Chapter 2. Alternatives

THIS chapter describes six alternatives considered in detail in this EIS, including the No Action Alternative (no road reconstruction), how the alternatives were developed, and the issues or conflicts each alternative is intended to resolve. The last two sections of this chapter describe options that were considered but dismissed from detailed analysis, and activities that could result in cumulative effects when combined with the effects of the proposed project.

2.1 ALTERNATIVE DEVELOPMENT

Major Issues

The FHWA held several meetings with the public and cooperating agencies to identify the issues and concerns associated with the project. The scoping process is described in greater detail in Chapter 6. Based on comments received during the public scoping meetings and from the cooperating agencies, ten major issues were identified and used to develop alternatives. The cooperating agencies reviewed these issues in June 1999. The issues are:

1. Changes in amount, function, and value of waters of the U.S., including wetlands
2. Changes in cultural resources along the road that are eligible for listing in the National Register of Historic Places
3. Changes in wildlife habitat and population, particularly the grizzly bear and lynx, both listed as threatened with extinction
4. Changes in vegetation along the road, and the ability to revegetate alpine areas
5. Compliance with SNF Land and Resource Management Plan
6. Changes in the road's visual quality
7. Changes in the recreation experiences along the road corridor
8. Changes in the area's economy
9. Changes in safety and traffic operations of Segment 4
10. Changes in maintenance costs and responsibilities of Segment 4

Each of these issues is described briefly in the following sections. In accordance with NEPA regulations, these issues were used as the focus of the analysis in the EIS.

Changes in Amount, Function, and Value of Waters of the U.S., Including Wetlands. Along the road corridor, waters of the U.S. consist of large perennial streams with riffle and pool complexes; small perennial drainages commonly supported by ground water seeps; springs; seeps and ephemeral drainages; small ponds; and jurisdictional wetlands. Wetlands are found throughout the area. A particular type of wetland with soils high in organic matter, called a fen, is found in some locations along the road. There is a concern that road reconstruction activities may affect wetlands and their functions. In locations where the existing road was built in wetlands, there is an opportunity to restore wetlands by moving the road away from wetlands.

Changes in Cultural Resources. The road and the four associated bridges were constructed in the early 1930s and are considered eligible for listing in the National Register of Historic Places (NRHP). There is a concern that the reconstruction project may affect historic properties, including the road itself, by widening and realigning the road, and replacing the bridges.

Changes in Wildlife Habitat and Population. The area surrounding the road provides suitable habitat for four threatened or endangered species—the grizzly bear, gray wolf, lynx, and bald eagle. All gray wolves within Wyoming are currently considered part of a nonessential experimental population. Although such wolves remain listed and protected under the Endangered Species Act, additional flexibility is provided for their management under provisions of the final rule and special regulations promulgated for the nonessential experimental population on November 22, 1994 (59 FR 60252). Requirements for interagency consultation under section 7 of the Act differ based on the land ownership and/or management responsibility where the wolf occurs. All lands along Section 4 of the Beartooth Highway are National Forest System lands managed by the SNF. Therefore, all gray wolves present in the project area are treated as a nonessential experimental population under the Act. Road reconstruction would remove and modify habitat for the grizzly bear, lynx, and other species. There is concern that road improvements may fragment habitat, reduce wildlife habitat use, and increase mortality of wildlife prey. There also is a concern that recreational use may increase, which could displace wildlife or increase mortality. Another concern is increased loss of habitat connectivity.

Changes in Vegetation. Expanses of alpine vegetation, with rare plant species in some locations, are found along the road corridor. There is a concern that road reconstruction may affect large areas of alpine vegetation, and the populations of the rare species. Another concern is that the revegetation of the road's sideslopes and abandoned sections in areas proposed for realignment, particularly in alpine areas, will not be successful.

Compliance with SNF Land and Resource Management Plan. The road corridor is on National Forest Lands managed by the SNF. The SNF has a land management plan that provides guidance on managing the road corridor and resources adjacent to it. There is a concern that the proposed project may not comply with the land management goals and objectives for the road corridor.

Changes in the Road's Visual Quality. The road is part of the scenic Beartooth Plateau, with several peaks above 3,660 m (12,000 ft.) elevation and numerous alpine lakes. The road corridor is visible from area lakes and streams used for recreation. The road also can be seen from the Absaroka-Beartooth Wilderness. There is a concern that a wider road may alter the scenic quality along the road, and cuts and fills may be visible from key viewing locations. Another concern is the visual effect of revegetation of the abandoned road and bridges in realignment areas.

Changes in Recreation Experience. The Beartooth Highway is considered one of the most beautiful drives in the country and is a popular "driving for pleasure" destination. Trails into the Absaroka-Beartooth Wilderness and other adjacent National Forest lands originate from the corridor. There is concern that during road reconstruction activities, access to recreational facilities would decrease and noise would increase.

Changes in the Area's Economy. The road is a nationally significant destination and transportation artery serving the adjacent communities in Wyoming and Montana. There is concern that the road's continued deterioration may decrease recreation and tourism in the area, affecting the area's economy. A similar concern is that reconstruction activities may create difficult or uncomfortable driving conditions, delays, and closures that may affect the economic livelihood of businesses in the area during construction.

Changes in Safety and Traffic Operations of Segment 4. The reported accident rate along Segment 4 is lower than that of similar rural roads in Wyoming. Because of the area's remoteness, however, minor accidents, such as side-swipe or single vehicle run-off-the-road accidents, may not be reported. Evidence along the road, such as damaged guardrail and broken mirror parts, indicates that numerous accidents of these types occur. There is a concern that the road's safety may deteriorate further if improvements are not made. Another concern is that road improvements may accommodate or encourage an increased speed of the typical road user, and increase the accident rate or severity along the road.

The road is used by tourists enjoying the road's scenery and by people traveling to Beartooth Plateau destinations between YNP and Red Lodge. Because of conflicting uses (sightseeing versus destination-oriented traffic use), there are safety and traffic operation concerns. For example, recreational users may drive slower and stop more frequently than destination-oriented traffic. Increased traffic will increase the possibility of accidents between the two user types. Unless the road is properly designed with a consistent alignment, shoulders, and pullouts, there is a safety and liability concern associated with the ownership of the road by a potential maintaining agency.

Changes in Maintenance Costs and Responsibilities of Segment 4. No federal or state agency has assumed ownership of the section of the Beartooth Highway in Wyoming, including Segment 4. The road was constructed under the National Park Approaches Act, which authorized the Secretary of the Interior to construct and reconstruct such roads, and to enter into agreements for the maintenance by State or county authorities, or to maintain them when otherwise necessary. The NPS has maintained the road historically, and has been allocated funding for snowplowing from the Forest Service through 2006 or 2007, depending on annual costs. Although the Forest Service has short-term funding for snowplowing, it is not prepared to assume long-term maintenance. There is a concern that unless the road is reconstructed to a condition that can be reasonably maintained in a sustainable manner, the present uncertainty about jurisdiction and maintenance will continue for all segments of the road (Segments 2 through 4) that are within the State of Wyoming.

Project Components and Options

NEPA and other laws and regulations require agencies to reduce or avoid environmental effects where possible. This entails developing and evaluating a range of reasonable alternatives that address the project's purpose and need while minimizing environmental effects. There are various issues and concerns (often competing or conflicting) that the alternatives address to a differing degree. The No Action Alternative also must be evaluated to provide an environmental baseline and give the decision maker a full range of options to consider. In accordance with 23 CFR 771.105, the FHWA has the responsibility to select an alternative that balances providing safe and efficient transportation with the social, economic, and environmental impacts of the project.

After identifying major issues, the main project components were identified. Of these, the primary component that defines the overall project purpose is the existing road segment proposed for reconstruction. As discussed in Chapter 1, the segment proposed for reconstruction begins near the Clay Butte Lookout turnoff east of the U.S. 212/WY 296 intersection and extends east to the Montana/Wyoming state line. KP 39.5 and KP 69.4 are logical ends or termini for the project because the Beartooth Highway has been reconstructed up to both ends of the proposed project. The general location and condition of Segment 4 determines the geographic extent and magnitude of the proposed project and is the same for all action alternatives studied in detail in the EIS. Other components identified for the project are:

- Design criteria (design speed and roadway width)
- Alignment options
- Other ancillary facilities, such as pullouts, a workcamp, material sources, and staging areas (discussed in the *Activities and Facilities Common to All Build Alternatives* section)

Design Criteria Options

Design criteria are the standards used to design various elements of the road, such as travel lane and shoulder widths. Before the design criteria can be established, the functional classification of the road must be determined. The functional classification provides the basis for the design speed. Because the functional classification is critical to alternative development, it is discussed first, followed by a discussion of the design speed. The functional classification and design speed, in turn, provide the basis for the range of standards considered for roadway elements.

Functional Classification

The road is functionally classified as a rural minor arterial using criteria developed by the American Association of State Highway and Transportation Officials (AASHTO) (AASHTO 2001). These guidelines have been adopted by the FHWA and the WYDOT. The FHWA selected a rural minor arterial as the functional classification for Segment 4 based on the characteristics of the highway and a 1999 origin and destination study of Segment 4 users (MK Centennial 1999a). The highway is located within a rural area and it primarily serves regional travel between Red Lodge, Montana and YNP, consistent with an arterial classification. Based on the origin and destination study, over half of motorists use the highway to travel between towns and to access YNP. The highway also serves a secondary function of providing access to adjacent recreation sites and areas.

The segments of the highway in Montana (Segment 1) and the other segments in Wyoming (Segments 2 and 3) have been reconstructed or are proposed for reconstruction using design criteria for a rural minor arterial. Additionally, the MDOT has classified all segments in Montana (Segments 1, 5, 6, and 7) as a rural minor arterial. This classification is consistent with the original intent of the construction of the roadway, which was to provide the public access to YNP from Red Lodge, Montana. Segment 4 needs to have similar design criteria as the adjacent segments to meet driver expectancy.

In cooperation with the SEE team, the FHWA refined the design criteria so that they are more suitable for a road in mountainous terrain. The design criteria are presented in Table 4. Four design criteria, design speed, travel lane width, shoulder width, and foreslopes were project components for which options were evaluated. The four project components are discussed in more detail in the following sections.

Design Speed

Design speed is a selected speed used to determine the various geometric design features of a roadway. The design speed selected is based on an analysis of the existing topography, the adjacent land use, and the functional classification of the road. The existing operating speed of traffic, the existing roadway alignment, and the compatibility of the design speed with adjacent segments also are considered.

When proposing to reconstruct an existing road, the design speed should be consistent over adjacent sections of a highway and equal or exceed the posted or regulatory speed limit of a roadway. Actual vehicle operating speeds can exceed the design speed in areas where the alignment, grade, and sight distance are favorable. The posted speed limit along some sections may be lower than the design speed based on the actual vehicle operating speeds, roadside conditions or activities, and other safety-related factors.

Table 4. Design criteria for the project.

Classification	Rural Minor Arterial
Seasonal Daily Traffic	2000 – 942 2025 – 1,972
Design Speed	60 km/h (37 mph) (from KP 39.4 to 49.3) 50 km/h (31 mph) (from KP 49.3 to 69.4)
Maximum Grade	8 percent with short sections slightly steeper
Maximum Superelevation	6 percent
Design Vehicle	AASHTO BUS (12 m [40 ft.] long and 2.6 m [8.5 ft.] wide, 3.2 m [10.5 ft.] with mirrors)
Minimum Travel Lane Width	3.6 m (12 ft.)
Minimum Shoulder Width	0.9 m (3 ft.) west of the road closure gate and 0.6 m (2 ft.) east of the gate
Foreslope	2.4 m (8 ft.) fixed width
Minimum Switchback Radius	30 m (100 ft.)/30 km/h (19 mph)
Curve Widening	Based on proposed curve radius and AASHTO BUS
Barrier Offset	0.6 m (2 ft.)
Minimum Clear Zone	Typically 3.0 m (10 ft.)

Source: MK Centennial Engineering, Inc. 1999c.

Once a design speed is selected, it is used to determine individual design criteria, such as stopping sight distance and curve radii. When design standards cannot be met due to extraordinary cost, adverse environmental impacts, or other reasons, exceptions to the selected design speed may be used. If the terrain varies throughout the road corridor, more than one design speed for different road sections may be selected. Isolated areas where short road sections are not designed to the selected design speed because of topographic or environmental constraints, such as at switchbacks, are called design exceptions.

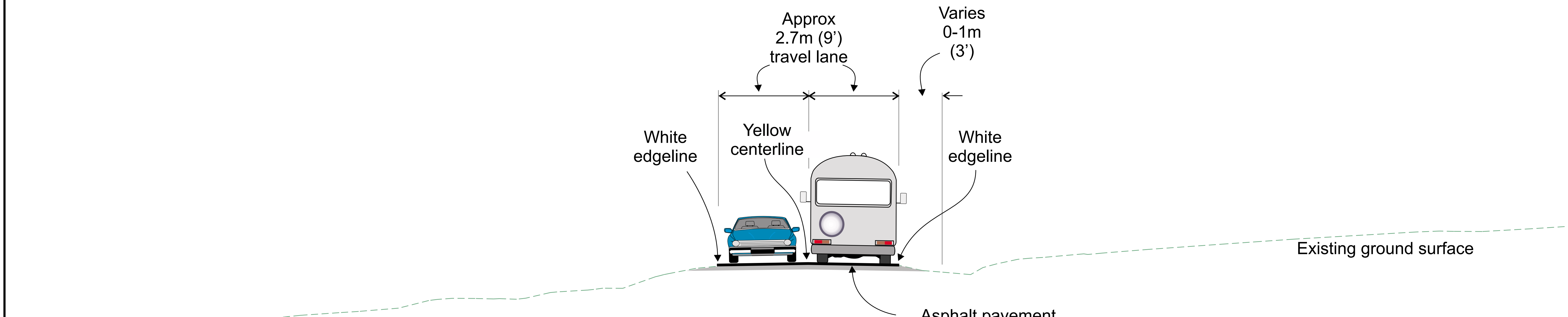
According to AASHTO standards, the recommended range of speeds for a rural minor arterial is 60 to 120 km/hr (37 to 75 mph). Design speeds in the higher range, 100 to 120 km/hr (62 to 75 mph), are normally used in level terrain, design speeds of 80 to 100 km/hr (50 to 75 mph) are normally used in rolling terrain, and design speeds of 60 to 80 km/hr (37 to 50 mph) are used in mountainous terrain.

To develop the design speed for the project, an inventory of the existing roadway curvature was completed and the speeds at which the road's curves could be driven safely were evaluated. The number of existing curves requiring a speed reduction for differing design speeds were then identified (MK Centennial Engineering, Inc. 1999c).

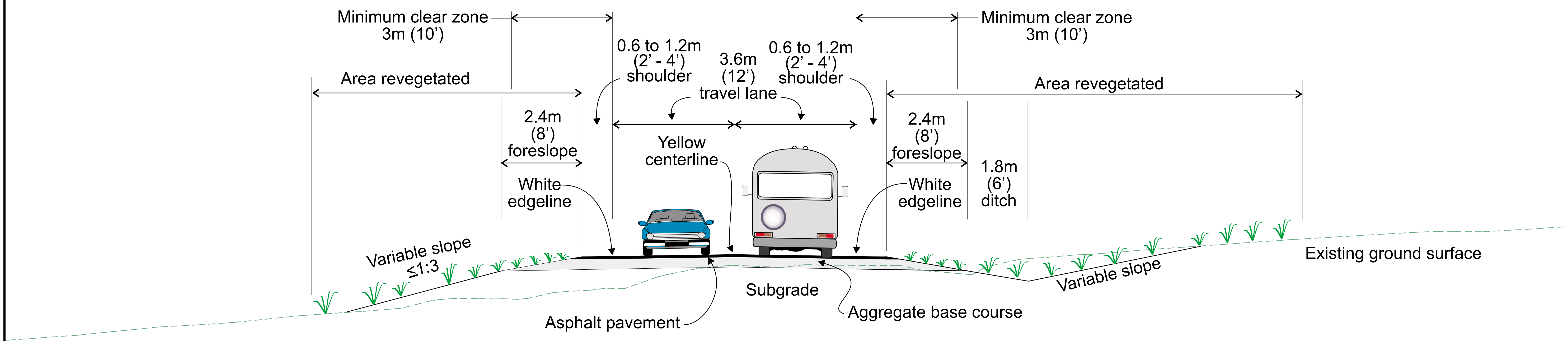
The analysis indicated that the project area had two sections with distinctly different curvature and operating characteristics. One section, the western section, was from the beginning of the project to the road closure gate past Long Lake (KP 39.4 to 49.3). This section contained relatively flat curves and several long, relatively straight sections. The other section, the eastern section, was from the road closure gate to the project end at the Montana/Wyoming state line (KP 49.3 to 69.4). The eastern section traversed over Beartooth Pass and contained 12 switchbacks. The two sections identified, based on road curvature and operating characteristics, are consistent with the separate management needs of the corridor discussed previously.

Because of the different nature of these two sections, two different design speeds were selected. A design speed for each section was selected so the curves of a reconstructed road would match about 80 percent of the existing curves and not require design exceptions. The design speed change would occur just before the curve past Little Bear Lake. This curve is the first curve after the relatively straight road sections near Beartooth Lake and Top of the World Store. A design speed of 60 km/h (37 mph) was selected for the western section (KP 39.4 to 49.3), and a design speed of 50 km/h (31 mph) was selected for the eastern section (KP 49.3 to 69.4). The design speed selected for the eastern section (50 km/h) is less than the AASHTO recommended speeds for mountainous rural minor arterials. This design exception is justified by the unique characteristics and environmentally sensitive nature of this section of Segment 4.

At the selected design speeds, about 18 percent of the existing curves in the western section and about 22 percent in the eastern section would require design exceptions. These two design speeds were used for all build alternatives considered in detail. All alternatives would have design exceptions at some locations. For example, all of the reconstructed switchback curves would be design exceptions of 30 or 40 km/h (19 to 25 mph).



Existing Roadway



Proposed Project Typical Section

(9.0m [30ft.] shown)

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Scale: 1" = 10'

5m 0 5m

20ft 10ft 0 20ft

Figure 2
Typical Cross Section of
Existing and Proposed Road

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Travel Lane and Shoulder Width

Another design criteria for which options were developed were travel lane and shoulder width, or collectively, roadway width. In the Draft EIS, four roadway width options were considered–7.2 m (24 ft.), 8.4 m (28 ft.), 9.6 m (32 ft.), and 10.2 m (34 ft.). Based on projected traffic volumes and types, and the rural minor arterial classification, a roadway width of 10.2 m (34 ft.) is the minimum recommended by AASHTO.

Where the road has been reconstructed west of Clay Butte Lookout turnoff (Segment 3), it has a paved width of 9.6 m (32 ft.). The roadside clear zone (an obstacle-free area on both sides of the road that allows an errant vehicle to safely recover) varies from 3 to 4 m (10 to 13 ft.). On the adjoining eastern segment at the Montana/ Wyoming state line, the road was reconstructed to a width of 8.4 m (28 ft.) between 1963 and 1968 and repaved to a width of 7.8 m (26 ft.) in 1993. The Rock Creek switchbacks are narrower.

These two roadway widths (8.4 m [28 ft.] and 9.6 m [32 ft.]) were used as options in the Draft EIS. Two alternatives were 8.4 m (28 ft.; 3.6 m [12 ft.] lanes and 0.6 m [2 ft.] shoulders) wide, and two alternatives were 9.6 m (32 ft.; 3.6 m [12 ft.] lanes and 1.2 m [4 ft.] shoulders) wide. In the fifth build alternative (Preferred Alternative), a 8.4 m (28 ft.) width was proposed for the upper, alpine section of the project east of the road closure gate, and 9.6 m (32 ft.) for the lower, subalpine and montane section of the road west of the road closure gate. In response to comments on the Draft EIS, the SEE team recommended reducing the roadway width to 9.0 m (30 ft.) for the lower section of the road between the Clay Butte Lookout turnoff to the road closure gate in the Preferred Alternative. A transition area between the project beginning and the Clay Butte Lookout turnoff would have a 1.2-m (4-ft.) shoulder and a roadway width of 9.6 m (32 ft.), consistent with the adjoining segment. The typical cross section is shown in Figure 2 on the preceding page. The other two roadway widths (7.2 m [24 ft.] and 10.2 m [34 ft.]) were dropped from consideration for reasons discussed in the subsequent *Options Considered But Eliminated* section.

In the three options retained for detailed analysis, the travel lane would be 3.6 m (12 ft.) wide. The shoulder width on each side of the road would be either 1.2 m (4 ft.) wide with the 9.6-m (32-ft.) option, 0.9 m (3 ft.) with the 9.0-m (30-ft.) option, or 0.6 m (2 ft.) wide with the 8.4-m (28-ft.) option. A travel lane width of 3.6 m (12 ft.) was chosen because it would provide better lateral clearance for opposing vehicles, reduced shoulder maintenance, and reduced pavement maintenance (AASHTO 2001). A 3.6-m (12-ft.) travel lane would match the reconstructed segment to the west of Segment 4. The need for this travel lane width is discussed in Chapter 1.

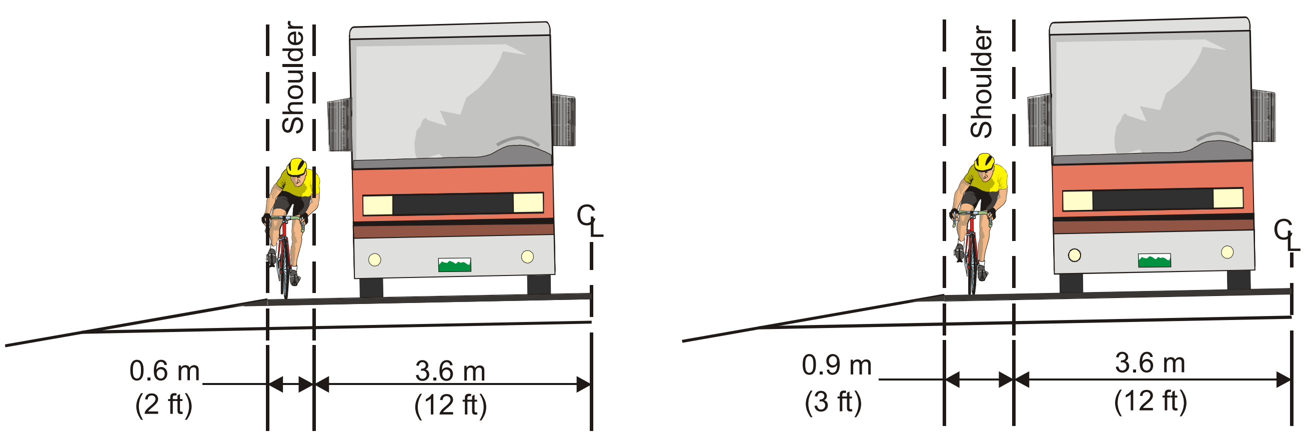
Three shoulder widths, 1.2 m (4 ft.), 0.9 (3 ft.), and 0.6 m (2 ft.), were selected, based on the amount of potential pedestrian and bicycle traffic, SNF management of the corridor, motorist's expectations, and the road's setting. For a reconstructed road with the projected traffic of 1,972 vehicles per day, recommended shoulder widths range from a minimum of 0.6 m (2 ft.) to 2.4 m (8 ft). Shoulders 0.6 m (2 ft.) wide would not adequately accommodate pedestrians or bicyclists, and would not provide sufficient clearance for vehicles experiencing trouble or stopping randomly for viewing scenery (Figure 3). According to the AASHTO Guide for the Development of Bicycle Facilities, a 1.2-m (4-ft.) shoulder width on each side is recommended to accommodate bicycle travel. However, where 1.2 m (4 ft.) widths cannot be achieved, any additional shoulder width is better than none at all (AASHTO 1999). Many of the comments on the Draft EIS focused on the roadway width, particularly shoulder widths. To minimize environmental impact, the SNF, in cooperation with the FHWA and other SEE team members, agreed a 0.9-m (3-ft.) shoulder would meet the recreation use needs and adequately provide for safety from the Clay Butte Lookout turnoff to the road closure gate.

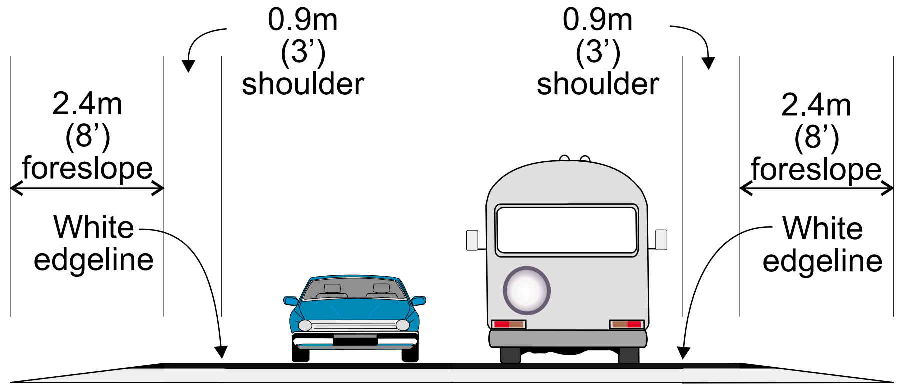
Foreslopes

The foreslope is the area from the edge of the shoulder to the edge of the subgrade. The foreslope ensures the stability of the roadway, provides an opportunity for recovery of an out of control vehicle, and provides an area for future maintenance operations. The foreslope improves roadway stability by providing lateral support to the structural section. The depth of the structural section (asphalt plus aggregate base) and the slope ratio determines the width of the foreslope.

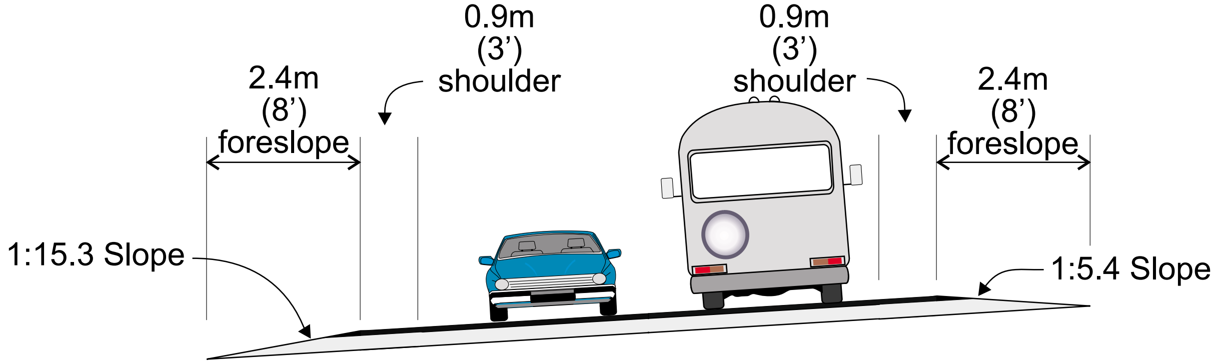
Foreslopes can either have a fixed width, with a varying slope depending on the superelevation, or a fixed slope, with the width varying depending on the superelevation. For example, when the superelevation is 0 percent and the structural section (asphalt and aggregate base) is 0.3 m (1 ft.) thick, the foreslope will have a width of 2.4 m (8 ft.) if the slope is 1:8 (Figure 4). (All slopes in this EIS are vertical: horizontal.) As the superelevation changes, such as in curves, either the foreslope width or the foreslope slope will have to vary to accommodate the superelevation. For example, when the superelevation is 6 percent, a 2.4 (8 ft.) fixed width foreslope will have a slope of 1:15.3 on the uphill side of the curve, and 1:5.4 on the downhill side of the curve (Figure 4). With a 2.4 m (8 ft.) fixed width foreslope, the foreslope will always be 2.4 m (8 ft.) on each side of the road, with a total of 4.8 m (16 ft.) associated with the foreslope. If a fixed slope is used, such as 1:8, the slope will remain constant, and the width of the foreslope will change with changing superelevation. On a superelevation of 6 percent, a 1:8 fixed slope foreslope will be 1.6 m (5.3 ft.) on the uphill side of the curve, and 4.6 m (15.1 ft.) on the downhill side of the curve (Figure 4). With a 1:8 fixed slope, the total foreslope width will be 6.2 (20.4 ft.), or 1.4 m (4.4 ft.) more than a 2.4 m (8 ft.) fixed width foreslope.

Figure 3. Bicycle use on a 0.6-m (2-ft.) and 0.9-m (3-ft.) shoulder.

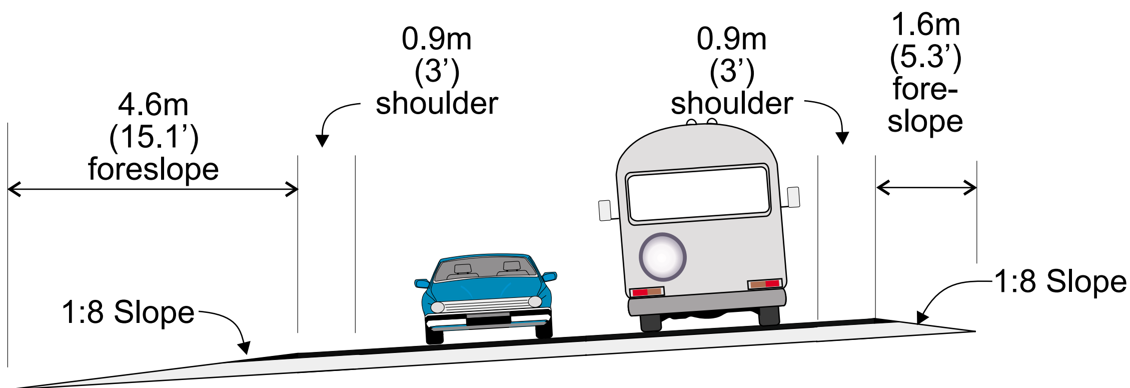




2.4 m Fixed Width Foreslope
on a 0% Superelevation



2.4 m Fixed Width Foreslope
on a 6% Superelevation



1:8 Fixed Slope Foreslope
on a 6% Superelevation

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Figure 4
Fixed Width and
Fixed Slope Foreslopes

File: 521-road slopes-8-03.cdr

Alignment Options

The alignments of all build alternatives would closely follow the existing alignment throughout most of the route. To minimize environmental impacts, or to improve the operation and safety of the road, location or alignment options were developed at six areas. The areas are:

- An area near Beartooth Falls (KP 41.1 to 41.7)
- The area in the vicinity of the Top of the World Store, from west of the first bridge crossing of Little Bear Creek (KP 44.1) to east of the entrance to the Island Lake Campground (KP 47.8)
- A wetland area east of Little Bear Lake (KP 49.2)
- An area east of Frozen Lake (KP 53.0 to 54.6)
- The "Bar Drift" area east of the West Summit (KP 59.6 to 60.4)
- Albright Curve east of the East Summit (KP 64.2 to 65.2)

Option areas are shown on Figure 5 through Figure 10. In each area, one of the options would generally follow the existing alignment. This option is called the Existing Alignment Option. Generally, the reconstructed road would be widened to one side or the other, encompassing the existing road (see *Techniques to Avoid or Minimize Impacts* section). Other options would depart from the existing alignment. With these options, the reconstructed road would be built outside the "footprint" or disturbance of the existing road. The existing road would be removed and the disturbed area reclaimed. In some locations where wetlands are adjacent to the abandoned road, the land would be reclaimed using wetland species to restore the wetlands currently filled by the existing road. Additional information, such as cost and environmental effects of each alignment option, is found in Appendix E.

Beartooth Ravine

Just west of Beartooth Falls is an extremely rugged area with steep topography called Beartooth Ravine. The area has four sharp curves with existing design speeds of 30 to 40 km/h (19 to 25 mph). The existing road was built on large fill slopes. West of Beartooth Ravine is a relatively straight section passing the Clay Butte Lookout turnoff. Beartooth Lake is east of the ravine.

More accidents have been reported at Beartooth Ravine than any other location along the road (see *Traffic Volume, Speeds, and Accidents* section of Chapter 1). The curves leading to the ravine from both directions are gentler than those in the ravine itself. This often causes either sudden slowing or traveling too fast for the curves, which may be the cause for the high accident rate in the area. Another possible cause for the high accident rate is the lack of a pullout to view the Beartooth Falls.

To resolve the conflicts in the Beartooth Ravine area, three options were developed (Figure 5). One alignment would closely follow the existing alignment and have a design speed of 40 km/h

Beartooth Ravine during road construction ca. 1930s.
Photo © Flash's, Red Lodge, MT

(25 mph) (Existing Alignment Option). Retaining walls would be needed to provide adequate roadway width. Two other options would use a bridge to traverse the area—one with a design speed of 50 to 55 km/h (31 to 34 mph) (Option A), and one with a design speed of 60 km/h (37 mph) (Option B). Option B would be consistent with the proposed design speed for the western section and would not be a design exception. The other two options (Existing Alignment and Option A) would be design exceptions. Two structure options for each of the alignments requiring a bridge were considered. One option consisted of a haunched welded steel plate girder structure and the other option was a post-tensioned concrete box structure. A decision about the structure will be made during final design. Additional information about the bridge structures can be found in the *Beartooth Ravine Bridge Structure Selection Reports* (MK Centennial Engineering, Inc. 2001b).

Top of the World Store Area

The road section near Top of the World Store is in the Little Bear Creek valley (Figure 6). The existing road alignment in this section is fairly straight and gently rolling. Sections of the existing road are near Little Bear Creek, which is a perennial stream with adjacent wetlands.

Three options for the Top of the World Store area were developed (Figure 6). One option (Existing Alignment Option) would follow the existing alignment from KP 45.0 to 47.7, with the reconstructed road widened on both sides of the existing road (see red line on Figure 6). New bridges would be constructed at the existing bridge locations. Another option (Option A; see blue line on Figure 6) would depart from the existing alignment 0.7 km (0.4 mi.) west of the Top of the World Store, head south and then east of the existing alignment, crossing Little Bear Creek and the existing alignment near the existing bridge west of the Top of the World Store. A new bridge would be constructed to cross Little Bear Creek. After the bridge, the new road would pass the Top of the World Store near the existing alignment, then curve 100 m (330 ft.) north of the existing alignment. It would then curve south, crossing Little Bear Creek again. A new bridge would be constructed to cross Little Bear Creek. From the second bridge crossing, the new alignment would curve once more north of the existing alignment, and return to the existing alignment east of the road to Island Lake Campground (see the blue line on Figure 6).

A third option (Option B–see yellow line on Figure 6) is similar to Option A. The road would depart from the existing alignment in the trees west of Little Bear Creek, traverse south and cross Little Bear Creek south of the Top of the World Store. A new bridge would be constructed to cross Little Bear Creek. The new bridge would be 107 m (350 ft) east of the existing bridge. The existing bridge would be removed. After crossing Little Bear Creek, it would travel east and north of the existing alignment. Instead of curving south to meet the existing alignment like Option A, the new road would be 100 to 150 m (325 to 500 ft.) north of the existing alignment, in the trees. The second or easternmost crossing of Little Bear Creek for Option B would be about 100 m (325 ft.) north (upstream) of the existing bridge. A new bridge would be required. The Little Bear Creek bridge #2 would not be removed in Option B.

Little Bear Lake Fen

A special type of wetland, called a fen, occurs near the road in some areas. One area is east of Little Bear Lake where the existing road bisects a large wetland complex at KP 44.2. Because a large wetland and fen complex occurs on both sides of the existing road, no practicable alternative was identified that avoided crossing the wetland and fen.

Consequently, two options for traversing the area within the existing road footprint were developed (Figure 7). Both options would avoid additional fill into the fen beyond that of the existing road. In the Retaining Wall Option, the road would be reconstructed and widened at the same location as the existing road. The road would be built atop a retaining wall constructed within the footprint of the existing road fill. The fill adjacent to the retaining walls would be removed if possible, and the area reclaimed as a wetland. The other option would entail building a bridge immediately adjacent to the north side of the existing road to traverse the fen. The bridge would be built on piers or pilings. This option is called the Bridge Option. In the Bridge Option, the existing fill in the fen would be removed if possible, and the area reclaimed as a wetland.

Frozen Lake

Just east of Frozen Lake is a sharp switchback and a series of sharp curves (KP 53.0 to 54.6). The existing switchback has a design speed of slightly less than 30 km/h (19 mph); several other existing curves in the West Summit switchbacks have a design speed of 40 km/h (25 mph). Two options for this area were developed (Figure 8). One option (Existing Alignment Option) would closely follow the existing road and have a design speed of 40 km/h (25 mph), except the switchback, which would have a design speed of 30 km/h (19 mph). North of the switchback, the road would diverge from the existing alignment to improve sight distance. The other option (Option A) would have a wider curve and would have a design speed of 50 km/h (31 mph), except the switchback, which would have a design speed of 40 km/h (25 mph). Option A would be consistent with the proposed design speed for the eastern section, and only the switchback (KP 53.3 to 53.4) would be a design exception. The Existing Alignment Option would be a design exception through the 1.6 km (1 mi.) section of the road.

Bar Drift near the West Summit

A large snowdrift, called the "Bar Drift," usually occurs on the switchbacks east of the West Summit (KP 60.1 to 61.4). It is called the Bar Drift because in the 1950s and 1960s, a bar was shaped in the deep snowpack and was used to serve drinks to visitors to the road. The drift typically can be as high as 10 m (35 ft.), and can present dangerous conditions for snowplow operators.

Two options for the Bar Drift area were developed (Figure 9). The Existing Alignment Option would closely follow the existing alignment. The other option (Option A) was designed to minimize environmental impacts by avoiding fen impacts and minimizing wetland impacts, improve horizontal alignment, and reduce exposure to the drift. Two of the existing switchbacks would be eliminated, and the realigned sections would have a gradient steeper than the existing road (7.0 percent versus

The "bar drift" during the 1950s.
Photo © Flash's, Red Lodge, MT

5.5 percent). Option A also would have more level slopes designed to facilitate revegetation. Parking for recreational use would be provided in both options.

Albright Curve

The Albright Curve area is the easternmost set of switchbacks on the Wyoming section of the road (KP 64.2 to 65.2). Several wetlands and fens are found in the area. Some of the wetlands contain rare plants (see *Vegetation, Timber, and Old Growth Forest* section in Chapter 3). In an effort to avoid these resources, three options for the area were developed (Figure 10). The options vary by the turning radius of the switchbacks and consequently, the design speed. The Existing Alignment Option would closely follow the existing alignment and have a design speed of 30 km/h (19 mph). It would be a design exception. Option A would have a design speed of 40 km/h (25 mph) and also would be a design exception. Option B would have a design speed of 50 km/h (31 mph) and would not be a design exception.

2.2 Alternatives Analyzed in this EIS

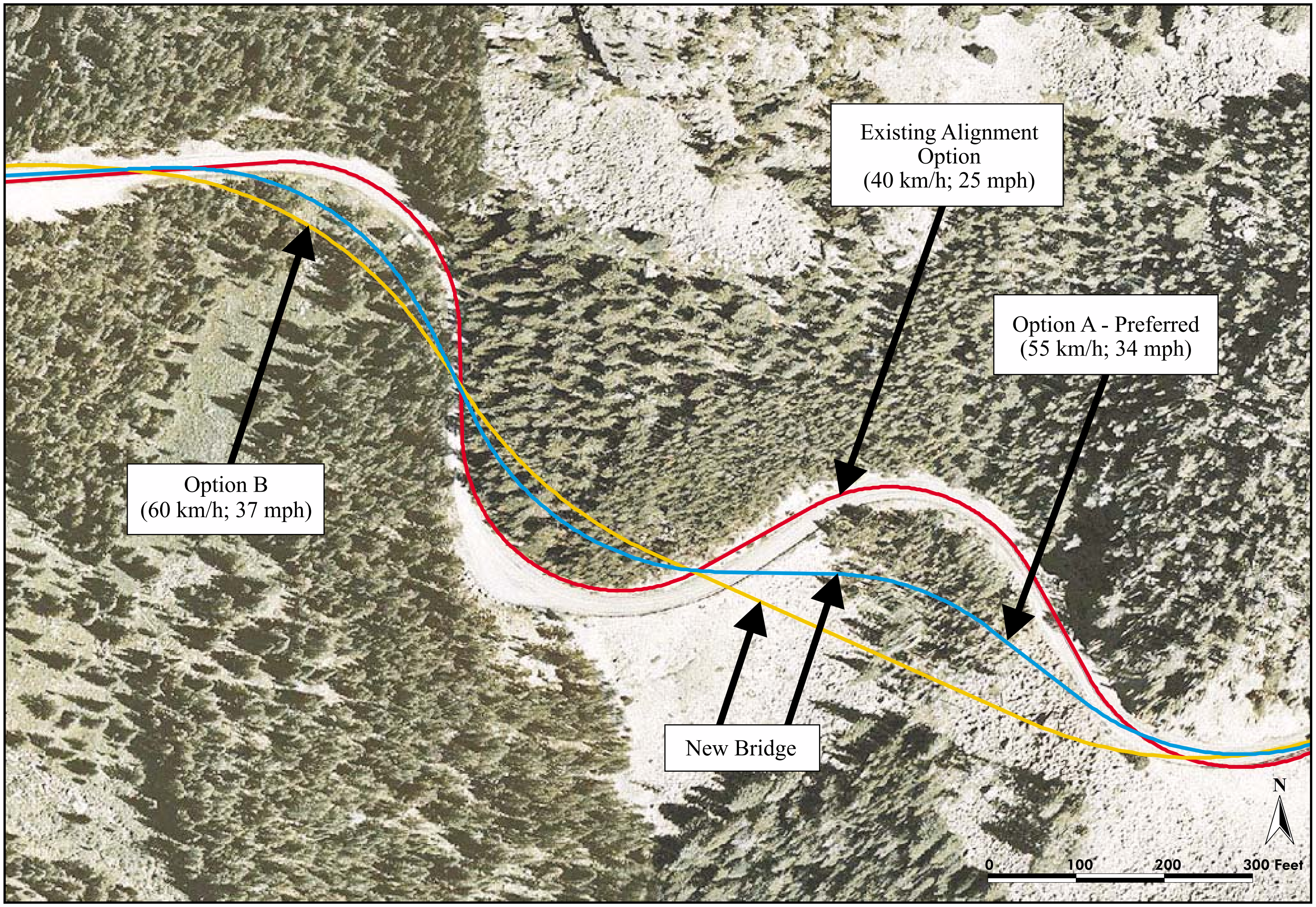
After considering the options that were retained for detailed evaluation, the FHWA, in cooperation with the SEE team, developed alternatives using an option for each alignment area that addressed suggestions and concerns from other agencies and the public. Five build alternatives and the No Action Alternative are analyzed in detail in this EIS. The build alternatives are designed with an emphasis on one or more major issues identified during public and agency scoping (see previous *Major Issues* section). Each alternative, along with the major issues it is intended to address, is described in detail in the following sections. The roadway width and alignment options associated with each alternative are presented in Table 5 (following the option figures, p. 43).

The alternatives are:

- Alternative 1–No Action (No Road Reconstruction)
- Alternative 2–Recreation and Cultural Resource Emphasis
- Alternative 3–Wildlife Resource Emphasis
- Alternative 4–Highway Operations, Safety, and Maintenance Emphasis
- Alternative 5–Biological Resource Emphasis
- Alternative 6–Blended Emphasis (Preferred)

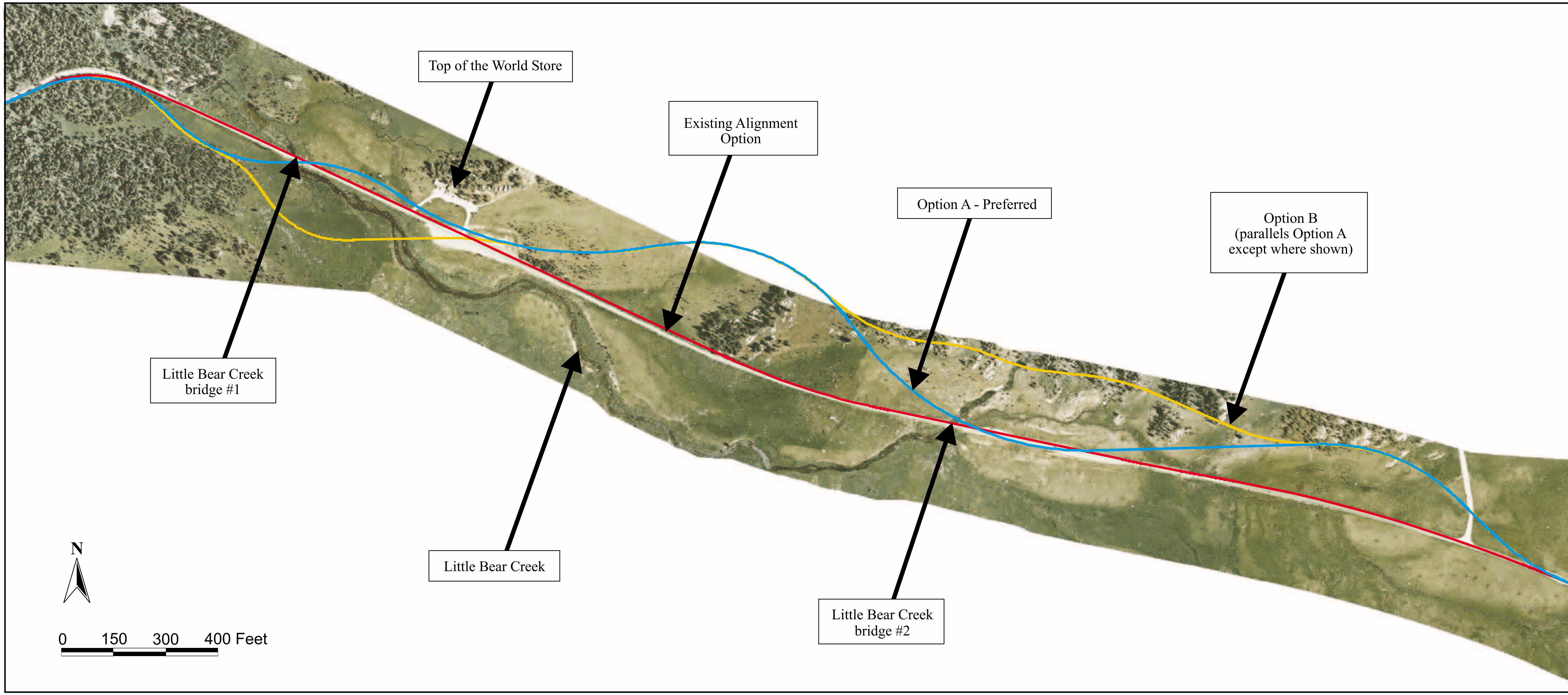
The alternatives have an emphasis on one or more major issues to provide a full range of alternatives and a clear distinction between alternatives. Although each alternative has been designed with an emphasis on one or more resources, each alternative would address other resources to the extent consistent with its emphasis. For example, the primary emphasis of Alternative 2 is recreation, with the shoulder width being wider [1.2 m (4 ft.)] to accommodate pedestrians, bicyclists, clearance for larger recreation vehicles, and related activities to view wildlife and scenery. Alternative 2 also would avoid the historic Little Bear Creek bridge #2, which would be left in place. Other alternatives would address other resources besides their primary emphasis in a similar manner.

Figure 5. Options for Beartooth Ravine area.



The Existing Alignment Option is the option that most closely follows the existing road alignment.

Figure 6. Options for Top of the World Store area.



The Existing Alignment Option is the option that most closely follows the existing road alignment.

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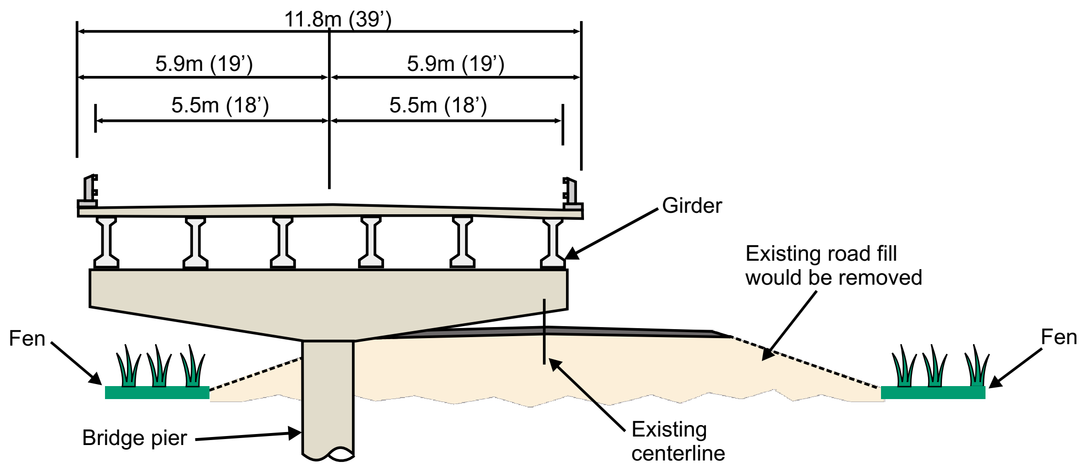
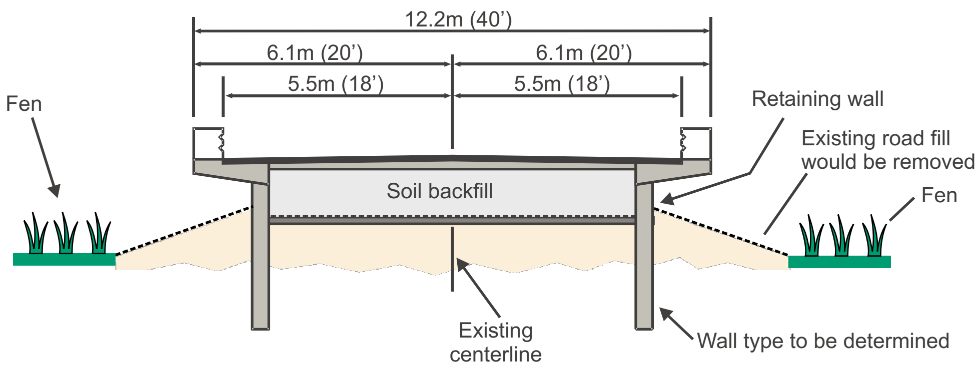


Bridge Option - Preferred



Retaining Wall Option

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Note: Proposed bridge design is preliminary and may change during final design.

Figure 7
Options for the Little Bear Lake Fen Area

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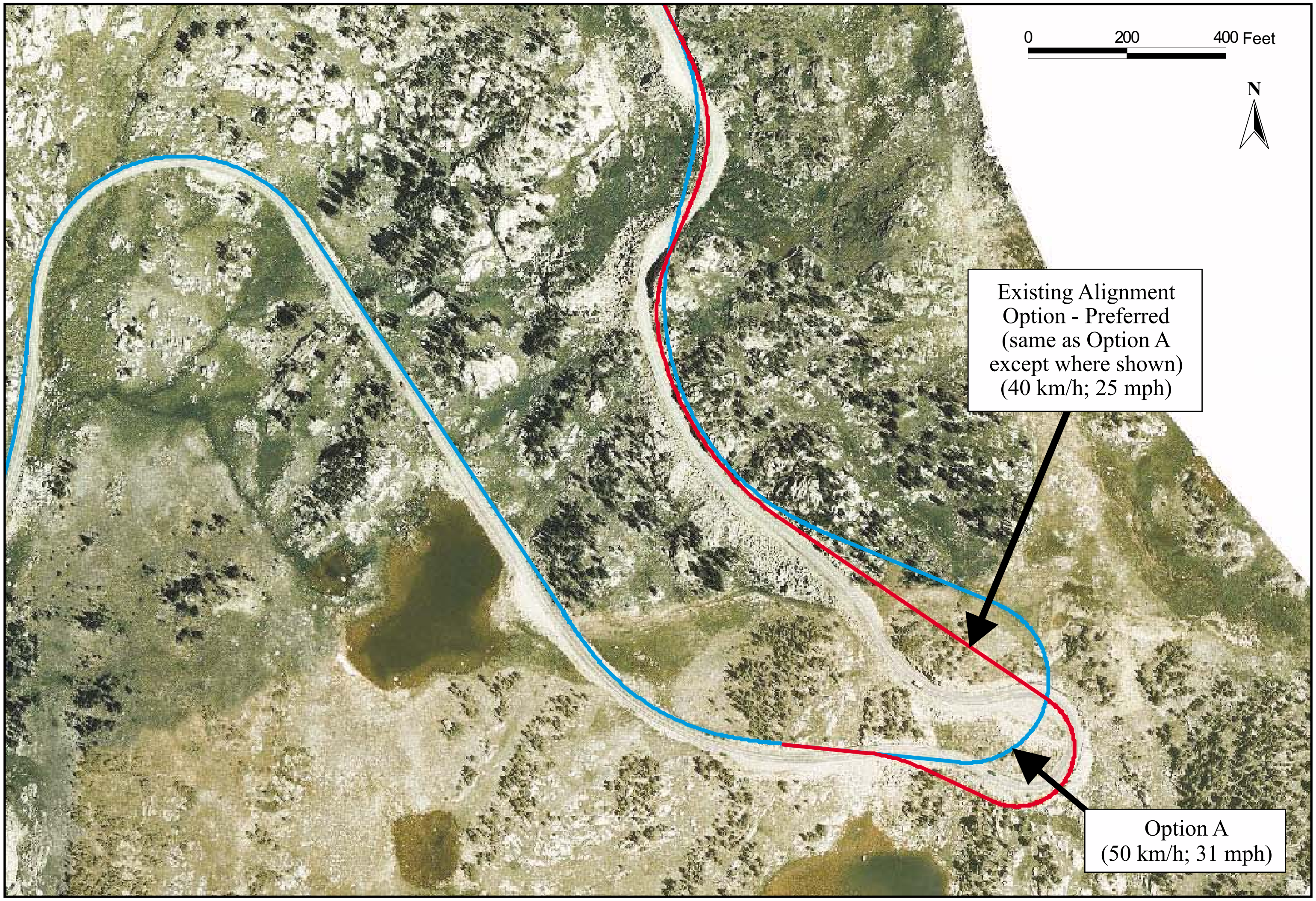
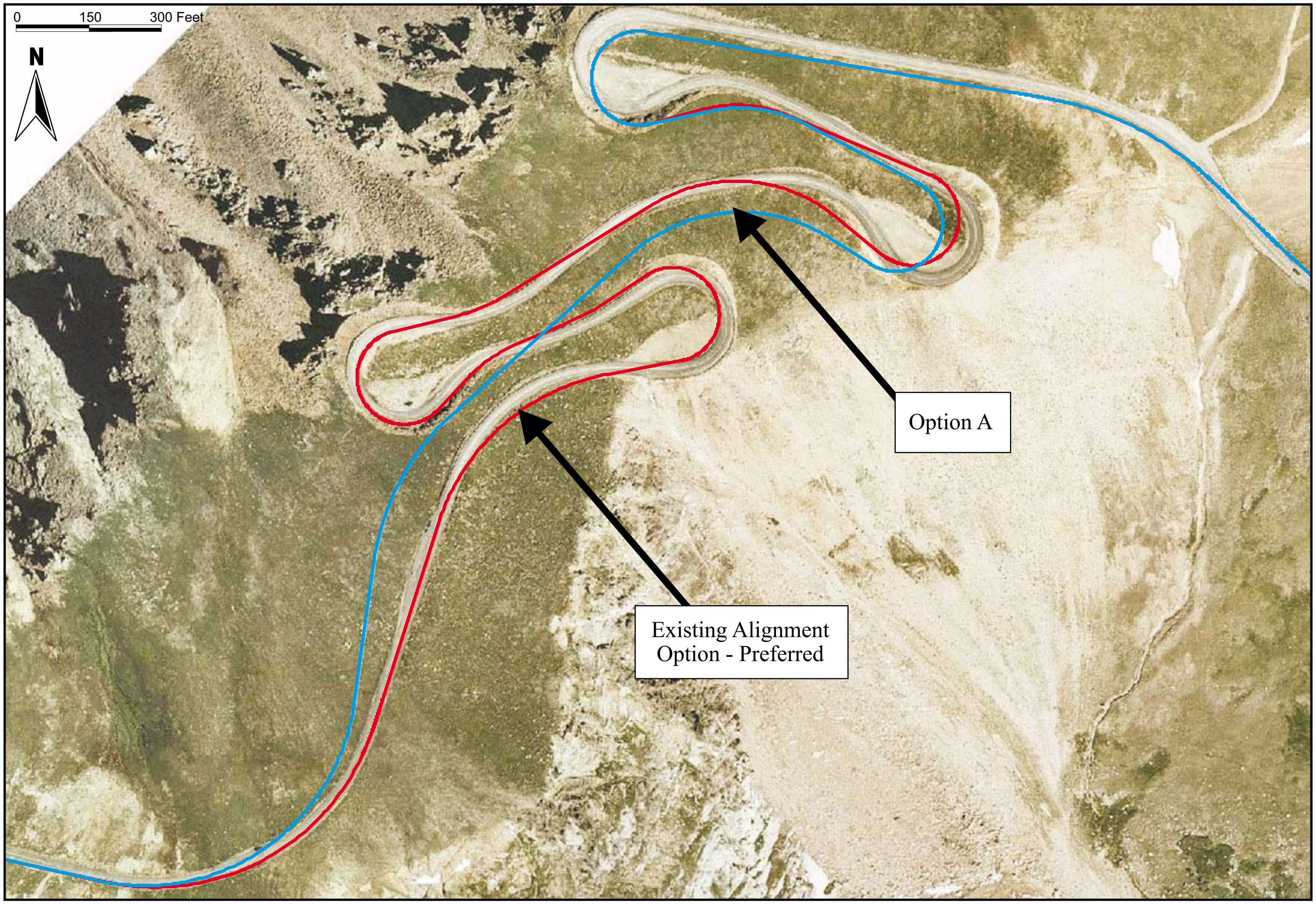
Figure 8. Options for Frozen Lake area.



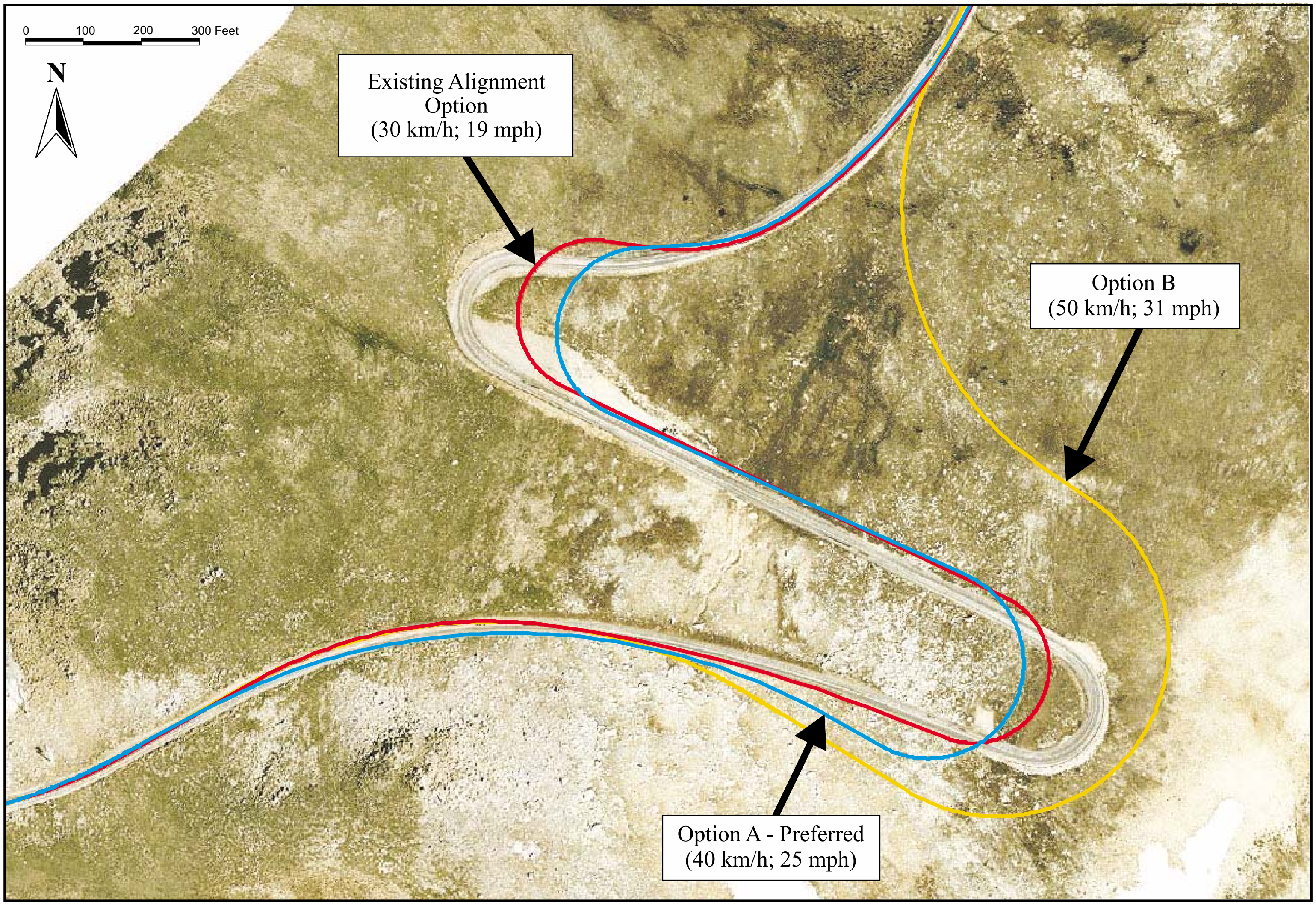
The Existing Alignment Option is the option that most closely follows the existing road alignment.

Figure 9. Options for Bar Drift area.



The Existing Alignment Option is the option that most closely follows the existing road alignment.

Figure 10. Options for Albright Curve area.



The Existing Alignment Option is the option that most closely follows the existing road alignment.

Table 5. Major components and alignment options of each alternative.

Component	Alternative 1 No Action (No Road Reconstruction)	Alternative 2 Recreation and Cultural Resource Emphasis	Alternative 3 Wildlife Resource Emphasis	Alternative 4 Highway Operations, Safety, and Maintenance Emphasis	Alternative 5 Biological Resource Emphasis	Alternative 6 Blended Emphasis (Preferred)
Roadway Width						
Total width	5.5 m (18 ft.)	9.6 m (32 ft.)	8.4 m (28 ft.)	9.6 m (32 ft.)	8.4 m (28 ft.)	8.4 m (28 ft.)[†] 9.0 m (30 ft.)
Travel lane width	2.75 m (9 ft.)	3.6 m (12 ft.)	3.6 m (12 ft.)	3.6 m (12 ft.)	3.6 m (12 ft.)	3.6 m (12 ft.)
Shoulder width	0	1.2 m (4 ft.)	0.6 m (2 ft.)	1.2 m (4 ft.)	0.6 m (2 ft.)	0.9 m (3 ft.)[†] 0.6 m (2 ft.)
Number of Pullouts	114	78	36	62	31	66
Number of Switchbacks	12	12	12	9	10	12
Disturbed Area Summary						
New disturbed area	0 ha (0 ac.)	78 ha (194 ac.)	71 ha (176 ac.)	74 ha (183 ac.)	73 ha (180 ac.)	76 ha (187 ac.)
Abandoned road sections	0 ha (0 ac.)	6 ha (14 ac.)	4 ha (9 ac.)	6 ha (14 ac.)	7 ha (16 ac.)	8 ha (19 ac.)
Estimated Construction Cost	$0	$45,700,000	$44,400,000	$50,800,000	$47,600,000	$47,800,000
Alignment Options						
Beartooth Ravine	Existing Alignment	Existing Alignment Option 40 km/h (25 mph)	Existing Alignment Option 40 km/h (25 mph)	Option B 60 km/h (37 mph)	Option A 55 km/h (34 mph)	Option A 55 km/h (34 mph)
Top of the World Store	Existing Alignment	Option B	Existing Alignment Option	Existing Alignment Option	Option A	Option A
Little Bear Lake Fen	Existing Alignment	Retaining Wall Option	Retaining Wall Option	Retaining Wall Option	Bridge Option	Bridge Option
Frozen Lake	Existing Alignment	Existing Alignment Option 40 km/h (25 mph)	Existing Alignment Option 40 km/h (25 mph)	Option A 50 km/h (31 mph)	Existing Alignment Option 40 km/h (25 mph)	Existing Alignment Option 40 km/h (25 mph)
Bar Drift (near West Summit)	Existing Alignment	Existing Alignment Option	Existing Alignment Option	Option A	Option A	Existing Alignment Option
Albright Curve (near East Summit)	Existing Alignment	Existing Alignment 30 km/h (19 mph)	Existing Alignment 30 km/h (19 mph)	Option B 50 km/h (31 mph)	Existing Alignment 30 km/h (19 mph)	Option A 40 km/h (25 mph)

Note: The existing alignment option is the new alignment that would most closely follow the road's existing alignment.
[†]The roadway width would be 9.6 m (32 ft.) (3.6 m (12 ft.) lanes with 1.2 m (4 ft.) shoulders) from the project start to the Clay Butte Lookout turnoff, 9.0 m (30 ft.) (3.6 m (12 ft.) lanes with 0.9 m (3 ft.) shoulders) from the beginning of the project to the road closure gate past Long Lake and 8.4 m (28 ft.) (3.6 m (12 ft) lanes with 0.6 m (2 ft.) shoulders) from the gate to the end of the project.

The *Purpose* section of Chapter 1 identified three needs that would be addressed by Segment 4 reconstruction:

- Support management of National Forest lands adjacent to the road, including maintaining the Scenic Byway/All-American Road qualities
- Maintain an efficient transportation link between Red Lodge, Montana and YNP that safely accommodates projected 2025 traffic
- Provide a roadway that could be reasonably maintained in a sustainable manner by a maintaining agency

The build alternatives carried forward for detailed analyses in this EIS were considered initially to meet all of these needs based on preliminary studies. However, subsequent analyses during the EIS process revealed that some of the alternatives would meet these needs better than others, and that two of the alternatives did not fulfill one or more of these needs. The No Action Alternative (Alternative 1) would not address any of the three project needs, and would not be a practicable alternative. The SNF management goals for the road are described in the *Needs Associated With Land Management Goals* section of Chapter 1. A 9.6-m (32-ft.) wide road in the western section of the project in Alternatives 2 and 4, or a combination of 9.6-m (32-ft.) and 9.0-m (30-ft.) wide road in the western section of the project in Alternative 6 would accommodate the existing and future recreational uses of the road and would support the SNF's management goals for the area. Alternatives 3 and 5, which have a narrower roadway in the western section of the project, would not support the SNF's management goals (SNF 2003) in this area and are not practicable alternatives. Specifically, the narrow shoulders proposed under Alternatives 3 and 5 would not adequately accommodate the existing and future mix of motorized and non-motorized uses of the roadway west of the road closure gate, would not adequately accommodate non-motorized uses, including bicycle and pedestrian use west of the road closure gate, and would not support the safe enjoyment of All-American Scenic Byway amenities.

All build alternatives would maintain an efficient transportation link between Red Lodge, Montana and YNP that would accommodate projected 2025 traffic. However, three of the build alternatives, Alternatives 2, 4, and 6, would safely accommodate the mix of local recreational users, such as pedestrians and bicyclists, and through trip purposes between Red Lodge, Montana and YNP. Alternatives 3 and 5, which have narrower shoulders in the western section of the project, would not accommodate this traffic mix safely. A shoulder width wider than 0.6 m (2 ft.) is needed to adequately accommodate bicyclist and pedestrian use (Figure 3).

Alternatives 2, 4 and 6 would provide a roadway that could be reasonably maintained in a sustainable manner by a maintaining agency. Alternatives 2, 4 and sections of Alternative 6 could be maintained in a more cost effective and safe manner (maneuverability of equipment, snow storage, reduced traffic conflicts, etc) because they would have a wider roadway.

2.3 Alternative 1–No Action (No Road Reconstruction)

In the No Action Alternative, the FHWA would not reconstruct Segment 4 of the Beartooth Highway, and road funds would not be expended on reconstruction. The road would remain 5.5 m (18 ft.) wide and in its existing alignment. The historic bridges would not be dismantled. The repair necessary on the bridges would not be completed. The existing 114 pullouts would remain in their same location and condition.

Maintenance responsibilities would remain with the Department of the Interior. Funding for maintenance would need to increase to maintain the road because of its deteriorated condition. Responsibility for future road maintenance would remain unresolved because of the road's operation, safety, and maintenance liabilities and because the road would not be built to a standard that could be effectively maintained. The Department of the Interior would be left with a deteriorating facility that is increasingly difficult to maintain. Alternative 1 would not fulfill the three primary needs for the reconstruction described in Chapter 1.

NEPA requires this alternative to be studied in an EIS. It serves as a baseline against which social, environmental, and economic effects of the other build alternatives are compared. Because the No Action Alternative would involve no disturbances, the No Action Alternative would address the identified major issues associated with increased disturbance, such as loss of wildlife habitat. However, issues associated with the road's existing condition, the area's economy, safety and traffic operations, maintenance and jurisdiction would not be addressed under this alternative.

2.4 DESCRIPTION OF BUILD ALTERNATIVES

The following sections discuss the five build alternatives analyzed in detail in this EIS. Each alternative has one of the options considered for each of the six realignment areas. The emphasis of each alternative also is discussed.

In each alternative discussion, the estimated construction cost of each alternative is presented. The estimated cost is for planning purposes and would be refined during final design. The FHWA currently has Congressional appropriations totaling about $20 million dollars in High Priority Program funds that were allocated for reconstruction of Segment 4 in the Transportation Equity Act for the 21st Century. This funding may be sufficient to complete reconstruction from the project beginning near Clay Butte Lookout turnoff to just past the Long Lake bridge. The first phase of the project would be reconstructed in the first 3 years of construction currently planned for 2005 through 2007. Additional funding would be necessary to complete reconstruction of the second phase of the proposed project from the Long Lake Bridge to the Montana/ Wyoming state line at KP 69.4. The second project phase would be constructed in 2008 through 2010.

Alternative 2–Recreation and Cultural Resource Emphasis

Alternative 2 has a recreation and cultural resource emphasis. This alternative is designed to address the recreation and land management issues by accommodating recreation uses along the corridor more than other alternatives. The road would be widened to 9.6 m (32 ft.) throughout its length to provide a 1.2 m (4-ft.) shoulder for bicyclists and pedestrians. A 1.2 m (4-ft.) shoulder is recommended to accommodate bicycle and pedestrian use, but would be too narrow to be a designated bike lane. A wider shoulder would also provide additional lateral clearance for recreational vehicles. Because the options with the slowest design and operating speeds would be used, Alternative 2, as well as Alternative 3, would have the most design exceptions.

Alternative 2 also has a cultural resource emphasis. Except in the Top of the World Store area, Alternative 2 includes the options that most closely follow the existing alignment, minimizing changes to the historic road alignment. The road would deviate from the existing alignment in the Top of the World Store area and preserve Little Bear Creek bridge #2. The bridge would not be removed and would remain in its present location, providing an opportunity to view a historic structure. Closely following the existing alignment also would address wildlife and vegetation issues. As shown in Figure 11, Alternative 2 would have the following alignment options; design speeds are shown in parentheses:

- Beartooth Ravine Existing Alignment Option (40 km/h; 25 mph)
- Top of the World Store Option B (60 km/h; 37 mph)
- Little Bear Lake Fen Retaining Wall Option (60 km/h; 37 mph)
- Frozen Lake Existing Alignment Option (40 km/h; 25 mph)
- Bar Drift Existing Alignment Option (30 km/h; 19 mph)
- Albright Curve Existing Alignment Option (30 km/h; 19 mph)

(All figures showing the alternatives are presented beginning on p. 49 after the discussion of Alternative 6.) Only one new alignment—at the Top of the World Store—would be part of this alternative. This option was used in this alternative because it would have the slowest operating speeds through this road section and it would not require dismantling Little Bear Creek bridge #2.

As with all build alternatives, informal vehicle pulloffs on the road shoulder would be accommodated safely. In this alternative, however, the incorporation of the greatest number of formal pullouts (78) to permit the viewing of scenic areas would provide travelers an opportunity to safely pull completely off the road to sightsee or recreate. Recreation-related pedestrian use of the road shoulder, especially in the vicinity of pullouts, is better accommodated by this alternative due to the 1.2-m (4-ft) wide shoulder. In all build alternatives, the size, number and location of pullouts may be modified during final design in cooperation with the SNF and other resource agencies. The estimated construction cost of Alternative 2 is $45,700,000.

Alternative 3–Wildlife Resource Emphasis

Alternative 3 is similar to Alternative 2, but has a wildlife resource emphasis. To minimize habitat disturbance, the road would be widened to 8.4 m (28 ft.) throughout its length, with no new alignments. Generally, the options with the slowest design and operating speeds and least amount of disturbance would be used. Like Alternative 2, it would have the most design exceptions. As shown in Figure 12, Alternative 3 would have the following alignment options:

- Beartooth Ravine Existing Alignment Option (40 km/h; 25 mph)
- Top of the World Store Existing Alignment Option (60 km/h; 37 mph)
- Little Bear Lake Fen Retaining Wall Option (60 km/h; 37 mph)
- Frozen Lake Existing Alignment Option (40 km/h; 25 mph)
- Bar Drift Existing Alignment Option (30 km/h; 19 mph)
- Albright Curve Existing Alignment Option (30 km/h; 19 mph)

To minimize disturbance, this alternative would have 36 pullouts at the most common viewing locations, and pullouts would be smaller compared to some of the other alternatives. The estimated construction cost of Alternative 3 is $44,400,000.

Alternative 4–Highway Operations, Safety, and Maintenance Emphasis

Alternative 4 is designed primarily to address highway operations, safety, and maintenance by having options that emphasize efficient and safe travel and ease of maintenance. Alternative 4 would have a 9.6-m (32-ft.) roadway width throughout Segment 4. A 1.2-m (4-ft.) shoulder would be wide enough to be used by bicyclists and pedestrians. The alignment options with the highest design and operating speeds would be used. Alternative 4 would have the fewest design exceptions. In total, 62 pullouts would be provided. The estimated construction cost of Alternative 4 is $50,800,000. As shown in Figure 13, Alternative 4 would have the following alignment options:

- Beartooth Ravine Option B (60 km/h; 37 mph)
- Top of the World Store Existing Alignment Option (60 km/h; 37 mph)
- Little Bear Lake Fen Retaining Wall Option (60 km/h; 37 mph)
- Frozen Lake Option A (50 km/h; 31 mph)
- Bar Drift Option A (30 km/h; 19 mph)
- Albright Curve Option B (50 km/h; 31 mph)

Alternative 5–Biological Resource Emphasis

Alternative 5 is designed to minimize disturbance to wetlands and fens, riparian areas, sensitive plants, and wildlife species that depend on these habitats. The road would be widened to 8.4 m (28 ft.) throughout its length. Alternative 5 would have the fewest number of pullouts (31) of any of the alternatives. This alternative would have design exceptions and new realignments that minimize wetland impacts or permit restoring wetland areas impacted by the original road alignment. The estimated construction cost of Alternative 5 is $47,600,000. As shown in Figure 14, Alternative 5 would have the following alignment options:

- Beartooth Ravine Option A (55 km/h; 34 mph)
- Top of the World Store Option A (60 km/h; 37 mph)
- Little Bear Lake Fen Bridge Option (60 km/h; 37 mph)
- Frozen Lake Existing Alignment Option (40 km/h; 25 mph)
- Bar Drift Option A (30 km/h; 19 mph)
- Albright Curve Existing Alignment Option (30 km/h; 19 mph)

Alternative 6–Blended Emphasis (Preferred)

Alternative 6 has been identified as the preferred alternative because it fully meets all three needs for the project, and best balances safety, maintenance, land management, and traffic operation needs with avoidance and minimization of environmental impacts. A final selection of a preferred alternative will not be made until the issuance of a Record of Decision, no sooner than 30 days after publication of the Final EIS.

In the Draft EIS, the preferred alternative (Alternative 6) had a proposed roadway width of either 8.4 m (28 ft.) on the eastern section and 9.6 m (32 ft.) wide on the western section. The roadway consisted of two 3.6 m (12 ft.) lanes with two 1.2 m (4 ft.) shoulders west of the road closure gate, and two 3.6 m (12 ft.) lanes with two 0.6 m (2 ft.) shoulders east of the road closure gate. In response to comments on Alternative 6, the shoulder width between the Clay Butte Lookout turnoff and the road closure gate was reduced to 0.9 m (3 ft.) to further minimize environmental impact.

While the alignment proposed for Alternative 6 did not change between the Draft EIS and this Final EIS, the preferred option for the Little Bear Lake Fen changed from the Retaining Wall Option to the Bridge Option. No other alignment changes were made to the preferred alternative. As shown in Figure 15, Alternative 6 would include the following alignment options:

- Beartooth Ravine Option A (55 km/h; 34 mph)
- Top of the World Store Option A (60 km/h; 37 mph)
- Little Bear Lake Fen Bridge Option (60 km/h; 37 mph)
- Frozen Lake Existing Alignment Option (40 km/h; 25 mph)
- Bar Drift Existing Alignment Option (30 km/h; 19 mph)
- Albright Curve Option A (40 km/h; 25 mph)

Alternative 6 would have 66 pullouts that would access popular recreational or scenic amenities while also providing adequate sight distance and safety features. The estimated construction cost of Alternative 6 is $47,800,000. The reasons why the various elements and options of Alternative 6 are preferred are discussed in the following section.

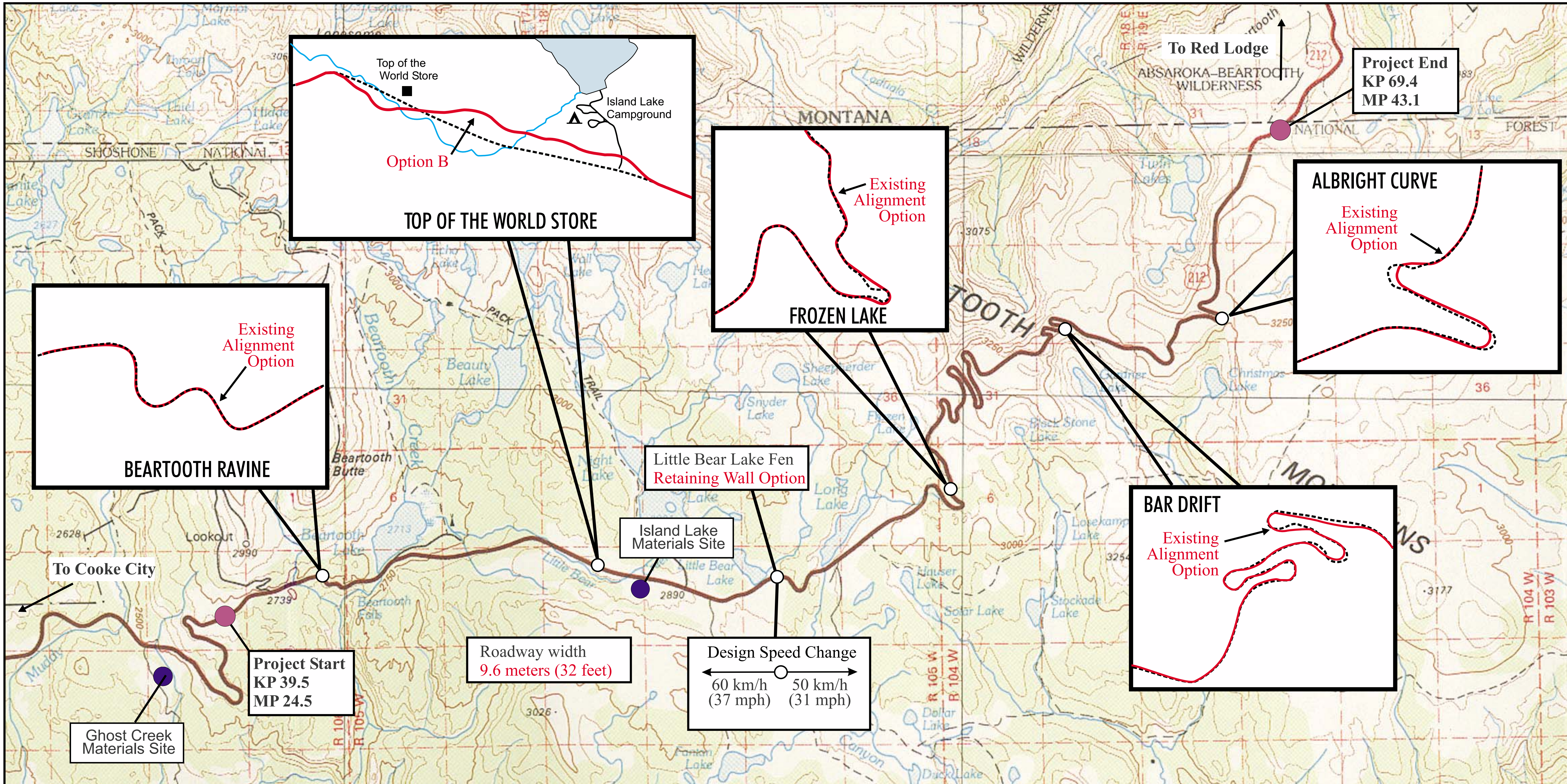
Rationale for the Preferred Alternative

Accommodating Land Management Goals. The SNF management of the corridor emphasizes rural and roaded 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. Although the entire road corridor is in the same Management Area, the SNF manages Segment 4 for two distinct types of road use. The SNF manages the section west of Long Lake for more intensive recreational activity, including pedestrian and bicycle use. All of the developed recreation sites along the road are found west of Long Lake. The two campgrounds along Segment 4, Beartooth Lake and Island Lake, are popular camping locations and provide access to area lakes.

Wilderness trails originate at both Beartooth Lake and Island Lake campgrounds. Because of their proximity to the road, Beartooth Lake and Long Lake are frequent stopping spots for tourists. Top of the World Store, the only location offering supplies, is between Island Lake and Beartooth Lake.

In the western section, travelers are more likely to stop along the road shoulder, use bicycles, motorcycles, and all-terrain vehicles in family groups and engage in roadside viewing and related activities. These activities involve frequent stops, slow moving motorized and non-motorized vehicles and a variety of user ages. To minimize environmental impact, the SNF, in cooperation with the FHWA and other SEE team members, agreed a 0.9-m (3-ft.) shoulder would meet the recreation use needs and adequately provide for safety from the Clay Butte Lookout turnoff to the road closure gate. Alternatives that would have shoulders narrower than 0.9 m (3 ft.) in the western section are not practicable alternatives. The needs associated with wider shoulders west of the road closure gate are discussed in detail in the *Needs Associated with Land Management Goals* section in Chapter 1.

The incidence of family group activities, bicycles, and road side stops and other day-use activities diminishes significantly east of Long Lake (SNF 2001a). The steep terrain, lack of trees for shelter, steep road grade, lack of camping facilities, and frequent, severe, and cold weather at all times of



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- - - - - - - Existing road
—— Proposed alignment
● Materials source
● Project start and end

The existing alignment option is the option that most closely follows the existing road alignment.

NORTH
Scale: 1:100,000
½ mile 0 1 mile
½ km 0 1 kilometer

Figure 11
Major Components of Alternative 2
Recreation and Cultural Resource Emphasis

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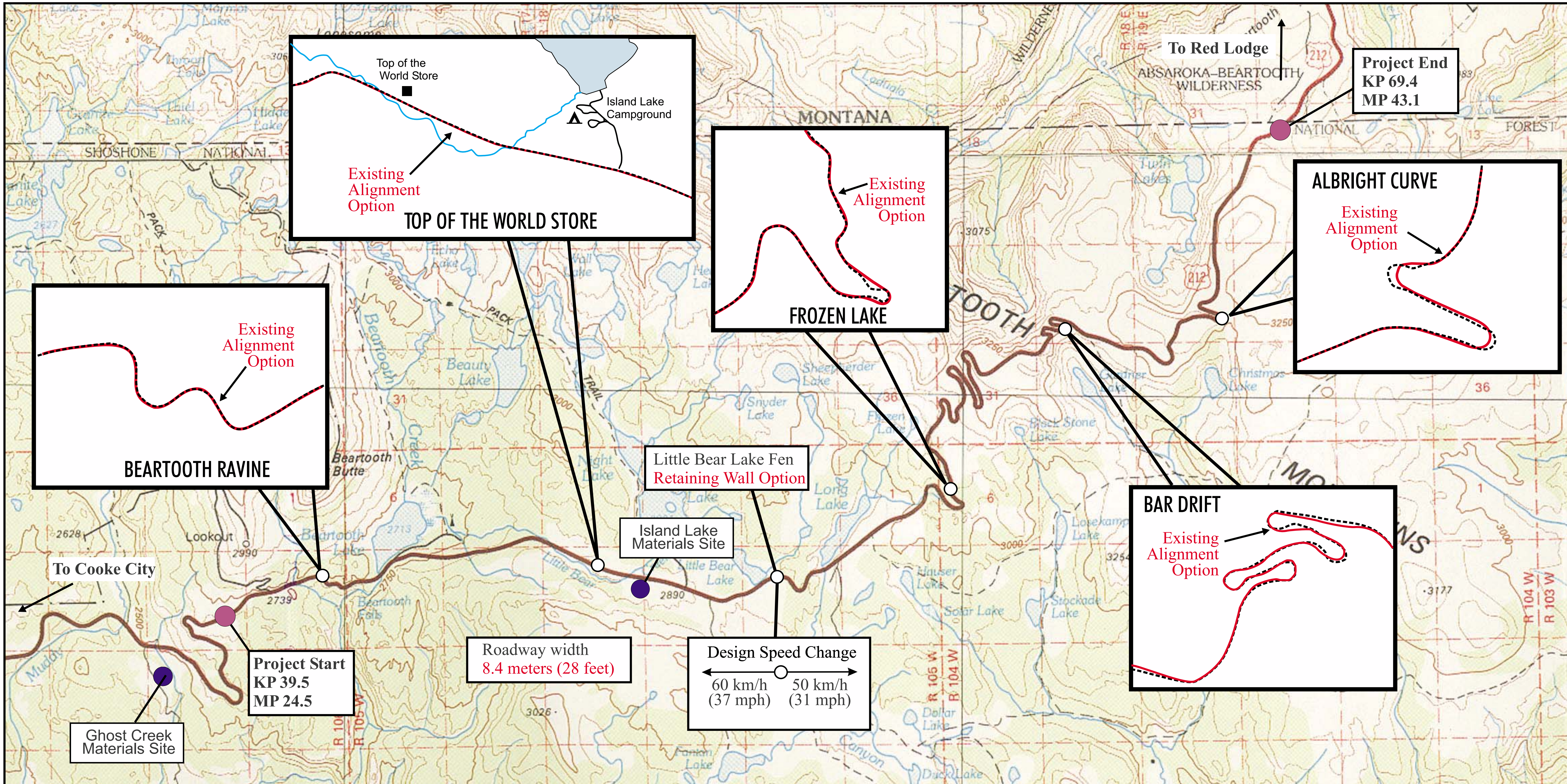

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- - - - Existing road
— Proposed alignment
● Materials source
● Project start and end

NORTH
Scale: 1:100,000
½ mile 0 1 mile
½ km 0 1 kilometer

Figure 12
Major Components of Alternative 3
Wildlife Resource Emphasis

The existing alignment option is the option that most closely follows the existing road alignment.

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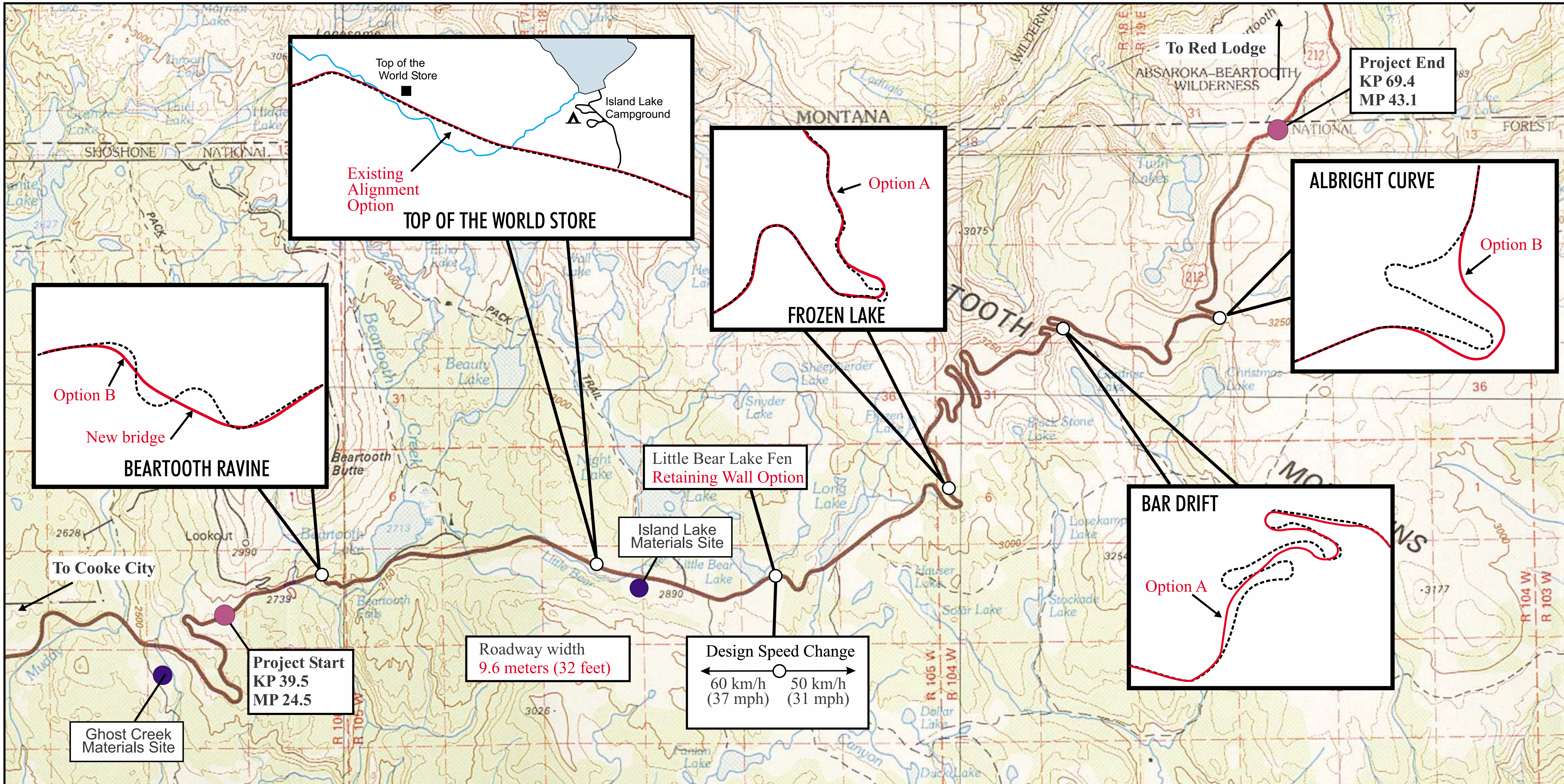

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- - - - Existing road
—— Proposed alignment
● Materials source
● Project start and end

The existing alignment option is the option that most closely follows the existing road alignment.

NORTH

Scale: 1:100,000

½ mile 0 1 mile

½ km 0 1 kilometer

Figure 13
Major Components of Alternative 4
Highway Operations, Safety and Maintenance Emphasis

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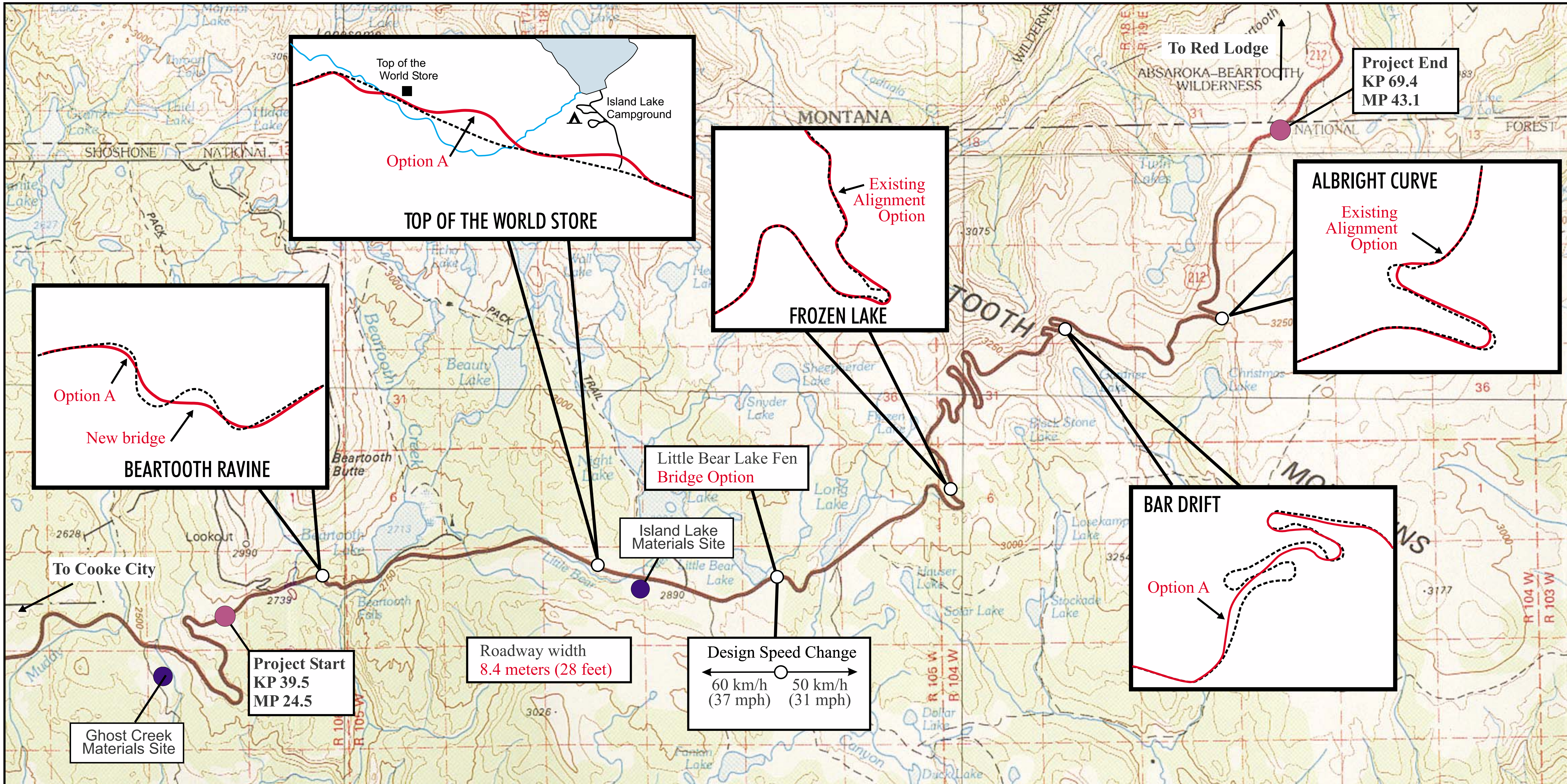

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------- Existing road
Proposed alignment
Materials source
Project start and end

The existing alignment option is the option that most closely follows the existing road alignment.

NORTH
Scale: 1:100,000
½ mile 0 1 mile
½ km 0 1 kilometer

Figure 14
Major Components of
Alternative 5
Biological Resource Emphasis

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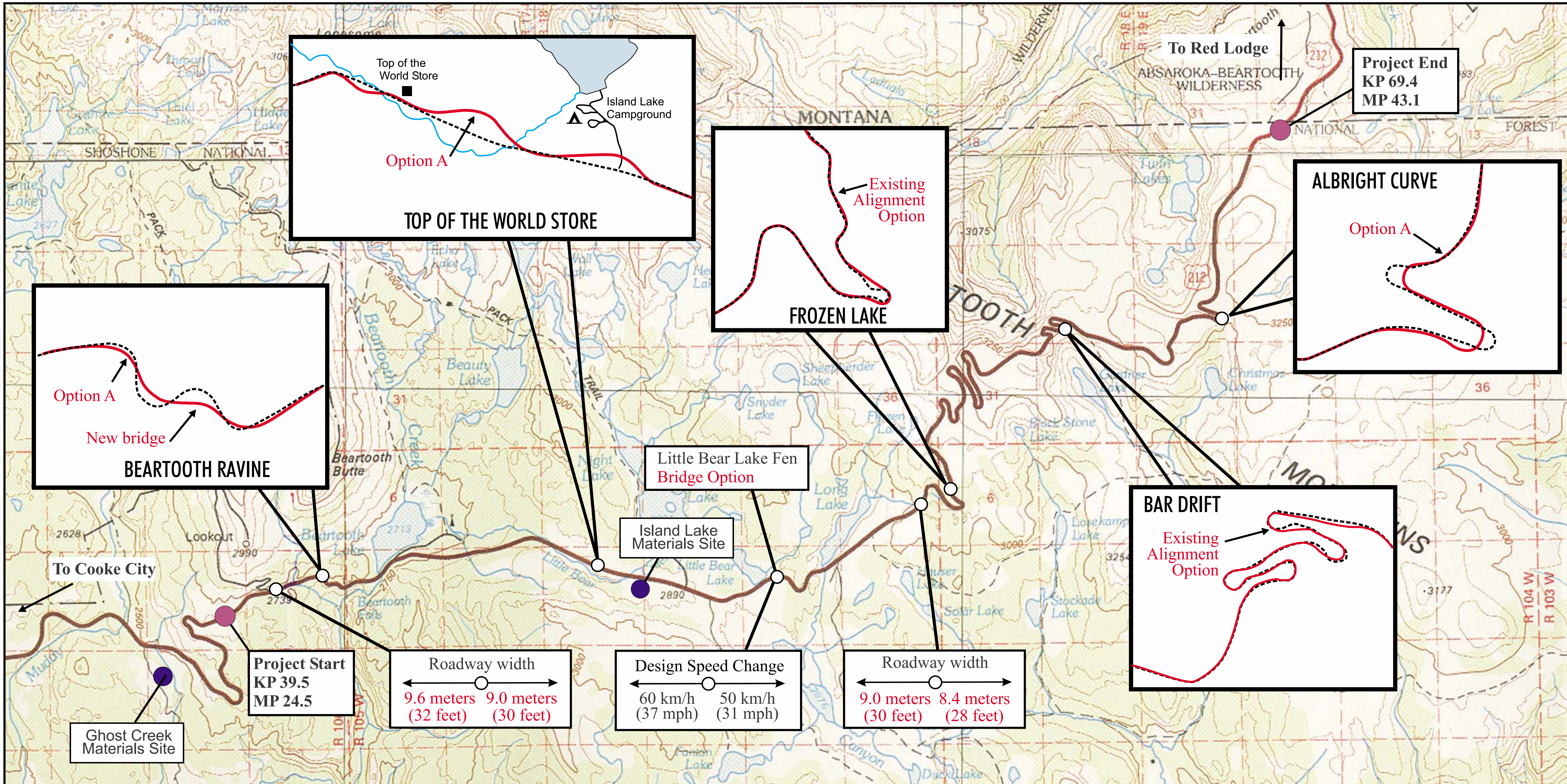

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Fax: 830-1199

- - - - Existing road
— Proposed alignment
● Materials source
● Project start and end

The existing alignment option is the option that most closely follows the existing road alignment.

NORTH

Scale: 1:100,000

1/2 mile 0 1 mile

1/2 km 0 1 kilometer

Figure 15
Major Components of
Alternative 6
Blended Emphasis (Preferred)

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the year limit road use east of Long Lake primarily to driving and viewing. The SNF discourages over-snow recreation east of Long Lake due to frequent hazardous snowstorms. Because of the more limited roadside activities in the eastern section of the project, wider shoulder widths are less essential. A narrower shoulder width in the alpine (eastern) section would balance recreational uses, and safety and traffic operations with minimizing environmental effects in the alpine section.

The preferred alternative would maintain the character and scenic qualities of the existing road. The curvilinear nature of the road would be maintained in the preferred alternative. The characteristics of setting, feeling, and location of the switchbacks would be preserved. The proposed alignment near Top of the World Store would eliminate the existing straight section and would be a more scenic drive. Pullouts and parking areas would be better designed and located, and would provide the opportunity to safely enjoy the spectacular scenery, area lakes and streams, and alpine vegetation and wildlife. The extensive landscaping and revegetation proposed for the foreslopes and other disturbances would reestablish the roadside vegetation.

Accommodating Projected Traffic. The preferred roadway width is 9.6 m (32 ft.) from the beginning of the project to the Clay Butte Lookout turnoff, then 9.0 m (30 ft.) to the road closure gate, and 8.4 m (28 ft.) east of the road closure gate. The width of each travel lane (3.6 m [12 ft.]) would be the same throughout, but the shoulder width would vary. In the western section, the preferred shoulder width is 1.2 m (4 ft.) up to the Clay Butte Lookout turnoff, and 0.9 m (3 ft.) from there to the road closure gate. East of the road closure gate, the preferred shoulder width is 0.6 m (2 ft.).

Accommodating Maintenance Needs. The proposed roadway width would accommodate the needs associated with maintenance. The wider travel lanes and shoulders would provide a roadway that would be more easily and safely maintained by a maintaining agency. A wider roadway would make snowplowing safer, and would provide for snow storage.

The proposed roadway width would accommodate a future road surface overlay with minimal environmental impact. Specifically, the proposed roadway design: 1) provides a shoulder width that would either not be narrowed or narrowed minimally with any future resurfacing; 2) provides a foreslope ratio that would minimize or avoid the amount of work required on the foreslope and not require reconstructing ditches and cut/fill slopes during future resurfacing; and, 3) maintains adequate future foreslope ratios for recovery of errant run-off-the-road vehicles.

A foreslope with a fixed or constant width of 2.4 m (8 ft.) is preferred primarily because it would accommodate a future overlay of 50 mm (2 in.) without disturbing the revegetated foreslopes in the alpine area and would not result in a paved taper that would be too steep for errant vehicle recovery after the overlay. In the typical section in the eastern section of the road, the foreslope would have a slope of 1:6.9. An overlay of 50 mm (2 in.) would extend down to the taper of the old asphalt and not affect the revegetated foreslope (Figure 16). Not disturbing the revegetated foreslope in the alpine area is important because revegetation and subsequent plant succession of the foreslopes in the alpine area is expected to be slow. One purpose of the project is to be able to complete an overlay in 20 years without disturbing the revegetated slopes. Foreslopes of 1:6 or 1:4 would not accommodate an overlay without disturbing the revegetated foreslopes (see *Foreslope Options*, p. 94).

A 2.4 m (8 ft.) foreslope would also be easier to construct and provide a more uniform roadway cross section. When coupled with a 0.6 m (2-ft.) shoulder, a 2.4 m (8 ft.) foreslope would not require any additional clearing to meet the minimum clear zone of 3 m (10 ft.). The preferred 2.4 m (8 ft.) foreslope is discussed in greater detail in *Roadway Cross Sections* section, p. 63.

Beartooth Ravine

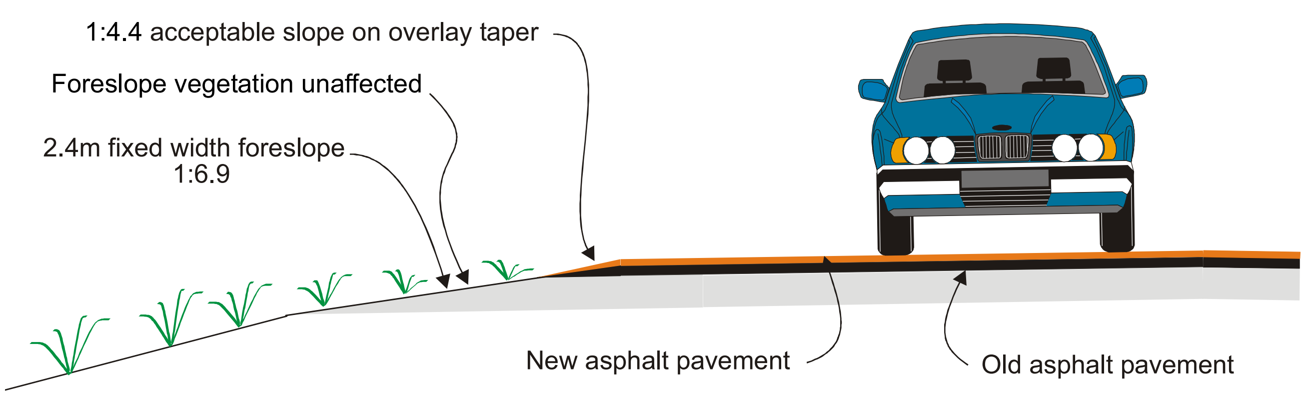
The preferred option at Beartooth Ravine is Option A, a new bridge with a design speed of 55 km/h (34 mph) (Figure 5). The primary reason for using a bridge at Beartooth Ravine in the Preferred Alignment is safety. The design speed in the section that includes the Beartooth Ravine is 60 km/h (37 mph). Although the 55 km/h (34 mph) bridge would be a design exception to this design speed, Option A would require less of a speed change than the 40 km/h (25 mph) Existing Alignment Option. Consequently, accident rates are expected to be lower than the Existing Alignment Option (see Traffic Accident Study, MK Centennial Engineering Inc. 2002). The Beartooth Ravine area was the location of about 25 percent of the reported accidents along the road, with unsafe speed cited as a cause in 60 percent of the accidents in this area. The existing curves in the Beartooth Ravine require a sudden speed reduction, and do not meet driver's expectations.

The bridge in Option A would be more easily constructed and would disturb less area than a bridge in Option B or the retaining walls needed in the Existing Alignment Option. Ease of construction includes factors such as construction safety, traffic control during construction, structure complexity, and construction duration.

The environmental effects of the three options considered at the Beartooth Ravine would be similar. An environmental advantage of Option A and B would be better accommodation of wildlife movement by providing a bridge that would allow movement beneath. Abandoned road sections would be graded to match existing grades and revegetated. A parking area is proposed at the location of the existing pullout, and would incorporate some of the abandoned road at this location.

Option A would best balance safety and traffic operations with environmental protection. The estimated construction cost of the preferred Option A at 9.0 m (30 ft.) is $10.3 million. The estimated construction cost of the Existing Alignment Option is $6.2 million, and $10.9 million for Option B (Appendix E).

Figure 16. Overlay on a 2.4 m fixed width foreslope on the typical section for the alpine section.



Top of the World Store

Option A at the Top of the World Store (Figure 6) was selected to minimize wetlands impact. Option A would affect less wetlands and riparian areas than the other two options. Option A also would offer the opportunity to restore four different wetlands affected by the existing road, more than the other two options. Because of the favorable climatic and moisture conditions at Top of the World Store area, the likelihood of successful wetland restoration and revegetation of abandoned road sections is high compared to areas at higher elevations.

Option A would best address the flooding and icing problems associated with the Little Bear Creek bridge #1 by providing a bridge alignment perpendicular to Little Bear Creek. Because Option A would have more curves than the other two options considered, it would have the slowest operating speeds, which is more consistent with adjacent sections, and provide a "sinuosity" of driving experience and viewing consistent with the driving-for-pleasure management objective of the SNF. The estimated construction cost of the preferred Option A at 9.0 m (30 ft.) is $3.9 million. The estimated construction cost of the Existing Alignment Option is $5.8 million, and $5.0 million for Option B (Appendix E).

Little Bear Lake Fen

The preferred option at Little Bear Lake fen is the Bridge Option (Figure 7). The Bridge Option would be constructed on piers or pilings placed in the existing road fill without filling into the adjacent fen, and the hydrology supporting the fen prior to road construction would be restored. The fill adjacent to the retaining walls would be removed if possible and restored to a wetland. Both the Retaining Wall and Bridge options would have similar environmental effect and cost, with the estimated construction cost of the Bridge Option being $0.5 million more (Appendix E).

Frozen Lake and Bar Drift

At these two locations, the Existing Alignment Option is the preferred option. At both locations, the alignment would closely follow the existing road, and would maintain the curvilinear road character. The design speed of the curves would be similar to the existing design speeds.

At the Frozen Lake switchback (Figure 8), the new alignment would diverge from the existing alignment at the switchback to increase sight distance. The abandoned road section may be used as a parking area or pullout. At Frozen Lake, the Existing Alignment Option would disturb less area and have less environmental impacts than Option A. Disturbance of wetlands and existing rock cuts would be minimized.

Because it is longer, the Existing Alignment Option at the Bar Drift (Figure 9) would disturb 1.5 ha (3.8 ac) more alpine meadows between the switchbacks than Option A, and require more revegetation. Option A at the Bar Drift would abandon 0.8 ha (1.9 ac.) of existing roadway. No existing road sections would be abandoned in the Existing Alignment Option. Revegetation at the Bar Drift with either option would be difficult.

In the Bar Drift Option A, eliminating two switchbacks would shorten the road. The steeper grade (7%) necessary to produce this shortened alignment, however, would present safety concerns for vehicles during snowy or icy conditions. The Existing Alignment Option at the Bar Drift would also continue to support the curvilinear driving experience characterizing the Beartooth Highway and provide continued opportunities for snow play activities that occur in the Gardner headwall area. To accommodate visitor use, a parallel parking area would be built at the easternmost switchback (see Figure G-4).

The estimated construction cost of the Existing Alignment Option at Frozen Lake at 8.4 m (28 ft.) is $2.4 million, similar to Option A. The estimated construction cost of the Existing Alignment Option at Bar Drift is $1.7 million, about $0.5 million more than Option A (Appendix E).

Albright Curve

The preferred alternative at Albright Curve is Option A, which would have a design speed of 40 km/h (25 mph) (Figure 10). The design speed in the section that includes the Albright Curve is 50 km/h (31 mph). Although Option A would be a design exception, it would require less of a speed change than the 30 km/h (19 mph) Existing Alignment Option. Option B would affect a small fen; Option A would not affect any of the fens in the area. To accommodate visitor use, parking areas would be built in the abandoned road sections of both switchbacks. Option A best balances safety and traffic operations with avoidance and minimization of environmental impacts. The estimated construction cost of Option A is $1.5 million. The other two options were $0.1 million to $0.2 million less.

2.5 Activities and Facilities Common to All Build Alternatives

Continued Agency and Public Involvement

In all build alternatives, coordination and field reviews would continue after the release of the Record of Decision and as the design progresses. To address public concerns about the proposed reconstruction in the alpine section east of the road closure gate, the FHWA would hold an open house for the interested public after the 30 percent design field review of the upper section. At the open house, information about techniques to avoid or minimize impacts would be discussed. The public would be provided the opportunity to sign-up to attend a field review the following day to review specific locations along the corridor where the minimization techniques are proposed. Then, after the 70 percent design field review of the upper section, the FHWA would conduct another public open house demonstrating how the public comments received at the 30 percent design level were evaluated for incorporation into the design.

Because of the sensitive environmental setting of the road and the anticipated complexity of the construction, the selection of a highway contractor and oversight of their operations would be a critical component of the success of any build alternative. The FHWA would use a contracting technique called “Best Value Procurement,” which allows the FHWA to award the construction project to a contractor on the basis of selected rating criteria rather than simply low bid. Selection criteria, such as compliance with environmental commitments and performance on past projects of a similar nature, can be considered with Best Value Procurement. The FHWA has used this contracting technique successfully in Yellowstone National Park and Rocky Mountain National Park. The FHWA would involve partner agencies in developing contractor selection criteria, reviewing contractor qualifications, and in making recommendations for contractor selection.

Working with the SEE Team, the FHWA would develop environmental training for the selected contractor. The training would cover topics such as minimizing grizzly bear and human conflicts, minimizing disturbance to roadside wetlands and fens, salvaging and replacing topsoil, and implementing the landscaping and revegetation techniques. The training would be required for all contractor and subcontractor personnel.

The FHWA would have an on-site construction Project Engineer, as the Contracting Officer's representative, responsible for overseeing the construction contract and ensuring the environmental commitments described in Chapter 4 are fulfilled. The FHWA also would fund a seasonal full-time environmental compliance position through the SNF to assist the FHWA Project Engineer in monitoring all contractors' operations. An FHWA representative with experience in landscape architecture and revegetation also would be available on-site to coordinate implementation of the landscaping and revegetation plan, and direct contractor operations through the FHWA Project Engineer, as required. A construction partnering agreement would be developed among the FHWA, SNF, NPS, and other interested agencies that would describe agency communication and coordination to be followed to progress construction work in a responsive and efficient manner and to resolve conflicts arising during construction.

During construction, the FHWA, in conjunction with the SEE Team, would conduct one or more project site visits to observe contractors' compliance with the environmental commitments made in this document. After Phase I of the project is completed in 2007, the FHWA would convene the SEE Team to review and discuss their observations of the Phase I construction project. The SEE Team would identify any social, economic, or environmental problems or issues associated with Phase I construction and recommend appropriate modifications to Phase II construction methods or procedures.

Roadway Cross Sections

Most of the road would be reconstructed using the typical section (Figure 2). The paved roadway would be either 8.4 m (28 ft.), 9.0 m (30 ft.), or 9.6 m (32 ft.), or a combination of these widths. In the typical section, the ditches would not be paved, but would be graded to control runoff. The ditches would be 1.8 m (6 ft.) wide beyond the foreslope on a slope of 1:6. Ditches would be constructed of native soil material and would be revegetated.

In the typical section, the foreslope would be 2.4-m (8-ft.) wide, with a varying slope ratio. Foreslope construction would be required in all areas without a paved ditch. Where paved ditches are proposed, a foreslope would not be required, reducing construction impacts. Paved ditch sections would have a curb, which would act as a barrier to vehicles. In guardrail areas, a steeper foreslope (typically 1:2) is proposed to minimize impacts because a barrier (guardrail) would prevent errant vehicles from leaving the road.

An area cleared of trees and larger rocks, called a clear zone, would be maintained in all areas without guardrail or paved ditch. The clear zone would be 3 m (10 ft.) from the white stripe at the edge of the travel lane. The shoulder and foreslope generally would provide sufficient clear zone, and additional clearing to provide a clear zone would not be necessary, except in high hazard locations where large fixed objects, such as boulders, would be adjacent to the clear zone. The FHWA anticipates additional clearing at such locations would be minimal and would be evaluated during final design.

Two other sections, paved ditch and retaining wall, would be used at selected locations where warranted. Paved ditches would be used at locations where they currently exist and where there is existing evidence of ditch erosion problems, or to minimize environmental impact (see paved ditch depicted on right edge of Figure 17 and Figure 18). Paved ditches would be 1.5 m (5 ft.) wide beyond the roadway shoulder on a slope of 1:8 or 1:10. Steeper ditches than proposed would reduce ditch capacity and may result in flows overtopping the ditch.

In steep fill, retaining wall, or other hazardous locations, a guardrail section (Figure 17) would be used to prevent errant vehicles from leaving the road. Guardrails would be placed on the fill side 0.6 m (2 ft.) from the shoulder's edge. The length of guardrail section would vary with the alternative.

A retaining wall section would be used where it would be necessary to elevate or widen the road and a fill slope used in the typical section could not be used (Figure 18). Preliminary design indicates a mechanically stabilized earthen wall would be the best wall type. Final retaining wall types would be determined during final design in cooperation with the SEE team.

Techniques to Avoid and Minimize Impacts

In developing the preliminary design, the FHWA used environmental resource information and mapping of features such as wetlands, fens, and wildlife crossings to shift the alignment or to modify the roadway design to avoid and minimize impacts. The FHWA held numerous field reviews and meetings with the cooperating agencies and regulatory agencies to review and modify the alternative alignments and roadway design. The proposed build alternatives are the result of several iterations of design refinements based on the resource information, mapping and field reviews. For example, all identified wildlife crossings were reviewed in the field, and changes to the fill slope, guardrail, and other roadway elements were made to better accommodate and enhance existing animal crossings.

The following avoidance and minimization techniques have been applied to all build alternatives to the extent possible at current level of design, and would continue to be applied as the project progresses through final design, to reduce environmental impacts:

- Shifting alignment to affect only one side of the road
- Using existing disturbed areas
- Reducing shoulder widths
- Using design criteria exceptions
- Using paved ditches
- Using retaining walls
- Using slope exceptions
- Reducing foreslope widths
- Adjusting pullouts and parking area locations

Shifting Alignment to Affect Only One Side of Road. The existing cut and fill slopes along the road have not been disturbed since the road was originally constructed in the 1930s. In most locations, the slopes have successfully revegetated, providing slope stability and reducing wind and water erosion. To avoid re-disturbing revegetated areas, the FHWA has designed the roadway so the disturbance is limited to one side of the road as much as possible (Figure 19; all figures for this section begin on page 68). By affecting only one side of the road, new disturbance would be minimized. At the current design stage, the technique of shifting the alignment to affect only one side of the road has been implemented on 38 percent, or 11.1 km (6.9 mi.) of roadway.

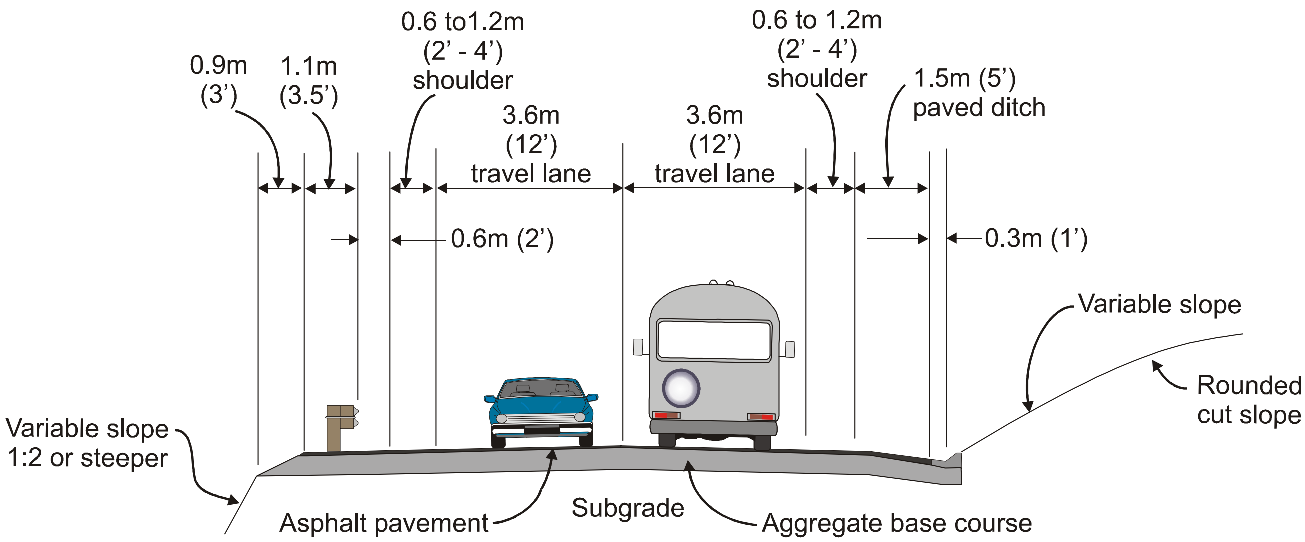


Figure 17. Guardrail section.

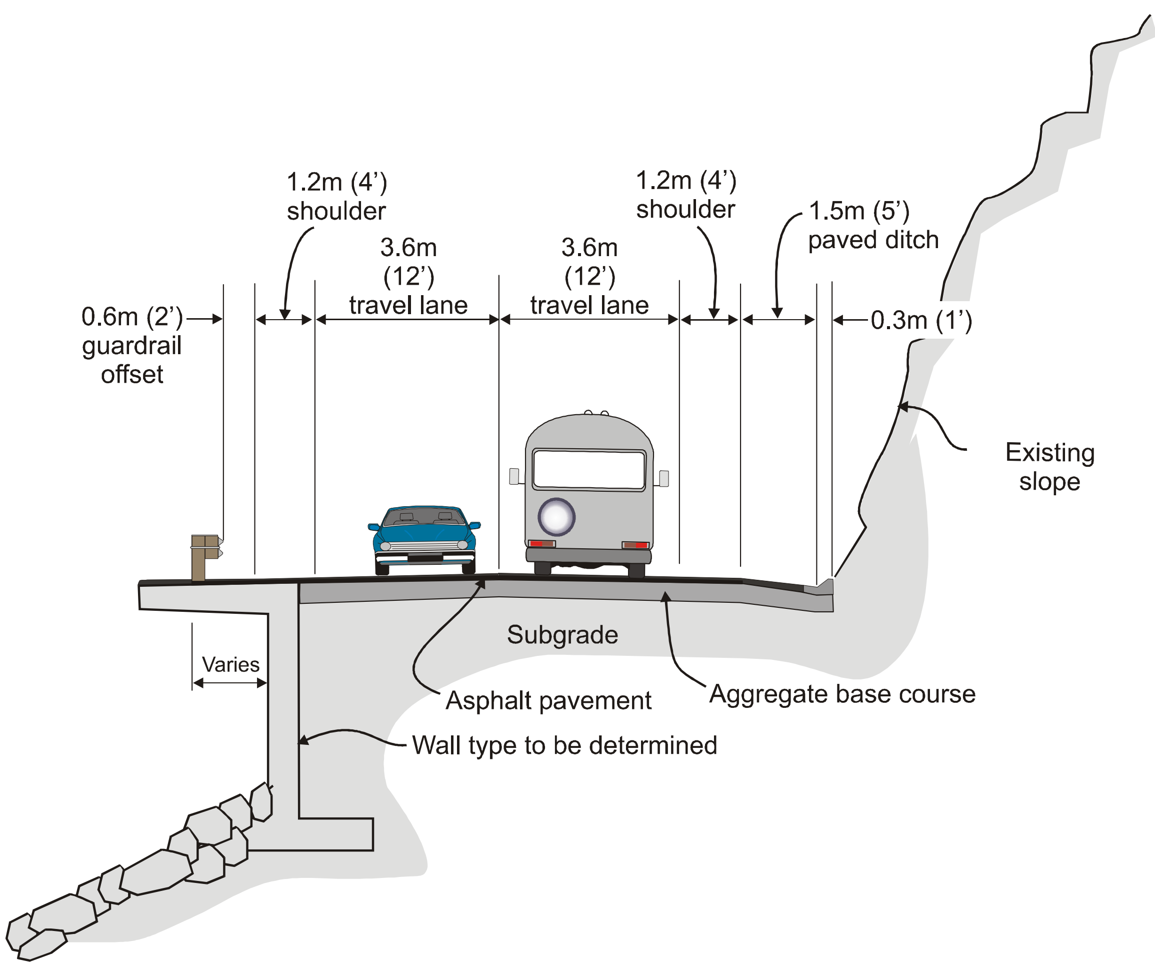


Figure 18. Retaining wall section.

Using Existing Disturbed Areas. Another technique to minimize new disturbance is to shift the alignment to ensure the new road disturbance encompasses the entire existing road disturbance. Instead of creating a new disturbance on one side of the road, and leaving sections of the existing disturbance unaffected, the road alignment is shifted to include the entire existing disturbance (Figure 20). At the current design stage, the technique of shifting the alignment to use existing disturbed areas was implemented on 52 percent, or 14.9 km (9.29 mi.) of roadway.

Reducing Shoulder Width. The proposed shoulder widths were minimized on all sections to reduce the environmental impact. AASHTO recommends a 1.8 m (6 ft.) shoulder width. The proposed shoulders were reduced to 0.9 m (3 ft.) from the Clay Butte turnoff to the road closure gate, a distance of about 12 km (7.5 mi). From the road closure gate east to the Montana/Wyoming state line, the shoulder widths were reduced to 0.6 m (2 ft.), the minimum recommended width. This section of roadway is 16.7 km (10.4 mi) in length.

Using Design Criteria Exceptions. Design exceptions, such as in the standards for design speed and horizontal alignment, have been used in several areas of sensitive environmental concern to minimize disturbance. These areas include Beartooth Ravine, Frozen Lake, Bar Drift, Albright Curve and the switchbacks over Beartooth Pass.

Using Paved Ditches. Paved ditches are an effective way to reduce the amount of disturbance outside the footprint of the road. Paved ditches minimize impact by eliminating the foreslope and graded ditch and the associated cut (Figure 21). A paved ditch is used at locations where the ditch flow volumes or velocities are expected to be high, where there is existing evidence of ditch erosion problems, or where environmental impacts need to be minimized. For example, in the alpine section from the road closure gate to the Montana/ Wyoming state line, paved ditches are used about 58 percent of the time, based on preliminary design. Adding or removing paved ditches at specific locations would be considered during final design. Adding a paved ditch would increase the width of the paved surface, but would reduce the overall width of the construction impact. Conversely, removing paved ditch sections would reduce the paved surface width, but increase the overall width of the construction impact.

Using Retaining Walls. Retaining walls can reduce disturbance by minimizing cut or fill slope limits of disturbance. Two potential types of walls include mechanically stabilized earth (MSE) walls and rockery walls. Rockery walls consist of dry-laid rocks. The MSE walls could be constructed and faced with a fabricated material or constructed in such a manner that existing talus material could be used to cover the face of the wall. These two options are shown in Figure 22. Walls are very expensive relative to cut or fill slopes, and would be used only in locations with high resource values. The FHWA, in cooperation with the SEE team, would decide on appropriate architectural treatments to ensure the proposed walls blend into the terrain. These architectural treatments also would be discussed at future public meetings.

Using Slope Exceptions. In certain sensitive areas, it may be possible to steepen the cut or fill slopes (called slope exceptions), and thereby the width of impact, for short stretches of the roadway (Figure 23). For example, a fill slope that is 4 m (13 ft.) high and has a slope ratio of 1:4 extends out 16 m (52 ft.). If the proposed slope were steepened to 1:3 on the same 4 m (13 ft.) high slope, the fill slope would extend out 12 m (39 ft.). Slope ratios are carefully selected based on the ability for errant vehicles to get back to the roadway and an analysis of the material of which they are constructed. Flatter slopes have safety, erosion control, and revegetation advantages over a steeper slopes so slope exceptions would only be used at environmentally sensitive locations, and would be implemented during final design.

Reducing Foreslope Widths. The proposed foreslope is a fixed width of 2.4 m (8 ft.) with varying slope ratios. This width would accommodate a future overlay without re-disturbing the foreslope in most locations, provide a recoverable slope, and provide a clear recovery area. Making the foreslope narrower increases its steepness and minimizes impacts. As noted in the previous discussion, however, steeper slopes are less safe, are more likely to erode, and revegetate more slowly than flatter slopes. In areas where the existing undisturbed ground is relatively flat so that the safety clear zone would not be compromised with a steepened foreslope, further adjustments to the foreslope ratios would be reviewed (Figure 24).

Adjusting Pullout and Parking Area Locations. The FHWA and the SNF have worked extensively to identify the most appropriate places for pullout and parking areas. These facilities provide the traveler with an opportunity to stop and enjoy the road's spectacular scenery. To minimize impacts, the number of pullouts in all alternatives has been reduced.

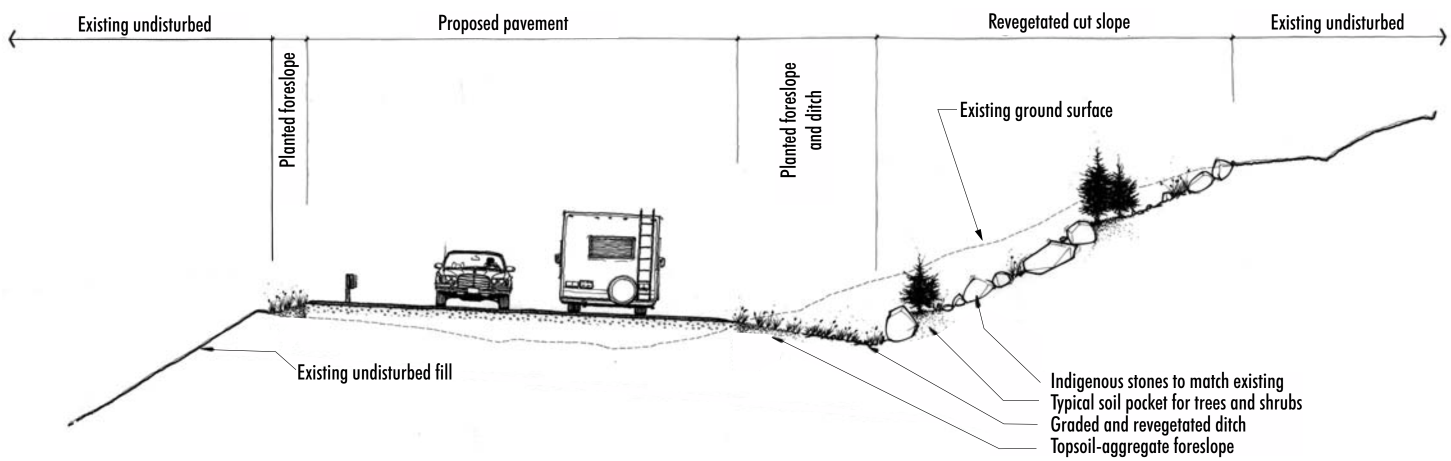
The FHWA has committed to avoiding wetland disturbance from pullout and parking area construction. In completing the impact assessment described in Chapter 3, the FHWA used the footprint of the road as developed during preliminary design. The preliminary design did not include a detailed field review of all proposed pullout and parking areas. During subsequent design and field reviews, each pullout and parking area would be reviewed to ensure that no wetlands are affected by the additional disturbance associated with the pullout or parking area. An example of where a pullout would be eliminated in final design to avoid wetland impact is shown in Figure 25.

Road and Bridge Reconstruction

Road Reconstruction

In all build alternatives, the road would be reconstructed, generally encompassing the existing roadway footprint. The existing asphalt surface would be removed and reused as subbase material in the reconstructed road. In most locations, the existing fill would remain, and additional fill would be brought from excavated areas or material sources. To determine the required thickness of asphalt and aggregate base, the FHWA examined the materials beneath the existing road. The strength of the underlying materials determines the thickness of the aggregate base and asphalt pavement. From the west end of the project to near Island Lake Campground, the road would consist of 75 mm (3 in.) of asphalt pavement over 300 mm (12 in.) of crushed aggregate base for a total structural depth of 375 mm (15 in.). The remainder of the road is located on higher strength materials. As a result, the proposed structural section for the upper section is 75 mm (3 in) of asphalt pavement over 225 mm (9 in.) of crushed aggregate base for a total structural thickness of 300 mm (12 in.).

In some locations where rock is present, rock blasting would be necessary to provide the necessary width, grade, and alignment. Specific areas where blasting would be necessary include the Beartooth Ravine area, the rocky area near Island Lake in Option B for the Top of the World Store area, and near Frozen Lake. The road would be closed for several hours at a time when blasting occurs. Excavated rock would be used as



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(303) 830-1188
Fax: 830-1199

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Figure 19
Minimizing New Impacts by Shifting Proposed Roadway Alignment

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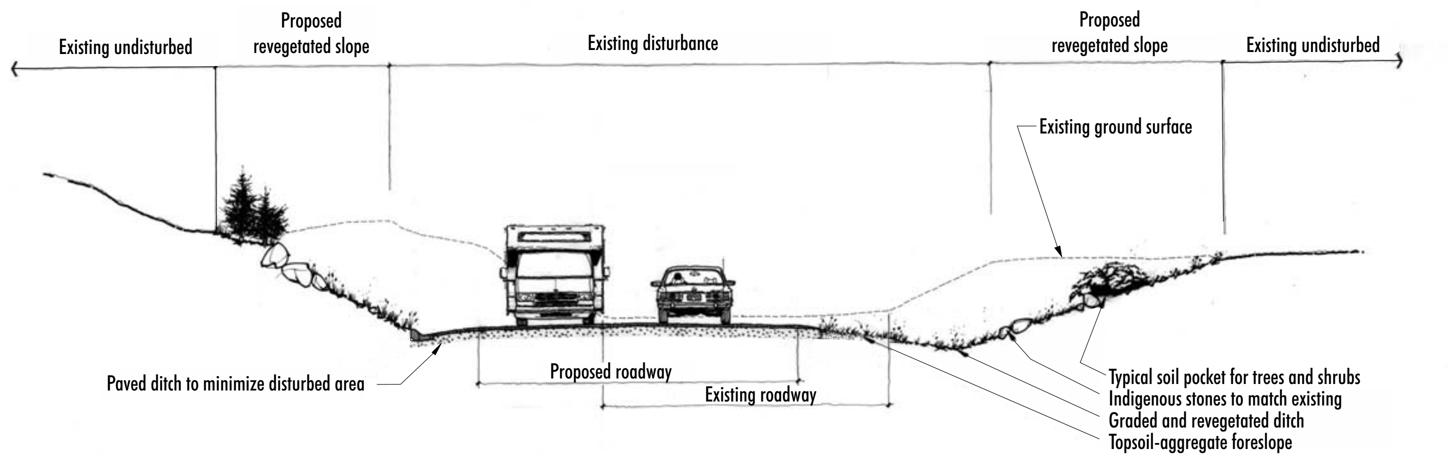

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Figure 20
Minimizing New Impacts by Using Existing Disturbance

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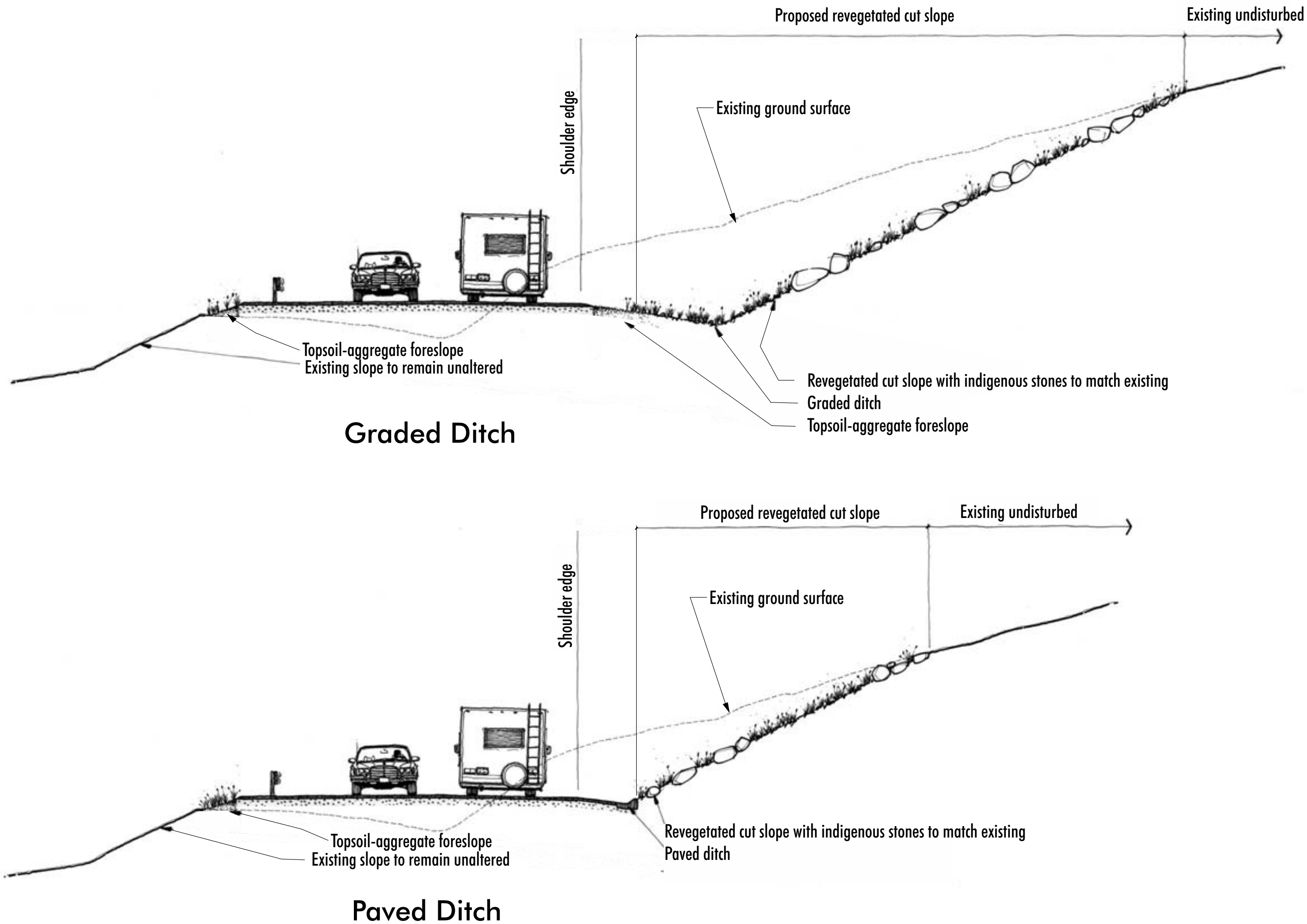

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Figure 21
Difference in New Impacts between Paved and Graded Ditch Types

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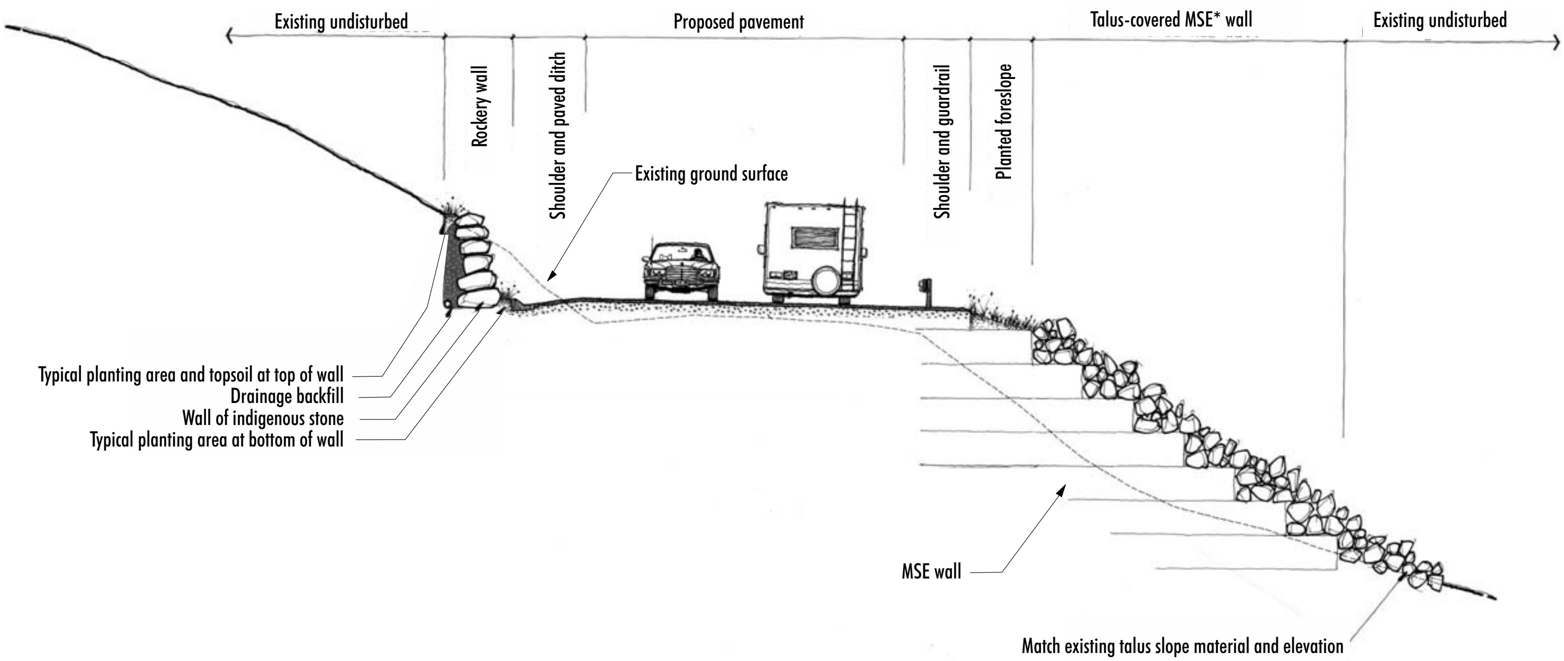

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* MSE wall = Mechanically stabilized earth wall

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Figure 22
Minimizing New Impacts by Using Various Wall Types

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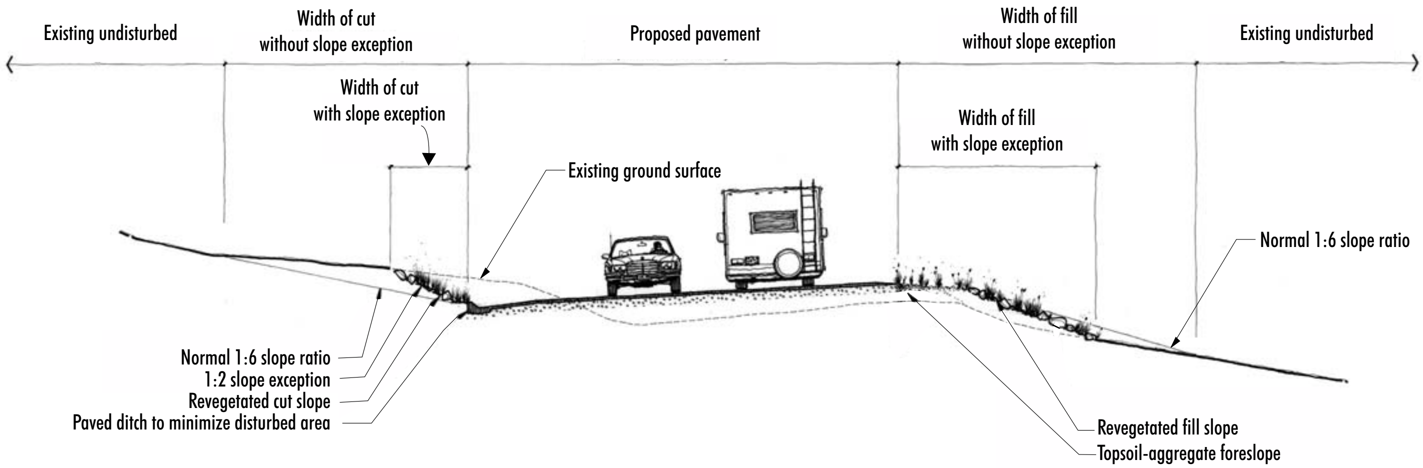

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Figure 23
Minimizing New Impacts by Using Slope Exceptions

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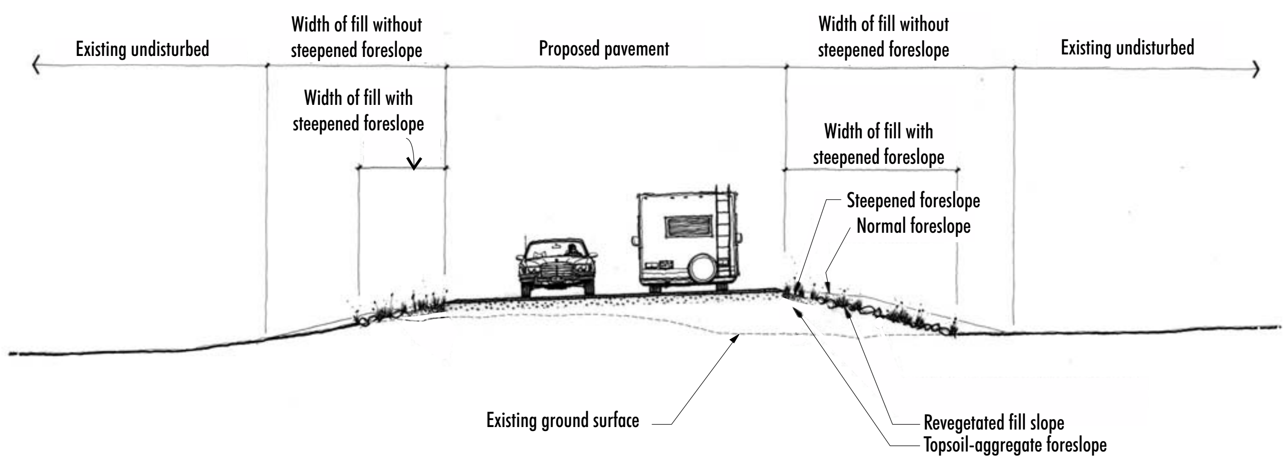

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Figure 24
Minimizing New Impacts by Adjusting Foreslope Widths

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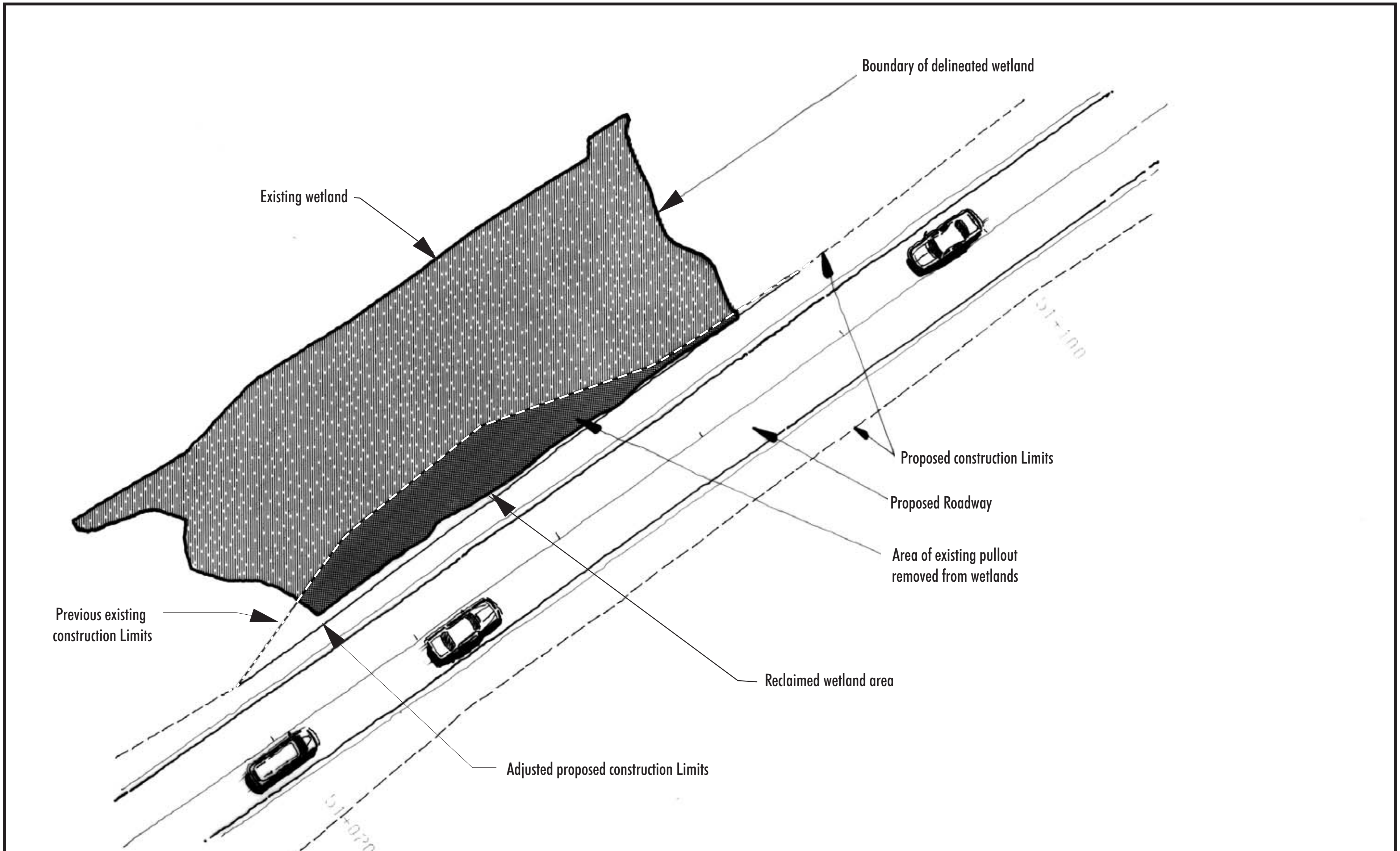

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Figure 25
Minimizing New Impacts to Sensitive Resources by Adjusting Pullout and Parking Locations

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embankment material or crushed and used as aggregate for the new base or asphalt pavement. If the quantity or quality of rock is not sufficient, material for aggregate base or asphalt material would be generated from material sources (see *Material Sources and Staging Areas* section). Drainage facilities, such as paved ditches and culverts, would be improved. Paved ditches would be added in steeper areas to control surface water runoff and eliminate ditch erosion. Culverts would be replaced and new culverts added. In locations where fish passage is important, culverts would be designed and placed to maintain fish passage.

The FHWA would use Best Management Practices (BMPs) to minimize soil erosion. Construction requirements described in FHWA's Standard Specifications for Road and Bridge Construction (FP-96 manual) would be used to minimize erosion and sedimentation during and after construction (FHWA 1996). The Wyoming Department of Environmental Quality's (WDEQ) BMPs designed to reduce or eliminate water quality degradation due to physical modifications of surface water would be used for the project (WDEQ 1999).

Mitigation measures to protect and preserve soil resources in the project area would be used throughout the construction project. General erosion control measures would include minimizing the area of disturbance to defined construction limits and limiting the time bare soil is exposed. Water would be sprayed periodically to control dust. Temporary sediment control measures such as silt fences, sediment logs, trenches, and sediment traps would be used to contain soils within the project area.

Bridge Reconstruction

In all build alternatives except Alternative 2, four new bridges, each 11 m (36 ft.) wide, would be built, and except in Alternative 2, the four existing historic bridges would be removed. Little Bear Creek bridge #2 would be avoided and not dismantled in Alternative 2. The proposed bridge width would accommodate the travel lanes and additional width for pedestrians and bicyclists on the structure. A pedestrian walkway would be constructed on the Beartooth Lake outlet bridge.

Bridge length would vary, depending on the span required. Bridges would span most wetland areas, and would provide for wildlife crossing beneath the bridges by providing connecting riparian areas along stream banks. The bridges at the Beartooth Lake and Long Lake outlets would be in the same locations as the existing bridges, but the alignment would be slightly different to accommodate the new bridge construction while permitting passage of traffic during reconstruction. The location of the two new bridges crossing Little Bear Creek would vary, depending on the alignment option selected in the Top of the World Store area. Possible new bridges at Beartooth Ravine and Little Bear Lake fen are included as options in some alternatives, including the Preferred Alternative. Water would not be diverted out of any stream for bridge construction, but stream flows may be temporarily rerouted within the streambed during construction. Any retaining walls built in waters or streams may require temporary dewatering. Settling ponds or settling tanks would be used to remove any sediment prior to returning the water to the stream.

All bridges except the Beartooth Ravine bridge and the Little Bear Creek bridge #1 in Alternative 2 would be single span bridges, constructed without the use of piers. The piers for the Beartooth Ravine bridge would be constructed in the talus slopes south of the existing road. A single pier would be needed for the Little Bear Creek bridge #1 in Alternative 2. It would be constructed on a small island under the existing bridge in the middle of Little Bear Creek (see red line on Figure 6).

Driven pilings would be used to provide support for the bridge abutments. At all bridge locations that cross streams, riprap would be placed beneath the bridge to provide stream stability adjacent to the bridge. To minimize effects on Long Lake and wetlands, retaining walls would be used on both sides of the new Long Lake bridge. A retaining wall on the bridge's northwest corner would be used to minimize impacts. Fill would be used at the northeast corner to provide a more aesthetic appearance, similar to the existing shoreline.

The FHWA would use the stone masonry from the existing bridge abutments or similar stone masonry to provide an aesthetic facing for the new bridge abutments except for the Beartooth Ravine bridge. It may be necessary to split the existing stone masonry in half to provide sufficient masonry for the new abutments. Any new, unweathered masonry face would be placed in less visible locations. The visible portion of the facing would closely match the look of the stone masonry on the existing bridges. In some locations, stone form liner may be used in lieu of stone masonry if the volume or quality of the existing masonry and nearby rocks are not adequate.

The FHWA considered various alignments and construction methods at Long Lake. Early in the design process, the FHWA considered a downstream alignment option and an upstream option. The upstream option was retained for further refinement because it avoided the fens on the south side of the existing bridge. At EPA's suggestion, the alignment was further refined to minimize wetland impacts. Minimizing wetland impacts required shifting the alignment into Long Lake. In addition to the location of the bridge, the FHWA considered two construction method options at the northeast abutment: a retaining wall and a rock-fill embankment. The rock-fill embankment is preferred at this location, due to higher impacts from retaining wall construction and the potential for long-term maintenance problems with the wall. Two construction method options at the northeast Long Lake Bridge abutment, a retaining wall and a rock-fill embankment, options, are discussed in the following sections.

Retaining wall construction in the lake would probably require a cofferdam. A cofferdam is a temporary wall structure that surrounds the retaining wall and seals out water during construction. Sealing the water at this location would be difficult due to the shallow bedrock and rocky lake bottom. Dewatering the cofferdam would produce a large amount of sediment that would require use of a settling tank or construction of a settling pond. Additional water testing may be required to release water from settling pond. Cofferdam and retaining wall construction would be very time consuming and expensive with a level of uncertainty due to the difficulty in being able to seal the cofferdam.

A rock embankment would use a more typical construction technique. The existing roadway is constructed out of rock material and filled in some of the lake. Construction of a rock embankment would mimic existing conditions and can be completed much faster that the retaining wall construction. To minimize turbidity during embankment construction, clean rock fill would be specified. The fill would require little to no long-term maintenance, and it would be very resistant to ice pressures and not as amenable to ice formation as the retaining wall option. Settlement would be almost immediate during construction with large riprap distributed over a larger footprint. The need to pump and treat water in the construction area would be limited to the abutment construction. Construction of a rock embankment would eliminate the need for additional construction equipment and wall components, and would minimize the duration and magnitude of lake disturbance.

A retaining wall would require filling about 348 m^2 (0.09 ac.) of Long Lake. A rock embankment will require filling about 616 m^2 (0.15 ac.) of Long Lake, and 60 m^2 (0.01 ac.) more wetlands adjacent to the lake.

The FHWA eliminated the retaining wall option because it does not fulfill the purpose and need for the project. Long Lake is the eastern termini for the recreational complex managed by the SNF. A large pullout east of the bridge provides recreational access to the lake and bridge. A retaining wall would appear out of place because it will be a large, man-made structure incongruent with the existing shoreline. It would not support the SNF's management goal for the area.

A rock embankment would be more "wildlife-friendly" and provide access to the riparian area created among the rock fill. A rock fill would also have a tendency to create suitable fish habitat along the shoreline of the lake and provide user access to the lake. It would be more consistent with the look of the existing shoreline. A rock embankment would support the SNF's management goal for the area.

Road Intersections

In all build alternatives, intersections would be reconstructed at the following major road intersections:

- Clay Butte Lookout turnoff (KP 40.20)
- Beartooth Campground road (KP 42.60)
- Top of the World Store access loop (KP 45.60 and 45.70)
- Island Lake Campground road (KP 47.60)
- Forest Service Road No. 149 to Sawtooth Lake (KP 48.00)
- Forest Service access to sheep corrals (KP 49.10)
- Forest Service Road No. 151 to dispersed recreation (KP 50.00)
- Forest Service Road No. 120 to Morrison Jeep Road and trailhead (KP 50.50)
- West Summit Rest Area road (KP 59.50)

The intersections would be designed to provide better sight distance and safer access. The intersections of some roads would be modified to accommodate the new road grade. A short paved apron would be placed at each intersection to reduce gravel getting on the road.

Pullouts and Parking Areas

The existing road has numerous pullouts along its length (about 114). Pullouts provide locations where travelers can safely park and enjoy the scenery, or where slower vehicles can pull over and let other vehicles pass. Alternative 2 would have 78 pullouts, Alternative 3 would have 36 pullouts, Alternative 4 would have 62 pullouts, Alternative 5 would have 31 pullouts, and Alternative 6 would have 66 pullouts (see Table 5). For all build alternatives, larger pullouts and interpretive sites with pull-in or parallel parking would be built at the following locations:

- Beartooth Ravine (KP 41.3)
- Frozen Lake (KP 53.3)
- Dead Man's Curve (KP 58.4)
- West Summit Switchbacks (KP 58.8)
- West Summit Rest Area (KP 59.2)
- Bar Drift (KP 61.1)
- Gardner Lake/National Recreation Trail (KP 62.1)
- East Summit/Red Lodge Race Camp (KP 64.2)
- Upper Albright Curve (KP 68.6)
- Lower Albright Curve (KP 69.0)

Conceptual designs for five pullouts and interpretive areas are presented in Appendix G. The size of these pullouts would vary with the alternative, depending on the alternative's emphasis. All pullouts and parking areas would be designed in compliance with the American Disabilities Act. In addition to the above locations, 11 other existing pullouts are common to all alternatives (Figure 26).

- KP 40.28
- KP 41.80
- KP 42.60
- KP 45.60
- KP 47.51
- KP 47.94
- KP 52.30
- KP 60.02
- KP 61.72
- KP 66.80
- KP 68.20

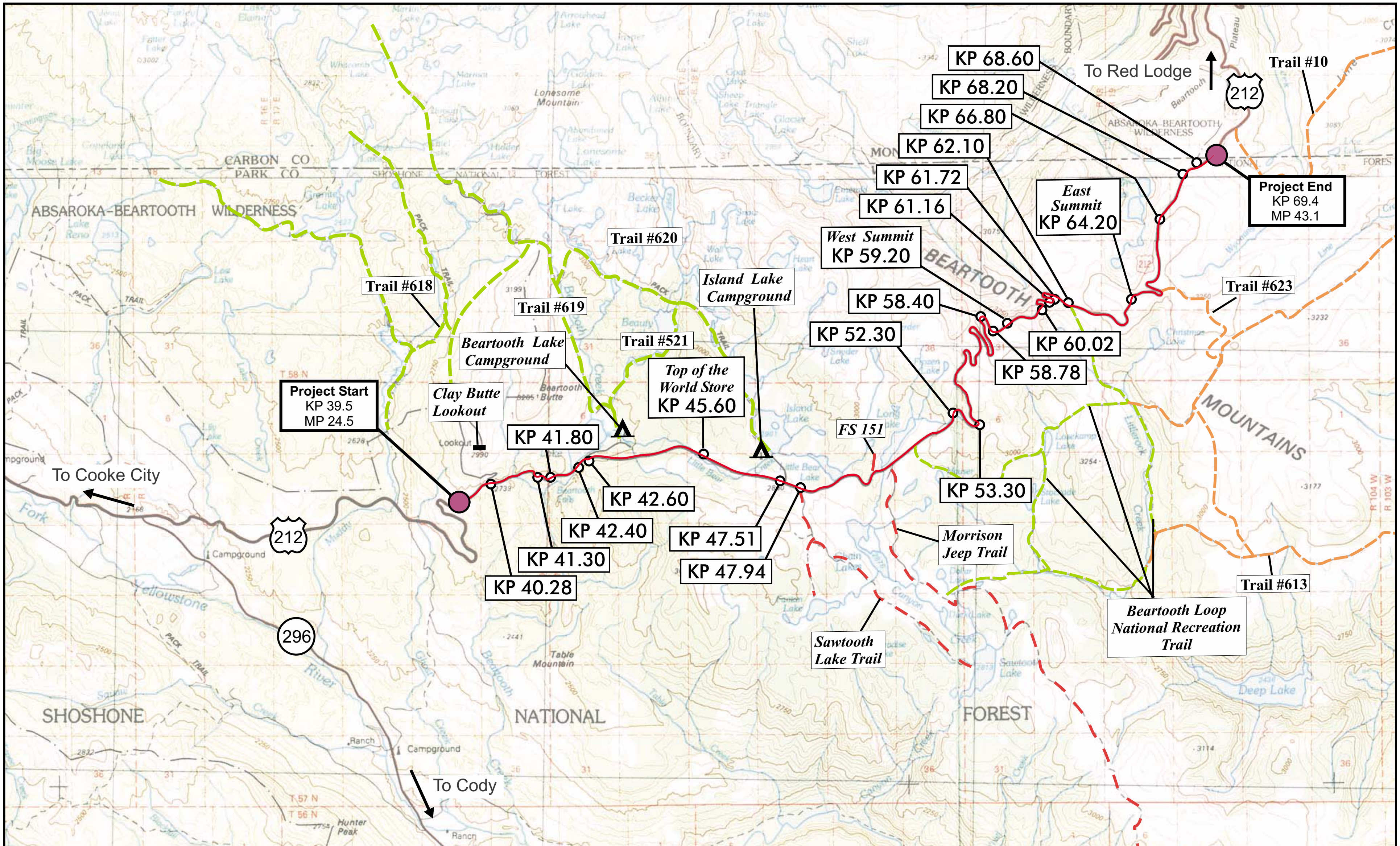
Three sites are being considered for interpretation of the original road construction. One site at the top of the West Summit switchbacks would provide an overview of the switchbacks leading up to the west summit (see Appendix G). A second site at the Bar Drift would provide an overview of the switchbacks leading up to the east summit. The third site at Beartooth Lake would provide interpretation of the former historic bridge at the outlet of Beartooth Lake. A pullout east of the Beartooth Lake outlet bridge would be reconstructed. A new trail would be constructed from the pullout to the lake near the new bridge. Interpretive historical information may be combined with information on other aspects of the area, such as geology, wildlife, and natural history. The details of the interpretation and site-specific locations would be developed by the FHWA in consultation with the Wyoming SHPO, the SNF, the NPS, and interested tribes.

Traffic Control

Closures and Delays

Closures and delays would be similar to those needed for the North Fork Road construction project (U.S. 12/14/20 from Cody to YNP). During peak tourist season (July 15 through August 15) and peak traffic times, the road would be kept open during the day with ½-hour maximum delays. For off-peak traffic times, the road would be kept open with 1-hour maximum delays at selected intervals, depending on the construction operation requirements during the delay. Longer delays or partial day closures may be needed for certain operations, such as rock blasting and bridge and retaining wall construction, and a specific schedule would be developed for these instances. The road may be closed at night during the entire construction season. In all cases, construction delays and closure information would be provided to the public via frequently updated news and broadcast media.

Segment 4 opens by Memorial Day and closes by Columbus Day (about October 15). The road sometimes is accessible by car up to the road closure gate east of Long Lake before Memorial Day, depending on snow conditions. To facilitate early season construction before Memorial Day, the FHWA may move the road closure gate to the western end of the project near Clay Butte Lookout turnoff during construction. The road closure gate would be returned to its current position after the road is reconstructed. The road east of the Clay Butte Lookout turnoff may be closed before Memorial Day to complete the complex construction operations in the Beartooth Ravine area.



ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

Segment 4 of the Beartooth Highway
Jeep Trails
Hiking Trails

1/2 Inch = 1 Mile
N

Figure 26
Pullouts Common to All Alternatives

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The FHWA would consider limiting nighttime construction adjacent to the campgrounds and Top of the World Store, when they are open. The decision would be made in cooperation with the SNF, based on the type of construction required by the selected alternative. Traffic would be stopped on either side of the Top of the World Store to provide continued access to the store.

To assist local business owners and the traveling public with the delays and closures, the FHWA would develop a traffic control plan in coordination with those communities that may be most affected by the reconstruction work, such as Red Lodge. The FHWA also would develop a public information program as part of traffic management during construction. The FHWA would use various forms of communication, such as ads, signs, and brochures via radio, TV, and the Internet, to inform road users and local business owners about the construction schedule and progress. Specific partial day or nighttime road closure times would be announced well in advance to assist motorists with trip planning.

Construction-Related Traffic

During construction, traffic on U.S. 212 and WY 296 would increase because of employee and construction traffic. Employees would either commute to and from a workcamp, commute from temporary private housing along WY 296, or commute from housing in local communities, such as Red Lodge or Cody. The FHWA estimates that without a workcamp, traffic on WY 296 would increase by 40 vehicles per day and by 20 vehicles per day on U.S. 212 from Red Lodge.

Trucks would be used to transport materials to and from the project location. During certain construction operations, truck traffic could increase to 150 to 200 truck trips per day. Trucks also would be used to transport materials from the material sources and staging areas. The Ghost Creek site would be the primary material source and staging area. The Pilot Creek site (at KP 20.2; MP 12.6) also may be used as a staging area.

Typical delays would be between ½ and 1 hour.

Other Ancillary Facilities

During road reconstruction, the FHWA would need other facilities including a workcamp, one or more material sources, and one or more staging areas. The material sources would be used to provide aggregate material for new road base and asphalt pavement. Staging areas would be used to store materials and equipment. An asphalt hot plant would be located either at a material source or staging area. The FHWA developed options for each of these components.

Workcamp

The FHWA estimates up to 80 people would be employed to work on the road during the 6-year reconstruction period. Employees would work day or night shifts. Because of the road's remote location, many employees probably would live in surrounding towns such as Cody, Cooke City, or Red Lodge, and drive daily to the project site. During the construction season, others may find accommodations in Crandall or Cooke City, but lodging typically is in extremely short supply. The commute from Cody and the surrounding area would be an hour and a half or more each day. Commuting would pose a safety risk for construction employees and would increase the risk of wildlife/vehicle accidents. The FHWA anticipates that by making a workcamp available, the pool of potential contractors that could complete the project may be larger, and overall construction costs would be less.

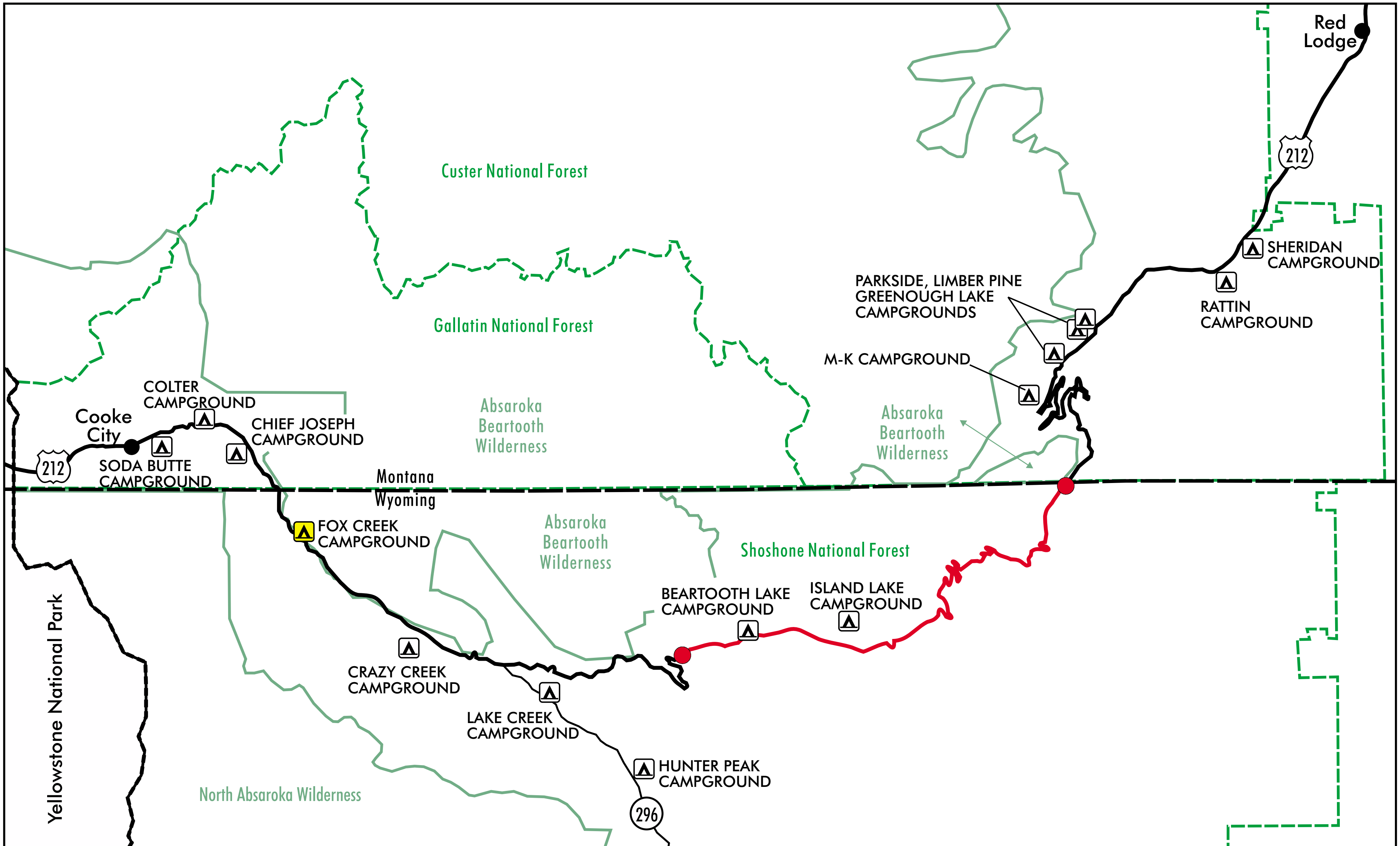
Two workcamp sites, the Fox Creek Campground and a site near the intersection of U.S. 212 and WY 296, were analyzed in detail in the Draft EIS. The U.S. 212/WY 296 intersection site was eliminated from consideration, and is discussed further in Section 2.6 *Options Considered But Eliminated.*

To provide a suitable workcamp for construction during the estimated 6-year road construction period and to minimize human-grizzly bear conflicts, a substantial investment in infrastructure would be necessary. Trailer pads with electrical power and provisions for sanitary and solid waste disposal would be needed. Potable water also would be required. Bear-proof food storage boxes, sheds, and trash cans would be needed to accommodate storage of food, coolers, barbecues, and any other potential bear attractants.

The Fox Creek Campground has 27 existing campsites, pit toilets, and water pumps. It is one of the least used campgrounds along the road (Reynolds 2001). A spring across U.S. 212 is piped under the road and then flows by gravity to the campground. The spring water does not meet current standards for potable water and is no longer used. The campground is more forested than other campgrounds along the road, which leads to poor natural ventilation. Because of the overland water flow and poor air circulation, mosquitoes are a problem during most of the camping season.

Even if the road is not reconstructed, the FHWA and SNF anticipate that the number of vehicles using the road that are larger than cars, such as recreational vehicles or trucks pulling camper-trailers, will increase. There are no developed campgrounds along the Beartooth Highway that provide amenities such as electricity and dump stations for these kinds of recreational vehicles. Modifications necessary for the Fox Creek Campground to serve as a workcamp site would also result in a campground facility that would better support the SNF's land management goals.

For the preceding reasons, the FHWA and the SNF are proposing the Fox Creek Campground as the preferred workcamp site (Figure 27). The Fox Creek Campground would be modified to accommodate up to 80 workers at 33 campsites. The campground would be closed to the public during the 6-year road construction period. To be available for construction crews starting in 2005, the campground would be rebuilt to current SNF campground standards during 2004. The workcamp would be modified to better accommodate recreational vehicles and trailers by adding potable water and sewer facilities. Common area restrooms and showers also would be provided. The existing surface water distribution system would be eliminated. Electrical power would be provided from the nearby Cooke City power line. Limited surface disturbance and tree clearing would be needed to provide for additional trailer pads and to improve air circulation. These measures, which are necessary to provide an adequate workcamp, would also enhance future visitor experience at the campground by reducing the number of mosquitoes. The FHWA would coordinate with the SNF to prepare the final workcamp design.



Segment 4 of the Beartooth Highway
Project Start and End
Forest Boundary
Wilderness Boundary

Fox Creek Campground Workcamp Site (Preferred)
Existing Forest Service Campground

Source: 1:100,000 BLM topographic maps

1 Inch = 4 Miles

N

Figure 27
Proposed Fox Creek Workcamp Site

521-workcamps.cdr

ERO
ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

Other existing campsites along U.S. 212 would continue to be open to the public during construction. After road reconstruction is completed, the SNF would resume management of the Fox Creek Campground for public recreational use. The SNF would use and manage the campground in accordance with applicable guidelines for such facilities in grizzly bear habitat.

To reduce the risk of adversely affecting the grizzly bear, the following mitigation measures would be implemented at the workcamp:

- All project-related construction employees would be given orientation and training regarding storage and disposal of food, garbage, and other attractants. Construction personnel would be trained in how to behave in the presence of bears and other wildlife.
- Centralized bear resistant storage facilities for attractants would be provided.
- No long-term food storage or storage in open containers would be allowed.
- Garbage and solid waste would be removed frequently. Containers would be bear-proof and confine odors.
- A Grizzly Bear Management and Protection Plan would be implemented to prevent bear/human conflicts during construction, and would include plans for proper sanitation of human foods, garbage, and other bear attractants.
- Project employees would be prevented from carrying firearms or bringing pets to the workcamp.
- An on-site manager would be responsible for the workcamp, including compliance with the Grizzly Bear Management and Protection Plan.
- Grizzly bear sightings would be reported to the Forest Officer in Charge and the Wyoming Game and Fish Department.

Material Sources and Staging Areas

Some of the materials that would be needed for production of an aggregate base and pavement (i.e., surfacing materials) would be generated from excavation along the road corridor. If the excavated material is not suitable, the FHWA would use selected areas as a source for the required materials. The FHWA considered six material sources as part of an initial site reconnaissance (FHWA 1998a). Four sites eliminated from detailed study are discussed in the *Options Considered But Eliminated* section. Two sites were retained as options.

A site at Ghost Creek, about 4 km (2.5 mi.) west of the project area, would be the primary materials source (Figure 28). The area is already partially disturbed from extracting material for previous road projects. Based on preliminary analysis, the FHWA estimates an area up to 11 ha (28 ac.) would be needed. Additional analysis regarding quantity and quality of rock along the road would determine the final area of disturbance. The excavation would remove the material east of the existing access road to a grade similar to the road. The excavation would not be deep enough to encounter ground water. Ghost Creek also would be used as a staging area for equipment, personnel, and aggregate and asphalt production.

A second materials site, Island Lake moraine, located south of the road and the Island Lake Campground entrance (KP 46.7) also may be used (Figure 29). It would be used only if the quantity and/or quality of material from rock blasting along the road and Ghost Creek are not adequate. An area up to 1 ha (3 ac.) could be used. The area, a large glacial moraine, would be excavated to match the existing grades north and south of the moraine. The excavation would not be deep enough to Island Lake sites would be graded and revegetated after they are no longer needed for construction.

Figure 28. Proposed Ghost Creek materials source.

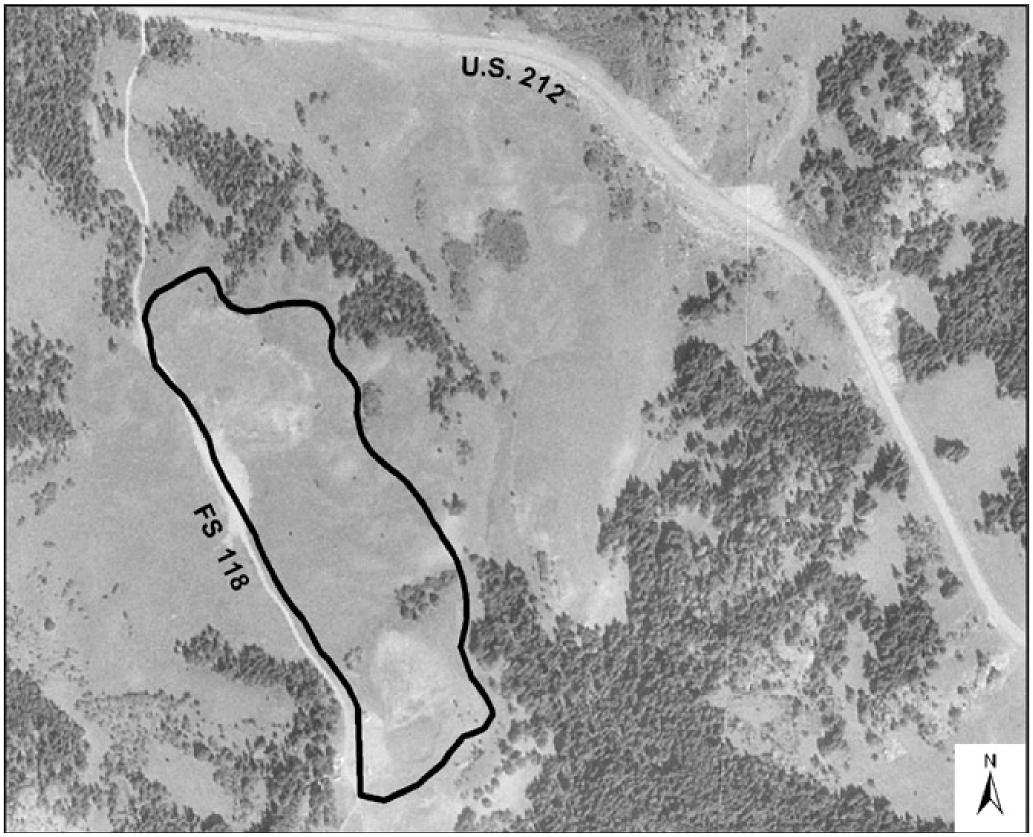
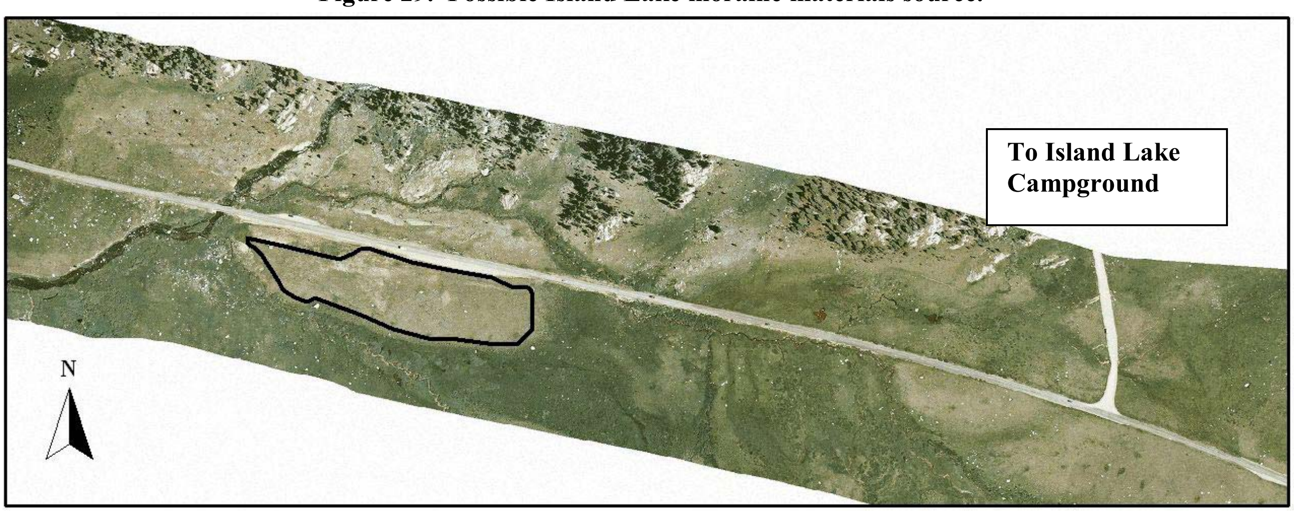


Figure 29. Possible Island Lake moraine materials source.



Five areas have been identified as possible staging areas for equipment, personnel, and materials. Other areas may be identified in consultation with the SNF before and during construction. The five identified areas are an existing disturbed area south of Top of the World Store, an area near the Sawtooth Lake jeep trail/Beartooth Highway intersection, an area near Forest Road 151 west of Long Lake, and an area at the West Summit. The Pilot Creek site (at KP 20.2; MP 12.6) also may be used. Staging areas not subsequently used as roads or pullouts would be reclaimed after construction. If used, the entrance to Forest Road 151 and the West Summit loop road would be paved.

Revegetation

A landscaping and revegetation plan that would address revegetation of the entire corridor, and landscaping in specific areas would be developed. The preparation of the landscaping and revegetation plan is underway, and would be completed during final design. The plan would be integrated into the final design package.

In areas where the road would be reconstructed or widened in undisturbed locations, surface soils would be salvaged for subsequent use in reclamation. Salvage material depth would vary by location, typically 10 to 20 cm (4 to 8 in.). Salvaged soils would be placed in smaller windrows adjacent to the tops of cuts or toes of fill, or stockpiled in piles adjacent to the roadway. Soil typically would be replaced on the disturbed cuts and fills during the same season. Special procedures would be used to handle soils from wetlands.

Results of the revegetation research conducted since 1999 are being used in developing the landscaping and revegetation plan.

In all build alternatives, the new road alignment may vary from the existing alignment at the realignment option areas and in some other locations. In all locations where the construction limits would not encompass the existing roadway, the existing roadway surfacing materials (pavement and base) and any culverts would be removed, disposed off-site, and the area reclaimed. The area would be graded to match the existing topography and revegetated. In most of the abandoned road sections, suitable soils for revegetation underlie the existing road fill. Where soil is needed for successful revegetation, suitable soils would be transported from disturbed areas with deeper soils, such as in the meadows near Top of the World Store. Organic amendments may be used in some areas where suitable soils are not available. Soil, seed, mulch, and plantings would be applied in accordance with the landscaping and revegetation plan.

Extensive revegetation research has been conducted since 1999 to assist in developing the landscaping and revegetation plan. The research began with an extensive review of state-of-the-art revegetation practices (ERO Resources Corp. 2001a). Test plot studies are being conducted at three alpine locations to evaluate various revegetation techniques. The test plots evaluated organic amendments, commercial and native seed, seeding rates, and erosion control fabrics. The *Vegetation, Timber, and Old Growth Forest* section of Chapter 3 provides additional information about the revegetation research.

All areas except areas of extensive rock would be revegetated using native species. Areas would be revegetated with species similar to those found in undisturbed areas. To the extent feasible, the FHWA plans to use seed collected from the Beartooth Plateau or from very similar habitats, such as in Canada. Different revegetation types would be seeded with different seed mixes to reflect different soil and climatic conditions. For example, revegetation types labeled "rocky" typically have thinner soils than those labeled "mesic", and would require species more tolerant of dry conditions. Plans are being developed for the following revegetation types:

- Rocky Forest and Mesic Forest
- Rocky Meadow and Mesic Meadow
- Rocky Alpine Meadow and Mesic Alpine Meadow
- Riparian

A sample revegetation plan for selected forested areas is shown on Figure 30. The detailed plan would be applied in selected forested areas and would include tree, shrub, and herbaceous plantings, native grass and forb seeding, and rock and log placement.

Wetland Mitigation

Mitigation for wetlands impacts is described in a *Conceptual Wetland Mitigation Plan*, and would involve both on- and off-site mitigation (ERO Resources Corp. 2002a). In designing the wetland mitigation plan, opportunities were considered in the following order:

- On-site wetland restoration
- On-site wetland creation
- Off-site wetland creation
- Off-site wetland preservation and restoration

On-site mitigation alternatives would consist of wetland restoration and creation. Off-site mitigation would consist of wetland preservation and restoration. The FHWA would mitigate all unavoidable impacts to both jurisdictional and non-jurisdictional wetlands. The *Wetlands and Other Waters of the U.S.* section in Chapter 3 discusses wetland mitigation in more detail.

2.6 Options Considered But Eliminated

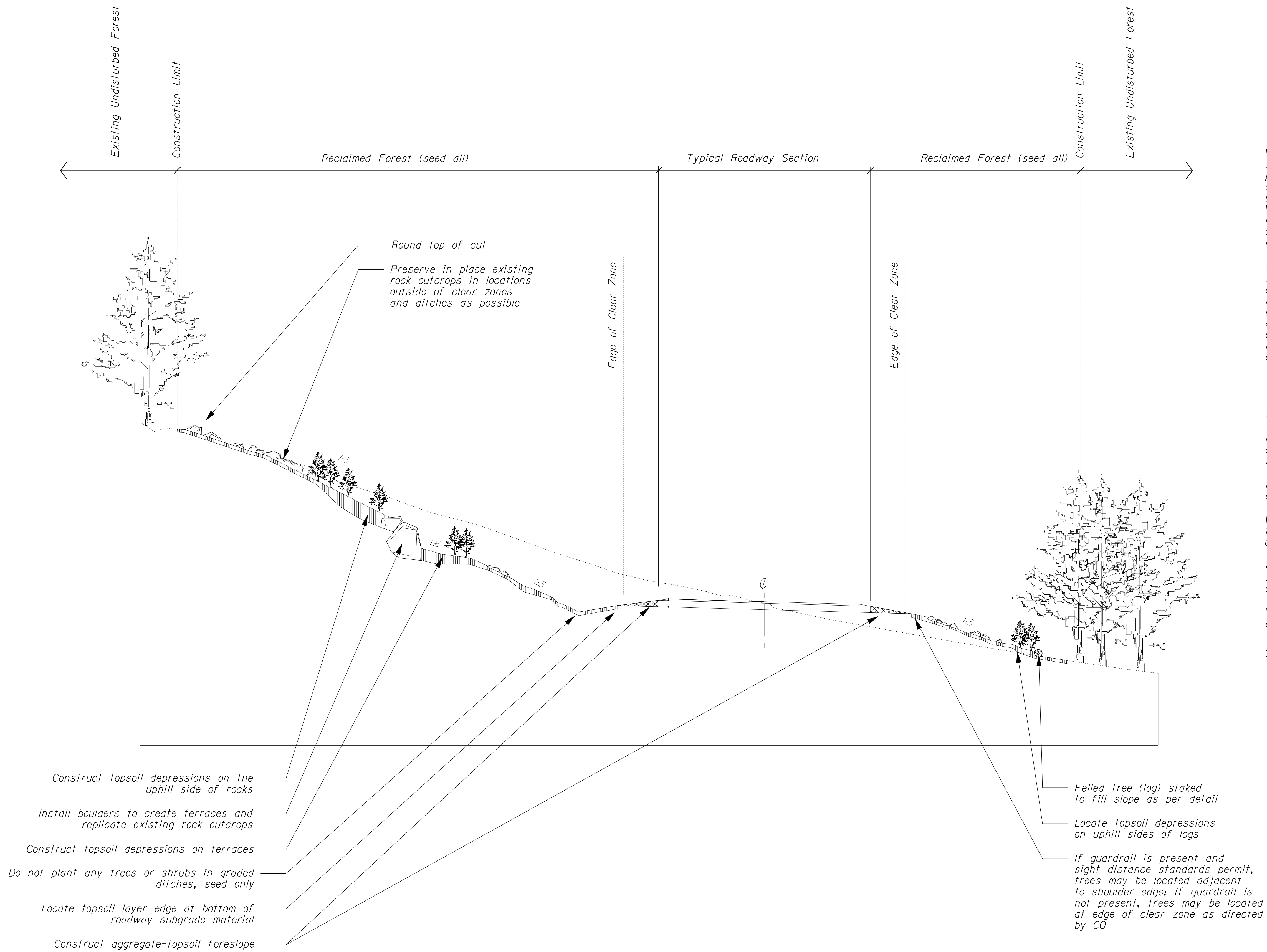
The process that the FHWA used to develop the alternatives is discussed previously in section 2.1, *Alternative Development*. A large number of options were considered in developing the alternatives analyzed in detail in this EIS. This section discusses the alternatives and options that were considered but not incorporated into any of the five build alternatives. Options considered but eliminated are discussed under five broad categories:

- Preservation of All Historic Resources
- Roadway Widths
- Bar Drift Realignment
- Materials Source Locations
- Workcamp Locations

Preservation of All Historic Resources

Avoiding or minimizing effects on historic resources is an important aspect in FHWA's planning and alternative development. Five historic resources eligible for listing in the NRHP occur along the road—Segment 4 of the road and four bridges. The FHWA considered several options designed to avoid or minimize effects on historic resources. A rehabilitation project, discussed in the *Segment 4 Rehabilitation* section below, would avoid or minimize effects on the road and the four bridges. Several options were considered that avoid or minimize effects on the

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS



Pattern Notes

Vary topsoil depth to create depressions in the surface greater than 150mm deep. Construct topsoil pockets on the uphill side of boulders, rock outcrops and logs, on the downhill side of rocks used to change slope ratios and create terraces. Vary the width and length of topsoil pockets to match the width and mass of the boulders, rock outcrops or logs retaining the topsoil pocket, or match dimensions of the terrace.

Set indigenous stones with lichen or moss sides facing up to continue surface stone patterns of adjacent undisturbed surface rock formations. Match density and area coverage of adjacent undisturbed surface rocks as directed by the CO and described in the Landscape Details. Furnish only granitic rock material from the project area matching the stone type, color, shape, and texture of undisturbed surface rock adjacent to the fill.

Locate all plants in topsoil depressions near boulders, rock outcrops, ground logs and on terraces to match the variable density of the adjacent undisturbed forest.

Furnish and install felled trees from existing forest at a density of 54/ha and as directed by the CO, throughout entire disturbed forest areas.

Perform only clearing operations (no grubbing) conforming to sections 152, 201 and 202.

Vary construction limits as directed by the CO to preserve existing individual trees, boulders, or rock outcrops.

Install stored (windrowed) topsoil conforming to subsection 713.01(b) 150mm to 200mm deep on all disturbed ground surfaces.

Vary tree spacing to match densities of the adjacent undisturbed forest as directed by the CO.

Seed mixtures "B" and "C", and plant schedules "2","3","4", and "5" apply to this typical pattern.

Figure 30
Revegetation Plan for Selected Forested Areas

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four bridges. These options are discussed in the following *Bridge Construction Options* section. The FHWA also considered two alignments at Long Lake bridge and eliminated one. The eliminated alignment is discussed in the *Long Lake Bridge Alignment* section.

Segment 4 Rehabilitation

In early 1998, Congress authorized rehabilitation of Segment 4. The project would repave the existing road at its current width and alignment, pave existing pullouts, replace culverts, and provide for minor roadside safety improvements such as signing, striping, and improving guardrails. Limited maintenance on the bridges would be completed. The road would remain in its existing alignment and the four historic bridges would remain. A rehabilitation project would minimize or avoid effects on the road and the four bridges. A rehabilitation project also would minimize overall environmental impacts.

The rehabilitation project was considered to be only a temporary maintenance measure that would not correct many of the road's deficiencies identified in Chapter 1. In a rehabilitation only option, none of the travel lanes, shoulders, or bridges would be widened and the horizontal and vertical alignment would not be changed. With an asphalt overlay done in a rehabilitation option, the roadway width would be reduced to less than 5.5 m (18 ft.) wide, and the bridges would remain between 6.2 m (20.2 ft.) and 6.9 m (22.6 ft.) wide. In comments on the Draft EIS, the U.S. Environmental Protection Agency (EPA) requested that the FHWA consider combining a rehabilitation project with reconstruction of areas of the road most in need of reconstruction. The FHWA has considered such an approach on other Forest Highway projects where it fulfills the project purpose and need.

In combining a rehabilitation project with a partial reconstruction project, the bridges would be widened, and culverts would be added in areas that need additional drainage. In this option, none of the travel lanes or shoulders would be widened and the horizontal and vertical alignment would not be changed. With an asphalt overlay, the road would be less than 5.5 m (18 ft.) wide.

A rehabilitation project, either stand-alone or in combination with reconstruction of sections of the road and associated facilities, would not fulfill the purpose and need for the project. The narrow travel lanes, lack of shoulders, and unsafe foreslopes would not accommodate existing and projected vehicle types or volumes, or current and anticipated uses along the road. The need to provide for future sustainable maintenance would not be addressed.

Further, improving some sections of the roadway while leaving others substandard by current industry criteria would create an unacceptable liability for FHWA and the maintaining agency. The current inconsistent alignment combined with narrow travel lanes and lack of shoulders would continue to pose safety risks. Abrupt changes in operating speed would only be exacerbated by a smoother driving surface. The road pavement would be subject to continued raveling because of the narrow travel lane width and lack of shoulders.

Drainage structures, such as culverts, would be replaced, but the road's existing grade, narrow ditch width and shallow ditch depth, which contribute to many of the existing drainage problems, would not be corrected. Without correction of the drainage problems, the improvements of the rehabilitation project would last about 5 to 10 years. Without major repairs, the road and bridges will continue to deteriorate, adversely affecting their historic integrity.

In late 1998 after the SNF and FHWA began considering the rehabilitation project, Congress identified the Beartooth Highway as a High Priority Project and authorized the complete reconstruction of Segment 4. Because any form of rehabilitation would not fulfill the project purpose and need, and would be only a temporary measure, rehabilitation is not a practicable alternative and was eliminated from further consideration.

Bridge Construction Options

Existing Condition of the Bridges. The four bridges within the proposed project are too narrow for vehicle types that currently use the road, and do not provide adequate load carrying capacity. Two large recreational vehicles cannot pass each other on the bridges, and two full-size vehicles, such as two pickup trucks, can barely pass each other (see photo on page 11).

Little Bear Creek bridge #1 is not long enough to handle the high runoff flows of the creek because of ice blockage. Often when the road first opens in May, water flows across the road and freezes, creating ice up to 15 cm (6 in.) thick. Ice has severely damaged the abutment wing wall of this bridge.

None of the bridges meet current acceptable safety standards. The bridge railing and guardrails are inadequate. The FHWA estimated the useful life of all bridges under current load limits and without major repairs to be 15 to 20 years (FHWA 1999b).

Several options were considered to avoid dismantling the historic bridges while ensuring all new bridges would be suitable for current and future vehicle volumes and types. The options considered were:

- Widening bridges on one side
- Using a divided highway
- Realigning the road and retaining bridges for interpretive purposes

Widening Bridges on One Side. YNP is currently completing improvements to roads throughout the park. Many of the bridges in the park are similar to the four historic bridges along the road. At some bridge locations in YNP, the bridge was widened on one side. The abutments were widened using concrete, and refaced using the existing stone from the bridge. In cases where the bridges were widened in this manner, the existing piers were wide enough with sufficient structural integrity to support a wider road deck. This option would not be feasible for the four bridges along Segment 4 of the road. The abutments and the piers of the existing bridges are not wide enough to support a widened bridge deck, nor do they possess sufficient structural strength to withstand projected future traffic loads.

Using a Divided Highway. In this option, the new road would be a divided highway in the immediate vicinity of the bridges and the existing bridges would be used for one of the traffic lanes. Because the bridges would not require widening, the existing pier and abutment widths would be adequate for use as a single traffic lane. The minor repairs needed on the bridges would be completed, but the bridges would not be reconstructed. Consequently, the useful life of the bridges would remain less than 20 years. Bridges would have to be reconstructed to obtain an expected life of 75 years.

The FHWA examined the feasibility of a divided road at each bridge location. A divided highway would adversely affect the historic integrity of the road, and would not be consistent with the character of the existing road. Retaining each bridge for use as a single traffic lane would not adversely affect the bridges and they would retain their NRHP eligibility.

This option was eliminated for several reasons. A divided highway would require median barriers between the two traffic lanes. Crash cushions at the bridges also would be needed. Because a divided highway would be inconsistent with the rest of the Beartooth Highway from Red Lodge to YNP, a divided road at any of the bridge locations would pose a safety concern. A divided highway also would be inconsistent with the character of the existing highway.

At all bridge locations, a divided highway would cause greater environmental impact. Wetlands and fens are near all bridge locations. Alignments far from existing bridges that avoided wetlands and fens while retaining the existing bridges would require longer sections of divided highway and would adversely affect large areas of undisturbed mountain meadow communities and undisturbed wetlands. Because of large rock outcrops, fens could not be avoided with a divided highway at the Beartooth Lake bridge. To avoid fens at the Long Lake bridge with a divided highway, a large bridge spanning Long Lake would be needed. More wetlands adjacent to Long Lake would be affected with the approaches for the divided road. A divided highway also would affect more wetlands at the two bridge locations over Little Bear Creek. For these reasons, this option was eliminated from consideration.

Realigning the Road and Retaining Bridges. In this option, the road alignment would be moved from the existing alignment, a new bridge constructed where necessary along a new alignment, and the existing bridges retained. Realigning the road would move the road from its current location, which would adversely affect the road's integrity as a historic resource.

This option would be similar to the Beartooth Highway reconstruction previously completed at Lake Creek, west of the project area. At Lake Creek, the new alignment was moved south and a new bridge built over the creek. The existing bridge was left in-place. Although no interpretation exists at the bridge, the bridge provides a viewing platform for rapids on Lake Creek. Retention of the four bridges along Segment 4 as an interpretive site was not envisioned in the Beartooth All-American Road Corridor Management Plan, which planned interpretation of historic bridges at the abandoned Lake Creek bridge (Beartooth All-American Road Steering Committee 2002).

The FHWA considered new alignments for the two Little Bear Creek bridge crossings. Little Bear Creek bridge #1 would be avoided in Option B at the Top of the World Store and a new bridge would be built over Little Bear Creek about 350 m (1,100 feet) east of the existing bridge. Option A would not avoid Little Bear Creek bridge #1. It would be dismantled and a new bridge built at the same location.

Although Little Bear Creek bridge #1 would be avoided in Option B, it would be subjected to continued deterioration because of the flooding and ice issues discussed previously. Neither the SNF nor a maintaining agency would want the responsibility of maintaining a deteriorating bridge. For these reasons, retention of Little Bear Creek bridge #1 was considered but eliminated from detailed evaluation.

Both the realignments at the Top of the World Store would avoid Little Bear Creek bridge #2. A new bridge would be built upstream of the existing bridge under both realignment options. In Option A, however, the centerline of the new bridge would be 10 m (30 ft.) upstream of the existing Little Bear Creek bridge #2 and the edge of the road would be less than 3 m (10 ft.) from the bridge. The proximity of the new road to the old bridge could cause confusion by motorists in determining the correct path of the new road and could cause additional accidents. For these reasons, retention of Little Bear Creek bridge #2 was considered but eliminated as an option in Option A.

In Option B, the new bridge would be 160 m (525 ft.) upstream of the existing Little Bear Creek bridge #2. The new bridge would be far enough away not to affect motorist's expectations nor cause confusion to motorists. Little Bear Creek bridge #2 could be retained in Option B, and this option was incorporated into Alternative 2.

Similar opportunities were considered at the Beartooth Lake bridge and the Long Lake bridge. At both locations, a lake is on one side of the bridge and wetlands and fens are south of the bridge. Realigning the road at either location would increase impacts on wetlands and fens. Both locations are popular pulloffs and have high visitors use. At both locations, it would not be practical to have a new alignment, retain the existing bridge, and provide for current and future visitor use.

Long Lake Bridge Alignments

The FHWA considered two different alignments for a new bridge across the outlet of Long Lake, a downstream option and an upstream option. Both options would require dismantling of the existing bridge and building a new bridge. Wetlands occur on the north side of the existing road (upstream) and wetlands and fens are found on the south side of the road (downstream). With the downstream option, the road would be widened away from the lake, extending about 11 m (36 ft.) beyond the existing fill slope. The bridge embankments associated with the downstream option would affect the fens south of the road. As a result, the downstream option was dismissed from further consideration. The FHWA retained the upstream option and incorporated it into all build alternatives. The upstream option was revised during subsequent design to minimize wetland impacts.

Travel Lane and Shoulder Widths

Three travel lane and shoulder width options (8.4 m [28 ft.]; 9.0 m [30 ft.]; and 9.6 m [32 ft.]) are incorporated into the build alternatives analyzed in detail. These widths are consistent with the adjoining road sections. As discussed below, the FHWA eliminated two other roadway width options from detailed analysis.

10.2-m (34-ft.) Width Option

A 10.2-m (34-ft.) width, consisting of 3.3-m (11-ft.) travel lanes and 1.8-m (6-ft.) shoulders, is recommended by AASHTO for the type of road and projected level of traffic (AASHTO 2001). In all build alternatives analyzed in detail, the travel lanes would be 3.6 m (12 ft.), but the shoulders would be narrower than 1.8 m (6 ft.).

With a 10.2-m (34-ft.) roadway width, the Segment 4 would be the widest section on the entire Beartooth Highway. The area of disturbance and habitat loss would be greater. Using the Alternative 4 alignment, a 10.2-m (34-ft.) roadway would disturb an additional 78 ha (191 ac.), including 3.4 ha (8.3 ac.) of wetlands, an increase of about 6 percent. Also, a wider road would be more costly to construct. The benefits of a wider road, such as increased bicycle safety and area for disabled vehicles to pull over, would not offset the larger area of disturbance and greater cost. The lower design speeds selected for the project would reduce the need for wider shoulders. The operational needs discussed earlier, however, would require a minimum travel lane width of 3.6 m (12 ft.). The sensitive environmental resources, the seasonal nature of the roadway use, and the rugged mountainous terrain justified deviating from AASHTO standards. For these reasons, the 10.2-m (34-ft.) width option was dropped from further consideration.

7.2-m (24-ft.) Width Options

Three 7.2-m (24-ft.) options were considered, one with 3.6-m (12-ft.) travel lanes and no shoulders, one with 3.3-m (11-ft.) travel lanes and 0.3-m (1-ft.) shoulders, and one with 3.0-m (10-ft.) travel lanes and 0.6-m (2-ft.) shoulders. In these options, the roadway would have to be widened to more than 7.2 m (24 ft.) at curves to accommodate vehicle turning and tracking.

In the option using 3.6-m (12-ft.) travel lanes and no shoulders, the travel lanes would accommodate recreational vehicles and pickup trucks pulling trailers. Such vehicles would periodically track off the travel lanes onto the foreslope, potentially affecting vehicular stability or causing pavement raveling. Damage to foreslope vegetation and subsequent erosion may occur. In the options using 3.3-m (11-ft.) travel lanes and 0.3-m (1-ft.) shoulders or 3.0 m (10 ft.) and 0.6 m (2 ft.), the travel lanes would not accommodate the range of vehicles types that currently use the road.

In both options with shoulder less than 0.6 m (2 ft.), the shoulder width would be below the minimum AASHTO and WYDOT standards and would be a major deficiency. Shoulders are important for numerous reasons and serve the following functions:

- Providing vehicles room to maneuver or recover from errant driving
- Providing vehicles room to escape encroachment of oncoming vehicles and avoid potential crashes or reduce their severity
- Providing space for pedestrian and bicycle traffic
- Accommodating temporarily stopped or disabled vehicles
- Improving sight and stopping distance
- Providing lateral clearance for signs and guardrails
- Providing storage space for plowed snow and maintenance operations
- Providing lateral support of the base and pavement
- Removing surface water runoff from the travel lanes

A roadway having 3.6-m (12-ft.) travel lanes with no shoulders or 3.3-m (11-ft.) travel lanes and 0.3-m (1-ft.) shoulders would not meet the functional needs for the road and would not be considered safe for the current and projected vehicle types on the road and the projected level of traffic. The inadequate shoulders would not accommodate existing and anticipated recreational uses. Because these options would not fulfill the project's purpose and need, they are not practicable alternatives and were eliminated from detailed analysis.

The other 7.2-m (24-ft.) option would use 3.0-m (10-ft.) travel lanes and 0.6-m (2-ft.) shoulders. The travel lanes would be only slightly wider than the existing road and would not accommodate current and projected vehicle types or traffic volumes. A 0.6-m (2-ft.) shoulder would not accommodate existing and anticipated recreational uses west of the road closure gate. Accommodating current and projected vehicle types throughout the project and traffic volumes as well as the existing and anticipated recreational uses west of the road closure gate is part of the project's purpose and need. Because this option would not fulfill the project's purpose and need, it is not a practicable alternative and was eliminated from further consideration.

Because of the curve widening and widening needed for adequate ditches and safe foreslopes, the impacts associated with a 7.2-m (24-ft.) roadway would not be substantially different from the build alternatives considered in detail.

The FHWA assessed the environmental effects of the 7.2-m (24-ft.) option for several key environmental resources. A 7.2-m (24-ft.) alignment closely following the existing road was used for the assessment. The alignment in this option would be similar to Alternative 3, which has a roadway width of 8.4 m (28 ft.). A comparison of the effects between Alternative 3 and a 7.2-m (24-ft.) roadway is presented in Table 6.

The total disturbed area with the 7.2-m (24-ft.) roadway would be 3 ha (8 ac.) less or 4 percent. Environmental impacts of the two options also would be similar (Table 6). Although a 7.2-m (24-ft.) roadway is 17 percent narrower than an 8.4 m (28 ft.) roadway, disturbed areas and environmental impacts are not proportionally reduced because of widening needed at curves to accommodate vehicle tracking and for foreslopes and ditches.

Foreslope Options

The FHWA evaluated several foreslope options, such as using a fixed width foreslope, or a fixed foreslope ratio of 1:8, 1:6 or 1:4. In the fixed width foreslope option, the foreslope would have a constant width of 2.4 m (8 ft.) (Figure 4). The slope ratio would vary, depending on the cross slope (superelevation) on curves of the road. Regardless of the superelevation, however, the 2.4 m (8 ft.) foreslope, coupled with the 0.6 m (2 ft.) of shoulder, would always provide the minimum clear

Table 6. Comparison of the 7.2-m (24-ft.) and 8.4-m (28-ft.) roadway options.

Criterion	7.2-m (24-ft.) Option (Existing Alignment)		8.4-m (28-ft.) Option (Alternative 3)	
	ha	ac.	ha	ac.
Disturbed Area				
Total disturbed area	81	201	84	209
Existing disturbed area in construction limits	27	67	27	67
New disturbed area	54	134	57	142
Abandoned road sections	0	0	4	9
Wetlands and Other Waters of the U.S. Impacts				
Jurisdictional wetlands	2	5	2	6
Non-jurisdictional wetlands	<1	1	<1	1
Fens	0	0	0	0
Vegetation Communities Temporarily Disturbed by Road Construction				
Alpine meadow	24	60	26	63
Mountain meadow	12	30	12	31
Wet meadow	3	8	4	9
Old growth forest	11	26	11	27
Forest	<1	1	1	2
Rock outcrop/talus	4	9	4	9
Whitebark Pine Habitat	7	17	11	28

zone needed for the project (3 m [10 ft.]). A fixed width foreslope was retained for all build alternatives, and fixed foreslopes of of 1:8, 1:6 or 1:4 were eliminated. Only foreslopes of 1:8 and 1:6 are discussed in the following sections. A 1:4 foreslope was eliminated for the same reasons as a 1:6 foreslope.

1:8 Fixed Foreslope Ratio Option

In a 1:8 fixed foreslope option, the foreslope would have a constant slope of 1:8, and the foreslope width would vary. The width would vary from 1.6 m (5.3 ft.) to 4.6 m (15.1 ft.), depending on the superelevation. In locations without guardrail or paved ditch where the foreslope would be less than 2.4 m (8 ft.) in width, an area at least 3 m (10 ft.) wide from the shoulder, on a 1:4 slope or flatter, would be kept clear of obstacles, such as trees or boulders, to meet clear zone requirements.

This option was eliminated for three reasons. In most locations, a 1:8 foreslope would have greater impacts than a 2.4 m (8 ft.) foreslope. For example, at a superelevation of 6 percent, total foreslope width (both sides of the road) would be 6.2 m (20.4 ft.). With a 2.4 m (8 ft.) fixed width, the total foreslope width (both sides of the road) would be 4.8 m (16 ft.), regardless of the superelevation. Second, additional clearing and slope flattening in some locations would be needed to meet clear zone requirements in locations without guardrail or paved ditch where the foreslope width would be less than 2.4 m (8 ft.). Third, the varying foreslope width would be more difficult to construct and would provide an inconsistent roadway cross section, adversely affecting driver expectancy. For these reasons, a 1:8 foreslope was eliminated from detailed analysis.

1:6 Fixed Foreslope Ratio Option

In a 1:6 foreslope option, the foreslope would have a constant slope of 1:6, and the width would vary. The foreslope width would vary from 1.3 m (4.3 ft.) to 2.8 m (9.2 ft.), depending on the superelevation. In locations without guardrail or paved ditch where the foreslope would be less than 2.4 m (8 ft.) in width, an area at least 3 m (10 ft.) wide from the shoulder, on a slope of 1:4 or flatter, must be kept clear of obstacles, such as trees or boulders, in order to meet clear zone requirements.

Generally, a 1:6 foreslope would have less disturbance than a 2.4 m (8 ft.) fixed width. For example, with a superelevation of 6 percent, a 1:6 foreslope would disturb 4.15 m (13.6 ft.), slightly less than the 4.8 m (16 ft.) using a 2.4 m (8 ft.) fixed width.

This option was eliminated for three reasons. In most locations, a 1:6 foreslope would not accommodate a future overlay without requiring disturbance to the revegetated foreslopes. After a future overlay, the remaining asphalt taper would be steepened to slope ratios ranging from 1:3.2 to 1:4.2, depending on the superelevation. The effect of an overlay on a 1:6 foreslope in the typical section is shown in Figure 31. Slopes steeper than 1:4 would be unsafe and would require disturbing the revegetated portions of the foreslope to make it at least 1:4.

Second, additional clearing and slope flattening in some locations would be needed to meet clear zone requirements in locations without guardrail or paved ditch. Third, the varying foreslope width would be more difficult to construct and would provide an inconsistent roadway cross section, adversely affecting driver expectancy. For these reasons, a 1:6 foreslope was eliminated from detailed analysis. A 1:4 foreslope was eliminated for the same reasons as a 1:6 foreslope.

Bar Drift Realignment

A road section at the Bar Drift consists of a series of four, closely spaced switchbacks on a steep, north-facing slope (see the previous *Bar Drift near the West Summit* section). A realignment was evaluated that eliminated all four switchbacks, and provided a more consistent alignment and minimized long-term environmental impact. In this realignment, the maximum grade would be 9 percent. The realignment was eliminated for two reasons. First, eliminating the Bar Drift switchbacks would adversely affect the character of the road. The switchbacks are one of the features for which the road is considered eligible for listing in the NRHP. Second, the 9 percent grade would be considered too steep for safe operation of the roadway, especially when snowpacked or icy.

Materials Source Locations

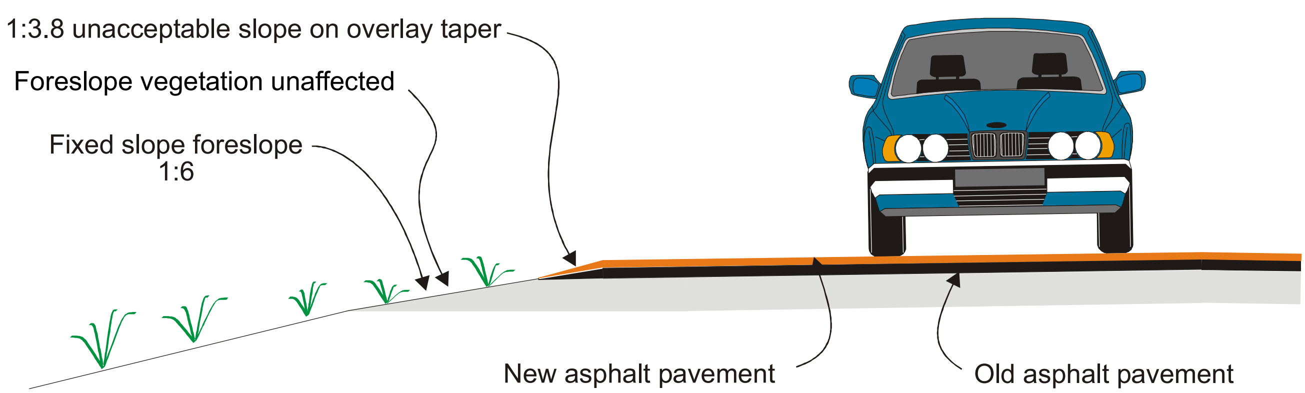
Six materials sources were evaluated as part of an initial site reconnaissance (FHWA 1998a). The use of two sites, Ghost Creek and Island Lake Moraine, were incorporated into all build alternatives analyzed in detail. The other four sites, a small, former materials source just south of the existing road west of the closure gate (KP 52.1); two former materials sites at KP 53.3 and 62.1; and Lily Lake, were eliminated from detailed analysis.

A small, former materials source is just west of the closure gate (KP 52.1) on the south side of the road. The area was used in previous road construction projects. Wetlands are immediately adjacent to the area. Because the source could not be used without affecting wetlands, it was eliminated from consideration.

A former material source is located at KP 53.3, behind a small rock outcrop at an elevation of about 3,050 m (10,000 ft.). The material is granite and would require blasting and crushing for aggregate. Because of the site's elevation, it would be difficult to access in the early spring and late fall. This site was eliminated from further analysis because suitable materials could be obtained from other material sources more readily accessible. Because the site was eliminated, tests were not conducted to determine if suitable quality and quantity of materials were available.

A former material source is located at KP 62.1, on the north side of the road across from the Gardner headwall. The site is located at 3,200 m (10,500 ft.). It was used as a material source on past projects and has not been revegetated. The lack of vegetation may be due to the lack of topsoil and seed. Because of the site's elevation, it would be difficult to access in the early spring and late fall. Use of the site as a materials source would require

Figure 31. Overlay on a 1:6 foreslope in the typical section for the alpine section.



disturbing both previously disturbed areas and undisturbed alpine meadows. The site was not retained for detailed analysis because sites that could be more easily reclaimed and that would be more accessible are available. Because the site was eliminated, tests were not conducted to determine if suitable quality and quantity of materials were available.

The Lily Lake site is about 0.8 km (½ mi.) southwest of Lily Lake and 1.6 km (1 mi.) north of the intersection of U.S. 212 and WY 296. The road from U.S. 212 to the site is unimproved, and would require upgrading if the site was used. The site is about 10 km (6 mi.) from the western end of the project. The site has been used previously as a material source and has been reclaimed. Lily Lake is a popular dispersed camping site for area visitors. The site was not considered further because closer sites with less recreational use are available. Because the site was eliminated, tests were not conducted to determine if suitable quality and quantity of materials were available.

Workcamp Locations

After preliminary analysis, the FHWA in cooperation with the SNF eliminated all workcamp options from detailed analysis except for the Fox Creek site. The options eliminated were:

- Permanent Campground Expansion or Development at selected locations
- Temporary Campground Expansion
- Temporary Campground Use/No Campground Expansion
- Scenic Byway Junction Site
- Temporary Workcamp

Permanent Campground Expansion or Development Option

Expansion of an existing campground was considered for the campgrounds at Crazy Creek and Beartooth Lake. Development of a new campground was considered for Lily Lake and Pilot Creek. The expansion or development would accommodate 80 workers and the camping area would be closed to the public during the 6-year construction period. The existing campgrounds have trailer pads, picnic tables, grills, potable water, and restrooms.

Lily Lake currently is an undeveloped camping area used primarily by area residents. It is 10 km (6 mi.) from the western end of the project. Lily Lake includes six designated campsites and about four dispersed campsites.

Pilot Creek has been used as a source of aggregate since the early 1960s. The FHWA used aggregate from the Pilot Creek pit during the repaving and rehabilitating of the road between Tower Junction and the northeast entrance of YNP. About 7.5 ha (18.5 ac.) have been disturbed. No campsites currently are at Pilot Creek. It is used for dispersed recreation uses in the fall by hunters and in the winter by snowmobilers.

This option was eliminated because the SNF did not want new or expanded facilities at Crazy Creek, Beartooth Lake, Lily Lake or Pilot Creek. Development at Pilot Creek would disturb the revegetation efforts that were completed in 2000. Facility development at Crazy Creek, Lily Lake, and Beartooth Lake also was limited by the proximity to wetlands. The Pilot Creek site also was suggested as a temporary workcamp, as discussed in a subsequent section.

Temporary Campground Expansion Option

This option is the same as the Permanent Campground Expansion Option except the expansion would be in place only during the 6-year construction period. After road reconstruction is completed, the SNF would remove the new facilities. Because of the surface disturbance associated with constructing temporary facilities, and the lack of long-term benefits to recreation, this option was eliminated from further consideration.

Temporary Campground Use/No Campground Expansion Option

In this option, the SNF would allow construction employees to camp at one or more existing campgrounds, such as the 21 campsites at Beartooth Lake, 6 campsites at Lake Creek, and 27 campsites at Fox Creek. Up to 33 campsites would be set-aside during the 6-year construction period for workers. Employees would use one part of the campground and recreational visitors would use another part. Any campground used by construction employees would be upgraded to current standards. This option was eliminated because nighttime construction would require construction workers to enter and leave the campground at hours different from tourists. The different schedules would result in user conflicts.

Scenic Byway Junction Site

In the Draft EIS, the FHWA and the SNF considered a site south of the junction of U.S. 212 and WY 296 as a potential workcamp site. The site is currently undisturbed and a workcamp would be constructed to serve the project. After road construction is completed, the SNF would use the site permanently for administrative purposes. Facilities that would be used by the maintaining agency, such as snowplow and other equipment storage, also would be permanent. The existing NPS maintenance facility, located east of the U.S. 212 and WY 296 junction would be closed permanently.

The FHWA and the SNF eliminated this site for several reasons. The site would be visible from U.S. 212 and WY 296, which are both Scenic Byways. Use of the site would disturb a previously undisturbed area used by wildlife to access the Clarks Fork Yellowstone River. Water supply at the site is uncertain. There is no assurance that a maintaining agency would want to relocate the existing NPS maintenance facility to this site. For these reasons, this site was eliminated from further consideration.

Temporary Workcamp Option

This option would be used in conjunction with one of the campground expansion options to provide overflow capacity during peak construction periods. In this option, the SNF would develop sanitation facilities and provide electrical power at either Lily Lake or Pilot Creek. The site would be used as a workcamp only for 1 to 2 months during peak construction periods. After road reconstruction is completed, the SNF would remove the facilities. Because this option would not accommodate the number of workers anticipated, and lacked long-term benefits to recreation, it was eliminated from further consideration.

Public comment on the Draft EIS suggested several sites could be used as a temporary workcamp. The suggested sites, in addition to the Pilot Creek site, were a site near Colter Pass near an existing GNF administrative cabin, private land near Painter Creek along the Clarks Fork Yellowstone River, and the Ghost Creek materials source. All of these sites would involve a large investment of public funds in infrastructure (such as water, toilets, showers, etc.) for a temporary facility. This infrastructure would be removed after construction was completed, and the monies used for them would not provide long-term benefit for recreational users. Because of the surface disturbance associated with constructing temporary facilities and the lack of long-term benefits, the above sites were eliminated from further consideration.

2.7 Reasonably Foreseeable Activities

Reasonably foreseeable future activities analyzed in this EIS are those actions and activities independent of the Beartooth Highway Reconstruction Project that could result in cumulative effects when combined with the effects of the proposed project. These activities are anticipated to occur regardless of which alternative is selected. The effects of these activities are described in the *Cumulative Effects* section under each resource in Chapter 3. The FHWA identified four categories of reasonably foreseeable future activities:

- Future road projects
- On-going New World Mine District cleanup
- Future SNF projects
- Future area growth

Some of these projects, such as future road projects, would involve decisions by federal agencies. A decision on these projects would be made separate from the decision on the Beartooth Highway Reconstruction Project.

Future Road Projects

Yellowstone National Park Road Improvements

For the past 5 years, the NPS has been implementing a 20-year road-improvement plan for YNP. The plan calls for rehabilitation and/or reconstruction of all park roads over a 20-year period (NPS 1992a). Either an environmental assessment or an environmental impact statement will be prepared on each project before it starts. The east entrance road in YNP, which begins at the western end of U.S. 14/16/20 leading from Cody, Wyoming, has been under construction for the past 5 years (NPS 1992b). The fourth phase of reconstructing the road is scheduled to be awarded in 2004, and the final phase is planned to be awarded in 2008. The road is expected to be reconstructed completely by 2010. The northeast entrance road from the northeast entrance of YNP to Tower Junction was rehabilitated in the late 1990s.

U.S. 212 Reconstruction

The FHWA is proposing to reconstruct a 13.5-km (8.4-mi) segment of U.S. 212 from YNP to the Montana/Wyoming state line east of Cooke City, Montana (FHWA 1998b). This segment of the road in Montana remains in much the same condition as when it was originally built in the 1930s. The FHWA completed an environmental assessment of the proposed project, which resulted in a Finding of No Significant Impact. The construction will begin in 2004 and is expected to last 4 years.

On-going New World Mine District Cleanup

The New World Mine District is a historical mining district about 1.6 km (1 mi.) north of U.S. 212 near Colter Pass, Montana. Mining disturbances have affected water quality in a tributary of the Clarks Fork Yellowstone River. The mine district is undergoing cleanup by the USFS. The cleanup is expected to continue until 2006. Heavy equipment and materials are brought to the site using WY 296 and U.S. 212. During peak construction periods, up to 15 loads per day may use U.S. 212 west of WY 296.

Future SNF Projects

The SNF has planned several projects in the vicinity of the road over the next 5 years. Proposed projects include trail reconstruction of short trail segments, minor campground maintenance and facility replacement, special use permit authorizations for recreation-related activities for a period of 5 years or less, maintenance of the access road to Clay Butte Lookout, and renewal of the Red Lodge Race Camp ski permit.

A Corridor Management Plan for the Beartooth All-American Road has been prepared. The Corridor Management Plan provides a vision, goals, and management recommendations for protecting and enhancing an 85-km (53-mi.) section of the Beartooth Highway. The Beartooth All-American Road extends between the CNF boundary south of Red Lodge to Colter Pass, located just east of Cooke City, Montana. Activities associated with implementing the plan are not expected to result in cumulative effects when combined with the proposed project.

Future Area Growth

Population growth in the project area has increased over the past 20 years, and growth is expected to continue over the next 25 years. Population and employment, especially in the retail and service sectors of the economy, is expected to increase. The demand for housing and government services likely will parallel the population increase.

The SNF anticipates that recreational uses on the forest will continue to grow. Over the past decade, for instance, campground receipts for National Forests surrounding YNP have doubled. Recreational uses in YNP also are anticipated to grow.

Future transportation growth is expected to continue. The amount of growth on area roads varies depending on the particular road. Traffic volumes on area roads (U.S. 212 and WY 296) are expected to increase at a 3 percent annual rate or double over the next 20 years. The SADT on Segment 4 in 2025 is projected to be 1,972 vehicles (Table 1).

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