail between Gardiner and Livingston.	Long-term	$390,000 per mile
11(a)	**Gardiner Area On-Street Parking**	RP 0.0 to 1.0	Modify existing on-street parking in the Gardiner area based on MDT guidelines.	Short-term	Labor
11(b)	**Gardiner Area Lighting Improvements**	RP 0.0 to 1.0	Coordinate with Gardiner Gateway Project partners to evaluate the need to upgrade existing street lighting to reflect lighting consistency with other phases of the project and to increase night-time visibility.	Short-term	To be determined
WILDLIFE-VEHICLE CONFLICTS					
13	***Grade Separated Crossing Structures-overpasses***	As needed	Consider grade separated crossing structures (overpass) on a case-by-case basis during project-level design.	As needed	$2,800,000 EA (overpass)
	Grade Separated Crossing Structures-underpasses	As needed	Consider grade separated crossing structures (underpass) on a case-by-case basis during project-level design.	As needed	$750,000 EA (underpass)
	Animal Detection System (At-grade Crossing)	As needed	Consider animal detection system installation on a case-by-case basis during project-level design.	As needed	$220,000 per mile
	Wildlife Signage	As needed	Consider additional wildlife signing on a case-by-case basis during project-level design.	As needed	$600 EA

Chapter 6
Funding Mechanisms

MDT administers a number of programs that are funded from State and Federal sources. Each year, in accordance with 60-2-127, Montana Code Annotated (MCA), the Montana Transportation Commission allocates a portion of available Federal-aid highway funds for construction purposes and for projects located on the various systems in the state as described throughout this chapter.

6.1. FEDERAL FUNDING SOURCES

The following summary of major Federal transportation funding categories received by the State through Titles 23-49 U.S.C., including state developed implementation/sub-programs that may be potential sources for projects. In order to receive project funding under these programs, projects must be included in the State Transportation Improvement Program (STIP) and the MPO TIP, where relevant.

6.1.1. National Highway Performance Program (NHPP)

The National Highway Performance Program (NHPP) provides funding for the National Highway System, including the Interstate System and National Highways system roads and bridges. The purpose of the National Highway System (NHS) is to provide an interconnected system of principal arterial routes which will serve major population centers, international border crossings, intermodal transportation facilities and other major travel destinations; meet national defense requirement; and serve interstate and interregional travel. The National Highway System includes all Interstate routes, a large percentage of urban and rural principal arterials, the defense strategic highway network, and strategic highway connectors.

Allocations and Matching Requirements

NHPP funds are Federally-apportioned to Montana and allocated to Districts by the Montana Transportation Commission. Based on system performance, the funds are allocated to three programs: Interstate Maintenance (IM), National Highway (NH), and Bridge (NHPB). For this corridor planning study, the IM program is not applicable since US 89 is not an interstate route.

6.1.1.1. National Highway

The Federal share for non-Interstate NHS projects is 86.58% and the State is responsible for the remaining 13.42%. The State share is funded through the Highway State Special Revenue Account.

Eligibility and Planning Considerations

Activities eligible for the National Highway System funding include construction, reconstruction, resurfacing, restoration, and rehabilitation of segments of the NHS roadway; construction, replacement, rehabilitation, preservation and protection of bridges on the National Highway System; and projects or part of a program supporting national goals for improving infrastructure condition, safety, mobility, or freight movements on the National Highway System. Operational improvements as well as highway safety improvements are also eligible. Other miscellaneous activities that may qualify for NHS funding include bikeways and pedestrian walkways, environmental mitigation, restoration and pollution control, infrastructure based intelligent transportation systems, traffic and traveler monitoring and control, and construction of intra or inter-city bus terminals serving the National Highway System. The Transportation Commission establishes priorities for the use of National Highway Performance Program funds and projects are let through a competitive bidding process.

The Butte District is anticipated to receive an average of about $14 million annually of NHPP funds during the next five years. Current Butte District priorities already under development total an estimated construction cost of $113 million. Given the estimated range of planning level costs, NHPP funding for improvements is highly unlikely over the short term, but may be available toward the end of the planning horizon depending on the other NHS needs within the Butte District.

6.1.1.2. NHPP Bridge (NHPB)

Federal and state funds under this program are used to finance bridge inspection, improvement, and replacement projects on Interstate and non-Interstate National Highway System routes. NHPB program funding is established at the discretion of the state. However, Title 23 U.S.C. establishes minimum standards for NHS bridge conditions. If more than 10% of the total deck area of NHS bridges in a state is on structurally deficient bridges for three consecutive years, the state must direct NHPB funds equal to 50% of the state's FY 2009 Highway Bridge Program to improve bridges each year until the state's NHS bridge condition meets the minimum standard.

No improvements have been identified for the bridges located on US 89 within the study area boundary; however if a project, or projects, are ever contemplated on bridges within the corridor, NHPB funding may be a potential funding source.

6.1.2. Surface Transportation Program (STP)

Surface Transportation Program (STP) funds are Federally-apportioned to Montana and allocated by the Montana Transportation Commission to various programs including the Surface Transportation Program Primary Highways (STPP)*, Surface Transportation Program Secondary Highways (STPS)* and the Surface Transportation Program Urban Highways (STPU)*. The Federal share for these projects is 86.58% with the non-Federal share typically funded through Highway State Special Revenue (HSSR).

*State funding programs developed to distribute Federal funding within Montana

6.1.2.1. Secondary Highway System (STPS)

The Federal and State funds available under this program are used to finance transportation projects on the state-designated Secondary Highway System. The Secondary Highway System includes any highway that is not classified as a local route or rural minor collector and that has been selected by the Montana Transportation Commission to be placed on the Secondary Highway System. Funding is distributed by formula and is utilized to resurface, rehabilitate, and reconstruct roadways and bridges on the Secondary System.

Allocations and Matching Requirements

Secondary funds are distributed statewide (MCA 60-3-206) to each of five financial districts, based on a formula, which takes into account the land area, population, road mileage and bridge square footage. Federal funds for secondary highways must be matched by non-Federal funds. Of the total received 86.58% is Federal and 13.42 % is non-Federal match. Normally, the match on these funds is from the Highway State Special Revenue Account.

Eligibility and Planning Considerations

Eligible activities for the use of Secondary funds fall under three major types of improvements: Reconstruction, Rehabilitation, and Pavement Preservation. The Reconstruction and Rehabilitation categories are allocated a minimum of 65% of the program funds with the remaining 35% dedicated to Pavement Preservation. Secondary funds can also be used for any project that is eligible for STP under Title 23, U.S.C. Priorities are identified in consultation with the appropriate local government authorizes and approved by the Montana Transportation Commission.

6.1.3. Highway Safety Improvement Program (HSIP)

HSIP funds are apportioned to Montana for allocation to safety improvement projects approved by the Commission and are consistent with the strategic highway safety improvement plan. Projects described in the State strategic highway safety plan must correct or improve a hazardous road location or feature, or address a highway safety problem. The Commission approves and awards the projects which are let through a competitive bidding process. Generally, the Federal share for the HSIP projects is 90% with the non-Federal share typically funded through the HSSR account.

6.1.4. Transportation Alternatives Program

The Transportation Alternatives Program (TA) requires MDT to obligate 50% of the funds within the state based on population, using a competitive process, while the other 50% may be obligated in any area of the state. The Federal share for these projects is 86.58, with the non-Federal share funded by the project sponsor through the HSSR.

Funds may be obligated for projects submitted by:

- Local governments
- Transit agencies
- Natural resource or public land agencies
- School district, schools, or local education authority
- Tribal governments
- Other local government entities with responsibility for recreational trails for eligible use of these funds.

Eligibility and Planning Considerations:

Eligible categories include:

- On-road and off-road trail facilities for pedestrians and bicyclists, including ADA improvements;
- Historic Preservation and rehabilitation of transportation facilities;
- Archeological activities relating to impacts for a transportation project;
- Any environmental mitigation activity, including prevention and abatement to address highway related stormwater runoff and to reduce vehicle/animal collisions including habitat connectivity;
- Turnouts, overlooks, and viewing areas;
- Conversion/use of abandoned railroad corridors for trails for non-motorized users;
- Inventory, control, and removal of outdoor advertising;
- Vegetation management in transportation right of way for safety, erosion control, and controlling invasive species;
- Construction, maintenance, and restoration of trails and development and rehabilitation of trailside and trailhead facilities;
- Development and dissemination of publications and operation of trail safety and trail environmental protection programs;
- Educations funds for publications, monitoring, and patrol programs and for trail-related training;
- Planning, design, and construction of projects that will substantially improve the ability of students to walk and bicycle to school; and
- Non-infrastructure-related activities to encourage walking and bicycling to school, including public awareness campaigns, outreach to press and community leaders, traffic education and enforcement school vicinities, student sessions on bicycle and pedestrian safety, health, and environment, and funding for training.

Competitive Process:

The State and any Metropolitan Planning Organizations required to obligate Transportation Alternative funds must develop a competitive process to allow eligible applicants an opportunity to submit projects for funding. MDT's process emphasizes safety, ADA, relationships to State and community planning efforts, existing community facilities, and project readiness.

6.1.5. Federal Lands Access Program (FLAP)

The Federal Lands Access Program was created by the "Moving Ahead for Progress in the 21st Century Act" (MAP-21) to improve access to Federal lands. Western Federal Lands administers the funds, not MDT. However, MDT is an eligible applicant for the funds.

The program is directed towards Public Highways, Roads, Bridges, Trails, and Transit systems that are under State, county, town, township, tribal, municipal, or local government jurisdiction or maintenance and provide access to Federal lands. The Federal lands access program funds improvements to transportation facilities that provide access to, are adjacent to, or are located within Federal lands. The program supplements State and local resources for public roads, transit systems, and other transportation facilities, with an emphasis on high-use recreation sites and economic generators. Program funds are subject to the overall Federal-aid obligation limitation. Funds are allocated among the states using a statutory formula based on road mileage, number of bridges, land area, and visitation.

Eligibility and Planning Considerations

The following activities are eligible for consideration on Federal Lands Access Transportation Facilities:

1) Preventive maintenance, rehabilitation, restoration, construction, and reconstruction.
2) Adjacent vehicular parking areas.
3) Acquisition of necessary scenic easements and scenic or historic sites.
4) Provisions for pedestrian and bicycles.
5) Environmental mitigation in or adjacent to Federal land to improve public safety and reduce vehicle-wildlife mortality while maintaining habitat connectivity.
6) Construction and reconstruction of roadside rest areas, including sanitary and water facilities.
7) Operation and maintenance of transit facilities.

Proposed projects must be located on a public highway, road, bridge, trail or transit system that is located on, is adjacent to, or provides access to Federal lands for which title or maintenance responsibility is vested in a State, county, town, township, tribal, municipal, or local government.

Allocation and Matching Requirements

Projects are funded in Montana to the ratio of 86.58% Federal funds and 13.42% non-Federal matching funds. Funding is authorized and allocated for each state under U.S.C. Title 23, Chapter 2, MAP-21, Division A, Title I, Subtitle A, Section 1119 distribution formula.

6.1.6. Congressionally Directed or Discretionary Funds

Congressionally Directed funds may be received through either highway program authorization or annual appropriations processes. These funds are generally described as "demonstration" or "earmark" funds. Discretionary funds are typically awarded through a Federal application process or Congressional direction. If a local sponsored project receives these types of funds, MDT will administer the funds in accordance with the Montana Transportation Commission Policy #5 – *"Policy resolution regarding Congressionally directed funding: including Demonstration Projects, High Priority Projects, and Project Earmarks."*

6.2. STATE FUNDING SOURCES

6.2.1. State Fuel Tax

The State of Montana assesses a tax of $0.27 per gallon on gasoline and $.2775 on clear diesel fuel used for transportation purposes. According to state law, each incorporated city and town within the state receives an allocation of the total tax funds based upon the following:

1) the ratio of the population within each city and town to the total population in all cities and towns in the State, and
2) the ratio of the street mileage within each city and town to the total street mileage in all incorporated cities and towns in the State. (The street mileage is exclusive of the Federal-Aid Interstate and Primary Systems.)

State law also establishes that each county be allocated a percentage of the total tax funds based upon the following:

1) the ratio of the rural population of each county to the total rural population in the state, excluding the population of all incorporated cities or towns within the county and State;
2) the ratio of the rural road mileage in each county to the total rural road mileage in the State, less the certified mileage of all cities or towns within the county and State; and
3) the ratio of the land area in each county to the total land area of the State.

For State Fiscal Year 2013, Park County received $109,203 in State fuel tax funds. The amount varies annually.

All fuel tax funds allocated to the city and county governments must be used for the construction, reconstruction, maintenance, and repair of rural roads or city streets and alleys. The funds may also be used for the share that the city or county might otherwise expend for proportionate matching of federal funds allocated for the construction of roads or streets that are part of the primary, secondary, or urban systems. Priorities for the use of these funds are established by each recipient jurisdiction.

6.3. LOCAL FUNDING SOURCES

Local governments generate revenue through a variety of funding mechanisms. Typically, several local programs related to transportation exist for budgeting purposes and to disperse revenues. These programs are tailored to fulfill specific transportation functions or provide particular services. The following text summarizes programs that are or could be used to finance transportation improvements by the county.

6.3.1. Road Fund

The County Road Fund provides for the construction, maintenance, and repair of all county roads outside the corporate limits of cities and towns in Park County. Revenue for this fund comes from intergovernmental transfers (i.e., state gas tax apportionment and motor vehicle taxes) and a mill levy assessed against county residents living outside cities and towns.

County Road Fund monies are used primarily for maintenance with little allocated for new road construction. Only a small percentage of the total miles on the county road system is located in the study area. Projects eligible for financing through this fund will be competing for available revenues on a countywide basis.

6.3.2. Bridge Fund

The Bridge Fund provides financing for engineering services, capital outlays, and necessary maintenance for bridges on all off-system and secondary routes within the county. These monies are generated through intergovernmental fund transfers (i.e., vehicle licenses and fees), and a countywide mill levy. There is a taxable limit of four mills for this fund.

6.3.3. Special Revenue Funds

Special revenue funds may be used by the county to budget and distribute revenues legally restricted to a specific purpose. Several such funds that benefit the transportation system are discussed briefly below.

6.3.3.1. Capital Improvements Fund

This fund is used to finance major capital improvements to county infrastructure. Revenues are generated by loans from other county funds and must be repaid within ten years. Major road construction projects are eligible for this type of financing.

6.3.3.2. Rural Special Improvement District Revolving Fund

This fund is used to administer and distribute monies for specified Rural Special Improvement District projects. Revenue for this fund is generated primarily through a mill levy and motor vehicle taxes and fees. A mill levy is assessed only when delinquent bond payments dictate such an action.

6.3.3.3. Special Bond Funds

The county may establish a fund of this type on an as-needed basis for a particularly expensive project. The voters must approve authorization for a special bond fund. The county is not currently using this mechanism.

6.4. PRIVATE FUNDING SOURCES

Private financing of roadway improvements in the form of right of way donations and cash contributions has been successful for many years. In recent years, the private sector has recognized that better access and improved facilities can be profitable due to increased land values and commercial development possibilities. Several forms of private financing for transportation improvements used in other parts of the United States are described in this section.

6.4.1. Cost Sharing

The private sector pays some of the operating and capital costs for constructing transportation facilities required by development actions.

6.4.2. Transportation Corporations

These private entities are non-profit, tax-exempt organizations under the control of state or local government. They are created to stimulate private financing of highway improvements.

6.4.3. Road Districts

These are areas created by a petition of affected landowners, and they enable issuance of bonds for financing local transportation projects.

6.4.4. Private Donations

The private donation of money, property, or services to mitigate identified development impacts is the most common type of private transportation funding. Private donations are effective in areas where financial conditions do not permit a local government to implement a transportation improvement itself.

6.4.5. General Obligation Bonds

The sale of general obligation (G.O.) bonds could be used to finance a specific set of major highway improvements. A G.O. bond sale, subject to voter approval, would provide the financing initially required for major improvements to the transportation system. This funding method is advantageous because when the bond is retired, the obligation of the taxpaying public is also retired. State statutes limiting the level of bonded indebtedness for cities and counties restrict the use of G.O. bonds. The present property tax situation in Montana, and recent adverse citizen responses to proposed tax increases by local government would suggest that the public may not be receptive to the use of this funding alternative.

6.4.6. Local Improvement District

This funding option is applicable to counties wishing to establish a local improvement district for road improvements. While similar to a Rural Special Improvement District, this funding option is more streamlined, thus benefiting counties.

6.4.7. Development Exactions/Impact Fees

Exaction of fees or other considerations from developers in return for allowing development to occur can be an excellent mechanism for improving the transportation infrastructure. Developer exactions and fees allow growth to pay for itself. The developers of new properties have to provide at least a portion of the added transportation system capacity necessitated by their development, or to make some cash contribution to the agency responsible for implementing the needed system improvements.

Establishment of an equitable fee structure would be required to assess developers based on the level of impact to the transportation system expected from each project. Such a fee structure could be based on the number of additional vehicle trips generated, or on a fundamental measure such as square footage of floor space. Once the mechanism is in place, all new development would be reviewed by the local government, and fees could be assessed accordingly.

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Chapter 7

Conclusions and Next Steps

The segment of US 89 from RP 0.00 to RP 52.50 was evaluated at a planning level to obtain an understanding of corridor needs, objectives, constraints and opportunities, and funding availability, as well as to plan for long-term corridor needs and develop a package of improvement options to address those needs. MDT initiated the development of this pre-NEPA/MEPA corridor planning study, with the cooperation of Park County, to identify and evaluate improvement options to address needs on this segment of US 89. The purpose of the study was to determine potential improvement options to address safety and geometrical concerns within the transportation corridor based on needs identified by the public, the study partners, and resource agencies. The study examined geometric characteristics, crash history, land uses, physical constraints, environmental resources, and existing and projected operational characteristics of the US 89 corridor.

After a comprehensive review of publically available information relative to environmental resources and existing infrastructure, coupled with focused outreach with the public, stakeholders, and various resource agencies, multiple improvement options were developed under varying implementation time frames. Several improvements are recommended to address corridor needs and objectives. The recommended improvements include short- and long-term recommendations intended to address the transportation needs of the highway over the planning horizon (year 2035). These recommendations will assist the study partners in targeting the most critical needs and allocation of resources. The results of the study indicate that, once funding has been identified, there will be no major impediments to developing the recommended improvement options. This study provides a diverse list of improvement options and strategies that may be considered as funding becomes available.

7.1. NEXT STEPS

The ability to develop projects based on the recommended improvement options to US 89 depends on the availability of existing and future federal, state, local, and private funding sources. At the current time, there is no funding identified to complete any of the recommended improvement options contained in this study. To continue with the development of a project (or projects) the following steps are needed:

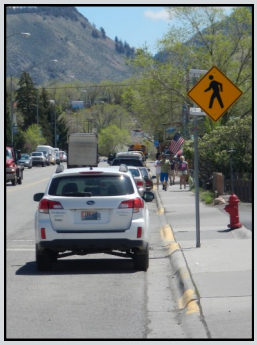
- Identify and secure a funding source or sources.
- For MDT-led projects, follow MDT guidelines for project nomination and development, including a public involvement process and environmental documentation.
- For projects that are developed by others and may impact MDT routes, coordinate with MDT via the System Impact Action Process (SIAP).

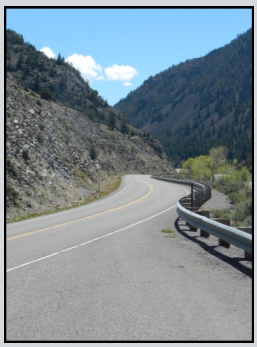
Improvement options identified in this study may lead to future projects. The purpose and need statement for any future project should be consistent with the needs and objectives contained in this study. However, not all of the needs and objectives at the corridor level are required to be included in a project-level purpose and need statement. For example, an advisory curve signing project may have little to no effect on access density objectives, thus rendering compliance with the intent of that particular objective unnecessary. Should this corridor planning study lead to a project or projects, compliance with NEPA (if federal funding is used) and MEPA (if a state action) will be required. Private or county funded projects do not require compliance with the MEPA process. Further, this corridor planning study will be used as the basis for determining the impacts and subsequent mitigation for the improvement options in future

NEPA/MEPA documentation. Any project developed will have to be in compliance with CFR Title 23 Part 771 and ARM 18, sub-chapter 2, which sets forth the requirements for documenting environmental impacts on highway projects.

Appendix 1

Consultation, Coordination and Public Involvement





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ID	Date and Name	Comment	Response
1	02/26/2014 Jerry Ladewig	Needs to be more left and right turn lanes at frequently used corners; South Dry Creek Road (mile 26) needs southbound right turn lane and north bound left turn lane; Trail Creek Road just north of the Emigrant intersection needs right turn lanes both southbound and northbound; astonished to see Maiden Basin Road with recommendation for turn lanes; like see longer no-passing zones and larger, reflective yellow no-passing signs; install large signs reading "Lights on for Safety"; consider reducing the speed limit; please consider all available options to advise drivers to drive in a more responsible, safe manner.	Thank you for your comments. They are included in our study records. Additional locations for turn lane evaluation(s) have been included in the report (see **Section 5.2.1**).
2	03/01/2014 Robert Branson	Request a turn-lane be considered for the exits off of US 89 into the 2 Glastonbury subdivisions; near accidents; out-of-state and unfamiliar.	Thank you for your comments. They are included in our study records. Additional locations for turn lane evaluation(s) have been included in the report (see **Section 5.2.1**).
3	03/07/2014 Shane Farnor	Concern over wildlife-vehicle collisions and impact on wildlife and human safety; road is the gateway to Yellowstone National Park and should be safe for park visitors, local residents, and wildlife; fully evaluate the potential to reduce wildlife-vehicle collisions on US 89; assure (1) any future projects on US 89 consider the cost-effectiveness of including technologies to reduce wildlife-vehicle collisions and (2) conduct a study of key collision 'hot spots' in the near-term to fully understand the scope, scale, and opportunity specific to reducing wildlife-vehicle collisions on 89 in the long-term. *(Note that this comment was submitted by numerous individuals. In those cases where the comment language is identical to this comment, reference is made to "see comment number 3").*	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).
4	03/07/2014 Marlene Harrell	*See comment number 3.*	*See response number 3.*
5	03/07/2014 Keith Adams	*See comment number 3.*	*See response number 3.*
6	03/07/2014 Lee Conway	*See comment number 3.*	*See response number 3.*
7	03/07/2014 Eugene Kiedrowski	*See comment number 3.*	*See response number 3.*
8	03/07/2014 Dick Forehand	*See comment number 3.*	*See response number 3.*

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ID	Date and Name	Comment	Response
9	03/07/2014 Jillian Fiedor	*See comment number 3.*	*See response number 3.*
10	03/07/2014 Jane Timmerman	*See comment number 3.*	*See response number 3.*
11	03/07/2014 Wm. Schultz	*See comment number 3.*	*See response number 3.*
12	03/07/2014 Andrea Silverman	*See comment number 3.*	*See response number 3.*
13	03/07/2014 Robert Miller	*See comment number 3.*	*See response number 3.*
14	03/07/2014 Andy Morgan	*See comment number 3.*	*See response number 3.*
15	03/07/2014 Pete Rorvik	*See comment number 3.*	*See response number 3.*
16	03/07/2014 George Ulrrch	*See comment number 3.*	*See response number 3.*
17	03/07/2014 Donna Gleaves	*See comment number 3.*	*See response number 3.*
18	03/07/2014 Bart Melton	*See comment number 3.*	*See response number 3.*
19	03/07/2014 Janet Flury	*See comment number 3.*	*See response number 3.*
20	03/07/2014 Richard Glacken	*See comment number 3.*	*See response number 3.*

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ID	Date and Name	Comment	Response
21	03/07/2014 Toni Semple	*See comment number 3.*	*See response number 3.*
22	03/07/2014 Tony Motto	*See comment number 3.*	*See response number 3.*
23	03/07/2014 Linda Cacopardo	*See comment number 3.*	*See response number 3.*
24	03/07/2014 Maurene Janke	*See comment number 3.*	*See response number 3.*
25	03/07/2014 Ralph Guay	*See comment number 3.*	*See response number 3.*
26	03/07/2014 Val Colenso	*See comment number 3.*	*See response number 3.*
27	03/07/2014 Doug Hammill	*See comment number 3.*	*See response number 3.*
28	03/07/2014 Liz Moran	Both husband and I have been in collisions with wildlife on US 89 – the animals were badly injured and cars totaled; left Mill Creek Forest Service Cabin north of Gardiner and swerved through a herd of elk crossing the road. *Also see comment number 3.*	Thank you for your comments. They are included in our study records. *Also see response number 3.*
29	03/07/2014 Ann King	*See comment number 3.*	*See response number 3.*
30	03/07/2014 Judy Moore	*See comment number 3.*	*See response number 3.*
31	03/07/2014 Bill Baum	*See comment number 3.*	*See response number 3.*
32	03/07/2014 Joan Daniels	*See comment number 3.*	*See response number 3.*

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ID	Date and Name	Comment	Response
33	03/07/2014 Marlene Miller	*See comment number 3.*	*See response number 3.*
34	03/07/2014 Joel Vignere	*See comment number 3.*	*See response number 3.*
35	03/07/2014 Judith Miller	Have collided with a mule deer on US 89. *Also see comment number 3.*	Thank you for your comments. They are included in our study records. *Also see response number 3.*
36	03/07/2014 V Kent	*See comment number 3.*	*See response number 3.*
37	03/07/2014 Julie Gandulla	*See comment number 3.*	*See response number 3.*
38	03/07/2014 Melissa Hinz	*See comment number 3.*	*See response number 3.*
39	03/07/2014 Evelyn Drews	*See comment number 3.*	*See response number 3.*
40	03/07/2014 Rachel Klempel	*See comment number 3.*	*See response number 3.*
41	03/07/2014 Pamela Baillio	*See comment number 3.*	*See response number 3.*
42	03/07/2014 Constance Fiske	*See comment number 3.*	*See response number 3.*
43	03/07/2014 Kathryn Jensen	*See comment number 3.*	*See response number 3.*
44	03/07/2014 Magoo Shoulderblade	*See comment number 3.*	*See response number 3.*

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ID	Date and Name	Comment	Response
45	03/07/2014 H Mcfadden	*See comment number 3.*	*See response number 3.*
46	03/07/2014 D.J. Burgard	*See comment number 3.*	*See response number 3.*
47	03/07/2014 Susan Ruiz	*See comment number 3.*	*See response number 3.*
48	03/07/2014 Laulette Hansen	*See comment number 3.*	*See response number 3.*
49	03/07/2014 David Fears	*See comment number 3.*	*See response number 3.*
50	03/07/2014 Dan Goehring	*See comment number 3.*	*See response number 3.*
51	03/07/2014 Harlan Mumma	*See comment number 3.*	*See response number 3.*
52	03/07/2014 Jean Mc Allister	*See comment number 3.*	*See response number 3.*
53	03/07/2014 Norman Bishop	Retired National Park Service employee in Yellowstone. *Also see comment number 3.*	Thank you for your comments. They are included in our study records. *Also see response number 3.*
54	03/07/2014 Larry Carter	*See comment number 3.*	*See response number 3.*
55	03/07/2014 Peg Dollinger	*See comment number 3.*	*See response number 3.*
56	03/07/2014 April Roby	*See comment number 3.*	*See response number 3.*

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ID	Date and Name	Comment	Response
57	03/08/2014 Rhiannon Blanchard	*See comment number 3.*	*See response number 3.*
58	03/08/2014 Monica Kelly Wright	*See comment number 3.*	*See response number 3.*
59	03/08/2014 Dee Hellings	*See comment number 3.*	*See response number 3.*
60	03/08/2014 Billy Angus	*See comment number 3.*	*See response number 3.*
61	03/08/2014 James Sweaney	*See comment number 3.*	*See response number 3.*
62	03/08/2014 Clinton Sennett	*See comment number 3.*	*See response number 3.*
63	03/08/2014 Gail Richardson	Support projects to reduce horrific waste of our precious wildlife by vehicles often driven at high speeds on US 89; crashes sometimes injure people as well and cause lots of damage to vehicles; MDT should be at the forefront of helping to prevent wildlife collisions and protecting the public. *Also see comment number 3.*	Thank you for your comments. They are included in our study records. *Also see response number 3.*
64	03/08/2014 Philip Naro	*See comment number 3.*	*See response number 3.*
65	03/08/2014 George Seielstad	*See comment number 3.*	*See response number 3.*
66	03/08/2014 Jeanette Copeland	*See comment number 3.*	*See response number 3.*

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ID	Date and Name	Comment	Response
67	03/08/2014 Norm Denton	*See comment number 3.*	*See response number 3.*
68	03/08/2014 Cat Maxwell	*See comment number 3.*	*See response number 3.*
69	03/08/2014 Nike Stevens	Have experienced high numbers of wildlife on the highway; have narrowly averted one collision with a deer despite slowing down and being careful; hard to look all directions at once; recommend increasing signing and using flashing lights that turn on when animals are near the highway; reduce speed limit north of YNP; evaluate all methods available and work to reduce wildlife-vehicle collisions on US 89.	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).
70	03/08/2014 Wm Schultz	*See comment number 3.*	*See response number 3.*
71	03/08/2014 Toddy Perryman	*See comment number 3.*	*See response number 3.*
72	03/08/2014 Susan Sharp	Do what is needed to evaluate and improve US 89 to minimize the collision potential between motorists and animals; road is an important approach to Yellowstone National Park and should be safe for park visitors, local residents, and wildlife; implement the technology needed to reduce vehicle / wildlife collisions and improve those sections that are prime collision areas; consider building some animal bridges like the one that has been built along Hwy 93 South on the Flathead Indian Reservation.	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).
73	03/08/2014 Lilyana Srnoguy	*See comment number 3.*	*See response number 3.*
74	03/08/2014 Mike O'Connell	*See comment number 3.*	*See response number 3.*
75	03/08/2014 Terri Shaw	*See comment number 3.*	*See response number 3.*
76	03/08/2014 Dan Sullivan	*See comment number 3.*	*See response number 3.*

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ID	Date and Name	Comment	Response
77	03/08/2014 Carole Parker	*See comment number 3.* Provide additional police presence along this route to regulate speeding vehicles; have never viewed a police vehicle along this corridor; speed limits should be reduced - why hurry to kill?; a few solar lights could be placed in the 'bad' areas - light sensitive high street lamps.	*See response number 3.* Statutory and special speed zones are posted in accordance with adopted Montana Transportation Commission resolutions (see **Section 3.2.12**).
78	03/08/2014 Eric Drissell	*See comment number 3.*	*See response number 3.*
79	03/08/2014 Peter Reum	*See comment number 3.*	*See response number 3.*
80	03/08/2014 Richard Faltonson	*See comment number 3.*	*See response number 3.*
81	03/09/2014 Paul Okerberg	*See comment number 3.*	*See response number 3.*
82	03/09/2014 Ruth Grindinger	*See comment number 3.* Travel corridor every day - what about a passage under the road way for animals; shouldn't this be studied?	*See response number 3.*
83	03/09/2014 Linda Pierce	*See comment number 3.*	*See response number 3.*
84	03/09/2014 Deborah Busch	*See comment number 3.*	*See response number 3.*
85	03/09/2014 Lisa Stanton	*See comment number 3.*	*See response number 3.*
86	03/09/2014 Anne Milllbrooke	*See comment number 3.*	*See response number 3.*

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ID	Date and Name	Comment	Response
87	03/10/2014 Mark Robertson	*See comment number 3.*	*See response number 3.*
88	03/10/2013 Joe Gross	Place signage just south of Livingston noting distances to restrooms along US 89; install pull-outs between RP 41 and RP 47; install 4 lanes between RP 41 and RP 47; fishing access out of Emigrant needs a by-pass between RP 33 and RP 34; Dry Creek area needs a bypass between RP 27 and RP 28; restroom area between RP 23 and RP 24 needs a bypass; need a pull-out between RP 17 and RP 18 going into Yankee jim Canyon; traffic backup in Gardiner getting into YNP; need a bypass between RP 1 and RP 2; envision a wildlife underpass near RP 27; envision an elk overpass between RP 17 and RP 18. *(Note individual also attached numerous letters and articles relative to the Gardiner Gateway Project, with corresponding comments; see appendix 1 for attachments.)*	Thank you for your comments. They are included in our study records.
89	03/11/2014 Janet Dunham	*See comment number 3.*	*See response number 3.*
90	03/10/2014 Temia Keel	Resident in Mammoth; frequently travel US 89; know dangerous in terms of wildlife-vehicle collisions; critical to appropriately evaluate options and reduce such dangerous situations. *Also see comment number 3.*	Thank you for your comments. They are included in our study records. *Also see response number 3.*
91	03/11/2014 Colleen Eldred	Complete a full study of US 89 (Livingston to Gardiner) to identify collision reducing measures to reduce collisions with wildlife and improve human safety.	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).
92	03/11/2014 Gregory Dalling	Drive US 89 between Livingston and Gardiner 2 - 3 days per week. *Also see comment number 3.*	Thank you for your comments. They are included in our study records. *Also see response number 3.*
93	03/11/2014 Sabina Strauss	*See comment number 3.*	*See response number 3.*
94	03/11/2014 Katherine Basirico	*See comment number 3.*	*See response number 3.*

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ID	Date and Name	Comment	Response
95	03/11/2014 Carolyn Fifer	Problems of wildlife versus vehicles; great potential for accidents; many options available to greatly reduce the chances of accidents; MDT should undertake a full study of the entire length of US 89 and implement significant improvements; use this opportunity to save lives; institute in Bozeman specializing in creative techniques to move wildlife over and under highways; traffic between Livingston and Gardiner will most definitely increase; let's do the job right while we have the opportunity.	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).
96	03/11/2014 Joe Bauman	*See comment number 3.*	*See response number 3.*
97	03/11/2014 Michele Wolff	*See comment number 3.*	*See response number 3.*
98	03/11/2014 Alex Russell	Strongly urge substantial improvements be made for wildlife and motorist safety along US 89; many cost effective methods for funneling wildlife around or through hazardous areas exist; communities along the front range of the Canadian Rocky Mountains have been very successful at reducing wildlife collisions with highway over and underpasses.	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).
99	03/11/2014 Kristine Ellingsen	Familiar with US 89 having driven it off and on for nearly 40 years; well aware of the wildlife to either side of the road each time I drive; attempt to limit usage to daylight hours; always saddened to see the carcasses of animals who have died while trying to get to forage or water on the other side of this road; concerned to know that many people have been injured because of wildlife/car collisions. Consider a study to determine the places where wildlife is most likely to cross; consider road designs that incorporate near-natural crossings for the many animals who need to intersect our high-speed human trails; most animals have few or no instincts that would help them correctly interpret and respond to the threat of an approaching automobile.	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).
100	03/11/2014 Jennifer Harris	*See comment number 3.*	*See response number 3.*
101	03/12/2014 Mike McGrath (USFWS)	Thank you for the opportunity to comment on the draft report for this corridor planning study; draft report did a good job addressing wildlife-vehicle collisions and potential remedies, as well as fish passage issues for any potential bridge or culvert replacement projects that might arise.	Thank you for your comments. They are included in our study records.
102	03/12/2014 Rose Norman	Please consider the deer and elk problem on US 89 South; consider planning a safe route for animal migration to the river across the highway; route is dangerous to the numerous animal population(s) and to the drivers who must use this route to travel.	Thank you for your comments. They are included in our study records.

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103	03/12/2014 Charlsie Bader	*See comment number 3.*	*See response number 3.*
104	03/12/2014 Katherine Carr	*See comment number 3.*	*See response number 3.*
105	03/12/2014 Jon Springer	Improvements options developed without knowledge of a future capacity demand at the Corwin Springs intersection; Royal Teton Ranch is presently contemplating revival of the LaDuke hot springs facility at the original Corwin Springs site, with a presently contemplated commercial opening back half of 2015.	Thank you for your comments. They are included in our study records. Additional locations for turn lane evaluation(s) have been included in the report (see **Section 5.2.1**).
106	03/13/2014 Sandra Sobanski	*See comment number 3.*	*See response number 3.*
107	03/13/2014 Christina Bauer	*See comment number 3.*	*See response number 3.*
108	03/13/2014 Susan Barron	*See comment number 3.*	*See response number 3.*
109	03/13/2014 Andrea Jones (MT FWP)	Wildlife is a primary issue for this area in terms of safety, resource conservation, and public interest; fifty percent of reported vehicle collisions over the past five years were caused by wildlife; impact to the wildlife resource is important to consider; wildlife is of great public concern in this area, as reflected by many public comments received. Draft report recommendations inadequate in regards to any specific recommendations for achieving a reduction in animal-vehicle conflicts; wildlife mitigation projects relegated to time and place where a higher priority project is being developed. Some suggestions for mitigation that merit additional consideration are as follows: • Mileposts 1 – 17: Reduction of speed limits between Carbella and the town of Gardiner. • Mileposts 12 – 16: Wildlife detection system to alert drivers to wildlife in the roadway in Yankee Jim Canyon. • Mileposts 16 – 22: Wildlife underpasses. Many hotspots for deer collisions along the corridor; ask that these be assessed on the ground to consider locations and strategies for the most feasible and cost-effective mitigations, to be included in the final report as recommendations. Specific areas we suggest for consideration	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).

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		are: • Mileposts 1 – 13: The entire Gardiner Basin has exceptionally high numbers of deer carcasses; • Mileposts 1 – 5: Just west of the town of Gardiner is an area of exceptionally high numbers of deer carcasses as well as other wildlife including elk, bison and bighorn sheep; • Mileposts 20 – 30: Very high numbers of deer carcasses between the town of Emigrant and Carbella; • Mileposts 30 – 45: Moderate to high numbers of deer carcasses between Emigrant and Pine Creek Fish passage considerations will need to be made for any future projects that cross surface waters. We request that the following be implemented if bridge work is to be completed: • Bridge span be increased to minimize constriction of the water and to accommodate flood events more easily by allowing access to the floodplain; • The number of piers reduced to the minimum if a free span is not possible. FWP maintains and operates 17 fishing access sites (FAS) within the US 89 highway corridor study area. For the thirteen sites accessed directly from US 89, FWP has the following concerns regarding safe ingress and egress which we request MDT take into account in its corridor design process: • The length of stable approaches, which lack suitable traction when exiting the FAS either with large RVs or tow vehicle with boat trailer. • Deteriorating highway shoulders in areas of pioneered river access points. • Dysfunctional approaches and unsafe ingress and egress, (i.e. Slip & Slide FAS). • Difficult approach angle, (i.e. Brogan Landing FAS). • During peak use, seven of the directly accessed sites typically have no less than twenty tow vehicles and trailers accessing the site. • Increased use, above routine peaks, can occur if other river drainages in southwest experience low water flow. This will increase the volume of traffic on US 89 and crowding at FAS along the corridor. • The lack of scenic pull-outs and/or turn-around areas often resulting in large RVs using private roads or property to turn-around in order to travel in the opposite direction on US 89. • The lack of adequate turning lanes for FAS, particularly at Carter's Bridge FAS, Mallard's Rest FAS, and Grey Owl FAS.	Additional locations for turn lane evaluation(s) have been included in the report (see **Section 5.2.1**).

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110	03/13/2014 Jerry Grebenc (Montana's for Safe Wildlife Passage & National Parks Conservation Association)	Urge MDT to revise the Draft to recommend a comprehensive study of how best to reduce collisions between motorists and wildlife, which account for 50 percent of all reported crashes from 2007 to 2012, along the US 89 study corridor from Livingston to Gardiner. The Draft should recommend that MDT undertake (or commission) a comprehensive wildlife mitigation study using existing data; request MDT commit to conducting (or commissioning) a further analysis of wildlife-vehicle collision risk in the US 89 corridor and the feasibility of implementing mitigation measures.	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).
111	03/14/2014 Diane Hilborn	Conduct additional study of US 89 from Livingston to Gardiner; lower the number of animal related vehicle accidents to benefit both people and animals; suggest signs be put up leaving both cities that instructs drivers to turn on their headlights for safety - many accidents would be avoided with one simple sign.	Thank you for your comments. They are included in our study records.
112	03/14/2014 Alan Shaw (Church Universal & Triumphant / The Summit Lighthouse)	Have a recommended safety improvement based on two crashes I'm aware of; close proximity of the LaDuke Hot Springs; in January 2014 and in July 2010, two crashes occurred northbound at approximately RP 6; 2014 crash resulted in a fatality; severity of both crashes could have been potentially mitigated by lengthening the existing guardrail at this location; 2014 vehicle crash completely missed the existing guardrail; SUV passed to the outside of the guardrail and rolled; 2010 crash impacted the end of the guardrail (PDF provided and in Appendix 1); consideration should be given to extending the guardrail in this section.	Thank you for your comments. They are included in our study records. This comment was forwarded to MDT Butte District personnel for further consideration.
113	03/14/2014 Kylie Paul (Defenders of Wildlfie)	Several wildlife species of our focus live in and around Yellowstone National Park including grizzly bears, gray wolves, wolverines, and lynx, and we are concerned with habitat connectivity and species health in the region; as reported by MDT in the Draft, collisions between motorists and wildlife account for 50% of all reported crashes from 2007 to 2012 along the US 89 study corridor from Livingston to Gardiner; US 89 thus presents a public safety problem, causing human injuries and lives, and is of course a risk to wildlife, from common species to threatened or endangered species. MDT does not offer any wildlife-related safety improvements to this highly dangerous situation. Instead, the Draft states that MDT will review "any improvement option relevant to wildlife mitigation … on a project case-by-case basis." These potential options will be explored in the future at (as-yet-undetermined) "as needed" locations within an "as needed" timeframe. This is disappointing and unacceptable. MDT can and should include an assessment into this Draft that will help guide and streamline efforts for mitigation in the future; MDT could and should suggest mitigation measures to reduce wildlife collisions at specific locations; MDT is already familiar with the variety of mitigation measures available as they have incorporated them effectively on US93 North and South. It is entirely feasible and logical to incorporate this level of analysis and recommendations into the Draft; while MDT offers vague language for wildlife-related safety improvements, it provides detailed language and site-specific suggestions for other recommended improvements. Specific planning to address wildlife concerns should be added into the Draft. It is not appropriate to	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).

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		leave such planning for piecemeal projects in the future. Defenders respectfully requests that MDT revise the Draft to include an identification of wildlife-vehicle collision "hot spots" and recommendations of mitigation measures at these locations, or that it recommends a comprehensive study in the very near future to do so. Human and wildlife safety on and along this highway is of utmost interest to Defenders, local Montanans, and the thousands of Yellowstone National Park visitors who travel to this area to appreciate the diversity of wildlife in the region.	
114	03/18/2014 Alyssa Allen (Glastonbury Landowners Association, Inc.)	The Glastonbury Landowners Association (GLA), represents owners of 396 separate tracts of land within two large subdivisions, which are accessed westerly off U.S. Route 89 by three county roads: Trail Creek Road, Story Road, and Dry Creek Road. We would like to be considered in this study for three possible exit lanes at these three county roads. We would be perfectly willing, as part of this study, to have traffic counters at all three of our entrances to show just how much traffic is using our subdivision roads.	Thank you for your comments. They are included in our study records. Additional locations for turn lane evaluation(s) have been included in the report (see **Section 5.2.1**).
115	03/20/2014 Daniel Wenk *(Yellowstone National Park)* RECEIVED AFTER CLOSE OF COMMENT PERIOD	Reduce impacts on wildlife in the study area; wildlife resources are important for hunting, photography, and wildlife viewing; many of the wildlife species, such as elk, bison, deer, and pronghom, that winter in the Gardiner Basin and Paradise Valley spend summers inside of Yellowstone National Park and tourists come from all over the world to see these species. Paradise Valley is known to have a high rate of vehicle-wi ldlife collisions; vehicle operational speed is generally considered the factor that contributes most to vehicle-wild life collisions; several mitigations have potential for reducing the risks of vehicle coll isions with wildlife, including reductions in speed limits, wildlife crossing structures, and wildlife detection systems. In our review of the study, we observed that much of the current plan is designed to make traffic move faster, which may have the unintended consequence of additional wildlife mortality within this corridor. We recommend that the existing study report be revised to commit to a comprehensive study of the highway corridor that would identify where collision-reducing measures would be most cost effective and offer the highest probability to reduce vehicle wildlife collisions. Reducing vehicle-wildlife collisions will make the corridor safer for Paradise Valley residents, visiting tourists, and the wildlife resources that are so important to the Greater Yellowstone Ecosystem and enjoyment by the public.	Thank you for your comments. They are included in our study records. Measures specific to reducing wildlife-vehicle collisions are included in the report (see **Section 5.2.5, 5.3 and 5.5**).
116	04/03/2014 Jess Davies *(US Corps of Engineers)*	Projects must avoid and minimize impacts to aquatic resources to the greatest extent racticable; under the authority of Section 404 of the CWA, Department of the Army permits are required for the discharge of fill material into waters of the U.S.; Waters of the U.S. include the area below the ordinary high water mark of stream channels and lakes or ponds connected to the tributary system, and wetlands adjacent to these waters; isolated waters and wetlands, as well as man-made channels, may be Waters of the U.S. in certain circumstances, which must be determined	Thank you for your comments. They are included in our study records.

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	RECEIVED AFTER CLOSE OF COMMENT PERIOD	on a case-by case basis. Future plans for improvements on the corridor need to consider avoidance of aquatic resources where practicable; minimization of adverse impacts where avoidance cannot occur; and possible compensatory mitigation for adversely affected aquatic resources; the section of the Yellowstone River and its adjacent riparian and floodplain areas lie within the boundaries of the Special Area Management Plan (SAMP) for the Upper Yellowstone River; permitting projects in waters of the U.S. within the SAMP area will require compliance with the SAMP to ensure minimal effects on the Yellowstone River and associated areas. Improvements along the U.S. Highway 89 corridor may have effects on aquatic resources along the East River Road corridor; please consider making this part of the dialogue as the corridor study moves ahead. Thank you for the opportunity to provide input. The Corps looks forward to continued involvement on this project.	
117	04/11/2014 Lynn Chan RECEIVED AFTER CLOSE OF COMMENT PERIOD	Encourage same roadway characters and practices as YNP to allow variances to road design; not in favor of road widening or passing lanes other than at busy intersections where safety is a legitimate issue; not many intersections busy enough to offset the visual ugliness and resource impacts of wide sections of asphalt; grade properly versus installing curb and gutter; when installing curb and gutter in Gardiner take into consideration where the water will go - Gardiner side streets do not have designed drainage; believe speed limits currently are just right in the valley and in Gardiner; do agree that the 25 mph speed limit could extend to the end of the built up are in Gardiner; wholheartedly support a bike lane, bike path, sidewalks, trails and any treatments that support and encourage non-motorized travel within and between our communities; support the idea of bus stops along the road at potential future bus pick-up points such as Pine Creek, Emigrant and Corwin Springs. Support and encourage replacement of HPS and LPS street lights on 30 foot poles and do NOT support any additional lighting of the road corridor or intersections; Gardiner is hoping to change out the lights on HW 89 to a pedestrian scale, historic looking, fully shielded LED light.	Thank you for your comments. They are included in our study records. Statutory and special speed zones are posted in accordance with adopted Montana Transportation Commission resolutions (see **Section 3.2.12**). Non-motorized path development and lighting in Gardiner are discussed in **Section 5.3** and **Section 5.2.4**, respectively.
118	04/23/2014 Dan Vermillion RECEIVED AFTER CLOSE OF COMMENT PERIOD	Urge MDT to analyze how to reduce wildlife-vehicle collisions into corridor planning study; wildlife-vehicle collisions represent one of the largest causes of accidents on Highway 89 south of Livingston; am a property owner in one of the primary collision hot spots - witness people with overturned cars, shattered front ends, or maimed deer sitting on the side of road; aside from the obvious unnecessary harvest of wildlife, this poses a safety risk for the drivers on Highway 89; is a public safety issue; need further study on how to reduce wildlife-vehicle collisions. Montanans place importance on wildlife and the important role wildlife plays in our quality of life; also true of visiotros to Paradise Valley; visitors are a very important part of our economy. Highway 89 is a very important roadway to the people of Park County; commend MDT for undertaking the planning study; study must analyze how to minimize wildlife-vehicle collisions; as traffic volume increases the collisions with wildlife will increase and the public safety imperative/economic imperative of reducing these collisions also increase.	Thank you for your comments. They are included in our study records.

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