

Grants for  
Transportation  
Investment  
Generating Economic  
Recovery  
(TIGER)  
APPLICATION



# Beartooth Highway Reconstruction Project

March 2012

Submitted by the WYDOT



In cooperation with CFLHD of FHWA,  
USFS, MDT and YNP of the NPS



U.S. Department  
of Transportation  
Federal Highway  
Administration



Prepared by

**ATKINS**



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## Basic Project and Contact Information

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### DUNS Number for Grantee and First-Tier Sub-awardees:

809916000

### TIGER ID:

jdavis65841

### Project Type:

Rural arterial highway (US 212)

### Project Location:

The project location is in Park County, Wyoming, near the towns of Red Lodge and Cooke City in Montana and Cody, Wyoming. The project is located in the statewide “at large” congressional district in Wyoming. It is a critical route that connects two Montana towns in the statewide congressional district in Montana. The project is located in northwest Wyoming within Shoshone National Forest, just east of Yellowstone National Park.

### Amount of Grant Requested for the Project:

The grant request amount is \$45.1 million.

This grant application references many documents that were prepared during the project development and environmental and engineering processes. These documents are listed below and are available at: <http://www.cflhd.gov/projects/archive/WY/beartooth/media.cfm>.

Document	Date
Beartooth Highway Funding and Delivery Plan	October 2011
Beartooth Highway FHWA TIGER Grant No. 3 FY 2009 TIGER	May 2010
Beartooth All-American Road Interpretive Plan	January 2009
“An Orphaned Highway,” <i>Public Roads Magazine</i>	July 2006
National Register of Historic Places Registration Form	September 2005
Record of Decision	February 2004
Final Environmental Impact Statement	September 2003
Beartooth All-American Road Corridor Management Plan	January 2002
Beartooth Highway Road Inventory and Needs Study	October 1994

For project area photos, see the following website:

<http://www.panoramio.com/map/#lt=44.9691119&ln=-109.4715514&z=4&k=2&a=1&tab=1>

## Acronyms and Abbreviations

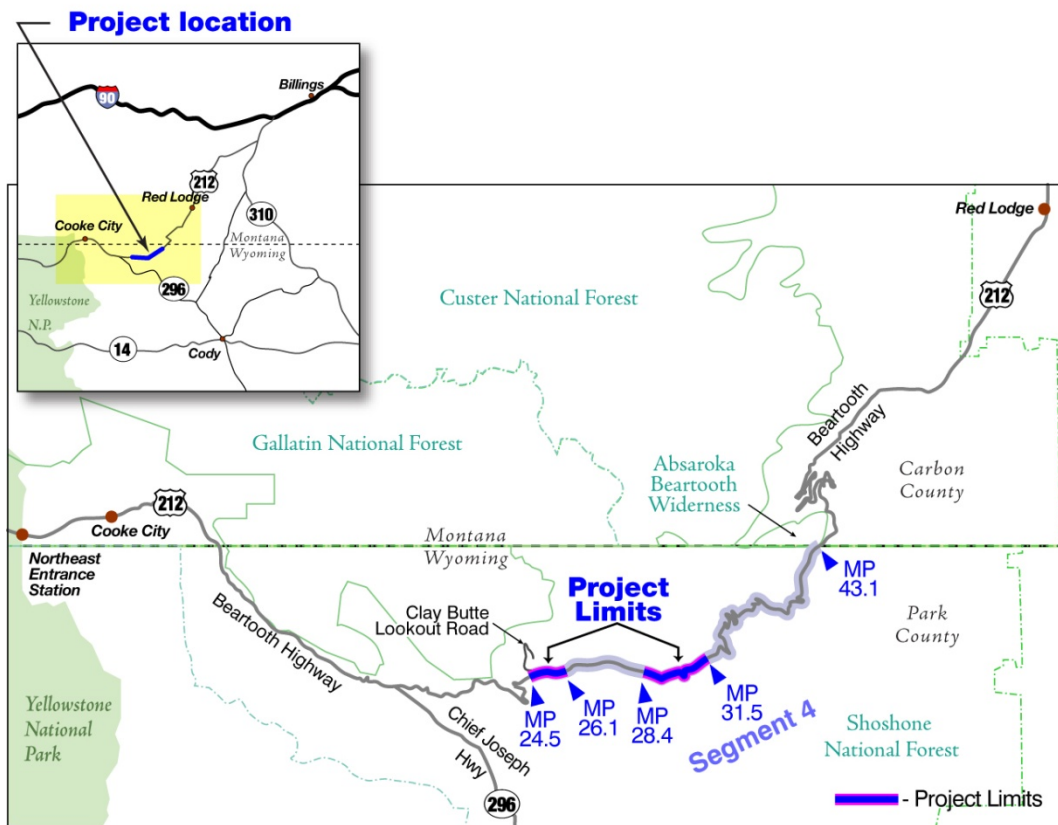
A/E	Architecture/engineering
AASHTO	American Association of State Highway and Transportation Officials
CFLHD	Central Federal Lands Highway Division
CNF	Custer National Forest
CO <sub>2</sub>	Carbon dioxide
DOI	U.S. Department of the Interior
FHWA	Federal Highway Administration
FLH	Federal Lands Highway
FLHP	Federal Lands Highway Program
FY	Fiscal Year
GNF	Gallatin National Forest
HPP	High-Priority Project
KP	Kilometer post
MDT	Montana Department of Transportation
MP	Milepost
mph	Miles per hour
NEPA	National Environmental Policy Act
NPS	National Park Service
REIMHS	Regional Economic Impact Model for Highway Systems
SNF	Shoshone National Forest
STP	Surface Transportation Program
TEA-21	Transportation Equity Act for the 21st Century
TIGER	Transportation Investment Generating Economic Recovery
USFS	U.S. Forest Service
USFWS	U.S. Fish & Wildlife Service
WYDEQ	Wyoming Department of Environmental Quality
WYDOT	Wyoming Department of Transportation
YNP	Yellowstone National Park

## 1.0 Project Description

The segment of the Beartooth Highway proposed for reconstruction (see Figure 1) has not been rebuilt since its original construction in the 1930s. The road has deteriorated significantly and will no longer accommodate current or future vehicle types/volumes, it does not meet the needs of bicyclists, it is substandard from a safety perspective, and it cannot be maintained in a sustainable manner. Reconstruction would bring the road up to standards accepted by the Federal Highway Administration (FHWA) and Wyoming Department of Transportation (WYDOT) and would be consistent with National Park Service (NPS) Park Roads Standards for this type of highway. The reconstruction would support the management of National Forest lands adjacent to the road, including maintaining the Scenic Byway/All-American Road qualities; maintaining an efficient transportation link between Red Lodge, Montana and Yellowstone National Park (YNP) that safely accommodates projected traffic; and providing a roadway that could be reasonably maintained in a sustainable manner by its maintaining agency.



**Beartooth Butte at Beartooth Lake**



**Figure 1. Project Area**

Forty years after the Beartooth Highway was originally constructed, reporter Charles Kuralt of CBS brought it to national recognition by calling it “America’s most beautiful highway.” In 2011, the Beartooth Highway was named “Number 1 Best Motorcycling Road” by members of the American Motorcyclist Association. The Beartooth Highway is a 108 kilometers (67 miles) long, beginning at the

northeast entrance to YNP and ends in Red Lodge, Montana. The road is designated as a U.S. Forest Service (USFS) Scenic Byway, a Wyoming State Scenic Byway, and sections of the road, including the project area, are designated as an All-American Road under the FHWA’s Scenic Byway Program (see Figure 2).



View from Long Lake Outlet Bridge



Beartooth from Switchbacks

Figure 2. Views of Beartooth Highway

The route has been divided into seven segments, all of which have been reconstructed with the exception of Segment 4, as shown in Figure 3. Current efforts are focused on Segment 4, which begins at kilometer post (KP) 39.5 (milepost [MP] 24.5), just west of the Clay Butte Lookout turnoff, traverses Beartooth Pass, and ends at the Montana/Wyoming state line at KP 69.4 (MP 43.1). To date, 22.56 kilometers (14.02 miles) of the 30.14 kilometers (18.73 miles) of Segment 4 have been improved (see Figure 4). Funding provided through the Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grants Program would complete the 7.58 kilometers (4.71 miles) of roadway in need of improvement for the entire route to be an upgraded facility. The remaining gap projects begin at KP 39.5 (MP 24.5), just west of the Clay Butte Lookout turnoff, to KP 42.06 (MP 26.1) and from KP 45.8 (MP 28.4), at the Top of the World Store, to west of the road closure gate near Long Lake at KP 50.8 (MP 31.5).

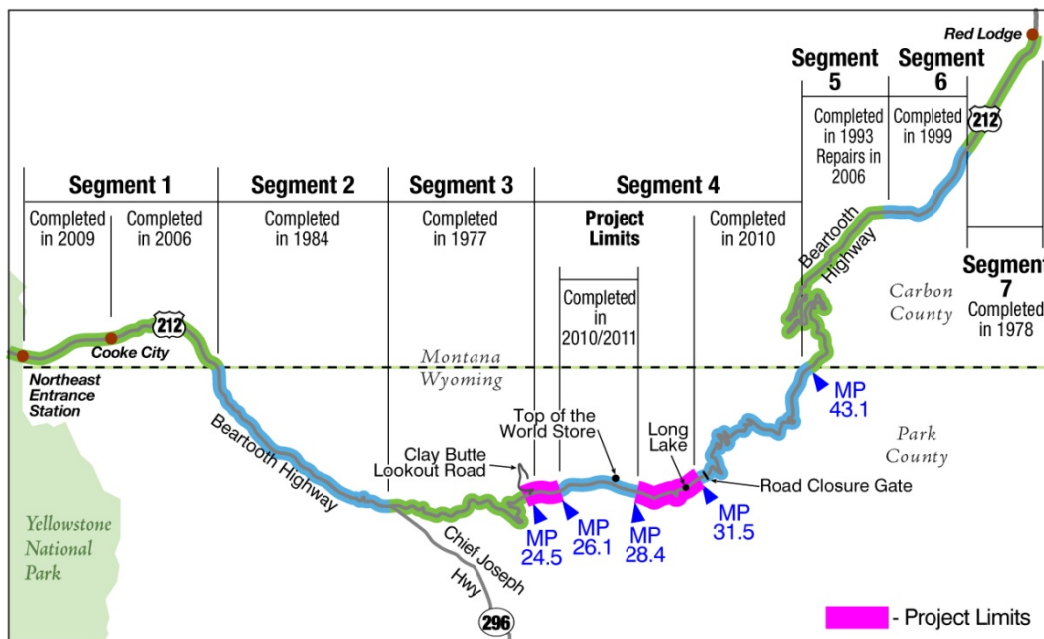


Figure 3. Beartooth Highway Segments



**Completed Section of Segment 4  
Little Bear Creek Bridge 1  
Top of the World Store  
Beartooth Highway**



**Completed Section Typical of  
Segments 2 and 3  
Beartooth Highway**



**FY 2009 TIGER Completed Section of Segment 4  
Beartooth Lake Outlet Bridge  
Beartooth Highway**

**Figure 4. Completed Sections of Beartooth Highway**

The Beartooth Highway segments in Wyoming are not on the State highway system (see *Public Roads, "An Orphaned Highway,"* dated July 2006); therefore, these segments require extensive partnership and coordination to implement road improvements. In 1992, YNP; the USFS and Custer National Forest (CNF), Shoshone National Forest (SNF), and Gallatin National Forest (GNF); FHWA; Montana Department of Transportation (MDT); and WYDOT formed a steering committee to address the deteriorating condition of the Wyoming segments. Since that time, the steering committee has expanded to include area communities, counties, chambers of commerce, and private citizens and organizations as members of the Friends of the Beartooth All-American Road.

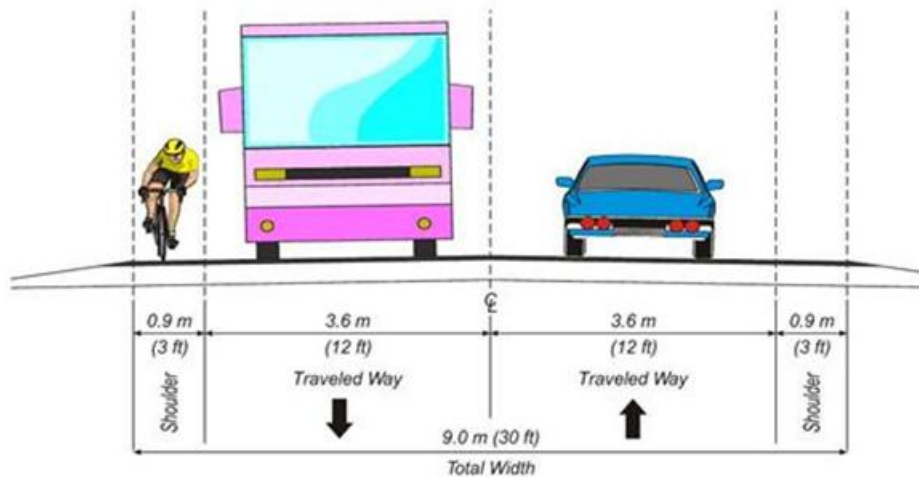
The proposed project responds to the overwhelming need for roadway improvements on Segment 4, which FHWA deemed inadequate and substandard as far back as 1994 (see the Beartooth Highway Road Inventory and Needs Study). Significant problems are insufficient road width, inadequate surface and subsurface drainage, inadequate roadside ditches and culverts, substandard signing and guardrail, lack of defined roadside pullouts, and little to no shoulder to accommodate high levels of bicycle use. The proposed project addresses these needs by replacing deficient bridges and culverts, constructing new bridges, reconstructing the travel way widths (including mainline and shoulders), reconstructing the side slope and clear recovery areas, and improving intersections, retaining walls, pullouts, and paving.

Most reconstruction will be along the existing road corridor of Segment 4, with an overall objective of an improved roadway alignment, grade, and width. The proposed project consists of a reconstructed



roadway with a width of 9.6 meters (32 feet) from the start of the project to the Clay Butte Lookout turnoff and 9.0 meters (30 feet) from the turnoff to the end of the project.

In 2025, the seasonal average daily traffic is projected to be 1,972 vehicles, with an average of 100 buses/recreational vehicles (5 percent of traffic) predicted to use the route daily. Due to existing and expected traffic greater than 6.0 meters (20 feet) in length (e.g., motor homes, buses, and vehicles hauling trailers), a travel lane width of 3.6 meters (12 feet) was selected for Segment 4. The proposed shoulder will transition from 1.2 meters (4 feet) from the project start to the Clay Butte Lookout turnoff to a 0.9-meter-wide (3-foot) shoulder to the end of the project. These dimensions are shown in Figure 5. An area cleared of trees and larger rocks (called a clear zone) will be maintained in all areas. The clear zone will be approximately 3 meters (10 feet) from the white stripe at the edge of the travel lane.



**Figure 5. Proposed Cross Section**

### 1.1 History

The Beartooth Highway was originally constructed as a Park Approach Road in the 1930s to provide access to YNP from Red Lodge. Executive Order 5949, signed by President Hoover in 1932, withdrew lands lying within 250 feet on each side of the center line of the Beartooth Highway from settlement, location, sale, entry, or other disposal to be used for road reservation purposes only.

The Beartooth Highway was divided into seven segments for reconstruction and study purposes (see Figure 3). Figure 3 shows construction activities completed for each segment. As shown, all other segments were reconstructed beginning in 1963. In 1968, Segment 4 was resurfaced and many paved ditches were added; however, complete reconstruction did not occur at that time.

In 1998, the Transportation Equity Act for the 21st Century (TEA-21) identified funding for the improvement of Segment 4. These funds were used to complete environmental documentation, perform preliminary engineering, and rehabilitate a portion of Segment 4. In



**Beartooth Highway Construction, 1931**

2000, FHWA completed a pavement preservation project to temporarily seal the roadway surface until funds were available for reconstruction.

In the last several years, the steering committee has collaborated to deliver construction projects on Segment 4. In 2009/2010, the High-Priority Project (HPP) 4-1(5) included pavement preservation and rehabilitation and replacement of the failing Little Bear Creek Bridge 1. A reconstruction project was not pursued on this eastern portion of Segment 4 because advanced roadway deterioration necessitated rehabilitation with available funds. This flexibility in the approach allowed the funding to be used for rehabilitation to meet the purpose and need identified in the Final Environmental Impact Statement/Record of Decision.

Funding was received from the Fiscal Year (FY) 2009 TIGER Discretionary Grant and project partners to complete the construction project HPP 4-1(6) in 2011. Based on this funding, HPP 4-1(6) was awarded in 2010 and included the replacement of the Beartooth Lake Outlet Bridge and reconstruction of the road east of the bridge to the western limits of the HPP 4-1(5) project.

## **1.2 Status of Existing Facility**

The highway currently consists of two 2.75-meter-wide (9-foot) travel lanes, for a total width of about 5.5 meters (18 feet). In most locations, there is little or no shoulder. The Beartooth Highway does not safely accommodate bicyclists and current vehicle types, such as recreational vehicles or pickup trucks with trailers. Further, inadequate surface and subsurface drainage systems accelerate road degradation, causing unnecessarily high maintenance costs. Existing bridges do not provide adequate load carrying capacity and acceptable safety standards. A 1994 FHWA needs assessment concluded that many components of the highway were inadequate and substandard and should be reconstructed. The FHWA needs assessment states:

Segment 4 clearly has the worst conditions of any portion of the route. The narrow width of the road is a major deficiency, but the conditions of the surface, inadequate subsurface drainage, lack of adequate roadside ditches and culverts, substandard signing and guardrail, lack of defined roadside pullouts, lack of snow storage area, and increasing bicycle use all indicate that serious consideration should be given to upgrading the road.

Reconstruction will address seven primary deteriorating or deficient elements: roadway surface, road alignment, travel lane width, shoulder width, bridges, drainage facilities, and parking areas, pullouts, and access road intersections. Examples of these deficiencies are shown on Figure 6.

## **1.3 Connections with Existing Transportation Infrastructure**

The Beartooth Highway is recognized as an important transportation route between Red Lodge, Montana, and YNP. The highway connects the Northeast Entrance of YNP to Billings and Red Lodge, Montana, and Cody, Wyoming (see Figure 1). The highway connects WY 296, Chief Joseph Scenic Byway, which provides a link to Cody. The road also provides access between the communities of Silver Gate, Cooke City, and Red Lodge, Montana. The road provides access to campgrounds, trailheads, vista points, pullouts, and recreation facilities in the SNF, CNF, and GNF.

## **1.4 Proposed Improvements**

Road reconstruction will improve the deteriorating condition, minimize future maintenance costs, safely accommodate current and projected multimodal use, allow the SNF to continue to manage activities along the road, and enhance the quality of user experience in terms of recreation and scenic values.

The proposed project will reconstruct the highway, remove and replace two existing bridges, and construct two new bridges with a curb-to-curb width of 11 meters (36 feet) to meet project traffic needs and a structure design life of 75 years. At Beartooth Ravine, a new bridge will be constructed to eliminate several sharp, narrow curves and improve overall safety deficiencies. One replacement bridge will be constructed at the eastern Little Bear Creek crossing; a new bridge will be constructed at the Little Bear Creek fen roadway crossing; and one replacement bridge will be constructed at the Long Lake outlet. The bridge replacement of the western road crossing at Little Bear Creek and Beartooth Lake Outlet were completed in the recent construction projects (see Table 1).



**Narrow travel lanes with no shoulders pose a safety hazard to motorists and pedestrians. Poor drainage causes lack of surface support and deterioration.**



**Existing road width does not safely accommodate bicyclists.**



**Narrow travel lanes contribute to pavement edge breakup from wider vehicles.**



**Existing bridges are in disrepair and rated functionally obsolete.**



**The current pavement condition index of 40 requires major reconstruction.**



**Existing guardrail does not meet safety standards.**

**Figure 6. Roadway Deficiencies**

**Table 1. Segment 4 Structures**

Segment 4 Proposed Structures	Status
Beartooth Ravine Bridge and Wall	New structures; included in the proposed project.
Beartooth Lake Outlet Bridge	Replaced existing; completed HPP 4-1(6), 2011.
Little Bear Creek Bridge 1	Replaced existing; completed HPP 4-1(5), 2010.
Little Bear Creek Bridge 2	Replace existing; included in the proposed project.
Little Bear Lake Fen Bridge	New structure; included in the proposed project.
Long Lake Outlet Bridge and Wall	Replace existing; included in the proposed project.

Retaining walls will be used adjacent to bridges to reduce impacts. Replacement bridges will be located in the same general locations as existing structures and will allow for the movement of traffic during reconstruction. All bridges except the Beartooth Ravine and the Little Bear Lake Fen will be single-span and constructed without the use of piers.

Graded and paved ditches will be reconstructed. Paved ditches will be used where there is evidence of ditch erosion problems, or where they will minimize environmental impacts. Guardrails and retaining walls will be used at selected locations where warranted. In guardrail areas, a steeper pavement edge slope is proposed because a guardrail will prevent errant vehicles from leaving the road. Extensive detail was given to the roadside design during project planning to minimize the roadway footprint. The project will also reconstruct major intersections to accommodate the new road grade at six locations: the intersection at the Top of the World Store, Island Lake Campground Road, Forest Road 149, the intersection at Station 49+154, Forest System Road 151, and Forest System Road 120.

Except in realignment sections, disturbed areas from existing pullouts will be incorporated into the widening for the reconstructed roadway. Existing pullouts will be consolidated to 18 pullouts and include interpretive sites with pull-in parking at some locations to improve safety. Interpretive exhibits will be provided at these locations (such as the Beartooth Ravine Parking Area) to alert the public to the presence of wildlife, the effects of human activity on wildlife, the potential for wildlife/vehicle collisions, historical construction of the roadway, and the unique geological aspects of the area.

## 2.0 Project Parties

This project is unique because multiple agencies (including both transportation and resource agencies) partnered to plan and develop highway improvements. In 1992, the Beartooth Highway Steering Committee was established. The committee was comprised of executives from five State and Federal agencies and local government representatives. The members have a shared interest in the route and convened the committee to find a long-term solution to keep the Beartooth Highway open and maintained. This steering committee has cooperated over the past 19 years and has built collaborative partnerships across State and Federal jurisdictions and among agency employees to assure the long-term viability of the Beartooth Highway. The steering committee has been instrumental in recommending appropriate roadway planning and funding requirements to guide expenditure decisions.

As a testament to the collaboration on this project, the FHWA project development team consisting of multi-agency employees and consultants was awarded the FHWA Strive for Excellence Team Award.

As a result of the collaborative efforts of the steering committee, this project received an award of \$6 million, less than the \$65 million requested for FY 2009 TIGER Discretionary Grant funds. The funds were supplemented with an additional \$2.6 million received from project partners to complete the

HPP 4-1(6) reconstruction project. The project was successfully delivered within the proposed schedule and budget.

Letters of support written by project partners for this grant and the development and continued viability of the Beartooth Highway are available on the website (<http://www.cflhd.gov/beartooth>) and in Appendix D.

Table 2 shows the project partners and their project responsibilities and roles.

**Table 2. Project Partnerships**

Project Party	Responsibility/Role
FHWA Central Federal Lands Highway Division (CFLHD)	Administers contractual, environmental, engineering, and construction activities.
NPS (YNP)	Performs road maintenance and snowplowing.
USFS (SNF)	Land management agency, corridor planning, and interpretive site maintenance.
WYDOT	Grant recipient; possible maintaining agency to consider assuming ownership when the Beartooth Highway is constructed to current standards.
MDT	Maintains the Montana portion of the Beartooth Highway.

### 3.0 Grant Funds

#### 3.1 Project Funding and Priorities

Planning for the project was initially funded as part of the Crown Butte Mine settlement (1998 Department of the Interior and Related Agencies Appropriation Act); subsequently, it was established as an HPP in the TEA-21 highway bill.

In 1994, FHWA evaluated the condition and repair needs of the Beartooth Highway from Red Lodge, Montana, to YNP. The evaluation was completed at the request of NPS in response to the road’s deteriorating condition and NPS’s lack of authority and funding to reconstruct a road outside the YNP boundaries.

As a result of the collaborative efforts of the steering committee, 22.56 kilometers (14.02 miles) of 30.14 kilometers (18.73 miles) of Segment 4 have been improved. With funding support from all project partners, Segment 4 has received \$40.23 million in funding to date and expended approximately \$39.84 million by the end of 2011.

Table 3 shows the funding and expenditure types to date for Segment 4. Included in parentheses is the percentage of total project funding received and corresponding source.

The annual maintenance budget for the Beartooth Highway is between \$400,000 and \$500,000 (YNP). As shown in Table 3, the USFS has provided \$200,000 annually to the NPS for snowplowing operations; however, the YNP has had to cover the remaining \$200,000 to \$300,000 from their road maintenance budget. USFS funds were from the Crown Butte settlement and were exhausted in 2006. YNP has provided the entire funding required for maintenance activities (including snowplowing) since that time. NPS has been absorbing the costs required for maintenance since 1946. MDT spends approximately \$80,000 annually to maintain the Montana segments of the Beartooth Highway.

**Table 3. Segment 4 Funding and Expenditure Summary**

<b>Funding Source or Expenditure Type</b>	<b>Administration</b>	<b>Funding Received</b>	<b>Expenditures</b>	<b>Description</b>
<b>Funding Source</b>				
Crown Butte (DOI appropriations)	USFS transferred to CFLHD	\$10,000,000 (24.9%)		National Environmental Policy Act (NEPA), pavement preservation, and engineering.
Crown Butte (DOI appropriations)	USFS (transfer of funds to NPS)	\$2,000,000 (5.0%)		NPS snowplowing.
Discretionary HPP funds	FHWA	\$17,500,000 (43.5%)		Engineering, environmental, rehabilitation.
FY 2008 Wyoming and Montana STP redistribution	WYDOT/MDT	\$1,730,000 (4.3%)		Construction only funds.
Wyoming Forest Highway (FLHP) Funds (2008)	WYDOT	\$2,000,000 (5.0%)		Construction only funds.
TIGER Discretionary Grant Recipient (2009)	WYDOT	\$6,000,000 (14.9%)		Construction only funds.
Wyoming Forest Highway (FLHP) Funds (2010)	WYDOT	\$700,000 (1.7%)		Construction engineering.
FLHP Aquatic Organism Passage (2011)	WYDOT	\$300,000 (0.7%)		Construction engineering, construction.
<b>Expenditure Type</b>				
Maintenance activities	USFS (transfer of funds to NPS annually)		\$200,000/annually (total \$2,000,000)	Crown Butte for NPS snowplowing.
Pavement preservation (Segment 4)	FHWA		\$2,000,000	Crown Butte for seal coat.
Environmental documentation (A/E)	FHWA		\$3,240,000	HPP/Crown Butte funds.
Preliminary engineering (A/E)	FHWA		\$5,471,000	HPP/Crown Butte funds.
Preliminary engineering (CFLHD internal)	FHWA		\$2,789,000	HPP funds.
Fox Creek Work Camp construction	FHWA		\$1,000,000	HPP funds.
Clearing contract construction	FHWA		\$320,000	HPP funds.
HPP 4-1(5) Project	FHWA		\$14,420,000	Rehabilitation, construction engineering. HPP/STP/Forest Highway Funds.
HPP 4-1(6) Project	FHWA		\$8,600,000	Rehabilitation, construction engineering. HPP/STP/Forest Highway Funds/TIGER Discretionary Grant Funds.
<b>Funding Summary</b>		<b>Total</b> <b>\$40,230,000</b>	<b>Total</b> <b>\$39,840,000</b>	<b>Balance (Funds Remaining)</b> <b>\$390,000</b>

A/E: Architecture/Engineering  
DOI: U.S. Department of the Interior

FLHP: Federal Lands Highway Program  
STP: Surface Transportation Program

SNF spent \$175,000 from the Wyoming State Department of Travel and Tourism for a corridor plan (see website <http://www.cflhd.gov/beartooth>) that included planning and road signage. SNF also contributed \$15,000, in addition to approximately \$15,000 from the National Scenic Byways Program, to complete an interpretive plan (see website <http://www.cflhd.gov/beartooth>) for the Beartooth Highway. These plans were approved by SNF and CNF and will be used to apply for an additional \$1 million to \$3 million for signage, interpretation, media, website, and potential campground rehabilitation through the National Scenic Byways Program to support corridor tourism. SNF rehabilitated the Island Lake Campground in 2010, which is within the project limits.

Each year, the Friends of the Beartooth All-American Road contribute funds and sponsor a road opening ceremony held over Memorial Day weekend in Red Lodge, Montana to promote tourism related to the highway.

Due to a change in TEA-21 legislation, HPP funds were made available for the 2009 rehabilitation project. This project included pavement preservation and rehabilitation within Segment 4 and replacement of the failing Little Bear Creek Bridge 1 at KP 45.3. At the recommendation of the steering committee, a reconstruction project was not pursued because advanced roadway deterioration necessitated rehabilitation with available funds.

An award of \$6 million was received for the reconstruction of package on Segment 4 through the FY 2009 TIGER Discretionary Grant funds. The project partners supplemented this amount with an additional \$2.6 million (30 percent of the total) to complete the construction project HPP 4-1(6) in 2011. Based on this funding, HPP 4-1(6) was awarded in 2010 and included the replacement of the Beartooth Lake Outlet Bridge and reconstruction of the road east of the bridge to the western limits of the recently completed HPP 4-1(5) project.

Table 4 shows major completed projects and funding spent on all segments of the Beartooth Highway since its initial construction completion in 1936.

**Table 4. Beartooth Highway Completed Projects and Funding**

Segment	Year(s)	Funding*	Project	Description
1	2006 2009	\$10,950,000 \$15,970,000	MT PFH 59-1(1), MT PFH 59-1(2)	Reconstruction, environmental, engineering; Title 23 FLHP Funds
2	1963, 1965, 1979, 1983, 1984	\$4,450,000	WYO FLH 15 (1, 2, 9,10,11), WYO FH 4-1 (1)	Bridges/reconstruction; Title 23 FLHP Funds
3	1968, 1970, 1972, 1974, 1977	\$4,340,000	WYO FLH 15 (4-8)	Bridges/reconstruction; Title 23 FLHP Funds
3/4	2001	\$2,070,000	WY FS 4-1 (2)	Micro-surfacing; Crown Butte Funds
4	1968, (2010), (2011)	\$700,000 (\$14,420,000) (\$8,600,000)	WYO FLH 15 (3) (HPP 4-1(5)) (HPP 4-1(6))	Resurfacing; Title 23 FLH Program Funds HPP/STP/Forest Highway Funds HPP/STP/Forest Highway Funds/TIGER
5	1963, 1965, 1970, 1993, 2004, (2006)	\$9,890,000 (\$19,180,000)	MT FH 59-2 (1-2), MT FH 59 (1-3), NPS Funds, MT FLH 28-2 (18), (ER 28-2(27))	Reconstruction, slide repair (emergency slide repair); Title 23 FLH, Park Road, and Emergency Relief Program Funds
6	1968, 1999	\$2,440,000	MT FH 59-2 (4), MT FH 59 (4), STPP 28-2 (21) 60	Reconstruction/overlay; Title 23 FLH and STP Program Funds
7	1978	\$2,900,000	MT FH 59-2 (6)	Reconstruction/bridge; Title 23 FLHP Funds

\* Rounded to nearest \$10,000.

### 3.2 Grant Amount Request for Beartooth Highway

Under the FY 2009 TIGER Discretionary Grant funding, Beartooth Highway received \$6 million out of a total request of \$65 million required to complete the entire project. Supplemental matching funds of \$2.0 million were received from project partners, delivering 2.92 kilometers (1.81 miles) of roadway reconstruction including bridge replacement and trail and interpretive site construction. WYDOT demonstrated appropriate stewardship of public funding through their ability to provide matching funding and completion on schedule and within budget in October 2011.

The total cost to complete Beartooth Highway reconstruction is \$46.1 million. WYDOT requests \$45.1 million in TIGER Discretionary Grant funds with supplemental matching funds of \$1 million committed by Wyoming Forest Highways to reconstruct Beartooth Highway. This amount provides a construction package that completes the remaining 7.58 kilometers (4.71 miles) of unimproved and unfunded remaining work on the lower section of the Beartooth Highway from KP 39.5 (MP 24.5) to KP 42.06 (MP 26.1) and from KP 45.8 (MP 28.4) to KP 50.8 (MP 31.5). This project updates the Beartooth Highway to current design and safety standards and provides a final link in a transportation infrastructure that will be viable for the next 75 years. Based on WYDOT's demonstrated good stewardship of the FY 2009 TIGER Discretionary Grant funding, receipt of additional funding under FY 2012 TIGER Discretionary Grant funding will be crucial to completion of the proposed improvements. Table 5 shows a detail cost estimate for construction of Beartooth Highway.

**Table 5. Beartooth Highway Proposed Construction Costs**

Description of Construction Cost	Amount (\$)
Mobilization, Survey and Quality Control	5,600,000
Earthwork	10,100,000
Aggregate and Pavement	5,500,000
Structures (Bridges and Retaining Walls)	15,900,000
Drainage	2,000,000
Temporary Traffic Control	2,000,000
Construction Engineering	5,000,000
<b>Total</b>	<b>46,100,000</b>

The \$45.1 million requested from TIGER Discretionary Grant includes \$41.1 million for construction items and approximately 11 percent in construction engineering and oversight costs to complete the project over three construction seasons. The total construction cost of \$46.1 million brings the total expenditures on Segment 4 to \$85.94 million. The FY2012 TIGER Discretionary Grant funds requested are approximately 52 percent of the total funding expenditures for Segment 4. Reduced grant award amounts can also be used to complete substantial components of the project if necessary. Five construction packages ranging from \$4.5 million to \$19.8 million (construction costs only) are available and can easily be constructed with grant funding. A figure and table showing Potential Construction Packages are in the Beartooth Highway Project Funding and Delivery Plan on the website (<http://www.cflhd.gov/beartooth>) and Appendix A.

## 4.0 Selection Criteria

### 4.1 Long-Term Outcomes

The proposed project would significantly benefit the highway, its users, nearby communities, and others living throughout the greater Yellowstone region and the nation. Benefits in terms of long-term outcomes from the proposed project fall within the following categories:



- State of good repair
- Economic competitiveness
- Livability
- Sustainability
- Safety
- Job creation and near-term economic activity

#### **4.1.1 State of Good Repair**

The Beartooth Highway is an All-American Road with visitors from all over the world traveling over the route to access YNP. As described, the proposed project will improve road conditions and drainage, minimize life-cycle costs, safely accommodate current and projected vehicular and bicycle use, allow SNF to continue to manage activities along the road efficiently, and enhance the quality of user experience in terms of recreational, educational, and scenic values.

The proposed project will greatly reduce the total lifecycle costs for this stretch of the Beartooth Highway through the following:

- The new roadway would be compatible with current maintenance equipment and practices, affording safe and efficient maintenance operations as required by law for the use of Federal highway funds, thus reducing life-cycle costs.
- The proposed project would provide for easier and safer snowplowing practices and snow storage.
- Reconstruction would provide a more durable pavement surface. The road surface has a design life of 20 years and at that time would need only an overlay. A second overlay at 40 years would extend the road design life to 60 years.
- Improved drainage features would minimize or eliminate road degradation from loss of pavement support.
- The bridge replacements would have a design life of 75 years.
- The improved facility would have an average reduction of maintenance costs of 50 percent over its life. Current maintenance and snowplowing activities are approximately \$400,000 to \$500,000 per year and are estimated to average approximately \$200,000 per year after reconstruction.

Excluding overlay costs of \$1.7 million every 20 years, the average lifecycle cost savings would be approximately \$80,000 per year over the 60-year period.

The Wyoming Transportation Commission has stated that they will consider assuming ownership of the road and taking responsibility for its maintenance when the route is constructed to current standards. No Federal or State agency holds ownership of Wyoming segments of the route and maintenance has been inconsistent and problematic since the route's completion in 1936. YNP has maintained the road historically but was allocated funding only for snowplowing from the USFS from 1998 through 2006. Although the USFS had short-term funding for the highway through the Crown Butte funds, the agency is not equipped to assume road maintenance. If WYDOT were to assume maintenance responsibility for Wyoming segments, lifecycle cost efficiencies would result because neither SNF nor YNP have the resources, or funding sources, to properly maintain pavement and structures to ensure highway longevity.

The WYDOT and MDT are committed to maintaining transportation facilities under their jurisdiction in a state of good repair. For example, mudslides in 2005 closed the Beartooth Highway north of the project in Montana. MDT spent more than \$19 million in late 2005 and 2006 to repair 13 landslide locations and quickly open the road to traffic to avoid substantial economic impacts to local communities. More

recently, the HPP 4-1(5) and HPP 4-1(6) projects provided pavement preservation, replaced two structurally deficient structures, provided trail and interpretive sites, and performed wetland mitigation. These projects completed 75 percent of Segment 4 and spent more than \$17 million in addition to the \$6 million in grant award received. WYDOT, MDT, and YNP use structural asset management approaches to optimize expenditures and would apply these practices to the completed project, if under their jurisdiction.

Table 6 summarizes proposed improvements by area of deficiency and the reconstruction long-term outcomes and benefits.

**Table 6. Proposed Improvements by Area of Deficiency**

Road Element	Deficiency	Reconstruction Outcome/Benefit
Bridges	Structurally deficient ratings; railing and guardrail inadequate; estimated current life (in 1999) is 15 to 20 years without repairs; therefore a life expectancy of 2-7 years remains.	Update bridges to current standards for a 75-year lifespan to reduce future maintenance concerns; accommodate wildlife movements to meet needs of agencies and region.
Roadway surface	Pavement Condition Index of 40 (Range of 0 to 100); needs major reconstruction.	Reconstruct roadbed and entire base and pavement structure; 20-year lifespan until future overlay required. Minimize costs and maintenance needs.
Drainage facilities	Subsurface moisture and inadequate drainage have caused the pavement structure to fail (cracking, rutting, etc.).	Provide adequate drainage in roadside ditches to significantly reduce maintenance with spring runoff and storm events; provide for subsurface drainage.
Road vertical and horizontal alignment	Numerous sharp curves and abrupt transitions; inadequate superelevation.	Correct superelevation and curvature to improve driver expectancy. Reduce accidents; improve speed changes that improve emissions; minimize maintenance requirements including ice/snow buildup and pavement damage.
Travel lane width	Narrow width causes driving on road edges and pavement ravel; not adequate for recreational vehicles.	Accommodate existing and future traffic volumes; widen road for better lateral clearance; reduce pavement maintenance.
Shoulder width	Inadequate recovery and breakdown area; restricts pedestrian and bicycle use.	Accommodate bicycles and pedestrians and reduce shoulder maintenance; accommodate snowplows and provide snow storage; complete a future overlay without impacting vegetated slopes. Reduce future impacts to environment; minimize costs for maintenance; meet needs of travelers/users.
Pullouts, parking areas, and access road intersections	Limited sight distance and hazard/safety concerns.	Improve safety and opportunities for visitors to experience the road through interpretive sites and trails; improve educational, recreational, and scenic opportunities; improve economy through tourism; reduce safety concerns.

**4.1.2 Economic Competitiveness**

The Beartooth Highway is an important transportation route between Red Lodge, Montana, and YNP. Since the road’s opening in the 1930s, tourism associated with the highway has provided significant economic benefits to Red Lodge and Cooke City, Montana, and Cody, Wyoming. By safely accommodating projected traffic types and volumes, the tourism associated with the highway will

continue to play a major role in sustaining these local economies. Further, the Beartooth Highway is the only access to the Northeast Entrance of YNP and supports economies accessing this entrance for the entire region east of the park.

The current deficiencies of the remaining portions of Beartooth Highway in Segment 4 will prohibit the entire route from adequately and safely accommodating projected traffic volumes and, therefore, would put local economies at future risk by reducing the selection of this route by tourists. Because tourism employs approximately one-third of all Carbon County workers, and the Beartooth Highway accounts for most summer tourist travel, it is expected that if the road continues to deteriorate, Red Lodge and Cooke City will face a greater risk of decline in tourist-related economic activity. The remaining portions of the Beartooth Highway in Segment 4 are located within an economically distressed area.

Services associated with food and lodging, which represent about 13 percent of all earnings for Carbon County workers, would be reduced if tourism associated with scenic driving and access to YNP decreased because of a poor, or closed, road. A decline in tourism employment would have a ripple effect in the local economy due to the economic multiplier effect where a dollar of lost tourism earnings generates one and a half dollars of total earnings lost countywide. Thus, a reduction in earnings for tourism-related workers in the county (one third of workers countywide) could lead to earnings impacts for half or more of workers across the county.

#### **4.1.3 Livability**

The following sections describe how the project would positively affect the qualitative measures of community life.

##### **Quality of Experience**

The proposed project would enhance livability in terms of the quality of experience offered to locals and visitors who travel this Scenic Byway and All-American Road. New, wider shoulders would improve the safety and general enjoyment for bicyclists and pedestrians. Shoulders and formal pullouts would allow travelers to safely enjoy views and the overall scenic nature of the highway. To enhance the quality of experience offered to users, the proposed project would construct 12 improved pullouts, 1 parking area, and 2 interpretive sites.

##### **Enhanced Mobility**

The proposed project would user experience by improving the travel way and shoulder width and improving pullouts and intersections to create more convenient transportation options. Travelers would be able to stop along the roadway to explore trails, interpretive sites, and lakes, or enjoy the views. A variety of transportation modes (including pedestrians, bicycles, motorcycles, snowmobiles, all-terrain vehicles, and large recreation vehicles) would have improved access and capabilities with the proposed improvements. Being in SNF and just outside of YNP, this project is a multimodal facility encompassing a larger recreational area. During the summer, motorcycles, sports cars, antique cars, and bicycle touring groups and individuals, as well as pedestrians, frequent the road; during the winter, snowmobilers and skiers are active.

##### **Enhanced Modal Connectivity**

In addition to being a recreation destination, the Beartooth Highway is used by travelers both as a scenic driving experience and as an arterial-quality through route to destination communities such as Billings, Laurel, Red Lodge, Cooke City, Gardiner, West Yellowstone, Montana, and YNP. The highway is used by destination travelers who fly into Billings, Montana, and Cody, Wyoming, to access YNP. Increased roadway widths will reduce congestion and improve safety on the existing roadway by allowing

vehicular traffic (including larger recreational vehicles) to travel on the road with bicycles, motorcycles, pedestrians, all-terrain vehicles, and snowmobiles.

### **Improved Accessibility**

The improved access through widening, larger curves, improved structures, and improved intersections and pullouts would allow large vehicles such as buses and recreational vehicles to access the project area. If the highway is left in its current condition, it will remain unsafe and congested during peak travel seasons; therefore, its accessibility would be decreased and fewer recreational travelers would use it in favor of alternate routes. The interpretive sites and parking area were designed in accordance with the Americans with Disabilities Act to accommodate visitors with disabilities so that they can experience the highway and associated amenities. Non-drivers (such as bicyclists and pedestrians or hikers) will benefit from improved shoulders.

### **Coordinated Transportation and Land Use Planning**

The FHWA created a Social, Economic, and Environmental study team to identify major issues associated with the project, develop alternatives and assess environmental impacts, and ultimately collaborate on a preferred alternative (see 2004 Record of Decision). Coordination, public meetings, and field reviews with agencies including the USFS Regions 1 and 2, SNF, GNF, CNF, YNP, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish & Wildlife Service (USFWS), and other State and local agencies and elected officials occurred during the project development stages to gain accurate insight into the perspectives of each project partner, or agency, to ascertain public issues and concerns. The Social, Economic, and Environmental team reviewed and approved the project Purpose and Need; consequently, the project design balances the plans and requirements of all agencies and users.

Public open houses were conducted during the design NEPA process, and comments were incorporated into the project. To address economic impact concerns of surrounding communities and citizens, an extensive construction public information program was developed to alert travelers to road construction so as not to deter them from visiting the area. The extended construction necessary to complete the project could be economically devastating to area communities if travelers avoided the area for one or more construction seasons.

The project traverses National Forest Service lands managed by the SNF. The SNF Land and Resource Management Plan (also called the Forest Plan) established a forest-wide goal of managing activities along travel routes to maintain and enhance recreation and scenic values. The Beartooth Highway corridor is in a Management Area that emphasizes rural and road natural recreation opportunities. Motorized and non-motorized recreation activities such as driving for pleasure, viewing scenery, picnicking, fishing, camping, hiking, snowmobiling, and cross-country skiing are emphasized. The designation of Segment 4 as an All-American Road under FHWA's Scenic Byway Program indicates the road has unique features that do not exist elsewhere.

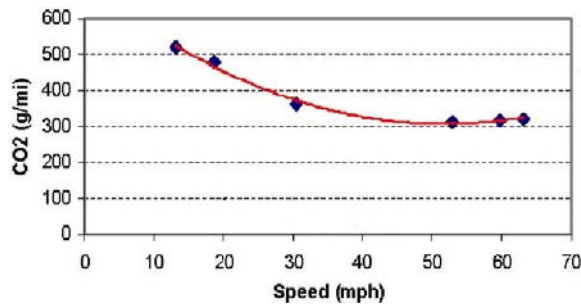
The All-American Road segment has two intrinsic qualities of national significance: natural and scenic. As an All-American Road, it provides an exceptional traveling experience so recognized by travelers that they would make a drive along the highway a primary trip purpose. A Corridor Management Plan (see website <http://www.cflhd.gov/beartooth>) prepared for the All-American Road section describes management and protection strategies and provides recommendations for interpretation. The project's engineering and environmental design complement the information developed in the SNF Forest Plan and the Corridor Management Plan (see website <http://www.cflhd.gov/beartooth>).

**4.1.4 Sustainability**

**Improved Energy Efficiency**

Improved vertical roadway grades and consistent design speeds provide for more efficient motor vehicle operations and reduce greenhouse gas emissions. Improvements to shoulder widths and pullouts will allow more opportunities for slow-moving vehicles to exit the travel way, allowing vehicles to pass. These improvements will reduce traffic congestion to allow consistent vehicle flow.

Current operating speeds range from 37 to 47 miles per hour (mph), with an average of 42 mph in the project limits. The project is projected to increase average operating speeds by 5 mph to an overall average of 47 mph. As shown on Figure 7, the project would improve vehicle efficiency and reduce carbon dioxide (CO<sub>2</sub>) emissions by shifting average vehicle speeds toward the minimum emission speed range of 47 to 55 mph. The reconstruction improvements would allow vehicles to operate at optimum speeds, producing the lowest CO<sub>2</sub> emissions possible as described by the Center for Clean Air Policy, and would save about 1,900 gallons of motor fuel annually.



Source: Center for Clean Air Policy

**Figure 7. Fleet Carbon Dioxide Emissions Versus Highway Speed**

**Environmental Protection**

The project would implement wetland mitigation strategies by avoiding wetlands where possible and restoring, creating, and preserving wetlands in other areas. When the original road was constructed, road fill material was placed in wetlands. In small areas of new alignment along the project, wetland mitigation would occur by removing existing roadbed material to reconnect and restore wetlands, thus improving water quality. While the project is impacting 1.94 hectares (4.8 acres) of jurisdictional wetlands, 1.78 hectares (4.4 acres) of wetlands are being created or restored on site, and about 3.64 hectares (9.0 acres) of offsite wetlands are being preserved, for a net gain of approximately 3.48 hectares (8.6 acres) of jurisdictional wetlands in the area.

In the long term, the project would benefit the surface water quality near the road. The bridges are adequately sized to accommodate flows, and pullouts, parking areas, and shoulders would be paved to reduce sediment in roadway runoff.

Because of its location and footprint, a National Register of Historic Places Registration Form (see website <http://www.cflhd.gov/beartooth>) for the Beartooth Highway was prepared by the FHWA for use by owning agencies in nominating the highway to the National Register. The project closely follows the existing centerline throughout most of the route to match the existing historic alignment. The existing masonry for the culvert headwalls and bridges would be dismantled and used on the new structures to match the historic features.

The USFWS was consulted about incorporation of wildlife crossings into the design. The project includes special landscape designs in wildlife crossing areas, eliminates guardrail and other features that would

impede wildlife movements, and includes signage to slow driver speeds. Other mitigation for wildlife includes minimizing limits of construction, revegetating disturbed areas with native species, and limiting construction at night. The project design also incorporates improved habitat connectivity by including aquatic and terrestrial passages connecting riparian areas along stream banks under bridges.

A Grizzly Bear Management and Protection Plan was developed with guidance from the SNF and the USFWS to minimize impacts to grizzly bears during construction. The plan includes limitations on night work, worker awareness, and proper trash disposal methods.

During construction, the FHWA will have a representative available for landscape architecture and revegetation expertise to implement the landscaping and revegetation design in the plans.

Other mitigation measures include preserving select individual trees, preserving existing rock outcrops, using weathered steel guardrail, applying aesthetic paint to bridge railings, and treating retaining wall and rock cuts with aesthetic patterns and stains.

#### **4.1.5 Safety**

The project addresses numerous safety hazards on the existing roadway, such as:

- Curve radii that cause sudden driver reactions inconsistent with expectations.
- Sharp curves, sudden dips, and crests that restrict visibility and stopping sight distance.
- Narrow travel lanes that cause encroachment into oncoming lanes or leaving the pavement.
- Narrow shoulders that limit bicycle and pedestrian use and cause bicycle/pedestrian conflicts.
- Narrow road width and minimum ditches that make it unsafe to plow/store snow under traffic.
- Bridges that do not meet current hydraulic or safety standards (width, railing, etc.).
- Pullouts/parking areas that are poorly located or undersized, thus causing safety problems.
- Inadequate sight distances and turning radii at intersections.

The existing safety hazards would be exacerbated under future traffic volumes. The project would address all existing safety hazards and provide a road that safely accommodates a variety of users and vehicle types. The reconstructed road will be wider, smoother, and have a more reliable horizontal and vertical alignment consistent with driver expectations on the remainder of the route and in YNP. The FHWA's accident prediction study indicates that the completed project would experience an average two-lane accident rate in 2025 of 1.37 accidents per million vehicle miles traveled, which is 43 percent less than the existing road accident rate of 2.41 accidents per million vehicle miles traveled under future traffic without improvements.

#### **4.2 Job Creation and Near-Term Economic Activity**

To estimate the magnitude of the job creation and economic stimulus from the TIGER Discretionary Grant, the Regional Economic Impact Model for Highway Systems (REIMHS) was applied to the proposed project. The REIMHS model takes standard highway data input and derives industrial output, earnings, and employment impacts of a highway project through the application of Bureau of Economic Analysis multipliers for regional industrial output, earnings of employees in those industries, and employment. Because the model was developed for the robust regional economy of the Dallas/Fort Worth, Texas, area, it is assumed that the economies of the three states that surround the project area (Montana, Wyoming, and Idaho) would capture a similar proportion of economic output and jobs. The jobs multiplier has been adjusted for inflation to 2012 using the Consumer Price Index for all urban consumers.

Based on the results of the REIMHS analysis, approximately 9.1 job years would be created in the three-state region for every \$1 million spent on highway construction. This estimate is conservative compared

to the 10.87 job years per \$1 million of government expenditures recommended by the May 2009 Estimates of Job Creation from the American Recovery and Reinvestment Act of 2009 prepared by the Executive Office of the President’s Council of Economic Advisors. In addition, the SNF region uses 10 job years for \$1 million of expenditures, which is comparable. Job creation includes both onsite employment due to the transportation project and additional employment in other industries as a result of the multiplier effect. Based on the REIMHS, the expenditure of \$46.1 million for construction and engineering costs is expected to generate 420 person years of employment, including direct, indirect, and induced jobs, as compared to not building the project. This figure does not include sustaining existing tourist-oriented jobs in Carbon and Park counties that may otherwise be lost if the project were not built.

The economic output from the REIMHS includes the multiplier effect of direct construction dollars being re-spent in service or other sectors of the economy as well as minor ongoing efficiency gains from improved highway travel. The regional economic output estimates shown in Table 7 represent the monetary value of all items produced by 39 output industries in response to construction expenditures from the Beartooth Highway TIGER Discretionary Grant. Regional economic output in the three-state region is estimated to total approximately \$76 million from the TIGER Discretionary Grant for the Beartooth Highway project. All costs and economic output are expressed in 2012 dollars. The impact of this spending and direct and indirect employment added to the regional economy would be positive in the current economic situation.

**Table 7. Economic Impact of Beartooth Highway Construction Investment (Millions of 2012 Dollars)**

Alternative	Construction Value (Including Engineering)	Regional Economic Output	Total Earnings	Total Jobs (Person Years of Employment)
Full Project	\$46.1	\$76.53	\$19.82	420

Sources: A. L. Politano and Carol J. Roadifer, Regional Economic Impact Model for Highway Systems, *Transportation Research Record 1229*, Transportation Research Board, Washington D.C., 1989. (Model adjusted to reflect inflation.)

The project would also result in a small, short-term increase in population in Park County, Wyoming and Park and Carbon counties in Montana due to the employment of about 80 seasonal construction workers onsite for two construction seasons. The project would result in increased expenditures for living and construction expenses associated with jobs and road construction. For workers who live in the area, the income earned would remain in the area. For workers who reside outside the study area, a significant portion of their earned income would go back to the areas where they live.

Local businesses providing lodging, meals, equipment, fuel, operating supplies, and other consumer goods and services would benefit from increased expenditures. These expenditures would positively affect the local and regional economies both directly and indirectly. Direct economic benefits include dollars spent in the local economy by project workers. Local merchants and other providers of goods and services would benefit. Indirect or secondary economic benefits would also be associated with the project. Indirect income results when dollars from an initial purchase of goods and services are spent again. For example, for every paycheck dollar spent on local gasoline or groceries, a portion is spent again by the receiver for other goods and services. Direct and indirect expenditures would also boost local and State taxes.

After the road is constructed, the economies of Red Lodge, Cooke City, and Cody would be beneficially affected by continued tourism associated with the road. Local businesses providing lodging, meals,

equipment, fuel, operating supplies, and other consumer goods and services would benefit from continued expenditures.

### **4.3 Innovation**

A unique aspect of the project that required innovative techniques included working with fens, alpine landscapes, and glacial moraines. Fens are unique in that they take thousands of years to form; therefore, special design considerations were evaluated. Hydraulic and landscaping studies were conducted to assess dewatering and shading of the Bear Lake fen from proposed construction, resulting in an innovative “causeway” bridge design that affords restoration of the fen within the area of existing road fill over the fen from the original construction.

The Beartooth Highway is one of the longest paved roads in the world to traverse alpine landscapes, and it allows travelers an opportunity to view rarely encountered alpine communities. An important aspect of mitigating impacts to the area was landscaping and revegetating the proposed project by re-establishing native plant species common to the area. The FHWA began conducting revegetation research on the Beartooth Plateau in 1999. Research began with an extensive review of state-of-the-art revegetation practices. Test plot studies were conducted at three high-alpine locations to evaluate revegetation techniques, which assisted in the design of the project’s landscape and revegetation design in the plans.

Site-specific landscape plan sheets were developed for seven existing wildlife crossings identified within the project limits by the USFWS. Design modifications at wildlife crossing areas include changes to cut-and-fill slopes, revised centerline locations, constraints on blasting and hauling schedules, and removal of pullouts and parking areas. Fill slopes were adjusted to minimize guardrail at the crossings. Further, proposed bridges have special abutment and riprap designs to provide aquatic and terrestrial passages connecting riparian areas along stream banks.

The historical nature of the road provided an opportunity for the design to include innovative features such as interpretive areas that will include historical, geological, and wildlife educational information for the traveling public. Such informational areas do not currently exist, and their inclusion will ensure that the entire Beartooth Highway receives the historical recognition and public respect of its environs that such an accomplishment deserves.

A work camp for construction workers was built at the SNF Fox Creek Campground in 2005. This camp was created because lodging in surrounding towns is typically in short supply, and the long commute to other towns would pose a safety risk for workers and increase the risk of wildlife/vehicle accidents. The work camp design improved the campground facility by providing 33 full-service hookups and enhanced future visitor experiences at the campground. It is estimated that the work camp will save Segment 4 projects approximately \$1 million per project in reduced contractor pricing and time on the job by locating workers near each project. The work camp was used by the contractor during construction of the HPP 4-1(5) and HPP 4-1(6) projects.

In 2012, a Beartooth Funding and Delivery Plan was developed to analyze the remaining portions of Segment 4. The previous amount of \$65 million was reduced by the \$8.6 million project, leaving a need of \$56.4 to construct the remaining Beartooth Highway. The team reviewed recently completed projects, changes in bidding environments, and value engineering analysis. Cost savings of more than \$10 million were realized, lowering the total amount requested to \$46.1 million. Also, other funding sources were approached, including applying for a grant through the National Scenic Byways Program.



## 4.4 Partnership

### 4.4.1 Jurisdictional and Stakeholder Collaboration

Delivery of the Beartooth Highway project has required strong collaboration among a broad range of participants including public and private organizations. The project partners and stakeholders include, but are not limited to:

- FHWA (CFLHD and Western Federal Lands Highway Division)
- USFS (Regions 1 and 2, SNF, CNF, and GNF)
- NPS (YNP and Intermountain Region)
- USFWS
- U.S. Army Corps of Engineers
- WYDOT
- MDT
- State Historic Preservation Offices
- Wyoming State Engineer's Office
- Wyoming Game and Fish Department
- Wyoming Department of Environmental Quality (WYDEQ)
- Chambers of Commerce
- Friends of the Beartooth All-American Road
- Carbon County, Montana
- Park County, Wyoming
- Towns of Red Lodge and Cooke City, Montana
- Cody, Wyoming

The project has time and labor commitments from SNF and NPS to inspect and coordinate work during current and future construction and continue maintaining the roadway during and after construction until a highway agency assumes the responsibility. Other time, labor, and travel commitments from State and local governments in attending steering committee meetings and expending time and effort working with the partnership on issues as needed have been in place since 1992. The SNF, Wyoming State Department of Travel and Tourism, and the National Scenic Byways Program have contributed funding for the planning and development of the Corridor Plan and Interpretive Plan (see website <http://www.cflhd.gov/beartooth>) for the Beartooth Highway. The Friends of the Beartooth All-American Road have also contributed funding for the annual road opening ceremony.

### 4.4.2 Disciplinary Integration

Both the SNF and NPS have environmental missions, and all partners (including the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, WYDOT, MDT, and FHWA) worked on this project to support environmental stewardship goals, which is one of the FHWA's top three missions.

Demonstrating the collaboration on this project, the project development team was awarded the FHWA Strive for Excellence Team Award and the Regional Forester's Honor Award—Caring for the Land Stewardship.

## 4.5 Results of Benefit-Cost Analysis

Many of the project's benefits, such as the value of access to a scenic area, cannot be valued easily in monetary terms; these values are discussed elsewhere in this document. Generally, rural roads have traditionally been assumed to have a value beyond what can be computed in purely economic terms. Because this highway is the tourist lifeline for Carbon County, however, the potential project benefit for the county is substantial when the preservation of tourist-dependent jobs is considered. The sections below describe the project benefits and costs that can be quantified as well as some of the more qualitative economic benefits.

### 4.5.1 Expected Benefits

Table 8 summarizes the expected project benefits for maintenance cost, preservation of Carbon County jobs, time savings, fuel, and accident savings.

**Table 8. Expected Project Benefits**

Long-Term Outcomes	Benefits	Cost Saving (2012)*
State of good repair	Life-cycle costs; reduce maintenance by 50%.	\$250,000
Economic competitiveness	Protect jobs (33% to 50% of Carbon County jobs with a total income of \$70 to \$105 million per year).	\$8,746,000
Livability	Time savings 2,749 hours/year.	\$70,000
Sustainability	Reduced carbon emissions (20-ton reduction of greenhouse gases per year); annual fuel consumption reduction of 1,900 gallons.	\$28,000
Safety	Accident reduction of 44%.	\$38,000
<b>Total</b>	<b>\$9.1 million total annual benefits</b>	

\* Rounded to the nearest 1,000.

Maintenance cost savings would average about \$250,000 per year when adjusted for periodic overlay costs needed to extend the design life of the road surface to 60 years. Average savings would be \$450,000 minus \$200,000 per year, or \$250,000 per year.

The project would lead to reduced user travel times and fuel savings. Approximately 80 percent of trips on the Beartooth Highway are through trips between Red Lodge, Montana, and the Northeast Entrance of YNP. Based on a 2025 projected seasonal average daily traffic of 1,972 vehicles, this equates to 1,578 vehicles. One vehicle traveling over the 7.58-kilometer (4.71-mile) project length with an average existing speed of 42 mph increased to 47 mph saves under 1 minute. For all vehicles, this equates to approximately 19 hours per day, or 2,749 hours per year saved at \$0.48 per minute, for a total of approximately \$79,000 per year of time savings. Time savings are based on 146 days per year with value of time as recommended by TIGER Benefit-Cost Analysis (BCA) Resource Guide for personal intercity auto trips, adjusted for inflation to 2012 and occupancy of 1.5 wage earners per vehicle.

The fuel savings at a more efficient speed of 47 mph would total 1,900 gallons of gasoline and diesel fuel per year, based on the AASHTO method (2003, p. 5-12). At the current price of \$3.20 for regular gasoline and \$3.92 for diesel in the Rocky Mountain Region, the value of fuel saved would be \$25,000 per year.<sup>1</sup> Based on U.S. Environmental Protection Agency data, this fuel savings would avoid 20 tons of greenhouse gas emissions per year.<sup>2</sup>

The accident rate is currently estimated to be 0.95 accidents per million vehicle miles; improvements to Beartooth Highway will reduce this number to 0.54 accidents per million vehicle miles, which will result in the 44 percent reduction in accidents per year. Based on the method of valuation from the U.S. Department of Transportation safety procedures outlined in the 2012 TIGER Discretionary Grant requirements, an average user cost per accident of approximately \$88,300 was assumed. The expected value of accident savings would total about \$39,000 annually, adjusted for inflation to 2012.

The total dollar value of all of the above annual benefits for time, fuel, maintenance cost, and accident savings would be \$385,000 per year in 2012 dollars.

<sup>1</sup> Based on February 27, 2012, fuel prices from the Energy Information Administration, U.S. Department of Energy, at <http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp>.

<sup>2</sup> <http://www.epa.gov/otag/climate/420f05001.htm>; <http://www.epa.gov/OMS/climate/420f05004.htm>, assuming the fuel mix is 5 percent diesel and 95 percent gasoline, with 5 percent additional greenhouse gas added above CO<sub>2</sub> content to account for related greenhouse gas emissions.

The most substantial project benefit is the preservation of Carbon County jobs. Because tourism employs about one third of all Carbon County workers, and because the road accounts for most summer tourism in Carbon County and Red Lodge, there would also be a substantial benefit to the local economy from keeping the road serviceable enough to continue attracting tourist traffic. Considering the multiplier effect of the income of workers directly employed by tourism, the project would help sustain the incomes of perhaps half of Carbon County workers. In 2012 dollars, this means that the highway access is critical to support county incomes of \$71 million to \$107 million per year in 2012 dollar value. This figure is based on U.S. Census 2000 data showing 4,065 households in Carbon County with a median income of \$32,139 in 2000 dollars. Inflating the median income to 2012 dollars to match the denomination of the costs gives an equivalent annual household income of \$53,972. Assuming that the tourism workers directly or indirectly support one-third to one-half of the county households gives the range of \$71 million to \$107 million in 2012 dollar value.

Even if continued highway deterioration reduces tourist-dependent incomes by only 10 percent, an income loss of approximately \$7 million to \$10million per year would be avoided by the project. Because Carbon County is so dependent on tourist traffic from the highway, the losses from a deteriorating highway could easily be much larger. For example, large vehicles such as tour buses and recreational vehicles, which constitute 5 percent of the traffic, contribute a disproportionate share of income in a remote tourist destination such as this, and highway deterioration could cause these larger vehicles to avoid the road even if all passenger cars remain. For purposes of this analysis, 10 percent job loss avoidance is assumed, which equals to about \$8.9 million income savings per year.

Total annual benefits including maintenance, fuel, time, and accident savings along with preservation of Carbon County jobs, equal \$9.3 million per year. This compares favorably with the investment costs of \$46.1 million. If the benefits and costs were distributed over the 20-year analysis period of the road at a 7 percent discount rate, the total savings are \$86 million with benefit-cost ratio of 1.85 for the project. Because the alternative use of project funding would be other public projects, a case using 3-percent discount rates was calculated. This resulted in cost savings of \$130.5 million and a benefit-cost ratio of 2.64. A year-by-year analysis for both scenarios is available on the application website (<http://www.cflhd.gov/beartooth>). Table 9 summarizes the annual cost of benefits associated with each long-term outcome. This project continues to have benefits beyond the end of the analysis period; therefore, a residual value of approximately \$17.5 million was added at the end of the analysis year and adjusted with a discount rate of 7 percent per year as an additional benefit of the project. All years of analysis and the residual value calculations are shown in Appendix B.

Other qualitative benefits are the improved recreation user experience, road jurisdiction having a greater likelihood of being resolved, and maintenance and improvement of an important historical link between Red Lodge, Montana, and YNP. The reconstruction would preserve the integrity and history of the road, which is a benefit. The road is a significant engineering accomplishment, conveyed primarily by its location and footprint.

**Table 9. Annual Benefits**

Long-Term Outcomes	Benefits	Annual Cost Saving (in 2012 \$)
State of good repair	Lifecycle cost, reduced maintenance	250,000
Economic competitiveness	Increased tourist spending	8,900,000
Livability	Travel time savings	79,000
Sustainability	Reduced carbon emission, fuel cost savings	25,000
Safety	Reduction in accidents by 44%	39,000
<b>Total</b>		<b>9,293,000</b>

**4.5.2 Expected Project Costs**

Expected project costs would total \$46.1 million.

**4.5.3 Evaluation of Project Performance**

After the stabilization period from the project completion, an assessment of the long-term outcomes can be performed. This evaluation will include the state of good repair, economic competitiveness, livability, sustainability, safety, job creation, and economic stimulus.

The state of good repair can be reevaluated to determine whether actual maintenance and snowplowing costs were reduced. The economic competitiveness can be evaluated based on future analysis of traffic volumes; however, increases in traffic volume depend on a variety of factors such as the economy, fuel prices, vacationing trends, road conditions, and Federal regulations and policies. The measure of tourism from YNP, SNF, Red Lodge, and Cooke City can be evaluated, but it is not an absolute factor because the variances are not dependent only on the improved road condition. The livability outcome should be evaluated through comments received by road users; this can be achieved by completing surveys at gateway communities and chambers of commerce. The SNF can determine visitation at pullouts, interpretive sites, trails, and parking areas to determine whether these areas are being used as designed. The sustainability outcome can be addressed through an analysis of traveler speed once reconstruction is complete and compared to existing data. Safety can be evaluated by compiling accident data to determine whether a reduction in accidents (including accidents involving wildlife) was achieved. Job creation and economic stimulus can be evaluated based on direct jobs created by the project.

**5.0 Project Readiness**

**5.1 Project Schedule**

The project plans, specifications, and estimate are 100 percent complete. The schedule in Table 10 shows that the project can be ready for advertisement once the grant funds are awarded.

**Table 10. Beartooth Highway Project Schedule**

Task Name	Duration (Days)	Start	Finish
<b>Contracting</b>	<b>65</b>	<b>04/30/12</b>	<b>06/15/12</b>
Advertise	20	05/07/12	06/01/12
Award	10	06/04/12	06/15/12
<b>Construction</b>	<b>640</b>	<b>06/18/12</b>	<b>10/31/14</b>
Construction Season One	120	06/18/12	11/30/12
Construction Season Two	135	05/06/13	11/8/13
Construction Season Three	130	, 05/05/14	10/31/14
Environmental Compliance Review	30	08/04/14	9/12/14
Construction Review Report	30	08/25/14	10/03/14
Final Construction Punchlist	50	08/25/14	10/31/14

The 2010 HPP 4-1(6) project, constructed with FY 2009 TIGER Discretionary Grant funds, demonstrated efficient delivery from execution of grant to notice to proceed of construction activities in 59 days as demonstrated below:

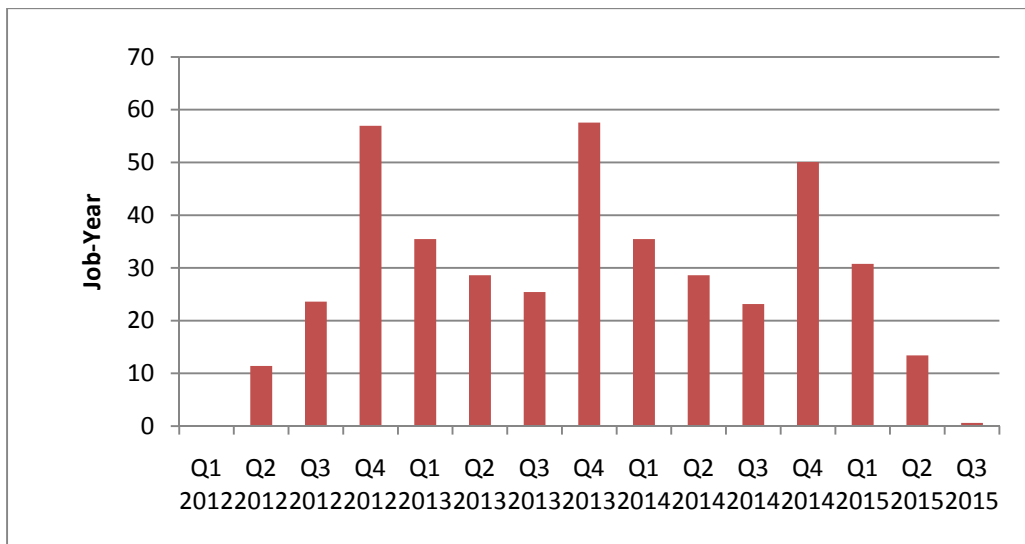
- WYDOT notified of \$6 million FY 2009 TIGER Discretionary Grant Fund award on February 17, 2010
- FY 2009 TIGER Discretionary Grant Fund (TIGER Grant Agreement #3) executed on May 10, 2010

- HPP 4-1(6) project awarded on June 22, 2010
- HPP 4-1(6) project notice to proceed on July 8, 2010

### 5.2 Environmental Approvals

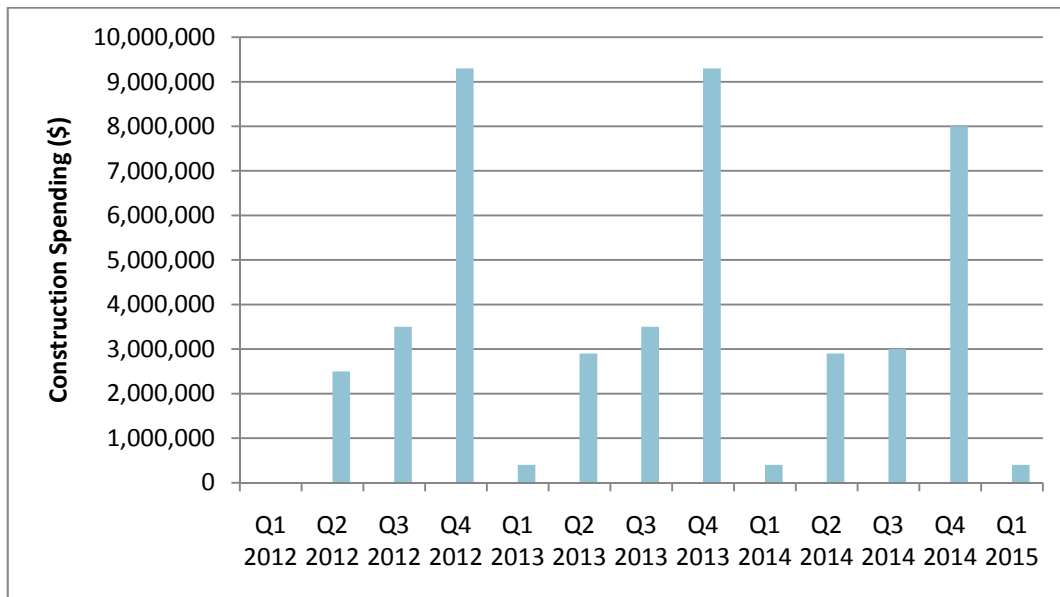
All environmental approvals required for the proposed project to be implemented have been obtained. The final permits will be obtained in final design. The Final Environmental Impact Statement was completed in September 2003, and the Record of Decision was signed in February 2004 for Segment 4 of the Beartooth Highway. A Special Use Permit authorized by the SNF has been obtained and contains conditions and limitations for uses at specific locations along the corridor.

The direct, on-project jobs expected to be created or sustained (shown in Figure 8) are based on each calendar quarter once the project is underway.



**Figure 8. Projected Beartooth Highway Jobs**

Grant funds will be spent steadily and expeditiously once construction starts, as shown on Figure 9.



**Figure 9. Beartooth Highway Construction Spending**

The contractor selected for the project will comply with the terms and conditions of the 404 permit (expiring 2014) and the 401 certification. The U.S. Army Corps of Engineers has authorized the discharge of dredged or fill material by Permit Number 199840159. The FHWA will be responsible for monitoring wetland mitigation areas for a maximum of five years after construction until successful restoration is approved by the U.S. Army Corps of Engineers. During July and August 2008, the consultant confirmed the previous delineation of the wetlands and made the necessary adjustments to wetlands observed in the field. This work was documented and sent to the U.S. Army Corps of Engineers in August 2008.

Table 11 summarizes the permits required for the project and their status for each section.

**Table 11. Status of Permits and Approvals**

Permit/Approval	Regulatory Agency	Status
Letter of Consent	SNF	Complete
Special Use Permit	SNF	Complete
Section 7 Consultation	USFWS	Complete
404 Permit	U.S. Army Corps of Engineers	Complete
Wetland Redelineation	U.S. Army Corps of Engineers	Complete
401 Certification	WYDEQ	Complete
National Pollutant Discharge Elimination System Permit	WYDEQ	Complete
Notice of Intent	WYDEQ	Will be completed once awarded
Dewatering Permit	WYDEQ	Will be completed once awarded
Construction Water Use Permit	State Engineer's Office	Will be completed once awarded
Section 106 Review and Memorandum of Agreement	Advisory Council on Historic Preservation	Complete

### 5.3 Legislative Approvals

Letters of support from the project partners are on the website (<http://www.cflhd.gov/beartooth>). The project is supported by all project partners, agencies, and governments in the region.

### 5.4 State and Local Planning

The project is anticipated to be listed in the Federal Transportation Improvement Plan and the Wyoming State Transportation Improvement Plan by March 2012. The WYDOT Transportation Commission committed to considering assuming ownership and accepting the road on the State system and in their State Transportation Plan when the route has been improved to current standards.

### 5.5 Technical Feasibility

The engineering and design are complete to a 100 percent level. Once the grant funding is approved, the package will be completed by updating quantities, standards, and specifications. This effort is minimal and should take a maximum of 2 months to complete, at which time invitations for bids can be posted. A Beartooth Highway Project Funding and Delivery Plan was completed in 2011, identifying different packaging options for the remaining work and analyzing costs based on the recently completed projects and changes in the bidding environment.

## **5.6 Financial Feasibility**

The funding request considers all construction, preliminary engineering, construction engineering, construction contingencies, and reserve funds for mitigation commitments to completely finish the proposed project. WYDOT and FHWA-CFLHD have a longstanding history of effectively managing Federal highway funds and programs. WYDOT will be the recipient of grant funds, and FHWA-CFLHD will manage funds and implement the project; this is the traditional arrangement for FHWA-CFLHD Forest Lands Highway Program and Park Road projects and is the paradigm for the Beartooth Highway reconstruction project currently underway. The 2010 HPP 4-1(6) project, constructed with FY 2009 TIGER Discretionary Grant funds, received a satisfactory rating, the highest rating, on June 6, 2011, during a review of project records and documentation by the FHWA National American Recovery and Reinvestment Act review team, demonstrating appropriate use of funds and completing a project on time and within budget.

## **6.0 Federal Wage Rate Certification**

WYDOT has signed a Federal wage rate certification stating they will comply with the requirements of Subchapter IV of Chapter 31 of Title 40, United States Code. The WYDOT also commits to completing the other certification requirements as part of this grant application.

## **7.0 Changes to Pre-application**

The total grant amount requested for this project in the pre-application was \$46.1 million. This amount is reduced to \$45.1 million. The matching fund opportunities were not identified at the time of the pre-application submittal; therefore, they were not included as a part of pre-application. At this time, Wyoming Forest Highways commits to a \$1 million matching fund, which is approximately 2 percent of the requested amount.

# Appendix A

## Potential Construction Packages



# Appendix B

## Benefit Cost Calculations

# Appendix C

## REIMHS Model

# Appendix D

## Support Letters

# Appendix E

## Federal Wage Rate Certification