Tongue River Road (S-332)
CORRIDOR PLANNING STUDY

Draft

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PREPARED FOR

Montana Department of Transportation

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    - Presentation
    - Summary of Meeting Notes
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ABBREVIATIONS / ACRONYMS

AADT	Average Annual Daily Traffic
BLM	Bureau of Land Management
CAPP	Community and Agency Participation Plan
CAPS	Critical Areas Planning System
DEQ	Department of Environmental Quality
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FWP	Fish, Wildlife, and Parks
GIS	Geographic Information Systems
LUST	Leaking Underground Storage Tank
LWQD	Local Water Quality District
MAP-21	Moving Ahead for Progress in the 21st Century
MCA	Montana Code Annotated
MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MSAT	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NAC	Noise Ambient Criteria
NEPA	National Environmental Policy Act
NPL	National Priority List
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRIS	Natural Resource Information Systems
RP	Reference Post
SFC	State Funded Construction
STB	Surface Transportation Board
STIP	State Transportation Improvement Program
STP	Surface Transportation Program
STPS	State Secondary Highway Program
TIF	Tax Increment Financing
TMDL	Total Maximum Daily Loads
TRR	Tongue River Railroad
USACOE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
UST	Underground Storage Tank
VPD	Vehicles per Day

EXECUTIVE SUMMARY

The 2011 Legislature appropriated funds to "... survey and provide design and preliminary engineering work to improve State Secondary 332." As a result, the Montana Department of Transportation (MDT), in partnership with Custer and Rosebud Counties, initiated a *Corridor Planning Study* of Secondary Route 332 (S-332) from approximately reference post (RP) 0.00 (MT-59 intersection) extending 50.4 miles southwest to approximately RP 50.4 (S-447 intersection).

The purpose of the study is to determine potential improvement options to address safety and geometrical concerns within the transportation corridor based on needs presented by the community, the study partners, and resource agencies. The study examined geometric characteristics, crash history, and existing and projected operational characteristics of the S-332 corridor. Existing and projected physical constraints, land uses, and environmental resources were also analyzed.

The study, intended as a planning study and not a design project, was developed through a collaborative process with MDT, the counties, and the Federal Highway Administration (FHWA) and involved focused outreach to the community, key stakeholders, and resource agencies. An evaluation of known and publically available resource information was conducted. Activities that were completed for the development of the study include the following:

- Research and analysis of existing S-332 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 to costs, available funding, feasibility, community input, and known environmental resource constraints.
- Documentation of potential funding mechanisms for improvement options.

ES.1. CORRIDOR ISSUES

An assessment of existing conditions within the study area was made through review of as-built drawings, field review, public databases, and on public and stakeholder input. A number of roadway issues and areas of concern were identified including existing roadway geometrics, roadway surfacing and condition, drainage issues, and environmental considerations. The following major issues were identified.

Roadway Geometrics

Geometric areas of concern include roadside safety and clear zones (including cut and fill slopes), sub-standard horizontal and vertical curvature, and sight distances. The following roadway geometric areas of concern were noted:

- Seven horizontal curves do not meet current standards.
- 46 vertical curves do not meet current standards.
- Nine locations have grades that do not meet current standards.
- 22 locations were estimated to have clear zones that do not meet current standards based on field review.

Roadway Surfacing and Condition

Roadway surfacing and condition is of concern along S-332. A number of public comments were made regarding roadway surfacing and were generally split between those wishing to pave the entire corridor and those wishing that gravel surfacing remain. S-332 is currently paved from RP 0.0 to RP 17.7 and is in need of repair. The gravel section is in poor condition and needs continual maintenance. Some of the concerns include:

- Longitudinal and transverse cracking in the asphalt surfacing.
- Evidence of asphalt failure due to recent slides.
- Gravel surfacing from RP 17.7 to RP 50.4.
- Presence of road generated dust inhibiting driver vision.

Drainage

2011 was a historic year for flooding in eastern Montana. Due to severe flooding, a number of slides occurred along S-332. The majority of the identified slide locations received minor repair work intended as temporary mitigation. Evidence of continued subsurface failure was noted at some of these locations. Evidence of recent slides was noted during the field review at the following approximate locations:

- RP 3.26
- RP 3.74
- RP 4.20
- RP 4.45
- RP 4.65
- RP 26.22
- RP 27.90
- RP 36.30
- RP 43.50

Environmental

An *Environmental Scan* was developed by MDT for the corridor. The primary objective of the *Environmental Scan* is to determine the potential constraints and opportunities within the study area boundary. As a planning level scan, the information is obtained from various reports, websites and other documentation. The scan is not a detailed environmental investigation. The following environmental considerations were noted:

- Areas of prime farmland are located within the study area.
- Tongue River is located within the study area and is listed as a 303(d) waterbody.
- Irrigated farmland exists within the study area.
- There are five abandoned mine sites within the study area.
- Seven endangered, threatened, proposed, or candidate species are listed for Custer and Rosebud Counties.
- 39 species of concern for Custer County and 47 species of concern for Rosebud County were listed.
- Nine plant species of concern for Custer County and eleven for Rosebud County were listed.
- 97 separate cultural resources are known to exist within the study area.
- Five 4(f) and one 6(f) resources are located within the study area.

ES.1.1. Development Influences

The southeastern region of Montana contains considerable mineral deposits with existing and projected mining developments. The most prevalent mining activity near the corridor is coal mining. Existing coal mines operate in the region, and the Tongue River Road is currently used to transport coal by semi-truck.

The State of Montana awarded a bid to lease the Otter Creek coal tracts to Ark Land Company, a subsidiary of Arch Coal of St. Louis Missouri, on March 18, 2010. Coupled with the Otter Creek coal tracts are additional tracts owned by Great Northern Properties. These additional tracts create a checkerboard land pattern with the State land. Great Northern Properties have also agreed to lease their tracts to Arch Coal for development. The potential exists for 40 years of coal mining at the location with an estimated production of 10 million tons per year.

ES.2. CORRIDOR STUDY NEEDS AND OBJECTIVES

The following needs and objectives were established based on the analyses of existing and future conditions of the study area. These needs and objectives were used to develop the improvement options that meet, to the extent practicable, given financial, community preference and environmental constraints within the corridor.

NEED 1: IMPROVE SAFETY AND OPERATION OF S-332

Objectives (To the Extent Practicable):

1.1 Improve geometric elements to meet current MDT design criteria.
1.2 Accommodate existing and future capacity demands within the corridor, including potential increases in semi-truck traffic.
1.3 Provide adequate clear zones to meet current MDT design criteria.
1.4 Provide appropriate drainage facilities throughout the corridor to minimize water on the roadway.
1.5 Provide consistent roadway and bridge widths.
1.6 Provide appropriate surfacing to allow for “all-weather” travel.
1.7 Improve maintenance practices, given limited funding, to address washboards, potholes, and dust issues.

NEED 2: PRESERVE THE ENVIRONMENTAL, CULTURAL, RECREATIONAL AND AGRICULTURAL NATURE OF THE CORRIDOR

Objectives (To the Extent Practicable):

2.1 Evaluate and incorporate “best practice” mitigation strategies as appropriate to reduce animal-vehicle conflicts.
2.2 Respect the agricultural nature of the corridor and allow for farm access as needed.
2.3 Avoid adverse impacts to the extent practicable, otherwise minimize adverse impacts to historic, cultural, archaeological, and environmental resources that may result from improvement options.
2.4 Evaluate fish (aquatic organism) passage issues and incorporate appropriate solutions to improve aquatic connectivity and stream function through structures and culverts.
2.5 Provide reasonable access to recreational sites in the corridor.

NEED 3: MINIMIZE CONFLICTS ALONG THE CORRIDOR

Objectives (To the Extent Practicable):

3.1 Minimize impacts to existing residential and agricultural uses along the corridor.
3.2 Minimize impacts to the Amish community, the Northern Cheyenne Indian Reservation and the St. Labre Indian School, all located south of the southern termini of S-332.
3.3 Consider all modes of transportation in the corridor.

OTHER

Objectives (To the Extent Practicable):

1. Reduce roadway maintenance costs.
2. Limit disruptions during construction as much as practicable.
3. Availability and feasibility of funding.

ES.3. IMPROVEMENT OPTIONS AND STRATEGIES

Improvement options for S-332 between MT-59 and S-447 were identified using a series of "concepts" for consideration. The improvement options are 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 various resource agencies, and information provided by the general public. Small scale improvement options (i.e. spot improvements) have been identified and may be as simple as installing guardrail. Larger, more complex improvements have also been identified. These include placing new gravel surfacing on the existing gravel roadway, widening the gravel section of the roadway to a consistent width, or paving the gravel portion of S-332.

Wildlife and aquatic concerns are found throughout the entire corridor. The improvement options should be considered with respect to wildlife and aquatic connectivity impacts. These should be more fully explored during project development activities. The following table contains a summary of the potential improvements along with planning level cost estimates.

Improvement Options Summary

Concept Title	Description	Estimated Cost
CONCEPT 1 – SPOT IMPROVEMENTS		
1.A - Vertical Curves	• Modify existing vertical curves to increase the driver's sight distance. • Identified in both paved and graveled sections. • 46 total curves identified.	$1,380,000
1.B - Slide Areas	• Identified in both paved and graveled sections. • Nine (9) areas identified.	$2,761,000
1.C - Guardrail	• Protect drivers from potential safety hazards due to the steep slopes. • Guardrail warrants to be evaluated prior to installation. • Re-work of slopes may not be feasible.	$1,290,000
1.D - Horizontal Curves (RP 40.23 – RP 40.98)	• Improve three (3) horizontal curves that do not meet current standards. • Limited to area just west of the Tongue River Bridge.	$689,000
CONCEPT 2 – GRAVEL WITHOUT RECONSTRUCTION (RP 17.7 to RP 50.4)		
2.A - Gravel Placement	• Place new 4" gravel surface on the roadway. • No widening of the roadway. • No reconstruction to address identified areas of concern.	$2,741,000
2.B - Double Shot / Bitumen Treatment	• Double chip seal coat on top of existing gravel road. • No widening of the roadway. • No reconstruction to address identified areas of concern.	$2,183,000
CONCEPT 3 – RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 to RP 50.4) [(a)]		
Reconstruct and Widen Gravel Section	• Reconstruct gravel portion to a base width of 36' with a 32' top surface. • May require additional right-of-way (not included in cost estimate).	$25,341,000
Bridge Replacement	• Replace three (3) bridges.	$1,878,000
CONCEPT 4 – REHABILITATE WITH MILL / FILL / OVERLAY (RP 0.0 to RP 17.7) AND RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 to RP 50.4) [(a)]		
Rehabilitate with Mill / Fill / Overlay (RP 0.0 to RP 17.7)	• Mill the existing asphalt pavement, fill areas for better drainage (as needed), and place a new asphalt overlay. • No modifications to existing road widths. • No modifications to existing bridge or hydraulic structures.	$10,690,000
Reconstruct & Widen Gravel Section (RP 17.7 to RP 50.4)	• Reconstruct gravel portion to a base width of 36' with a 32' top surface. • May require additional right-of-way (not included in cost estimate).	$25,341,000
Bridge Replacement	• Replace three (3) bridges along gravel section.	$1,878,000
CONCEPT 5 – RECONSTRUCT WITH PAVEMENT (RP 0.00 to RP 50.4) [(a)]		
Reconstruct with Pavement (RP 0.0 to RP 50.4)	• Reconstruct both the paved and gravel section of the roadway to a paved section. • Width dependent on AADT • May require additional right-of-way (not included in cost estimate).	$54,614,000 (24') $63,716,000 (28') $72,819,000 (32') $81,921,000 (36') $91,023,000 (40')
Bridge Replacement	• Replace one (1) bridge along paved section. • Replace three (3) bridges along gravel section.	$2,790,000

[(a)] The continuation of improvements described under these concepts for the 2.7 miles of S-447, located between the intersection of S-332 / S-447 and the beginning of existing pavement, should be considered if and when a project is developed.

ES.4. CONCLUSION

This study provides a diverse array of improvement option concepts that may be considered as funding becomes available. The ability to develop improvement options to S-332 is dependent 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 the improvement option(s) that meet the needs in the area;
- Identify and secure a funding source or sources.
- Follow MDT guidelines for project nomination and development, including a public involvement process and environmental documentation.

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 particular project-level "Purpose and Need" statement. For example, a signing project may have little to no effect on aquatic connectivity objectives, thus rendering compliance with the intent of that particular objective unnecessary.

Chapter 1
INTRODUCTION

1.1. PURPOSE

The 2011 Legislature appropriated funds to "... survey and provide design and preliminary engineering work to improve State Secondary 332." As a result, the Montana Department of Transportation (MDT), in partnership with Custer and Rosebud Counties, initiated a *Corridor Planning Study* of Secondary Route 332 (S-332) to assess needs and to identify improvement options for the 50.4 mile roadway.

The purpose of the study is to determine potential improvement options to address safety and geometrical concerns within the transportation corridor based on needs presented by the community, 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 S-332 corridor.

The S-332 corridor provides a link between Montana Highway 59 (MT-59) south of Miles City and Secondary Highway 447 (S-447) north of Ashland. S-332, locally known as "Tongue River Road", roughly parallels the Tongue River and traverses through level and rolling terrain that consists of mostly farm and ranch land.

The study area includes a half-mile buffer on each side of S-332 beginning at the junction with MT-59 (Reference Post (RP) 0.0), approximately eleven miles south of Miles City, and ending at the junction with S-447 (RP 50.4), approximately nine miles north of Ashland. The study area is shown in **Figure 1**.

1.2. PROCESS

MDT has established the corridor planning process in order to investigate improvement options for a corridor or subarea via a Pre-National Environmental Policy Act (NEPA) / Montana Environmental Policy Act (MEPA) study. The NEPA/MEPA environmental review process is an approach to balance transportation decision making that takes into account the impacts on the human and natural environment with the need for safe and efficient transportation. The *Corridor Planning Study* is a pre-NEPA/MEPA process that allows for earlier planning-level coordination with the community, resource agencies, and other entities. The study does not replace the NEPA/MEPA process. The results of the study may be used to assist in determining the level and scope of environmental review required if a project is forwarded into a subsequent NEPA/MEPA process.

This study identifies both known technical issues and environmental conditions within the corridor, and identifies reasonable and feasible improvements to increase safety and efficiency for the traveling public. Additionally, it defines potential impacts to 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 community and decision makers before decisions are made and carried forward.

This *Corridor Planning Study* is developed as a planning study to determine various improvement options to S-332 and does not include project level design.

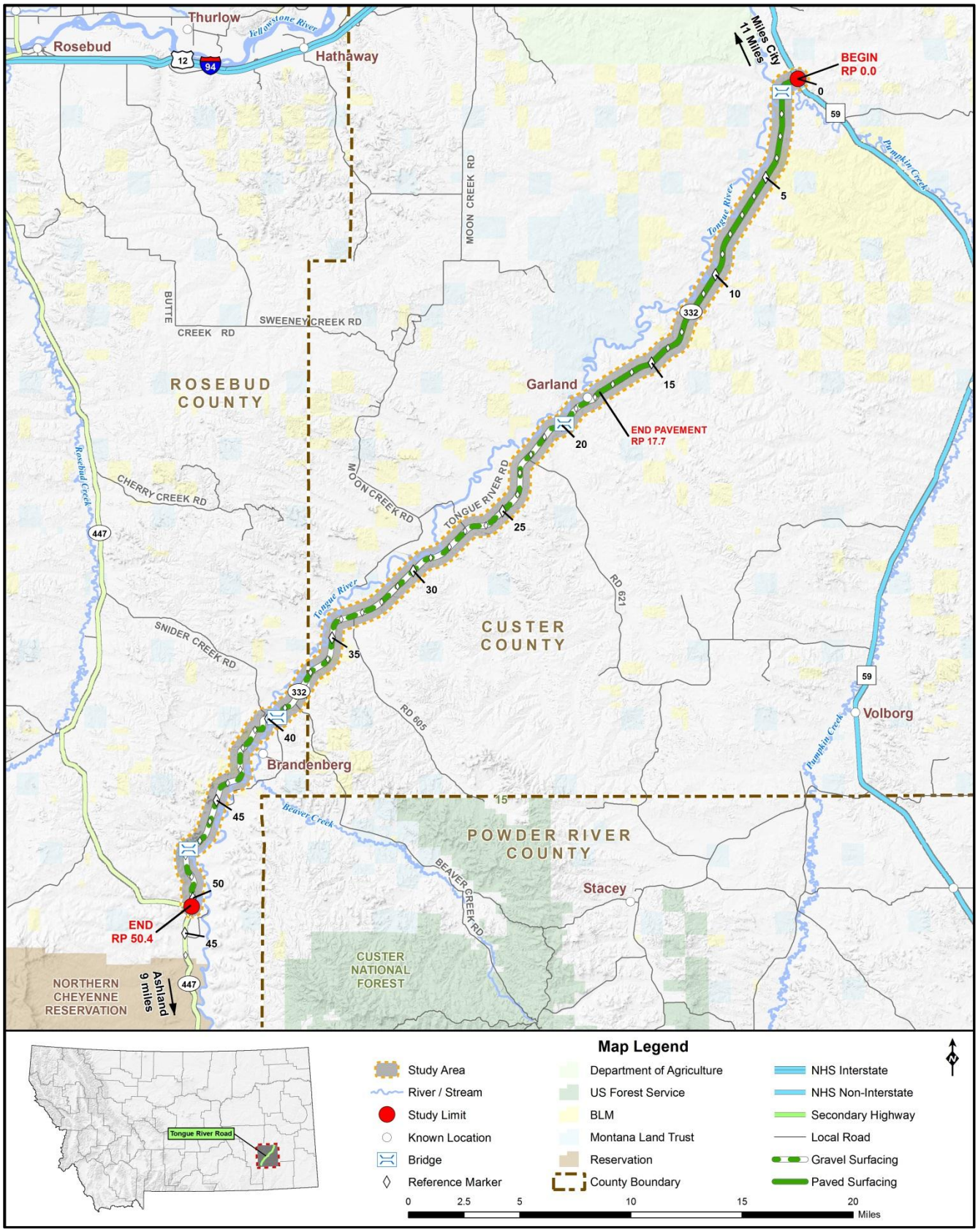

Figure 1: Study Area Boundary

Chapter 2
COMMUNITY AND STAKEHOLDER OUTREACH

An important goal of the corridor planning study process was to have ongoing public involvement. Education and public outreach were essential parts of achieving this goal. A *Community and Agency Participation Plan (CAPP)* was developed to identify public involvement activities needed to gain insight and build consensus about existing and future corridor needs. The purpose of the plan was to ensure a proactive public involvement process that provided opportunities for the public to be involved in all phases of the corridor planning study process.

2.1. PUBLIC INVOLVEMENT

2.1.1. Informational Meetings

Two formal informational meetings were scheduled to be held over the course of the study process. Press releases were distributed and meeting announcements were advertised in local newspapers prior to each meeting. The ads announced the meeting location, time and date, purpose of the meeting, and the locations where documents may be reviewed.

The first informational meeting was held on May 31, 2012, from 6:00 PM to 8:30 PM at Miles Community College in Miles City, MT. An estimated total of 28 members of the public attended the meeting. A second meeting was also held, at the request of the Northern Cheyenne Tribe on July 18, 2012, from 6:00 PM to 7:30 PM at St. Labre Indian School in Ashland, MT.

The purpose of the informational meetings was to inform interested parties about the scope and purpose of the study, present the findings of the existing conditions analysis, and to solicit input on the existing conditions and concerns within the study area that may be relevant to the corridor planning effort.

The second informational meeting is scheduled for October 24, 2012 at 6:00 PM in Miles City, MT. The purpose of this meeting will be to present various improvement option concepts developed for the corridor and to gather public feedback on the draft *Corridor Planning Study Report*.

2.1.1.1. Other Public Involvement Efforts

Two newsletters were produced that described the work in progress, results achieved, preliminary recommendations, and other topics. The newsletters were made available at the informational meetings and were posted to the study website. In addition, copies were mailed to individual landowners adjacent to the corridor and to the following identified stakeholders:

- House District 40
- Senate District 20
- Montana State Highway Patrol
- Williston Basin Interstate Pipeline Company
- Northern Cheyenne Tribe
- Arch Coal Consultant

A website was also developed to provide up-to-date information regarding the study as well as an opportunity to provide comments on the study. The website, http://mdt.mt.gov/pubinvolve/tongueriver/, was maintained by MDT.

2.1.1.2. Comments from the Public

Comments were received from the public during informational meetings, through e-mail, telephone conversations, and standard postal mail. The following summarizes the public comments received during the development of this study:

- **Roadway Surfacing** – Comments relating to roadway surfacing were generally split between those wishing to pave the entire corridor and those wishing that gravel surfacing remain. Some residents commented that a paved roadway would provide a better route between Ashland and Miles City and would help encourage economic growth. Others expressed concern that a paved roadway would decrease the quality of life in the area due to increased traffic and increased vehicle speeds.
- **Livestock** – Some comments were made expressing concern about livestock movements along the corridor if it were to be paved. The comment was made that moving cattle along S-332 is important and that paving the roadway would create safety issues.
- **Traffic** – Concern was expressed about future traffic along S-332. A number of residents were concerned about increased truck traffic and vehicle traffic if the entire corridor is paved.
- **S-447 (RP 43.7 to RP 46.2)** – Some residents expressed desire to extend the study area to incorporate the gravel section of S-447 from the end of S-332 to the beginning of existing pavement at the Northern Cheyenne Reservation boundary to ensure continuity of the roadway system.
- **Coal Development** – Comments were made relating to coal mining development south of Ashland. Some residents were concerned about increased traffic, particularly truck traffic, along S-332. Others expressed a desire to improve the corridor to encourage economic development in the Miles City area.
- **Roadway Condition and Maintenance** – Comments were made that the existing paved section of S-332 is in need of repair. The gravel section is often in poor condition and needs continual maintenance. Comments were made related to areas with limited sight distances, narrow road widths, and failing surfacing. The counties have difficulty keeping up with maintenance activities along the gravel section due to limited available funds.

2.2. STAKEHOLDER PARTICIPATION

A stakeholder contact list was developed to include individuals, businesses, or groups identified by Custer County, Rosebud County, MDT, and/or the Consultant based on knowledge of the study area. The intent of developing the stakeholder list was to identify those individuals and groups to actively seek out and engage in the various phases of the study.

2.3. RESOURCE AGENCY WORKSHOP

A resource agency workshop was held on June 6, 2012, at MDT. The resource agency workshop was held to provide an overview of the study and process as well as to confirm content and accuracy of the *Environmental Scan* document. Each agency was sent a draft *Environmental Scan* prior to the workshop in order to set the stage for further discussion. In addition to the Planning Team, the agencies involved in this study included the following:

- Bureau of Land Management (BLM)
- Environmental Protection Agency (EPA)

- Montana Department of Environmental Quality (MDEQ)
- Montana Fish, Wildlife and Parks (MFWP)
- US Army Corps of Engineers (USACOE)
- US Fish and Wildlife Service (USFWS)

The workshop consisted of a presentation of an overview of the study and a summary of the pre-NEPA/MEPA corridor study process. Open discussion was held on various resource areas that the agencies felt needed to be further identified and considered. The following summarizes the comments made at the resource agency workshop:

- **Fish Passage** – Culverts throughout the corridor must allow for fish passage, even in intermittent drainage. All tributaries within two miles of the Tongue River are potentially utilized by fish species. Culverts should be sized at least to a bankfull dimension.
- **Wildlife** – Special attention should be made to candidate species in the area; specifically the sprague's pipet and sage grouse.
- **Water Resources** – Any future project should avoid or minimize impacts and encroachments to streams and wetlands.
- **Animal / Vehicle Conflicts** – Most animal / vehicle collisions go unreported in the study area. There is a desire for underpass / overpass structures to be placed to protect wildlife due to the sensitivity of the area.

Chapter 3
EXISTING AND PROJECTED CONDITIONS

This chapter portrays the existing and projected roadway conditions and social, economic and environmental factors for S-332. These factors were utilized as part of a high-level planning analysis to identify known issues and/or areas of concern in the corridor. This general information may be used to guide future, detailed "project level" analysis if projects are forwarded from this study to project development.

3.1. DEMOGRAPHICS

A review of demographics within the study area is appropriate to gain an understanding of historical trends in population, age, race and ethnicity. There is a direct correlation between motor vehicle travel and socio-economics. Historic and recent trends in area demographics help define existing conditions and aid traffic forecasting techniques.

A review of social and economic characteristics for the region surrounding the study area was conducted. Note that socio-economic data sources often lag considerably behind the current year. Also, economic data are often limited in rural counties. The analysis provided herein presents the most recent socio-economic statistics available and describes recent and potential future changes in the area.

3.1.1. Population Characteristics

Understanding the composition of the population is necessary, as the data may influence the types of improvements that are identified. For example, an aging population may indicate a need for specific types of transportation improvements such as transit services and/or non-motorized infrastructure improvements. Additionally, the presence of a disadvantaged population may warrant other consideration.

Over the last decade, the population growth in Custer County has remained flat with no measurable growth. In Rosebud County, the population has actually decreased by 1.6 percent. This is in contrast to the 9.7 percent growth experienced over the last decade in the State of Montana and the entire United States. According to the 2010 Census, Custer County has a population density of 3.1 persons per square mile, while Rosebud County has a density of 1.8 persons per square mile. Both of these densities are much less than the population density for the State of Montana and the United States. This population data is shown in **Table 1**.

Table 1: Population Growth and Density (2000 – 2010)

Area	Population (2000)	Population (2010)	Percent Growth	Persons per Square Mile (2010)
Custer County	11,696	11,699	0.0%	3.1
Rosebud County	9,383	9,233	-1.6%	1.8
State of Montana	902,195	989,415	9.7%	6.8
United States	281,421,906	308,745,538	9.7%	87.4

Source: US Bureau of the Census, Census of the Population

Between 1980 and 2010, the number of residents in both counties has decreased. County residents in the "less than 18 years old" and "between 18 and 64 years old" categories have decreased during the time period. The age group that has increased in both counties is the "65 and older" category. This points to the aging of the population, and follows similar trends within Montana and the United States.

Race and ethnicity characteristics in Custer County, Rosebud County, the State of Montana, and the United States during 2010 were also compared. Of note is that Rosebud County has a much higher percentage of "American Indians and Alaska Natives" than Custer County and the State of Montana.

3.1.2. Employment and Income Characteristics

Employment by economic sector for Custer County and Rosebud County was evaluated. Of note is that for Custer County, total employment between years 1970 and 2000 increased by 1,498 jobs. More recent data shows that Custer County employment was recorded at 6,927 total jobs in year 2001 and 7,279 jobs in year 2009[1]. For Rosebud County, total employment between years 1970 and 2000 increased by 3,187 jobs. Year 2001 employment for Rosebud County was recorded at 5,831 jobs and year 2009 employment was recorded at 5,932 jobs.

A look at unemployment rates shows that Custer County has a lower unemployment rate than the State of Montana (4.2% versus 7.4%). For Rosebud County, however, the rate is higher than for the State of Montana (8.2% versus 7.4%). All of these rates are lower, though, than the United States unemployment rate of 8.8 percent.

Custer County's year 2010 median household income of $39,469 is lower than the State of Montana's at $42,303. Rosebud County's median household income of $44,683 is higher than the State of Montana's. The median household income for both Custer County and Rosebud County is lower than the median household income for the United States, which is listed at $50,046.

3.1.3. Economic Development

The linkage of local economies to national and global conditions, particularly in natural resource-based rural regions, can be direct and immediate. Industry and transportation changes far beyond the control of local people and governments can affect huge shifts in local investment and income. This region is a case in point.

Arch Coal is proposing a coal development that could add about 300 permanent jobs in coal mining in the state. MDT estimated the economic impacts of such a development[2]. The following conclusions apply to all counties in eastern Montana.

- Otter Creek coal tracts are expected to generate $35 million more income per year in eastern Montana in the year it opens. That amount rises to $119 million per year after twenty years, in constant 2010 dollars.
- Counting the direct, indirect, and induced employment, the total employment impact is estimated at 590 jobs in the first year, and 745 jobs in the 20th.
- Total population increases are expected to be 222 in the first year of operations, and 1,865 by the 20th. Population growth will allow the region to capture earnings from increased spending on retail, housing, wholesale business, and direct suppliers to the area.
- Mining is the primary affected sector. Other job growth in this region is also expected in the following industrial sectors: retail trade, construction, health care and social assistance, other services, and accommodations and food services. These sectors constitute over 90 percent of projected private sector employment impacts.

[1] US Department of Commerce Bureau of Economic Analysis
[2] MDT Transportation Planning, *Social and Economic Conditions*, 2012

- Employment and population growth in the region would have effects on the communities that attract spending on housing and industrial activity. Community economic impacts include increased public sector demands such as infrastructure (water, sewer, schools, and healthcare) and law enforcement.

Observation of recent mining developments suggests that the nearest town may not be the choice for settlement by new employees and their families. The location of household settlement is influenced not only by location, but by basic family needs such as schools, shopping, services, and other jobs.

3.2. EXISTING TRANSPORTATION CONDITIONS

S-332 was initially constructed as a gravel road in the 1930's and placed on Montana's Secondary Highway System in 1945. The road was reconstructed to an all-weather gravel surface by the County in the 1950's. In the 1990's, the first 17.7 miles (RP's 0.0 to 17.7) were reconstructed to pavement. The paved portion is maintained by MDT while the gravel section is maintained by the counties.

S-332 is functionally classified as a rural major collector on Montana's Secondary Highway System and is an integral part of the regional rural transportation network connecting local population and commerce to the National Highway System. S-332 serves as a north-south corridor between Miles City and Ashland, passing through rolling terrain that consists of mostly farm and ranch land. The majority of the land within the corridor is undeveloped.

3.2.1. Existing Roadway Users

Primary users of the roadway consist of local residents, commuters between Ashland and Miles City, recreationalists, and commercial users. The study area primarily consists of ranch and farmland. Intermittent BLM and Montana State Trust Land properties also exist within the study area. Noted recreational areas within the study area include the 12-Mile Dam Fishing Access Site (RP 1.0) and the Pumpkin Creek Recreational Area (RP 4.1).

3.2.2. Traffic Data

Historic traffic data was provided by MDT for the study area. **Table 2** shows the most recent 20 years of traffic data. The Average Annual Daily Traffic (AADT) for S-332 ranges from approximately 280 vehicles per day (vpd) on the northern end near MT-59, to 50 vpd on the southern end near the intersection with S-447.

Table 2: Average Annual Daily Traffic

Site	Location	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
9-2-9	RP 1.0	190	170	180	260	180	140	270	250	180	190
9-4-3	RP 11.0	140	150	90	80	80	160	180	90	110	130
9-4-4	RP 26.5	70	90	(a)	(a)	80	210	100	110	90	110
44-7-5	RP 39.5	100	100	70	90	(a)	90	40	10	(a)	(a)
44-8-4	RP 49.5	60	100	60	60	(a)	60	90	40	(a)	40

Site	Location	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
9-2-9	RP 1.0	190	290	220	(a)	220	230	220	220	280	(a)
9-4-3	RP 11.0	160	210	150	150	120	100	100	100	100	100
9-4-4	RP 26.5	100	140	100	130	90	70	70	70	70	80
44-7-5	RP 39.5	20	20	30	(a)	80	70	70	70	50	(a)
44-8-4	RP 49.5	70	30	90	(a)	60	60	60	60	50	(a)

Source: MDT Data and Statistics Bureau, Traffic Data Collection Section, 2012

(a) Data unavailable

The traffic data in **Table 2** is representative of yearly average traffic volumes. It is likely that seasonal peaks in traffic volumes occur due to recreational and agricultural use in the area. Vehicles traveling along the corridor currently do not experience vehicle delay or congestion. Trucks and agricultural equipment are common throughout the study area.

3.2.3. Right-of-Way and Jurisdiction

The existing road is predominately located adjacent to private property, with intermittent BLM and Montana State Land Trust lands. Exact right-of-way widths are unknown for the corridor. During the field review it was noted that right-of-way widths appear to be wider along the northern portion of S-332. Along the southern portion in Rosebud County, right-of-way widths appear to generally decrease based on location of fencing.

Between RP 40.0 to RP 41.0 there are multiple horizontal curves do not meet current standards. Pivot irrigation facilities currently exist adjacent to these substandard horizontal curves. Changes to the horizontal alignment may result in impacts to the existing pivot irrigation systems.

3.2.4. Crash Analysis

The MDT Traffic and Safety Bureau provided ten years of crash data for S-332 between January 1, 2001 and December 31, 2010. There were a total of 18 crashes reported along S-332 for the ten-year crash analysis period. One fatality, zero incapacitating injuries, two non-incapacitating injuries, and four other injuries resulted from the 18 reported crashes. 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.

All 18 reported crashes were single-vehicle crashes. Alcohol was listed as a contributing circumstance in two crashes. Six crashes involved either a wild or domestic animal. The majority of crashes involved driver error, either driving too fast for conditions or careless driving. There are no identifiable crash clusters during the analysis period.

A comparison of the crashes along S-332 to the statewide crashes along rural secondary highways was made based on crash rate, crash severity index, and crash severity rate. Crash rates are defined as the number of crashes per million vehicle miles of travel. For S-332, the crash rate is 0.86 crashes per million vehicle miles travelled between 2001 and 2010. By comparison, the statewide crash rate for a rural secondary highway is 1.40 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 1.94 was calculated for S-332 versus the statewide rural secondary highway crash severity index of 2.25. Crash severity rate is determined by multiplying the crash rate by the crash severity index. S-332 has a crash severity rate of 1.67; the statewide rural secondary rate is 3.17.

Table 3 shows the crash data metrics compared to the statewide rural secondary highway rates. A percent difference between the statewide and S-332 rates was calculated for comparison purposes. All three crash metrics are below statewide rates for similar roads.

Table 3: Crash Data Analysis

Site	Crash Rate	Crash Severity	Crash Severity Rate
S-332	0.86	1.94	1.67
Statewide Secondary - Rural	1.40	2.25	3.17
Percent Difference	-38.6%	-13.8%	-47.3%

Source: MDT Traffic and Safety Bureau, 2012

[(a)] Based on crashes occurring between 2001 and 2010

[(b)] Provided by MDT Traffic – Safety Management, 2011

3.2.5. Design Standards

The MDT *Road Design Manual* specifies general design principles and controls which determine the overall operational characteristics of the roadway and enhance the aesthetic appearance of the roadway. The geometric design criteria for the study corridor are based on the current MDT design criteria for a "Rural Collector Secondary Highway". The function of collector routes is to provide for both access and mobility. Rural collectors serve regional needs and provide connections to the arterial system. **Table 4** lists the current design standards for rural collectors according to MDT design criteria.

The design speed for a rural collector roadway ranges between 45 mph and 60 mph depending on terrain. MDT's *Road Design Manual* contains the following definitions for each terrain type:

- **Level Terrain** – The available stopping sight distances are generally long or can be made to be so without construction difficulty or major expense.
- **Rolling Terrain** – The natural slopes consistently fall below and rise above the roadway and occasional steep slopes offer some restriction to horizontal and vertical alignment.
- **Mountainous Terrain** – Longitudinal and traverse changes in elevation are abrupt and extensive grading is frequently needed to obtain acceptable alignments.

Based on these definitions, the majority of the study area appears to be level terrain (60 mph design speed) with some areas of rolling terrain (50 mph design speed). A determination of terrain type (i.e. level or rolling) has not been made for the study corridor. For the purposes of this study, areas that do not meet MDT's minimum design standards for level terrain were considered "areas of concern".

There is a difference between a facility's design speed and its posted speed. The design speed is a selected speed used to determine the various geometric design features of the roadway. The posted speed can be lower or higher than the design speed.

Table 4: Geometric Design Criteria

Design Element			Design Criteria				
Design Controls	Design Forecast Year (Geometrics)		20 Years				
	Design Speed [a]	Level	60 mph				
		Rolling	50 mph				
		Mountainous	45 mph				
	Level of Service		Desirable: B Minimum: C				
Roadway Elements	TRAFFIC	Current AADT	0-299	300-999	1000-1999	2000-3000	> 3000
		DHV	50-99	100-199	200-299	300-400	>400
	Roadway Width (Travel Lanes & Shoulders) [a]		24'	28'	32'	36'	40'
	Cross Slope	Travel Lane [a]	2%				
		Shoulder	2%				
	Median Width		Varies				
Earth Cut Sections	Ditch	Inslope	DHV ≥ 200 - 6:1 (Width: 10') DHV < 200 - 4:1 (Width: 6')				
		Width	10' Min.				
		Slope	20:1 towards back slope				
	Back Slope; Cut Depth at Slope Stake	0' - 5'	5:1				
		5' - 10'	Level/Rolling: 4:1; Mountainous: 3:1				
		10' - 15'	Level/Rolling: 3:1; Mountainous: 2:1				
		15' - 20'	Level/Rolling: 2:1; Mountainous: 1.5:1				
		> 20'	1.5:1				
Earth Fill Slopes	Fill Height at Slope Stake	0' - 10'	DHV ≥ 200 - 6:1 DHV < 200 - 4:1				
		10' - 20'	DHV ≥ 200 - 4:1 DHV < 200 - 3:1				
		20' - 30'	3:1				
		> 30'	2:1				
Alignment Elements	DESIGN SPEED		45 mph	50 mph	60 mph		
	Stopping Sight Distance [a]		360'	425	570'		
	Passing Sight Distance		1625'	1835	2135'		
	Minimum Radius (e=8.0%) [a]		590'	760	1200'		
	Superelevation Rate [a]		e_{max} = 8.0%				
	Vertical Curvature (K-value) [a]	Crest	61	84	151		
		Sag	79	96	136		
	Maximum Grade [a]	Level	5%				
		Rolling	7%				
		Mountainous	10%				
	Minimum Vertical Clearance [a]		16.5				

Source: MDT Road Design Manual, Chapter 12, Figure 12-5, "Geometric Design Criteria for Rural Collector Roads (Secondary System)", 2008

[a] Controlling design criteria (see Section 8.8 of the MDT Road Design Manual)

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 not available for the entire length of the study corridor. As such, a field review of the study corridor was conducted in March 2012 to confirm and 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. MDT's standards for horizontal curves are defined in terms of curve radius and vary based on design speed. For a 60 mph design speed (level terrain) the maximum recommended radius is 1,200 feet. The maximum recommended radius for a 50 mph design speed (rolling terrain) is 760 feet.

Horizontal curve radius was determined based either on as-built drawings, or for areas where as-built drawings were unavailable, estimates were made based on field review and aerial photography. Seven horizontal curves were identified that do not meet current MDT standards based on level terrain standards. **Table 5** provides a summary of the seven substandard horizontal curves.

Table 5: Substandard Horizontal Curves (Based on Level Terrain Standards)

RP	Element	Value (ft)
39.52	Radius	955
40.23	Radius	350 [(a)]
40.66	Radius	300 [(a)]
40.98	Radius	350 [(a)]
42.21	Radius	500 [(a)]
42.97	Radius	500 [(a)]
44.37	Radius	1000 [(a)]

[(a)] *Estimated based on field review and 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 affects 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 5 percent for level terrain and 7 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 6** provides a list of substandard vertical alignment areas based on level terrain standards.

Table 6: Substandard Vertical Alignment Areas (Based on Level Terrain Standards)

RP	Element	Value
3.06	Vertical Curvature	137.3
	Stopping Sight Distance	544.3'
3.20	Vertical Curvature	95.2
3.42	Vertical Curvature	150.9
3.42 - 3.66	Grade	-5.01%
3.66	Vertical Curvature	87.1
3.66 - 3.97	Grade	6.47%
17.82	Vertical Curvature	51.9
	Stopping Sight Distance	334.8'
17.82 - 17.97	Grade	5.93%
17.97	Vertical Curvature	69.4
18.84	Vertical Curvature	140.4
20.28	Vertical Curvature	99.5
23.86	Vertical Curvature	109.3
24.01	Vertical Curvature	117.6
	Stopping Sight Distance	503.9'
24.50	Vertical Curvature	67.6
	Stopping Sight Distance	381.9'
24.73	Vertical Curvature	67.8
24.40	Vertical Curvature	89.6
	Stopping Sight Distance	441.7'
25.53	Vertical Curvature	129.0
	Stopping Sight Distance	548.1'
25.89	Vertical Curvature	53.5
	Stopping Sight Distance	339.9'
26.04	Vertical Curvature	83.3
26.53	Vertical Curvature	125.0
	Stopping Sight Distance	519.4'
26.53 - 26.72	Grade	-6.96%
26.72	Vertical Curvature	54.3
27.09	Vertical Curvature	95.4
	Stopping Sight Distance	457.4'
27.27	Vertical Curvature	96.9
27.95	Vertical Curvature	122.0

RP	Element	Value
28.05	Vertical Curvature	61.6
	Stopping Sight Distance	364.7'
28.05 - 28.16	Grade	-5.13%
28.16	Vertical Curvature	56.1
28.26	Vertical Curvature	75.6
	Stopping Sight Distance	404.0'
28.58	Vertical Curvature	79.7
28.78	Vertical Curvature	100.3
29.03	Vertical Curvature	106.1
	Stopping Sight Distance	478.5'
29.24	Vertical Curvature	100.0
29.60	Vertical Curvature	90.9
31.54 - 31.76	Grade	-5.99%
31.76	Vertical Curvature	115.1
31.96 - 32.41	Grade	5.76%
32.41	Vertical Curvature	144.2
	Stopping Sight Distance	557.9'
33.76	Vertical Curvature	91.4
38.77	Vertical Curvature	117.5
39.35	Vertical Curvature	134.5
41.44	Stopping Sight Distance [(a)]	< 570'
41.56	Stopping Sight Distance [(a)]	< 570'
42.07	Stopping Sight Distance [(a)]	< 570'
42.45	Stopping Sight Distance [(a)]	< 570'
43.04	Stopping Sight Distance [(a)]	< 570'
43.27	Stopping Sight Distance [(a)]	< 570'
43.36	Stopping Sight Distance [(a)]	< 570'
45.46 - 45.69	Grade [(a)]	> 7.00%
46.46	Stopping Sight Distance [(a)]	< 570'
48.48	Stopping Sight Distance [(a)]	< 570'
49.69	Stopping Sight Distance [(a)]	< 570'
49.84	Stopping Sight Distance [(a)]	< 570'
50.03	Stopping Sight Distance [(a)]	< 570'
50.17 - 50.27	Grade [(a)]	> 7.00%

[(a)] *Estimated based on field review.*

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 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 MDT, clear zone should be attained by removing or shielding obstacles if costs are reasonable.

A list of roadside clear zone areas of concern was developed based on information obtained during field reviews. Features looked at during the field reviews were sight distances, side slopes, and roadside hazards. A table of roadside clear zone observations is presented in **Table 7**.

Table 7: Roadside Areas of Concern

RP	Comments	RP	Comments
3.74	Slide Area	26.70	Steep Fill Slope
4.20	Slide Area	27.90	Slide Area
4.45	Slide Area	31.30	Steep Fill Slope
4.65	Slide Area	31.70	Steep Fill Slope
4.90	Steep Fill Slope	36.30	Slide Area
5.10	Steep Fill Slope	36.60	Steep Fill Slope
22.00	Steep Fill Slope	37.50	Steep Fill Slope
23.80	Steep Fill Slope	39.00	Steep Fill Slope
24.10	Steep Fill Slope	43.30	Steep Fill Slope
24.70	Steep Fill Slope	48.10	Steep Fill Slope
26.22	Slide Area	50.40	S-332 / S-447 Intersection

3.2.7. Roadway Surfacing

Existing roadway surfacing characteristics were determined from MDT's 2011 *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. This information was supplemented through field data collection efforts. **Table 8** shows the existing roadway width and surfacing type.

The MDT *Road Design Manual* requires a minimum travel lane width of 12 feet. A surface width of 24 feet is recommended for a rural collector road with an AADT less than 300 vpd. For a rural collector road with an AADT between 300 vpd and 999 vpd, a minimum surface width of 28 feet is recommended. The MDT *Road Width Committee* will ultimately determine the appropriate width during future project development.

S-332 is currently paved from RP 0.00 to RP 17.7; gravel surfacing exists from RP 17.7 to RP 50.4. Based on the road widths identified in the *Road Log* and current traffic volumes, S-332 currently meets minimum road width standards as defined by the *Road Design Manual*.

Table 8: Existing Roadway Surfacing

			Width			
Begin RP	End RP	Lanes	Surface	Lane	Shoulder	Surfacing
0.0	5.7	2	26	12	1	Asphalt
5.7	12.2	2	32	12	4	Asphalt
12.2	17.7	2	24	12	0	Asphalt
17.7	39.6	2	28	10	4	Gravel
39.6	41.0	2	32	12	4	Gravel
41.0	44.7	2	26	9	4	Gravel
44.7	50.4	2	28	10	4	Gravel

Source: MDT Road Log, 2011

3.2.8. Access Points

Access points were identified through a review of available GIS data and aerial photography. There are approximately 147 access points along S-332. The vast majority of the access points are private roads or farm field approaches. There are a total of 10 public road approaches within the study area.

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 becomes restricted. According to MDT standards[3], the approach angle should be between 60° and 120°. **Table 9** provides a summary of access points grouped into segments and show the number of public approaches and approaches with substandard angles.

Table 9: Access Points

Begin RP	End RP	Length (mi)	Access Points	Density (Access / mi)	< 60° Angle	Public Approach	
						Access Points	< 60° Angle
0.0	6.0	6.0	27	4.5	1	3	0
6.0	12.0	6.0	26	4.3	1	0	0
12.0	17.7	5.7	15	2.6	0	0	0
17.7	24.0	6.3	20	3.2	3	1	1
24.0	31.0	7.0	7	1.0	0	1	0
31.0	37.2	6.2	20	3.2	2	1	0
37.2	44.0	6.8	21	3.1	5	3	2
44.0	50.4	6.4	11	1.7	0	1	0
Total		**50.4**	**147**	**2.9**	**12**	**10**	**3**

3.2.9. Hydraulics

3.2.9.1. Slides

Recent slides were noted at the following approximate locations along S-332 during the field review:

- RP 3.26
- RP 3.74
- RP 4.20
- RP 4.45
- RP 4.65
- RP 26.22
- RP 27.90
- RP 36.30
- RP 43.50

The majority of the identified slide locations received minor repair work intended as temporary mitigation. Evidence of continued subsurface failure was noted at some of these locations.

3.2.9.2. Bridges

Four bridge crossings are located within the study area. All four have recent inspection reports available listing review parameters for the bridges, including weight limits.

An important consideration in the evaluation of a roadway bridge structure is its sufficiency rating. The sufficiency rating formula is a method of evaluating a highway bridge and indicates the sufficiency of the bridge to remain in service. 100 is an entirely sufficient bridge and 0 indicates an entirely deficient bridge. Structures with a sufficiency rating between 0 and 49.9 are eligible for replacement, and structures with a rating between 50 and 80 are eligible for rehabilitation.

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

Bridges are considered "structurally deficient" if significant load carrying elements are found to be in poor condition due to deterioration or the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to point of causing intolerable traffic interruptions. A "functionally obsolete" bridge is one that does not meet current standards. Functionally obsolete bridges are those that do not have adequate lane widths, shoulder widths, or vertical clearances to serve current traffic demand, or those that may be occasionally flooded.

All four bridges within the study area were determined to be not structurally deficient and not functionally obsolete for the current conditions. The design loadings also meet current MDT standards[4].

The following summarizes the four bridges in the study area:

- **RP 1.02 (S00332000+09001)** – Three-span concrete structure across Pumpkin Creek. Approximately 27 feet wide and 139 feet long. Originally constructed in 1959, reconstructed in 1973. Sufficiency rating of 68.0.
- **RP 19.87 (S00332019+08751)** – Two span wood structure across Foster Creek. Approximately 26 feet wide and 38 feet long. Originally constructed in 1953. Sufficiency rating of 90.1.
- **RP 39.61 (S00332039+06161)** – Four span concrete structure across Tongue River. Approximately 27 feet wide and 215 feet long. Originally constructed in 1963. Sufficiency rating of 91.3.
- **RP 47.80 (S00332047+08001)** – One span concrete structure across Roe and Cooper Creek. Approximately 28 feet wide and 24 feet long. Originally constructed in 1986. Sufficiency rating of 97.7.

3.2.10. Other Transportation Modes

Frank Wiley Field Airport is located in Miles City and serves an average of 31 aircraft per day. Service consists of transient general aviation (43%), local general aviation (29%), and air taxi (29%). The St. Labre Mission Airport, located in Ashland, serves an average of 50 aircraft per month. Transient general aviation consists of 83% of aircraft operations, with the remaining 17% categorized as air taxi.[5]

Some minor freight activity currently occurs within the study area. Most notably, freight trucks associated with agriculture and farming, as well as some mining trucks, currently use S-332. Horse and buggy were also noted as a means of transportation near the Amish community just south of S-332. There are currently no rail lines or transit services within the study area.

3.2.11. Utilities

Electric power is provided by the Tongue River Electric Cooperative. Overhead power lines are present intermittently within the study area. Range Telephone Cooperative provides telecommunications services to the area. Williston Basin Interstate Pipeline Company controls a natural gas line located within the study area. Water and sewer service is provided to individuals by wells and septic tanks.

3.3. PROJECTED TRANSPORTATION CONDITIONS

Projected transportation conditions were analyzed to estimate how traffic volumes and characteristics of the corridor may change compared to existing conditions. The analysis was based on known existing conditions and projected out 20 years to the year 2032.

[4] Montana Department of Transportation, *Bridge Design Standards*
[5] AirNav, LLC., 2012, www.airnav.com

3.3.1. Traffic Growth Rates

Historic traffic data was analyzed to determine traffic growth patterns along S-332. Average annual growth rates were calculated at each traffic count location during multiple time periods. Weighted average annual growth rates were calculated based on 2010 AADT. The weighted average annual growth rates provide a representative picture of traffic growth within the study area.

Traffic volumes have fluctuated throughout the study area and have resulted in both positive and negative growth rates as shown in **Table 10**. For the purposes of projecting traffic growth, a weighted average annual growth rate of 0.24% was calculated based on the most recent 20 years of traffic data. This growth rate was used to forecast ambient background traffic growth for S-332. Ambient background traffic growth accounts for general growth characteristics such as population growth, general economic expansion, and increased recreational activities.

Table 10: Average Annual Growth Rates

Site	Location	2010 AADT [(a)]	Average Annual Growth Rate			
			1992 - 2011	1992 - 1999	2000 - 2011	2005 - 2011
9-2-9	RP 1.0	280	1.57%	3.77%	2.55%	4.48%
9-4-3	RP 11.0	100	-0.41%	-0.54%	-4.06%	-5.49%
9-4-4	RP 26.5	70	-1.49%	7.47%	-4.36%	-6.76%
44-7-5	RP 39.5	50	-2.07%	-21.67%	17.64%	-8.97%
44-8-4	RP 49.5	50	-1.15%	-3.87%	2.00%	-3.58%
Average		110	0.24%	0.45%	1.79%	-0.72%

[(a)] *MDT Data and Statistics Bureau, Traffic Data Collection Section, 2012*

3.3.2. Future Development

The southeastern region of Montana contains considerable mineral deposits with existing and projected mining developments. The most prevalent mining activity near the corridor is coal mining. Existing coal mines operate in the region, and the Tongue River Road is currently used to transport some coal by semi-truck.

The State of Montana awarded a bid to lease the Otter Creek coal tracts to Ark Land Company, a subsidiary of Arch Coal of St. Louis Missouri, on March 18, 2010. Located approximately 10 miles southeast of Ashland, the Otter Creek coal tracts development has the potential to impact development and travel patterns along the corridor. Coupled with the Otter Creek coal tracts are additional tracts owned by Great Northern Properties. These additional tracts create a checkerboard land pattern with the State land. Great Northern Properties have also agreed to lease their tracts to Arch Coal for development. The potential exists for 40 years of coal mining at the location with an estimated production of 10 million tons per year[6].

3.3.2.1. Mine Traffic Generation

It is anticipated additional traffic would be generated by the Otter Creek coal tracts due to employees, general services, deliveries, and various other factors. In order to estimate trip generation from the coal tracts, data from the Absaloka Mine in Sarpy Creek, MT was looked at to approximate the amount of local traffic generated by a representative coal mine. The Absaloka Mine is accessed by Sarpy Basin Road, which intersects Secondary Highway 384 (S-384).

For the Absaloka Mine comparative analysis, it was assumed that traffic generated by the mine would come from Hardin, MT which is located west of Sarpy Basin Road. Traffic volumes along S-384 west of Sarpy Basin Road were assumed to include traffic generated by the mine in addition to local traffic. Traffic volumes along S-384 east of

[6] Norwest Corporation, *Otter Creek Property Summary Report – Volume I*, 2006

Sarpy Basin Road were assumed to include local traffic only. The difference in traffic volumes between the two locations along S-384 (i.e. east and west of Sarpy Basin Road) was assumed to account for the estimated traffic generated by the Absaloka Mine.

An estimate of trips generated per million tons of coal by the Absaloka Mine was then calculated based on historic coal production rates[7]. The traffic data and coal production rates were averaged for the most recent five years of available data to account for yearly variations. As shown in **Table 11**, the average trip generation rate for the Absaloka Mine was estimated to be 50.0 vehicles per million tons of coal. Based on these values, it is estimated that the Otter Creek coal tracts could generate approximately 500 general trips per day.

Table 11: Estimated Traffic Generated by Absaloka Mine

Site	Location			2003	2004	2006	2008	2009	Average
2-2-4 [(a)]	S-384	RP 26	NW of Sarpy Basin Rd	70	90	150	140	150	120
2-2-3 [(a)]	S-384	RP 24	1.5 mi W of Sarpy Basin Rd	200	220	440	430	720	402
Net Difference in AADT				130	130	290	290	570	282
Absaloka Mine Production - Million Tons of Coal [(b)]				5.975	6.474	6.807	6.391	4.738	6.077
Vehicles per Million Tons of Coal				21.8	20.1	42.6	45.4	120.3	50.0

[(a)] *MDT Data and Statistics Bureau, Traffic Data Collection Section, 2012*

[(b)] *Absaloka mine production from Coal Driver, http://coaldiver.org/mine/ABSALOKA-MINE*

3.3.2.2. Tongue River Railroad

Portions of the Tongue River Railroad (TRR) have been proposed for construction since 1983. There are three distinct segments that have been planned and approved over the past three decades by the U.S. Surface Transportation Board (STB) and its predecessor, the Interstate Commerce Commission. The first segment was approved in 1985 and connects Ashland to Miles City with an approximately 85 mile long new rail line. In 1991, the second segment was planned, and in 1996 approved, that connects Ashland with Decker to the south, resulting in approximately 41 miles of new track. Lastly, a third request for new rail was made in 1997 that modified the southern end of the second segment. Commonly referred to as the western alignment, it was approved in 2007.

In June of 2012, however, the STB ruled that the TRR must reapply for a permit to carry coal from the Otter Creek coal tracts southeast of Ashland via a new rail line. This ruling was made in part because the Ninth Circuit U.S. Court of Appeals ruled in December of 2011 that the TRR's environmental impact statement was insufficient, and that due to the changes in the TRR's proposals, a new environmental impact statement and corresponding permit would be necessary.

3.3.2.3. Truck Traffic

The *Otter Creek Property Summary Report* contains data pertinent to the combined coal mining operations of the Otter Creek coal tracts and the Great Northern Properties tracts. Relative to conventional truck transportation, the report identifies certain parameters to arrive at a theoretical trucking scenario. It was estimated that 10 million tons per year of coal transported solely by trucks would result in the potential for 30 loaded trucks per hour. This is based on an assumed work schedule of 350 working days per year and 24 hours per day. The report goes on to state that this is the equivalent to one loaded truck every two minutes. In addition, an empty truck would pass by in the opposite direction every two minutes. In all, a total of 1,440 truck trips per day would be needed to haul the estimated coal production.

[7] Coal Diver, *Absaloka Mine*, 2012, http://coaldiver.org/mine/ABSALOKA-MINE

3.3.3. Future Traffic Projections

Since it is unknown what the future holds for development in the area, multiple growth scenarios were looked at relative to the Otter Creek coal tracts:

- **Baseline Traffic –** Accounts for existing traffic along S-332 projected out to the year 2032. As discussed previously, an average annual growth rate of 0.24 percent was used to forecast ambient background traffic.
- **Scenario 1: Base Traffic Generation –** Assumes that 100 percent of the base traffic generation resulting from the Otter Creek coal tracts discussed previously would utilize S-332 (i.e. 500 vpd). The base traffic generation is in addition to the baseline traffic forecasts. This scenario also assumes that the proposed Tongue River Railroad would be constructed and that coal produced from the Otter Creek coal tracts would be shipped by rail.
- **Scenario 2: Base Traffic Generation + Mining Truck Traffic** – Assumes that all coal produced from the Otter Creek coal tracts would be shipped via trucks along S-332. In addition, baseline traffic forecasts and base traffic generation from the mine were included.
- **Scenario 3: Base Traffic Generation + Percent Mining Truck Distribution** – Assumes that coal produced from the Otter Creek coal tracts would be shipped to both Colstrip and Miles City by trucks. Under this scenario, 25 percent of the truck traffic was applied to S-332 destined for Miles City. The remaining truck traffic would travel to Colstrip under this scenario. In addition, baseline traffic forecasts and base traffic generation from the mine were included.

Table 12 shows the future projected traffic values for the year 2032 under the previously discussed scenarios. Of note is that average future traffic projections range between 116 vpd to 2,056 vpd for S-332.

Table 12: Future Projected Traffic Data - Year 2032

Site	Location	Existing - 2010	Baseline [(a)]	Scenario 1	Scenario 2	Scenario 3
9-2-9	RP 1.0	280	295	795	2,235	1,155
9-4-3	RP 11.0	100	105	605	2,045	965
9-4-4	RP 26.5	70	74	574	2,014	934
44-7-5	RP 39.5	50	53	553	1,993	913
44-8-4	RP 49.5	50	53	553	1,993	913
Average		110	116	616	2,056	976

[(a)] *Baseline projection was based on an average annual growth rate of 0.24%.*

3.4. ENVIRONMENTAL SETTING

This section provides a summary of the *Environmental Scan* developed by MDT[8]. The primary objective of the *Environmental Scan* is to determine the potential constraints and opportunities within the study area boundary. As a planning level scan, the information is obtained from various reports, websites and other documentation. This scan is not a detailed environmental investigation. Refer to the MDT *Environmental Scan* for more detailed information.

[8] MDT Environmental, *Environmental Scan – Tongue River Road*, 2012

3.4.1. Physical Resources

3.4.1.1. Prime Farmland

Information regarding areas of prime farmland in the corridor area was compiled from the US Department of Agriculture, Natural Resource Conservation Service (NRCS).

The Farmland Protection Policy Act of 1981 (Title 7 United States Code, Chapter 73, Sections 4201-4209) has as its purpose "to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure that federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland."

Farmland is defined by the act in Section 4201 as including prime farmland, unique farmland, and farmland, other than prime or unique farmland, that is of statewide or local importance.

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

The CPA-106 Farmland Conversion Impact Rating Form for Linear Projects is a way for the NRCS to keep inventory of the Prime and Important farmlands within the state. Soil map units found within the project area have been classified as prime and important farmlands. Project activities associated with the construction of the Tongue River Road Corridor will likely create impacts to the soil map units with prime and important farmland status, thus it is likely that a completed CPA-106 Farmland Conversion Impact Rating Form for Linear Projects will be required. The process for completing this form requires mapping of the prime and important farmlands to be converted to non-farmable land, coordination with the NRCS, and final completion of the conversion form.

3.4.1.2. Geologic Resources

Information was obtained on geology in the study area. This geologic information may help determine any potential design and construction issues related to embankments and road design.

S-332 traverses the alluvial terraces of the Tongue River, occasionally climbing onto exposed area of the Fort Union Formation. Locally, the Fort Union consists of the Tongue River Member and is described as sandstone with thin interbeds of siltstone, mudstone, and clay. In some areas the rock has been metamorphosed into clinker by the natural burning of coal. The Alluvial Terrace Deposits typically consist of gravel, sand, silt, and clay.

3.4.1.3. Water Resources

3.4.1.3.1. Surface Water

Maps and GIS data were reviewed to identify the location of surface water bodies within the study area, including rivers, streams, lakes, or reservoirs.

S-332 travels through the Middle Yellowstone Watershed District. Information on the Tongue River and its tributaries within the study area was obtained from the MDEQ website. Section 303, subsection "d" of the Clean Water Act requires the State of Montana to develop a list, subject to US EPA 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 sub-basin assessment and sets maximum pollutant levels, called total

maximum daily loads (TMDL). The 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.

Tongue River is listed as the only 303(d) water body within the study area. Probable causes of impairment are listed as cadmium, copper, iron, lead, low flow alterations, nickel, salinity, solids, and sulfates. Probable sources of impairment include irrigated crop production, dam construction, and stream bank modifications / destabilization.

3.4.1.3.2. Groundwater

Custer County and Rosebud County have not developed Local Water Quality District's (LWQD). LWQD's are established to protect, preserve, and improve the quality of surface water and groundwater within the district. Currently there are four in Montana. MDEQ provides support to LWQD programs, but does not have an active management role in their activities. LWQD serve as local government districts with a governing board of directors, and funding obtained from fees collected annually with county taxes. A significant component of selected district programs is the ability to participate in the enforcement of the Montana Water Quality Act and related rules.

If a LWQD is developed for Custer County or Rosebud County, water quality protection measures may have to be addressed at the local level, in addition to the federal level and state level.

3.4.1.3.3. Irrigation

Irrigated farmland exists in Custer County and Rosebud County within the study area. Impacts to irrigation facilities should be avoided to the greatest extent practicable. However, depending on recommended improvement option(s), there is a potential to impact lateral and longitudinal irrigation facilities. Operators of irrigation facilities would need to be contacted for flow requirements during project development to minimize impacts to farming operations.

Any potential impacts to irrigation facilities will need to be examined to determine if the irrigation facilities are considered waters of the U.S. and subject to jurisdiction by the U.S. Army Corps of Engineers (USACOE) and if other permits or authorizations are necessary such as SPA or 318.

3.4.1.3.4. Other Drainage Considerations

There are four existing bridges within the study corridor. Should a project be identified and advanced, it will be necessary to consider the potential impacts resulting from drainage off the existing or new bridge decks. MDEQ's 401 certification of the general conditions of the USACOE 404 permits requires that all permittees shall, to the maximum extent practicable, incorporate and construct design features that eliminate bridge deck run-off containing sediment, salt, or other pollutants from discharging directly into state water. To the extent practicable, bridge deck discharge should be directed to a detention basin of unspecified size prior to discharge into state waters.

MDEQ has stated this same principle is desirable for roadside ditch drainage (i.e. roadside drainage that is directed to State waters should also be directed to a detention/retention basin prior to discharge into the State water).

Pertinent to drainage culverts, MDEQ and MFWP have both stated that culverts would need to be designed to provide both fish passage and aquatic organism passage. This would not only be applicable to perennial streams, but also some intermittent streams that may provide only seasonal flows yet still have a benefit for the fisheries system.

Lastly, both MDEQ and MFWP reiterated that culverts cannot be sized smaller to their current size, and that culverts should be sized to at least the appropriate "site specific" bankfull dimension.

3.4.1.4. Wetlands (EO 11988)

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.

The study area encompasses portions of the Tongue River, and associated drainages, which have wetland areas associated with them. Formal wetland delineations will need to be conducted according to standard USACOE defined procedures if a project is developed. Wetland jurisdictional determinations will also need to be done during the project development process.

Wetland impacts should be avoided to the greatest extent practicable. All unavoidable wetland impacts will be mitigated as required by the USACOE.

3.4.1.5. Wild and Scenic Rivers

The Wild and Scenic Rivers Act, created by Congress in 1968, provided for the 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 U.S. National Park Service (NPS) website was accessed for information on river segments that may be located within the study area with wild and scenic designation. There are no wild or scenic rivers in the study area.

3.4.1.6. Floodplains (EO 11988) and Floodways

Executive Order (EO) 11988, Floodplain Management, requires federal agencies to avoid direct or indirect support of floodplain development whenever a practicable alternative exists. EO 11988 and 23 CFR 650 Part A requires an evaluation of project alternatives to determine the extent of any encroachment into the base floodplain. The base flood (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 one percent or greater chance of flooding in a given year. As described in FHWA's 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.

3.4.1.7. Hazardous Substances

The Montana Natural Resource Information System (NRIS) database was searched for underground storage tank (UST) sites, leaking underground storage tank (LUST) sites, abandoned mine sites, remediation response sites, landfills, National Priority List (NPL) sites, hazardous waste, crude oil pipelines, and toxic release inventory sites in the study area.

There were no UST sites, LUST sites, remediation response sites, landfills, or NPL sites identified in the study area. There were four abandoned mine sites located south of Brandenberg and one abandoned mine site located south of Garland. All five of these abandoned mine sites appear to be minor coal prospects/explorations. Further evaluations would be needed to determine if any of these abandoned mine sites pose an environmental concern related to potential improvement options.

Further evaluation may also be needed at specific sites to determine if contamination will be encountered during any future construction. This may include reviewing MDEQ files and conducting subsurface investigation activities

to determine soil and groundwater contamination. If contaminated soils or groundwater is encountered during construction, handling and disposing of the contaminated material will be conducted in accordance with State, Federal, and local laws and rules.

3.4.1.8. Air Quality

EPA 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. S-332 is not located in a non-attainment area for PM-2.5, PM-10, or carbon monoxide.

An evaluation of mobile source air toxics (MSATs) may be required. MSATs are compounds emitted from highway vehicles and off-road equipment which are known or suspected to cause cancer or other serious health and environmental effects.

3.4.1.9. Noise

The majority of S-332 passes through farm and ranch land, therefore it appears unlikely that improving this road would cause any traffic noise impacts. However, a traffic noise study may be necessary for any planned improvements to S-332.

If improvements are developed for S-332 that include a significant shift in the horizontal or vertical alignments or increasing the traffic speed and volume then the project would be considered a Type I project. A detailed noise analysis would be required if any future project is considered a Type I project. A detailed noise analysis includes 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 approach or substantially exceed the noise abatement criteria (NAC) listed in MDT's Noise Policy.

If traffic noise impacts are shown to exist on the project, a number of possible abatement measures may be considered, including but not limited to the following:

- Altering the horizontal or vertical alignments;
- Constructing noise barriers such as sound walls or earthen berms; and/or
- Decreasing traffic speeds.

Any future construction activities along S-332 may cause localized, short-duration noise impacts. These impacts need to be minimized in accordance with MDT's standard specifications for the control of equipment noise during construction.

3.4.2. Visual Resources

Visual resources refer to 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 corridor contains an array of biological, scientific, historic, wildlife, ecological, and cultural resources mixed with a remote location.

There are no properties or corridors within the study area listed on the Department of Interior's National Landscape Monument System.

3.4.3. Biological Resources

Biological resources in the study area were identified using maps, aerial photographs, the endangered, threatened, proposed, and candidate species list for Montana counties (May 2009) from the US Fish and Wildlife Service

(USFWS), Montana Natural Heritage Program data, and windshield surveys of the project site. This limited survey is in no way 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 will occur, and a complete biological survey of the study area will need to be completed. Due to potentially extensive mitigation measures, project costs may be higher than typically expected and should be budgeted for in the planning process.

3.4.3.1. Fish and Wildlife

General fish and wildlife resources in the study area will need to be surveyed during any future project development process. MFWP should be contacted during the project development process for local expertise of the study area. Riparian and river, stream or creek habitats should be avoided to the greatest extent practicable, including but not limited to, the Tongue River riparian and river habitat. Fish and wildlife species use waterway corridors during all life stages. Encroachment into the wetted width and waterway and the associated riparian habitat should be avoided, or minimized, to the maximum extent practicable. It is recommended that a riparian corridor remain on both sides of waterways to facilitate wildlife movement along the river corridor.

3.4.3.1.1. Threatened and Endangered Species

The federal list of endangered and threatened species is maintained by the USFWS. Species on this list receive protection under the Endangered Species Act (ESA). 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. The USFWS also maintains a list of species that are candidates or proposed for possible addition to the federal list.

The endangered, threatened, proposed, and candidate species list for Montana counties (August 2011) was obtained from the USFWS website. This list generally identifies the counties where one would reasonably expect the species to occur, not necessarily every county where the species is listed.

There are seven endangered, threatened, proposed, or candidate animal species listed for Custer and Rosebud Counties:

1. Black-footed Ferret (Listed Endangered – LE)
2. Pallid Sturgeon (Listed Endangered – LE)
3. Piping Plover (Listed Threatened, Critical Habitat – LT, CH)
4. Interior Least Tern (Listed Endangered – LE)
5. Whooping Crane (Listed Endangered – LE)
6. Greater Sage Grouse (Candidate – C)
7. Sprague's Pipit (Candidate – C)

Although the Pallid Sturgeon has not been recorded in the Tongue River in the Study corridor, junior Pallid Sturgeon do use the Tongue River near Miles City, and the Tongue River was historically used by adult Pallid Sturgeons. An evaluation of potential impacts to all endangered, threatened, proposed, or candidate species will need to be completed if a project is developed.

3.4.3.1.2. Species of Concern

Montana Species of Concern 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 Animal Species of Concern is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision-makers to direct limited resources to priority data collection

needs and address conservation needs proactively. Each species is assigned a state rank that ranges from S1 (greatest concern) to S5 (least concern). Other state ranks include SU (unrankable due to insufficient information), SH (historically occurred), and SX (believed to be extinct). State ranks may be followed by modifiers, such as B (breeding) or N (non-breeding).

A search of the Montana Heritage Program was conducted for Custer and Rosebud counties. A total of 39 species of concern for Custer County and 47 species of concern Rosebud County were listed. The results of a data search by the Montana Natural Heritage Program reflect the current status of their data collection efforts. These results are not intended as a final statement on sensitive species within a given area, or as a substitute for on-site surveys. If a project is forwarded from the improvement option(s), on-site surveys will need to be completed during the project development process.

3.4.3.1.3. Crucial Areas Planning System (CAPS) Report

The MFWP recently implemented a web-based tool to help identify and evaluate the fish, wildlife and recreational resources of Montana. The Crucial Areas Planning System (CAPS) is a mapping service intended to provide useful and non-regulatory information about highly valued fish and wildlife resources and recreation areas during the early planning stages of projects. The CAPS can provide information for specific areas of interest. The CAPS Report concludes that the study area yields high-quality wildlife and fisheries habitat and diversity, and suggests that due to this diversity project sponsors commit to working with the appropriate agencies if a project is forwarded from the improvement options(s) to identify and mitigate potential impacts directly attributable to the project.

3.4.3.1.4. Wildlife and Traffic Concerns

During the project development process, wildlife crossings and/or wildlife accident cluster areas along the corridor may need to be addressed. It is likely most wildlife/vehicle collisions are unreported within the Study corridor.

3.4.3.1.5. Tongue River Fisheries Information

Due to recent habitat and conveyance improvements to the Tongue River, all Yellowstone River fish species have the potential to utilize the entire Tongue River and tributaries within the corridor study area. With the construction of the Muggli Bypass in 2007, and removal of SH Dam in 2008, Yellowstone River fish can now migrate upstream into the Tongue River. Prior to the bypass construction, Yellowstone River fish could not migrate upstream of T&Y Dam since its construction in 1886. Multiple fish species not documented upstream of T&Y Dam prior to bypass construction have now been documented upstream of the Muggli Bypass since 2007. These species are: goldeye, western silvery minnow, freshwater drum, bigmouth buffalo, smallmouth buffalo, and sturgeon chub. Over time it is likely additional species will find their way upstream of T&Y Dam. Other species already present upstream of T&Y Dam have also been documented using the bypass and are adding to the overall numbers of fish utilizing the Tongue River in the corridor study area. Many of these species are cyprinids and suckers which are forage species for many of the larger predatory and game species in the Tongue and Yellowstone Rivers.

The increased fish usage upstream of T&Y Dam increases the need to maintain connectivity to all of the tributaries. Because of the close proximity of road crossings on tributaries to the Tongue River, adequately sized bridges or culverts will be required with future projects to allow for stream flow and function and provide for fish passage. Following are lists of tributaries and their potential for fish usage:

- Perennial tributaries with documented fish usage: Pumpkin Creek and Foster Creek.
- Large perennial tributaries capable of fish usage but not documented: Ash Creek and Liscom Creek.
- Intermittent and ephemeral creeks with strong potential for fish usage during flash rain/runoff events: Dry Creek, Prat Creek, Nelson Creek, Dry Creek, Jack Creek, Brown Creek, Haddow Creek, Cheever Creek,

Sand Creek, Stony Creek, Elk Creek, Coon Creek, Garden Creek, Big John Creek, Freda Creek, Goodale Creek, Joe Leg Creek, Hammond Creek, and Lay Creek.

3.4.3.2. Vegetation

Native vegetation in the study area generally consists of wetland and riparian areas along the Tongue River and sagebrush/grasslands in the upland areas. The remaining vegetation consists of cultivated crop land.

3.4.3.2.1. Threatened and Endangered Plant Species

The federal list of threatened endangered and threatened species is maintained by the USFWS. Species on this list receive protection under the ESA. 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. The USFWS also maintains a list of species that are candidates or proposed for possible addition to the federal list.

Information regarding endangered, threatened, proposed, and candidate species list for Montana counties (August 2011) was obtained from the USFWS website. This list identifies the counties where one would reasonably expect the species to occur, not necessarily every county where the species is listed.

This list identified no endangered, threatened, proposed, or candidate plant species listed for Custer or Rosebud Counties, and none are currently expected to occur in the study area. An evaluation of all endangered, threatened, proposed, or candidate species will need be done during the project development process.

3.4.3.2.2. Species of Concern

Montana Species of Concern are native plants 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 Plant Species of Concern is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision-makers to direct limited resources to priority data collection needs and address conservation needs proactively. Each species is assigned a state rank that ranges from S1 (greatest concern) to S5 (least concern). Other state ranks include SU (unrankable due to insufficient information), SH (historically occurred), and SX (believed to be extinct). State ranks may be followed by modifiers, such as B (breeding) or N (non-breeding).

The Montana Heritage Program lists nine plant species of concern in Custer County and eleven in Rosebud County. Two (2) of these plant species occur in both counties. The results of a data search by the Montana Natural Heritage Program reflect the current status of their data collection efforts. These results are not intended as a final statement on sensitive species within a given area, or as a substitute for on-site surveys. On-site surveys will need to be completed during the project development process.

3.4.3.2.3. Noxious Weeds

Noxious weeds degrade habitat, choke streams, crowd native plants, create fire hazards, poison and injure livestock and humans, and foul recreation sites. Areas with a history of disturbance are at particular risk of weed encroachment. There are 32 noxious weeds in Montana, as designated by the Montana Statewide Noxious Weed List (effective April 15, 2008). The study area will need be surveyed for noxious weeds. County Weed Control Supervisors should be contacted regarding specific measures for weed control during project development.

3.4.4. Cultural and Archaeological Resources

If a project is developed and is federally-funded, a cultural resource survey of the Area of Potential Effect for this project as specified in Section 106 of the National Historic Preservation Act (36 CFR 800) would need to be conducted. 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 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 to these properties are recognized under Section 4(f) of the Transportation Act.

The Tongue River drains a vast area of north central Wyoming and Southeastern Montana. In the relatively dry grasslands of southeastern Montana the river has always acted as a focus of human activities. The Tongue River Valley and its surrounding breaks have a rich history from early pre-contact times through the 19th century Indian Wars. The 20th century brought mining, cattle and horse ranching.

A search of existing (known) cultural resources, both archaeological sites and historic properties, was conducted for the full, one mile wide study area. The study area is approximately 33,000 acres in size and within that area 97 separate cultural resources are known to exist. These resources include historic irrigation ditches, residences, and trash deposits, as well as stratified archaeological sites, lithic scatters, lithic quarries, cribbed log structures, stone cairns and rock art. Bison kills, tipi rings and human burials are very likely present in the study area as well.

The Tongue River drainage is full of high quality raw material (known as porcellanite) suitable for making stone tools. For that reason pre-contact lithic scatters are very common in the area. Lithic scatters may account for most of the known sites in the study corridor. Although S-332 does bisect some cultivated ground used for hay production, the vast majority of the land on either side of the existing road is native range. The high concentration of porcellanite lithic scatters coupled with the fact that most of the study corridor has never been subjected to plowing means that there are undoubtedly many hundreds of unidentified and undisturbed lithic scatters in the corridor.

Based on a review of prior cultural resource inventories we know that approximately 7 percent of the study area has had some past cultural resource survey. Some of these surveys date back to the 1970's when methods and expectations were not what they are today. On the other hand, many of the previous surveys in the study area date from the 2000's and meet present day cultural resource management methods. Approximately 75 percent of the previous cultural resource inventories in the corridor have been conducted on public land, mostly administered by the Bureau of Land Management. Based on existing data we can estimate that there are well over a thousand cultural resources in the study area. Since the majority of these resources are pre-contact archaeological sites (lithic scatters), archaeological testing may be a key component and expense of projects developed within the study area.

Compliance with applicable laws such as Section 106 of the National Historic Preservation Act, the Native American Graves Protection and Repatriation Act, the Montana State Burial Law, etc. will be required if a project is forwarded. Additionally, tribal consultation will be required at an early stage of project development.

3.4.4.1. 4(f) and 6(f) Resources

Reviews were also conducted to determine the presence of Section 4(f) and Section 6(f) properties along the corridor. Section 4(f) refers to the original section within the Department of Transportation Act of 1966 (49 U.S.C. 303), which set the requirement for consideration of park and recreational lands, wildlife and waterfowl refuges, and historic sites in transportation project development. Prior to approving a project that "uses" a Section 4(f) resource, FHWA must find that there is no prudent or feasible alternative that completely avoids 4(f) resources. "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 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 4(f) are "substantially impacted". Section 4(f) resource information was gathered by field

observation and review of the National Register of Historic Places (NRHP) list for Custer County and Rosebud County. In addition, MFWP identified additional 4(f) resources pertaining to conservation easements.

There are five 4(f) / 6(f) resources within the study area:

1. Twelve Mile Dam Fishing Access – 4(f) and 6(f)
2. Pumpkin Creek Ranch Recreational Area – 4(f)
3. Tongue / Yellowstone River Irrigation District Canal – 4(f)
4. Brice Ranch – 4(f)
5. Hirsch Ranch – 4(f)

3.5. AREAS OF CONCERN AND CONSIDERATION SUMMARY

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.

3.5.1. TRANSPORTATION SYSTEM

The following transportation system areas of concern were noted:

Surfacing

- Longitudinal and transverse cracking in the asphalt surfacing.
- Evidence of asphalt failure due to recent slides.
- Gravel surfacing from RP 17.7 to RP 50.4.
- Presence of road generated dust inhibiting driver sight lines.

Drainage

- Nine locations with evidence of recent slides.

Horizontal Alignment

- Seven horizontal curves do not meet current standards.

Vertical Alignment

- 34 vertical curves do not meet current standards.
- 12 vertical curves were estimated to not meet current standards based on field review.
- Seven locations have grades that do not meet current standards.
- Two locations were estimated to have grades that do not meet current standards based on field review.

Clear Zones

- 22 locations were estimated to have clear zones that do not meet current standards based on field review.

Access Points

- Three public approaches do not meet current standards based on intersection angles.
- Nine private approaches do not meet current standards based on intersection angles.

Cost

- Due to potentially extensive mitigation measures, project costs may be higher than typically expected and should be budgeted for in the planning process.

3.5.2. Environmental Considerations

The following environmental considerations were noted:

Prime Farmland

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

Water Resources

- Tongue River is located within the study area and is listed as a 303(d) waterbody.
- Irrigation facilities exist within the study area.

Wetlands

- Wetlands are located within the study area.

Hazardous Substances

- There are five abandoned mine sites within the study area.

Fish and Wildlife

- Seven endangered, threatened, proposed, or candidate species are listed for Custer and Rosebud Counties.
- 39 species of concern for Custer County and 47 species of concern for Rosebud County were listed.

Vegetation

- No endangered, threatened, proposed, or candidate plant species are expected to occur within the study area.
- Nine plant species of concern for Custer County and eleven for Rosebud County were listed.

Cultural and Archaeological Resources

- 97 separate cultural resources are known to exist within the study area.
- Five 4(f) and one 6(f) resources are located within the study area.

Chapter 4
CORRIDOR NEEDS AND OBJECTIVES

Needs and Objectives for the S-332 corridor within the study area were identified based on a comprehensive review of existing data, and input from resource agencies, stakeholders and the public. The needs and objectives are important in explaining why an improvement option, or options, may be necessary. The discussion and analysis leading to the development of these needs and objectives recognizes the diverse nature of the corridor and takes into account social, economic and environmental conditions.

The following needs and objectives were used in the development of improvement options. 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, a simple gravel road resurfacing project may have little to no effect on wildlife connectivity objectives, thus rendering compliance with the intent of that particular objective unnecessary.

NEED 1: IMPROVE SAFETY AND OPERATION OF S-332

At the current time, S-332 primarily serves adjacent landowners by providing a travel route for various agricultural and ranching operations to the economic hub of Miles City. S-332 also provides a crucial link between Ashland and Miles City. In the future, and depending on the development of coal mining operations, S-332 may realize increased passenger and vehicular traffic. Need number 1 recognizes that the roadway must be safe and efficient to meet the travelling needs of the public, both for through traffic and local traffic. To address this need, improvement options and /or management strategies are necessary for the corridor to achieve a higher level of safety and improve operations. This can be achieved by improving the roadway to meet current design standards (to the extent practicable), providing adequate clear zones, improving drainage conditions, providing consistent road and bridge widths for "all-weather" travel, and properly maintaining the roadway.

Objectives (To the Extent Practicable):

1.1 Improve geometric elements to meet current MDT design criteria.
1.2 Accommodate existing and future capacity demands within the corridor, including potential increases in semi-truck traffic.
1.3 Provide adequate clear zones to meet current MDT design criteria.
1.4 Provide appropriate drainage facilities throughout the corridor to minimize water on the roadway.
1.5 Provide consistent roadway and bridge widths.
1.6 Provide appropriate surfacing to allow for "all-weather" travel.
1.7 Improve maintenance practices, given limited funding, to address washboards, potholes, and dust issues.

NEED 2: PRESERVE THE ENVIRONMENTAL, CULTURAL, RECREATIONAL AND AGRICULTURAL NATURE OF THE CORRIDOR

Sensitivity to the rich historic, cultural and archaeological integrity of the area should be considered. All improvements should be reviewed for their potential impact to the environmental, cultural, recreational and agricultural aspects of the corridor.

Objectives (To the Extent Practicable):

2.1 Evaluate and incorporate "best practice" mitigation strategies as appropriate to reduce animal-vehicle conflicts.

2.2 Respect the agricultural nature of the corridor and allow for farm access as needed.

2.3 Avoid adverse impacts to the extent practicable, otherwise minimize adverse impacts to historic, cultural, archaeological, and environmental resources that may result from improvement options.

2.4 Evaluate fish (aquatic organism) passage issues and incorporate appropriate solutions to improve aquatic connectivity and stream function through structures and culverts.

2.5 Provide reasonable access to recreational sites in the corridor.

NEED 3: MINIMIZE CONFLICTS ALONG THE CORRIDOR

This need recognizes the rural nature of the corridor and the predominately agricultural operations adjacent to the route. The presence of the Amish community, the Northern Cheyenne Indian Reservation and the St. Labre Indian School located south of the southern termini of S-332 are also noted. Improvement options should be sensitive to the day-to-day operations of adjacent landowners and the potential effect improvements may have on diverse populations near Ashland.

Objectives (To the Extent Practicable):

3.1 Minimize impacts to existing residential and agricultural uses along the corridor.

3.2 Minimize impacts to the Amish community, the Northern Cheyenne Indian Reservation and the St. Labre Indian School, all located south of the southern termini of S-332.

3.3 Consider all modes of transportation in the corridor.

OTHER

Improvement options should be sensitive to the availability of funding for construction, and also recurring maintenance costs. Limiting disruptions to adjacent properties during construction would be desirable, especially during harvest periods.

Objectives (To the Extent Practicable):

1. Reduce roadway maintenance costs.
2. Limit disruptions during construction as much as practicable.
3. Availability and feasibility of funding.

Chapter 5
IMPROVEMENT OPTIONS

The corridor needs and objectives described previously led to the development of a range of improvement options that address roadway issues and areas of concern. This chapter provides a description and evaluation of each improvement option. The improvement options were identified based on field review, engineering analysis of as-built drawings, crash data analysis, consultation with various resource agencies, and information provided by the general public.

5.1. IMPROVEMENT STRATEGIES EXPLORED

A number of strategies were developed to help address the identified issues and areas of concern. Some of the strategies examined were:

- Expand roadway widths to bring the roadway up to current MDT standards.
- Modify sub-standard vertical curves, and associated vertical grades, to bring vertical curves and grades up to current MDT standards.
- Improve clear zones by flattening slopes or installing guardrail.
- Reconstruct slide areas that were damaged during the 2011 flood events.
- Mill, fill and overlay the existing paved section.
- Place new gravel surfacing on the existing gravel section.
- Reconstruct and pave S-332 in its entirety, with four new replacement bridges.
- Modify substandard horizontal curves to current MDT standards.

A fundamental consideration in identifying potential improvement options is the concept of paving S-332 in its entirety. Currently, asphalt surfacing exists between RP 0.00 and RP 17.7. The remaining section of S-332 (RP 17.7 to RP 50.4) contains gravel surfacing of varying widths. Although MDT does not have a defined paving threshold by which a secondary road must be paved, analysis of all state secondary roads in the Glendive District indicates that traffic volumes of approximately 200 vpd may be a potential threshold for paving a roadway. Most of the secondary roads in the Glendive District that carry 200 vpd or more are paved.

5.2. ESTIMATE OF IMPROVEMENT COSTS

Planning level cost estimates were developed for the improvement options. These costs are for construction costs only and are in year 2012 dollars. The planning level costs do not include right-of-way acquisition, utility relocation, preliminary engineering or construction engineering.

A number of factors were used to help estimate the planning level costs including as-built drawings, aerial photography, MDT's average unit costs for materials, past projects, local expertise, and engineering judgment. More detail about the planning level cost estimates is provided in the following sections.

5.2.1. Vertical Curve Improvement Costs

Cost estimates for vertical curve improvements were developed by calculating quantities and resultant costs to bring sub-standard vertical curves up to current standards. The existing vertical curves were drawn using data from as-built drawings provided by MDT. A new curve length designed to meet current MDT standards was then developed and used to estimate excavation (or borrow) quantities. MDT unit costs were used for the remainder of

the items needed for the cost estimate. For locations where as-built drawings were unavailable, an average cost was used based on all the calculated vertical curve improvements along the gravel section.

Vertical curve improvements have been identified in both the paved and graveled sections of the roadway. As these projects are viewed as "stand-alone" spot improvements, the width of the roadway was assumed to be 26 feet for the paved sections and 28 feet for the gravel sections.

5.2.2. Slide Area Costs

Planning level cost estimates for slide area repair projects were calculated based on past MDT projects. An average cost per mile of $2,443,544 was calculated based on MDT slide area project award costs with letting dates between 2011 and 2012. The average cost per mile was multiplied by the estimated length for each improvement option along S-332 as determined based on aerial photography.

5.2.3. Roadway Reconstruction & Widening Improvement Costs

Cost estimates for roadway reconstruction were gathered for both gravel and asphalt surfacing. These planning level costs came from a variety of sources that included the *Winifred to Big Sandy Corridor Study (May 2011),* the MDT's *US 212 – Ashland East* project, MDT's *Preliminary Estimating Tool Spreadsheet* (PET – Revised 09/2011), and personal communications with MDT Glendive District personnel. A summary of the estimated costs per square foot for roadway reconstruction are included in **Table 13**.

Table 13: Roadway Reconstruction Cost Estimates

Reconstruction Effort	Estimated Cost (per square foot)	Source
Asphalt Surface	$8.55	US 212 – Ashland East project
Gravel Surface	$4.08	Winifred to Big Sandy Corridor Study
Bridge Reconstruction	$150	MDT Planning

5.3. DESCRIPTION AND EVALUATION

Improvement options are described in terms of "concepts" as a way of packaging options together. The concepts identified for potential implementations are described as follows:

- **Concept 1 – Spot Improvements –** This concept resulted in the generation of several individual, geographically distinct spot improvements that could be developed as a stand-alone treatment or a series of treatments. These spot improvements included bringing past slide areas up to standards, fixing sub-standard vertical curves (and associated grades), improving sub-standard horizontal curvature just west of the Tongue River Bridge, and installing guardrail at locations with apparent high, steep fill slopes.
- **Concept 2 – Gravel without Reconstruction (RP 17.7 to RP 50.4) –** This concept includes two sub-concepts that consist of a gravel roadway without major reconstruction. One concept includes the placement of new gravel surfacing on the currently graveled portion of S-332 while the other would consist of a double-shot / bitumen surfing treatment on top of the existing gravel road. Under both concepts, no reconstruction or widening of the roadway would occur.
- **Concept 3 – Reconstruct and Widen Gravel Section (RP 17.7 to RP 50.4) –** This concept includes the reconstruction and widening of the existing gravel portion of the roadway to a new 32-foot wide gravel top width, but on a roadway base that would be suitable for a future 36-foot wide top width. Gravel surfacing would be utilized, and three existing bridges would be removed and replaced with new, 40-foot wide bridges.

- **Concept 4 – Rehabilitate with Mill / Fill / Overlay (RP 0.0 to RP 17.7) & Reconstruct and Widen Gravel Section (RP 17.7 to RP 50.4) –** This concept includes a mill, fill and overlay of the existing pavement section between RP 0.0 and RP 17.7. It assumes that no improvements to the width of the roadway would be made. The mill, fill and overlay concept is proposed as a method to improve the riding service and extend the life of the existing pavement, but stop short of a full reconstruct to widen the roadway. No modifications to existing widths would occur, nor would any bridge or hydraulic structures be replaced. Also included with this concept is the reconstruction and widening of the existing gravel portion of the roadway (RP 17.7 to RP 50.4) to a new 32-foot wide gravel top width, but on a roadway base that would be suitable for a future 36-foot wide top width. Gravel surfacing would be utilized, and three existing bridges could be removed and replaced with new, 40-foot wide bridges.
- **Concept 5 – Reconstruct with Pavement (RP 0.00 to RP 50.4) –** This concept includes a total reconstruction of S-332 from RP 0.0 to RP 50.4. This concept envisions an asphalt surface, although the exact top width would be dependent on future traffic volumes. The four existing bridges could be removed and replaced with new, 40-foot wide bridges.

It should be recognized that inherent to any improvement concept (or concepts) there will need to be sensitivity to wildlife and aquatic connectivity concerns. Due to the proximity to the Tongue River, implementation of the improvement concepts may necessitate close coordination with resource agencies to identify areas of sensitivity in regards to wildlife and aquatic needs. Additional information can be found in the *Environmental Scan*.

Concept 1 - Spot Improvements

Spot improvements were identified along the corridor that could address specific areas of concern. The description of each spot improvement option is included in this section. The location of each spot improvement is shown graphically in **Figure 2**. Spot improvements generally fall within the following categories:

- **Vertical Curve Improvements** – Consist of modifications to existing vertical crest and sag curves. Crest vertical curves would be flattened by shaving off the top of the curve to lower the road profile and increase the driver's sight distance. For sag vertical curves, the road profile would be raised by filling in the sag area. In most cases, the vertical curves would also be lengthened. Vertical curve improvements have been identified in both the existing paved and graveled portions of S-332.
- **Slide Area Improvements** – Numerous slide areas were identified through the field review and discussions with stakeholders and the public. The slide areas were a result of severe flooding during 2011. The slide areas were reconstructed as emergency repairs, under the premise additional work would be needed at a later date.
- **Guardrail Installation** – There are several areas documented along S-332 that contain steep side slopes and high embankments. MDT's strategy to deal with these hazards is to first remove the hazard. An example would be to flatten a steep side slope by re-grading. The second strategy would then be to consider the installation of barriers, such as guardrail. Spot improvements have been identified where guardrail should be considered for installation to mitigate clear zone concerns.
- **Horizontal Curve Improvements** – Between RP 40.23 and 40.98 a series of horizontal curves exist that may be a candidate for a roadway alignment modification. Modifications to the existing horizontal curves to improve sight distance and better match driver expectations would be desirable. By increasing the radius of the horizontal curve, the curve would be lengthened so that the change in direction is smoother. In some cases this may be difficult due to physical obstructions such as irrigation pivots or other constraints. In these circumstances, advance warning signs may be utilized to warn the driver of the abrupt shift in alignment.

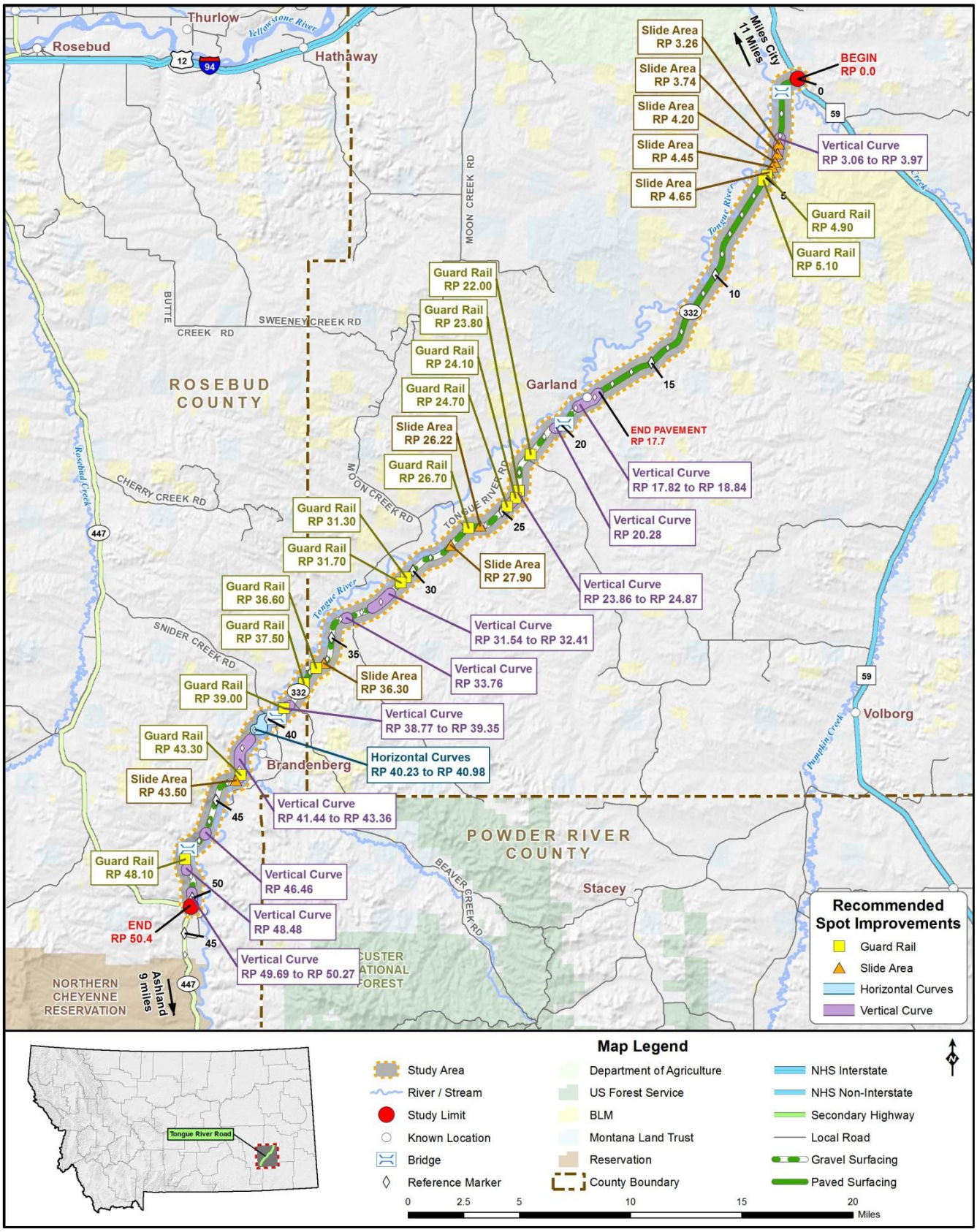

Figure 2: Concept 1 – Spot Improvements

Concept 1.A – Vertical Curves

Numerous vertical curves were identified through the analysis of as-built drawings and field review that do not meet current MDT standards. Spot improvements to address the sub-standard curves by modifying them to meet MDT standards are being forwarded for review. This improvement option could be completed on an individual curve basis, or by improving a series of curves adjacent to each other. **Table 14** portrays the vertical curves that are candidates for improvement to bring them up to standards, along with the estimated cost of improvement.

Some vertical curves have been identified that are relatively close to each other. In those cases, it would be possible to improve the curves in close proximity with one project. Crest vertical curves would be flattened by shaving off the top of the curve to lower the road profile and increase the driver's sight distance. The road profile would be raised by filling in the sag area for sag vertical curves.

As seen in **Table 14**, the majority of the identified vertical curves are in the graveled roadway section (i.e. beyond RP 17.7). The curve improvements are envisioned as spot improvements that can be addressed by project sponsors as funding and time allows. Another longer-term strategy that would address these curves would be a total reconstruction of the roadway as described under Concepts 3, 4 and 5.

Estimated Cost: $1,380,000 (Total)

Table 14: Concept 1.A – Vertical Curve Improvements

Location	Number of Vertical Curves	Estimated Cost
RP 3.06 to RP 3.97	4	$588,000
RP 17.82 to RP 18.84	3	$61,000
RP 20.28	1	$5,000
RP 23.86 to RP 24.87	5	$81,000
RP 25.53 to RP 29.60	16	$329,000
RP 31.54 to RP 32.41	2	$57,000
RP 33.76	1	$18,000
RP 38.77 to RP 39.35	2	$13,000
RP 41.44 to RP 43.36 [(a)]	7	$133,000
RP 46.46 [(a)]	1	$19,000
RP 48.48 [(a)]	1	$19,000
RP 49.69 to RP 50.27 [(a)]	3	$57,000
TOTAL	46	$1,380,000

[(a)] *Cost estimate was based on average cost for vertical curve improvements along the gravel section.*

Concept 1.B – Slide Areas

Several slides occurred in 2011 due to heavy rainfall and flooding in the area. The slide locations have had minor repair work completed as temporary mitigation. Several of these areas have already begun to deteriorate in terms of slope erosion, pavement settling, and drainage issues. Concepts 3, 4 and 5 present alternatives for the long-term reconstruction of the roadway, however, spot improvements have been identified to rectify the slide areas in a more permanent fashion. Slide area improvements have been identified in both the paved and graveled sections of S-332, and would include drainage culvert(s), embankment material and compaction, base course, and new asphalt. **Table 15** lists all the slide areas identified in the corridor along with the estimated cost of improvement.

Estimated Cost: $2,761,000 (Total)

Table 15: Concept 1.B – Slide Area Improvements

Location	Number of Slide Areas	Estimated Cost
RP 3.26	1	$195,000
RP 3.74 to RP 4.65	4	$1,197,000
RP 26.22	1	$195,000
RP 27.90	1	$367,000
RP 36.30	1	$318,000
RP 43.50	1	$489,000
TOTAL	9	$2,761,000

Concept 1.C – Guardrail

Multiple areas with steep fill slopes exist between RP 3.74 and RP 50.40. These areas are potential safety hazards due to the steep slopes, as they do not appear to be traversable and/or recoverable. A total reconstruction of the roadway in some of the areas could occur and address these problems as described under Concepts 3, 4 and 5. However since any reconstruction would be a long-term endeavor, a stand-alone option may be to incorporate guardrail in the areas listed in **Table 16**.

Note that prior to installing guardrail, guardrail warrants would need to be evaluated. Because most of the areas have high embankments, it does not appear feasible to re-work the slopes to provide the proper slope ratio and recovery area that could be developed otherwise with a total reconstruction of the roadway. **Table 16** lists all of the potential guardrail areas that were identified within the corridor. The length of the potential guardrail treatments includes guardrail on both sides of the road, and in most cases traverses the entire length over an existing drainage.

Estimated Cost: $1,290,000 (Total)

Table 16: Concept 1.C – Guardrail Improvement Areas

Location	Estimated Length of Guardrail Needed (ft)	Estimated Cost
RP 4.90	1,260	$54,142
RP 5.10	1,600	$68,752
RP 22.00	3,700	$158,989
RP 23.80	1,380	$59,299
RP 24.10	1,900	$81,643
RP 24.70	1,600	$68,752
RP 26.70	4,220	$181,333
RP 31.30	3,160	$135,785
RP 31.70	4,760	$204,537
RP 36.60	2,120	$91,096
RP 37.50	2,120	$91,096
RP 39.00	840	$36,095
RP 43.30	840	$36,095
RP 48.10	520	$22,344
TOTAL	30,020	$1,290,000

Concept 1.D – Horizontal Curves (RP 40.23 – RP 40.98)

This improvement option has been identified between RP 40.23 to 40.98. This area has three horizontal curves that do not meet current MDT design standards. A long-term improvement option is to reconstruct these horizontal curves to bring the geometrics up to current standards. This would necessitate a shift off of its present

alignment. The work would be limited to just west of the Tongue River Bridge, thereby eliminating the need to replace the bridge in the short term. The envisioned project would be complicated by the presence of two irrigation pivot systems that currently irrigate fields that straddle both side of the existing roadway. To improve the sub-standard curves, the alignment shift would be off the present road and would require new right-of-way from adjacent, landowners.

Estimated Cost: $689,000

Concept 2 – Gravel Without Reconstruction (RP 17.7 to RP 50.4)

This improvement option has been identified between RP 17.7 and RP 50.4. This area of the corridor is currently a gravel roadway. This concept includes two sub-concepts.

Concept 2.A – Gravel Placement

This concept would place a new four-inch gravel layer on the roadway in order to improve the roadway surface. This option does not include widening the roadway or improve any other areas of concern. Gravel quantities are represented in cubic yards of gravel and the utilized unit cost (per cubic yard) includes placement and mobilization.

Estimated Cost: $2,741,000

Concept 2.B – Double Shot / Bitumen Treatment

This concept proposes a double-shot / bitumen surfacing treatment on top of the existing gravel road. This concept would seal the surfacing course which would improve the overall roadway surface condition and help to reduce dust and provide for lower maintenance requirements. Minor grading, elimination of soft spots, and incidental gravel placement prior to application would be included. This concept would be most appropriate for lower traffic volumes and would likely not hold up well under heavy traffic or truck traffic conditions.

Estimated Cost: $2,183,000

Concept 3 – Reconstruct and Widen Gravel Section (RP 17.7 to RP 50.4)

This improvement option has been identified between RP 17.7 and RP 50.4. This area of the corridor is currently a gravel roadway of inconsistent width. Multiple narrow sections are found throughout, especially just west of the Tongue River Bridge.

Narrow roadway widths can be a concern because vehicles may encroach upon the opposite travel lane, thereby creating a potentially unsafe condition. According to projected traffic volumes for the corridor, this area could potentially see an increase in traffic from an average of 110 vpd to 2,056 vpd. MDT standards recommend a roadway width of 28’ for an AADT of 300 to 999, 32’ for an AADT of 1,000 to 1,999, and 36’ for an AADT of 2,000 and 3,000. Until which time that the higher traffic volumes are realized, this concept envisions reconstructing the existing gravel portion and placing a 32-foot wide gravel surfacing on top of a roadway base that could accommodate a 36-foot wide top width in the future. For cost estimating purposes, a 36-foot wide gravel roadway was assumed. New right-of-way may be required depending on the public right-of-way available (not included in the cost estimate).

Three new replacement bridges or culverts would be required to meet width requirements. To be conservative in planning level costs estimating, it is assumed that bridges would be required and would be built to a 40’ top width, require 12 feet of clearance over existing topography, and utilize 2H:1V sloping abutments. The following bridges would need to be replaced:

- Foster Creek [RP 19.87] – 40’ x 50’ (Estimated cost = $300,000)

- Tongue River [RP 39.61] – 40' x 227' (Estimated cost = $1,362,000)
- Roe and Cooper Creek [RP 47.80] – 40' x 36' (Estimated cost = $216,000)

Also included in this concept is the extension of the reconstruct and widen gravel section from the end of S-332, along S-447, to the beginning of existing pavement at the Northern Cheyenne Reservation boundary. It may be desirable to reconstruct this segment of S-447 to the same standards as S-332 to ensure continuity of the roadway system.

Estimated Cost: **$25,341,000 (Without Bridge Reconstruction)**
$1,878,000 (Bridge Reconstruction Only)
$2,092,000 (Extension on S-447)

Concept 4 – Rehabilitate with Mill / Fill / Overlay (RP 0.0 to RP 17.7) and Reconstruct and Widen Gravel Section (RP 17.7 TO RP 50.4)

This concept includes a mill, fill and overlay of the existing pavement section between RP 0.0 and RP 17.7. It assumes that no improvements to the width of the roadway would be made along this section. The mill, fill and overlay concept section is proposed as a method to improve the riding service and extend the life of the existing pavement, but stops short of a full reconstruct to widen the roadway. This section of roadway is in good condition in terms of meeting geometric standards. Accordingly, the mill, fill and overlay would extend the life of the surfacing without a total reconstruct, and would be considered a rehabilitation effort. No modifications to existing widths would occur, nor would any bridge or hydraulic structures be replaced along this section.

Also included in this concept are the improvements described under Concept 3 (i.e. reconstruction and widening of the gravel section between RP 17.7 and RP 50.4, to include three new bridges).

Estimated Cost: **$10,690,000 (Pavement RP 0.0 – RP 17.7)**
$25,341,000 (Gravel RP 17.7 – RP 50.4, without Bridge Reconstruction)
$1,878,000 (Bridge Reconstruction Only RP 17.7 – RP 50.4)
$2,092,000 (Extension on S-447)

Concept 5 – Reconstruct With Pavement (RP 0.00 to RP 50.4)

This improvement option has been identified between RP 0.0 and RP 50.4 and would consist of asphalt pavement throughout the entire S-332 corridor. This option would address many of the issues and areas of concern previously identified.

According to projected traffic volumes for the corridor, the roadway could potentially experience an increase in traffic from an average of 110 vpd to 2,056 vpd. MDT standards recommend the following roadway widths based on AADT:

- AADT between 0-299 24' width
- AADT between 300-999 28' width
- AADT between 1,000-1,999 32' width
- AADT between 2,000-3,000 36' width
- AADT greater than 3,000 40' width

Ultimately, the required width of the roadway would be determined based on future AADT values. Due to the overall uncertainty of coal development southeast of Ashland and resultant future AADT, cost estimates were provided for a variety of roadway widths.

In addition, four new replacement bridges or culverts would be necessary to meet width requirements. To be conservative in planning level costs estimating, it is assumed that bridges would be required and would be built to a 40' top width, require 12 feet of clearance over existing topography, and utilize 2H:1V sloping abutments. The following bridges would need to be replaced:

- Pumpkin Creek [RP 1.02] – 40' x 152' (Estimated Cost = $912,000)
- Foster Creek [RP 19.87] – 40' x 50' (Estimated cost = $300,000)
- Tongue River [RP 39.61] – 40' x 227' (Estimated cost = $1,362,000)
- Roe and Cooper Creek [RP 47.80] – 40' x 36' (Estimated cost = $216,000)

Also included in this concept is the extension of the reconstruct with pavement section from the end of S-332, along S-447, to the beginning of existing pavement at the Northern Cheyenne Reservation boundary. It may be desirable to reconstruct this segment of S-447 to the same standards as S-332 to ensure continuity of the roadway system.

Estimated Cost: **$54,614,000 (24' Width without Bridge Reconstruction)**
$63,716,000 (28' Width without Bridge Reconstruction)
$72,819,000 (32' Width without Bridge Reconstruction)
$81,921,000 (36' Width without Bridge Reconstruction)
$91,023,000 (40' Width without Bridge Reconstruction)
$2,790,000 (Bridge Reconstruction Only)
$4,389,000 (Extension on S-447)

5.4. ADDITIONAL CONSIDERATIONS

This section offers additional considerations regarding the S-332 corridor.

- Because the language authorizing the corridor study was very specific to S-332, the study concludes at the intersection of S-332 and S-447 (i.e. RP 50.4 on S-332). However, south of this intersection there is a two-mile length of roadway (S-447) that is currently gravel until just south of the Northern Cheyenne Indian Reservation's northern boundary. It is likely if reconstruction occurs along S-332, construction would be continued over this section of S-447 to ensure continuity of the roadway system. In this case, it would be desirable to reconstruct the stretch of S-447 to the same standard as S-332. Special infrastructure considerations would be necessary to accommodate travel for the local Amish community in the area. Travel within this community is by horse-and-buggy, horseback, and walking. A separated, gravel surfacing pathway adjacent to the roadway in this area should be considered if and when a project develops, in addition to special speed zone considerations with signing.

- The Tongue River Railroad (TRR) is currently undergoing an Environmental Impact Statement (EIS) to document impacts and mitigation based on a variety of factors, most important of which is the potential impact of the Otter Creek coal tracts. An alignment for the future TRR is not available or known at this time. If and when the TRR is developed, it would be highly desirable to provide grade-separated crossings wherever the proposed railroad would intersect with S-332. Because railroad design standards necessitate a flat, gradual vertical profile, in most cases the roadway would have to cross rail facilities either above or below the rail infrastructure. These are general guidelines, and because of uncertainties regarding the TRR, no cost estimates for grade-separated facilities have been developed.

- The traffic forecasts made in this study's *Existing and Projected Conditions Report* suggest a conservative traffic volume of 2,056 vpd could potentially be realized in the future depending on development

activities associated with the Otter Creek coal tracts. There is a concept called "induced demand" that suggests if a reconstructed, paved roadway was in place that additional traffic could be pulled off adjacent roadways and diverted to the newly improved roadway. Adjacent roadways that currently are paved and carry traffic in a general north-south direction are State Route 39 (Lame Deer to Forsyth) and State Route 59 (Broadus to Miles City). It is possible that some travelers between Ashland and Forsyth, or Ashland and Miles City, may currently avoid S-332 due to its gravel surfacing and sub-standard conditions. If the road was improved with pavement, some of these travelers may choose to alter their routes accordingly. In this case, S-332 may realize more than 2,056 vpd.

5.5. SUMMARY

This chapter identifies improvement options for S-332 between MT-59 and S-447 using a series of "concepts" for consideration. The improvement options are 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 various resource agencies, and information provided by the general public. Small scale improvement options (i.e. spot improvements) have been identified and may be as simple as installing guardrail. Larger, more complex improvements have also been identified. These include placing new gravel surfacing on the existing gravel roadway, widening the gravel section of the roadway to a consistent width, or paving the gravel portion of S-332.

Wildlife and aquatic concerns are found throughout the entire corridor. The improvement options should be considered with respect to wildlife and aquatic connectivity impacts. These should be more fully explored during project development activities. **Table 17** contains a summary of the potential improvements along with planning level cost estimates.

Table 17: Improvement Options Summary

Concept Title	Description	Estimated Cost
CONCEPT 1 – SPOT IMPROVEMENTS		
1.A - Vertical Curves	• Modify existing vertical curves to increase the driver's sight distance. • Identified in both paved and graveled sections. • 46 total curves identified.	$1,380,000
1.B - Slide Areas	• Identified in both paved and graveled sections. • Nine (9) areas identified.	$2,761,000
1.C - Guardrail	• Protect drivers from potential safety hazards due to the steep slopes. • Guardrail warrants to be evaluated prior to installation. • Re-work of slopes may not be feasible.	$1,290,000
1.D - Horizontal Curves (RP 40.23 – RP 40.98)	• Improve three (3) horizontal curves that do not meet current standards. • Limited to area just west of the Tongue River Bridge.	$689,000
CONCEPT 2 – GRAVEL WITHOUT RECONSTRUCTION (RP 17.7 to RP 50.4)		
2.A - Gravel Placement	• Place new 4" gravel surface on the roadway. • No widening of the roadway. • No reconstruction to address identified areas of concern.	$2,741,000
2.B - Double Shot / Bitumen Treatment	• Double chip seal coat on top of existing gravel road. • No widening of the roadway. • No reconstruction to address identified areas of concern.	$2,183,000
CONCEPT 3 – RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 to RP 50.4) [(a)]		
Reconstruct and Widen Gravel Section	• Reconstruct gravel portion to a base width of 36' with a 32' top surface. • May require additional right-of-way (not included in cost estimate).	$25,341,000
Bridge Replacement	• Replace three (3) bridges.	$1,878,000
CONCEPT 4 – REHABILITATE WITH MILL / FILL / OVERLAY (RP 0.0 to RP 17.7) AND RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 to RP 50.4) [(a)]		
Rehabilitate with Mill / Fill / Overlay (RP 0.0 to RP 17.7)	• Mill the existing asphalt pavement, fill areas for better drainage (as needed), and place a new asphalt overlay. • No modifications to existing road widths. • No modifications to existing bridge or hydraulic structures.	$10,690,000
Reconstruct & Widen Gravel Section (RP 17.7 to RP 50.4)	• Reconstruct gravel portion to a base width of 36' with a 32' top surface. • May require additional right-of-way (not included in cost estimate).	$25,341,000
Bridge Replacement	• Replace three (3) bridges along gravel section.	$1,878,000
CONCEPT 5 – RECONSTRUCT WITH PAVEMENT (RP 0.00 to RP 50.4) [(a)]		
Reconstruct with Pavement (RP 0.0 to RP 50.4)	• Reconstruct both the paved and gravel section of the roadway to a paved section. • Width dependent on AADT • May require additional right-of-way (not included in cost estimate).	$54,614,000 (24') $63,716,000 (28') $72,819,000 (32') $81,921,000 (36') $91,023,000 (40')
Bridge Replacement	• Replace one (1) bridge along paved section. • Replace three (3) bridges along gravel section.	$2,790,000

[(a)] The continuation of improvements described under these concepts for the 2.7 miles of S-447, located between the intersection of S-332 / S-447 and the beginning of existing pavement, should be considered if and when a project is developed.

Chapter 6
FUNDING MECHANISMS

MDT administers a number of programs that are funded from state and federal sources. There are a number of potential funding programs that may be used to fund all or portions of any future improvements on S-332.

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 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 the Moving Ahead for Progress in the 21st Century Act (MAP-21) enacted on July 6, 2012, includes state developed implementation / sub-programs that may be potential sources for any projects developed along S-332. In order to receive project funding under these programs, projects must be included in the State Transportation Improvement Program (STIP).

6.1.1. Surface Transportation Program (STP)

STP funds are Federally apportioned to Montana and allocated by the Montana Transportation Commission to various programs.

6.1.1.1. State Secondary Highway Program (STPS)[9]

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 highways that have been functionally classified by MDT as either rural minor arterials or rural major collectors and that have been selected by the Montana Transportation Commission to be places on the secondary highway system [MCA 60-2-125(4)]. S-332 is a designated secondary highway.

Allocations and Matching Requirements

Secondary funds are distributed statewide (MCA 60-3-206) to each of five financial districts, including the Glendive District. The Commission distributes STPS funding based on system performance. Of the total received, 86.58 percent is Federal and 13.42 percent 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 use of the 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 percent of the program funds, with the remaining 35 percent dedicated to pavement preservation.

6.1.1.2. Discretionary Funds

Discretionary funds may be received through either highway program authorization or annual appropriations processes. These funds are generally described as “demonstration” or “earmark” funds. Receiving Discretionary funds has been a viable mechanism for local governments to secure federal funding for projects. If a local

[9] State funding programs developed to distribute Federal funding within Montana

sponsored project receives these types of funds, MDT will administer the funds in accordance with the Montanan Transportation Commission Policy #5 – *"Policy resolution regarding Congressionally directed funding: including Demonstration Projects, High Priority Projects, and Project Earmarks."*

The 2011 Legislature appropriated approximately $5.5 Million to "... survey and provide design and preliminary engineering work to improve State Secondary 332."

6.1.1.3. Federal Lands and Tribal Transportation Program

This program is a three part program consisting of the Federal Lands Transportation Program, Tribal Transportation Program and the Federal Lands Access Program. The Federal Lands Transportation Program is administered by FHWA and the federal land management agencies. The Tribal Transportation Program is administered by the BIA and the appropriate tribal agency.

6.1.1.3.1. Federal Lands Access Program

This program is administered by Western Federal Land Highway Division of the FHWA in consultation with MDT and MACO who represent the local governments. Projects are funded in Montana to the ratio of 87.58% federal funds and 13.42% matching funds.

All public roadways are eligible under the following criteria:

- Roadway jurisdiction or maintenance is by a state government, local government or tribal government and
- The route must provide direct access to or run adjacent to federal lands.

6.2. STATE FUNDING SOURCES

6.2.1. State Funded Construction (SFC)

Allocations and Matching Requirements

The State Funded Construction Program, which is funded entirely with state funds from the Highway State Special Revenue Account, typically provides funding for projects that are not eligible for Federal funds. This program is totally State funded, requiring no match.

Eligibility and Planning Considerations

This program funds projects to preserve the condition and extend the service life of highways. Eligibility requirements are that the highways be maintained by the State. MDT staff nominates the projects based on pavement preservation needs. The District's establish priorities and the Transportation Commission approves the program. Funding for this corridor from this source would depend on availability and need.

6.3. LOCAL / PRIVATE 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.

6.3.1. Private Funding Sources and Alternatives

Private financing of highway 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 increases in 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.

6.3.1.1. Development Financing

The developer provides the land for a transportation project and in return, local government provides the capital, construction, and necessary traffic control. Alternatively, developer constructs necessary roadway improvements as a condition for access approval. Such a financing measure can be made voluntary or mandatory for developers.

6.3.1.2. Cost Sharing

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

6.3.1.3. 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.

6.3.1.4. Road Districts

These are areas created by a petition of affected landowners, which allow for the issuance of bonds for financing local transportation projects.

6.3.1.5. 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 very effective in areas where financial conditions do not permit a local government to implement a transportation improvement itself.

6.3.1.6. General Obligation (G.O.) Bonds

The sale of general obligation 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. The advantage of this funding method is that 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.

6.3.1.7. Development Exactions/Impact Fees

As mentioned in the section on city funding sources, 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 should be required 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 upon the level of impact to the transportation system expected from each project. Such a fee structure could be based upon the number of additional vehicle trips generated, or upon 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 assessed accordingly.

6.3.1.8. Tax Increment Financing (TIF)

Increment financing has been used in many municipalities to generate revenue for public improvements projects. As improvements are made within the district, and as property values increase, the incremental increases in property tax revenue are earmarked for this fund. The fund is then used for improvements within the district. Expenditures of revenue generated by this method are subject to certain spending restrictions and must be spent within the district. Tax increment districts could be established to accomplish transportation improvements in other areas of the community where property values may be expected to increase.

Chapter 7
CONCLUSIONS AND NEXT STEPS

The S-332 corridor was evaluated at a planning level to obtain an understanding of corridor needs, objectives, constraints and opportunities, funding availability, and 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 Custer County and Rosebud County, to identify and evaluate improvement options to address the needs of S-332.

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 option concepts were developed. Small scale improvement options (i.e. spot improvements) were identified and may be as simple as installing guardrail. Larger, more complex improvements were also identified. These include placing new gravel surfacing on the existing gravel roadway, widening the gravel section of the roadway to a consistent width, or paving the gravel portion of S-332.

Improvement options are described in terms of "concepts" as a way of packaging options together. The concepts identified for potential implementations are described as follows:

- **Concept 1** identified several individual, geographically distinct spot improvements. These improvements are aimed at addressing identified roadway issues and areas of concern. Included would be bringing past slide areas up to standards, fixing sub-standard vertical curves (and associated grades), improving sub-standard horizontal curvature just west of the Tongue River Bridge, and installing guardrail at locations with apparent high, steep fill slopes.
- **Concept 2** includes two sub-concepts that consist of a gravel roadway without major reconstruction from RP 17.7 to RP 50.4. One concept would include the placement of new gravel surfacing on the currently graveled portion of S-332 while the other would consist of a double-shot / bitumen surfing treatment on top of the existing gravel road. Under both concepts, no reconstruction or widening of the roadway would occur.
- **Concept 3** would result in the reconstruction and widening of the existing gravel portion of the roadway from RP 17.7 to RP 50.4.
- **Concept 4** envisions a mill, fill, and overlay of the existing pavement section between RP 0.0 and RP 17.7 and the reconstruction and widening of the existing gravel portion of the roadway from RP 17.7 to RP 50.4.
- **Concept 5** includes a total reconstruction of S-332 from RP 0.0 to RP 50.4 to include asphalt surfacing.

The results of the study suggest that once funding has been identified there are no major impediments to developing the recommended improvement options. This study provides a diverse list of improvement option concepts and strategies that may be considered as funding becomes available.

7.1. NEXT STEPS

The ability to develop improvement options on S-332 is dependent 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 the improvement option(s) that meet the needs in the area;
- Identify and secure a funding source or sources; and
- Follow MDT guidelines for project nomination and development, including a public involvement process and environmental documentation.

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, a signing project may have little to no effect on aquatic connectivity objectives, thus rendering compliance with the intent of that particular objective unnecessary. Should this study lead to a project or projects, compliance with NEPA (if federal funding is utilized) and MEPA (regardless of funding source) 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 documents. Any project developed will need to be in compliance with CRF Title 23 Part 771 and ARM 18, sub-chapter 2 which sets forth the requirements for documenting environmental impacts on highway projects.