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 on 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 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 inclusion on 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. 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. Several rare plant species are found along the road corridor. There is a concern that road reconstruction may affect the populations of these species. Another concern is that the revegetation of the road's sideslopes and abandoned segments 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 located 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 used primarily for recreational purposes. Trails into the Absaroka-Beartooth Wilderness 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 recreational resource 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 roads. Because of the area's remoteness, however, minor accidents may not be reported. 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 that could be addressed by reconstruction. 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 portion 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, but has only been allocated funding for snowplowing from the Forest Service through 2007. 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, the present uncertainty about jurisdiction and maintenance will continue.

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 would 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. As lead agency, the FHWA has the responsibility to select an alternative that balances providing safe and efficient transportation with minimizing environmental impacts.

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 west 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 a work-camp, material sources, and staging areas (discussed in the *Activities and Facilities Common to All Build Alternatives* section)

Design Criteria Options

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 standards have been adopted by the FHWA and the WYDOT. The road meets the definition of a rural minor arterial because it links cities, towns, and other traffic generators that attract visitors from distant places. Minor arterials usually provide for relatively high travel speeds and minimum interference to traffic flow.

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. Two design criteria, design speed and roadway width, were project components for which options were evaluated.

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.

The design speed should equal or exceed the posted or regulatory speed limit of a roadway. Actual

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)
Roadway Width	8.4 m (two 3.6 m [12 ft.] travel lanes; two 0.6 m [2 ft.] shoulders) (28 ft. total width) or 9.6 m (two 3.6 m [12 ft.] travel lanes; two 1.2 m [4 ft.] shoulders) (32 ft. total width)
Minimum Switchback Radius	30 m (100 ft.)/30 km/h (19 mph)
Barrier Offset	0.6 m (2 ft.)
Minimum Clear Zone	Typically 3.0 m (10 ft.)

Source: MK Centennial Engineering, Inc. 1999c.

vehicle operating speeds may safely exceed the design speed in areas where the alignment, grade, and sight distance are favorable. The posted speed limit may be lower than the design speed based on the actual vehicle operating speeds, roadside conditions or activities, and other factors.

Once a design speed is selected, it is used to determine individual elements, such as stopping sight distance and the sharpness of the curves. 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 segments are not designed to the selected design speed because of topographic or environmental constraints, such as at switchbacks, are called design exceptions.

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 segments with distinctly different curvature and operating characteristics. One segment, the western segment, was from the beginning of the project to the road closure gate past Long Lake (KP 39.4 to 49.3). This segment contained relatively flat curves and several long, relatively straight sections. The other segment, the eastern segment, was from the road closure gate to the project end at the Montana/Wyoming state line (KP 49.3 to 69.4). The eastern segment traversed over Beartooth Pass and contained 12 switchbacks. The two segments 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 segments, two different design speeds were selected. A design speed for each section was selected so that about 80 percent of the existing curves could be accommodated and would 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 segment (KP 39.4 to 49.3), and a design speed of 50 km/h (31 mph) was selected for the eastern segment (KP 49.3 to 69.4). At these 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. All of the reconstructed switchback curves would be design exceptions of 30 or 40 km/h (19 to 25 mph).

Roadway Width

The other design criterion for which options were developed was roadway width. Initially 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 the type of road and projected travel volumes and types, a roadway width of 10.2 m (34 ft.) is the minimum recommended by AASHTO design standards.

Where the road has been rebuilt 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 selected as options. 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 both 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 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 wider travel lane width is discussed in Chapter 1.

Two shoulder widths, 1.2 m (4 ft.) and 0.6 m (2 ft.), were selected, based on the amount of 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 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. A 1.2-m (4-ft.) shoulder width is the minimum recommended shoulder width when shoulders may be used by bicycles. The need for wider shoulders is discussed in Chapter 1.

Alignment Options

The new alignments in 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 2 through Figure 7 beginning on page 28. In each area, one of the options would generally follow the existing alignment. This option is called the Existing Alignment Option. The reconstructed road would be widened to one side or the other, encompassing the existing road. Other options would depart from the existing alignment. With these options, the reconstructed road would be built outside the "footprint" of the existing road. The existing road would be removed and the land 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 D.

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 segment passing the Clay Butte Lookout turnoff. Beartooth Lake is east of the ravine.

The Beartooth Ravine had more accidents 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 the east and the west are gentler than those in the ravine itself (Table 2). This often causes sudden slowing, which may be the cause for the high accident rate in the ravine 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 2; figures for all options are shown beginning on p. 28). One alignment would closely follow the existing alignment and have a design speed of 40 km/h (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 segment and would not be an 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. After the preliminary analysis, a haunched welded steel plate girder structure was used in both bridge options. Additional information about the bridge structures can be found in the *Beartooth Ravine Bridge Structure Selection Reports* (MK Centennial Engineering, Inc. 2001b).

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

Top of the World Store Area

The road segment near Top of the World Store is located in the Little Bear Creek valley (Figure 3). The existing road alignment in this section is fairly straight and gently rolling. Portions 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 3). 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 3). New bridges would be constructed at the existing bridge locations. Another option (Option A) 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 15 to 20 m (50 to 65 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 3).

A third option (Option B–see yellow line on Figure 3) 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. 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 located 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 4). 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 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 four piers. This option is called the Bridge Option. In the Bridge Option, the existing fill in the fen would be removed 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 switchbacks have a design speed of 40 km/h (25 mph). Two options for this area were developed (Figure 5). 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 increase 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 segment, 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 6). The Existing Alignment Option would closely follow the existing alignment. The other option (Option A) was designed to minimize environmental 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 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 portion 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). Because of these resources, three options for the area were developed (Figure 7). 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.

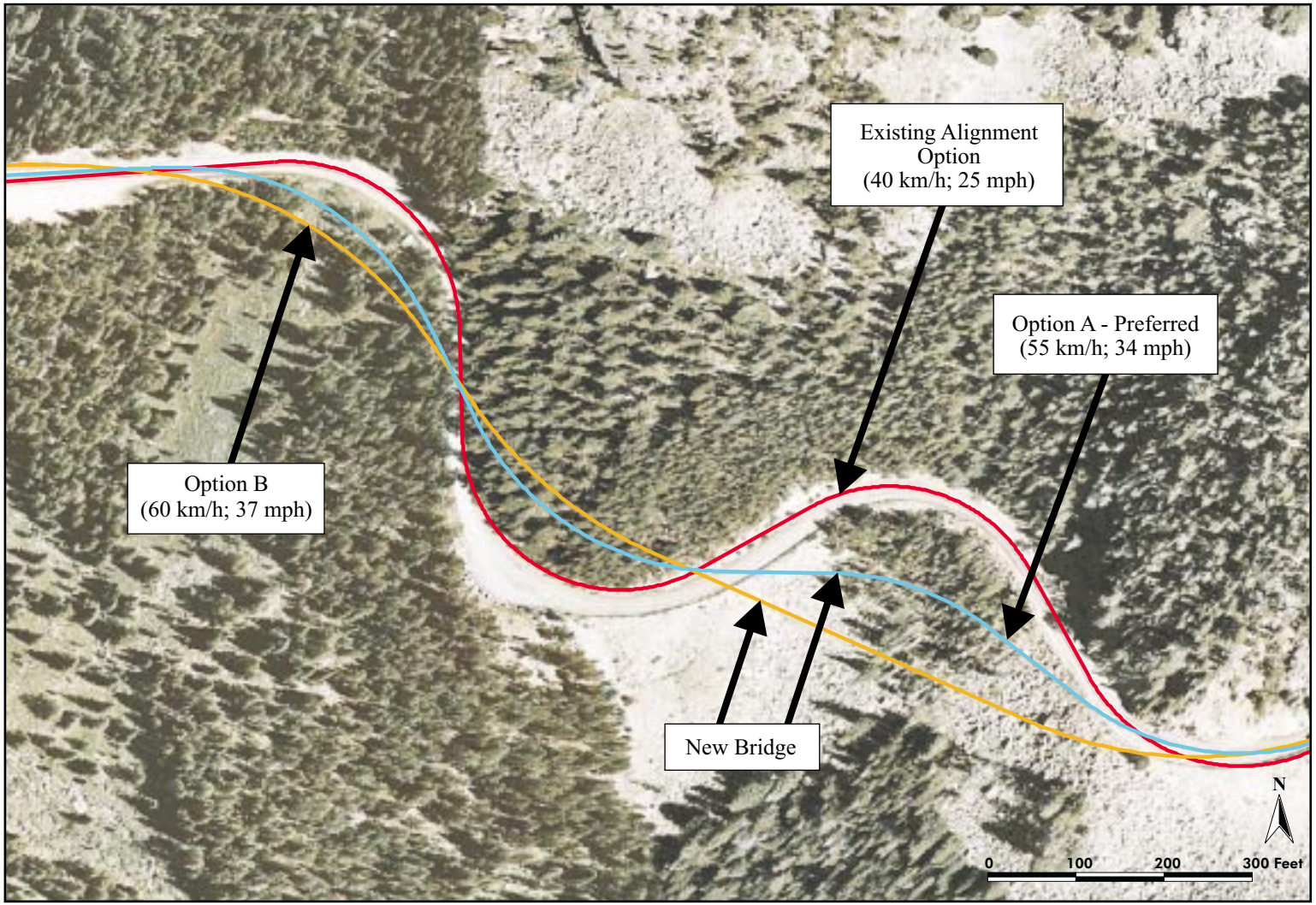
The "bar drift" during the 1950s.
Photo © Flash's, Red Lodge, MT

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

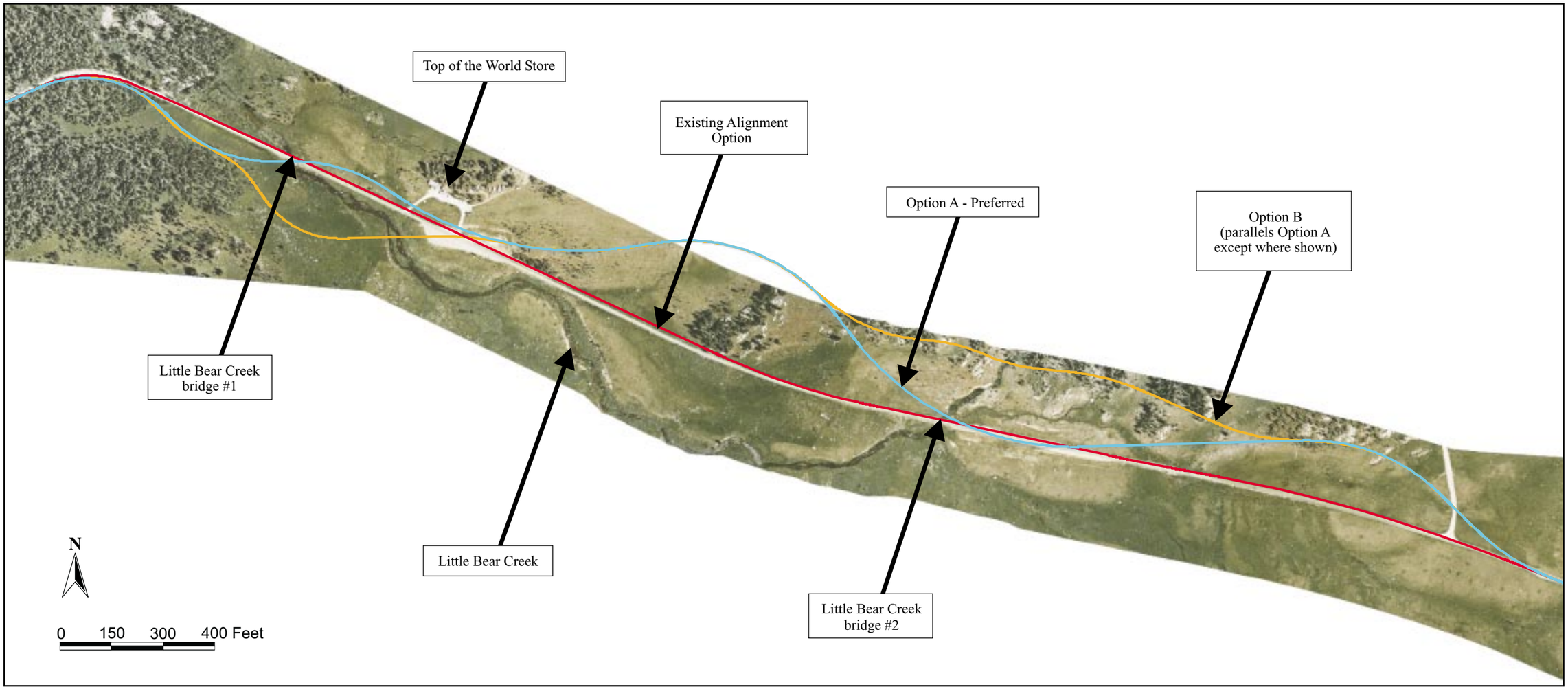
After considering the options that were retained for detailed evaluation, the FHWA, in cooperation with the SEE team, developed alternatives using an option for each alignment area that addressed suggestions and concerns from other agencies and the public. Five build alternatives and the No Action Alternative are analyzed in detail in this EIS. Combinations of alternatives evaluated in detail may be changed in the Final 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. 35).

Figure 2. Options for Beartooth Ravine area.



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

Figure 3. Options for Top of the World Store area.



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

Figure 4. Options for the Little Bear Lake fen crossing.

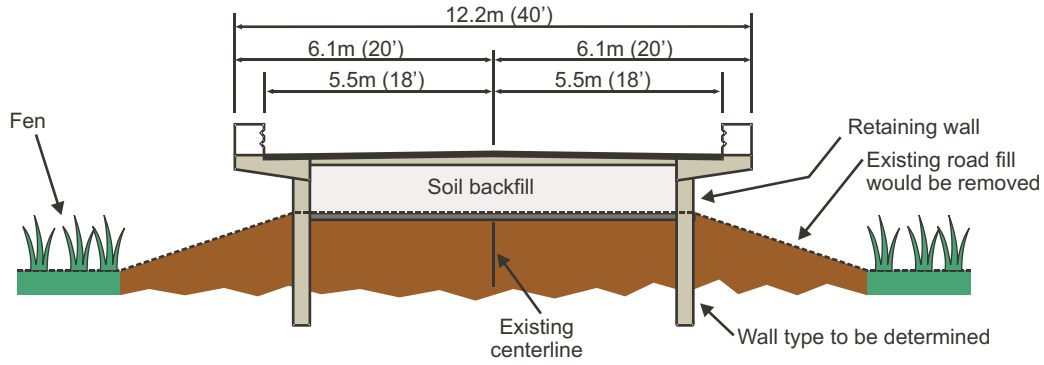
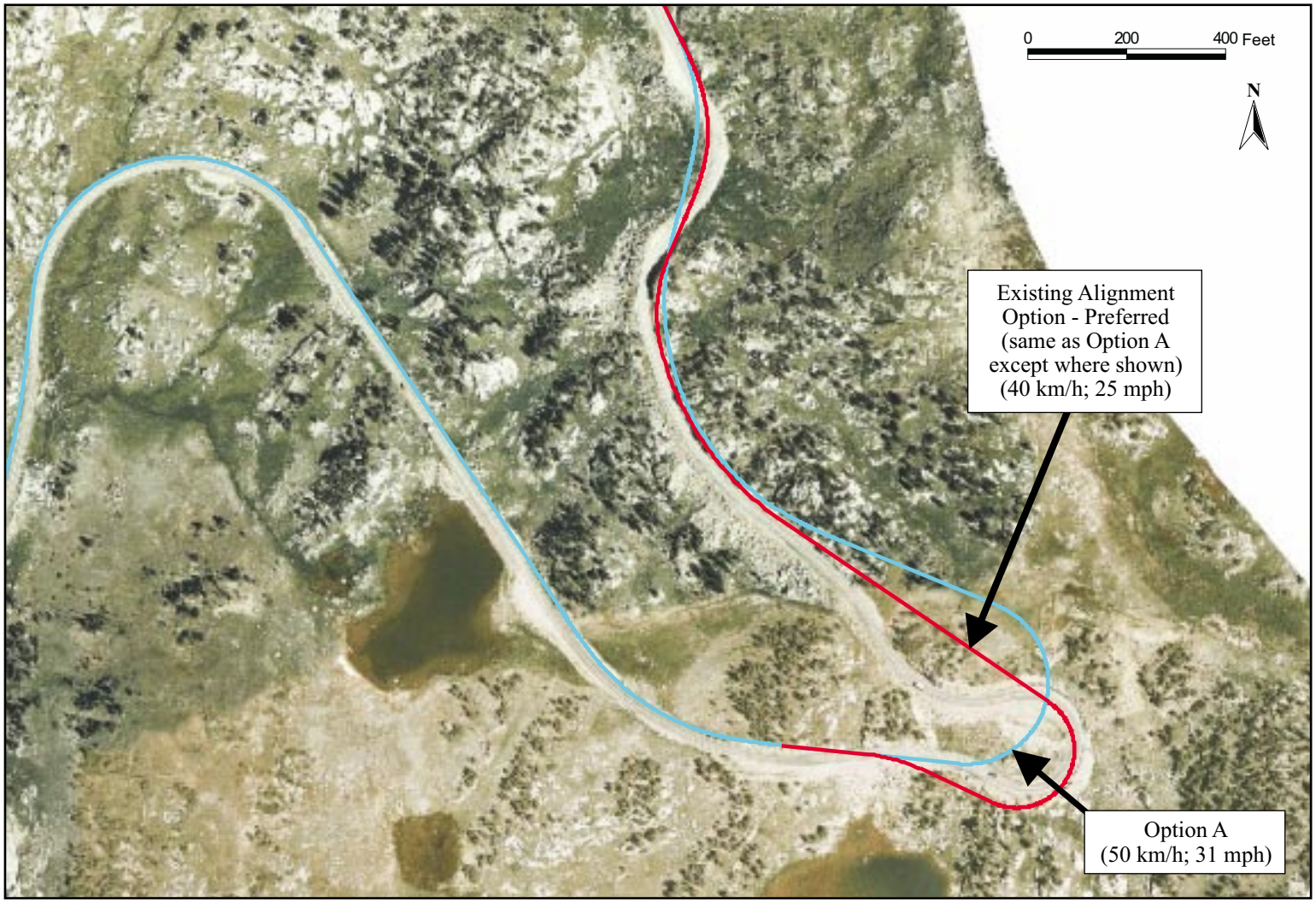
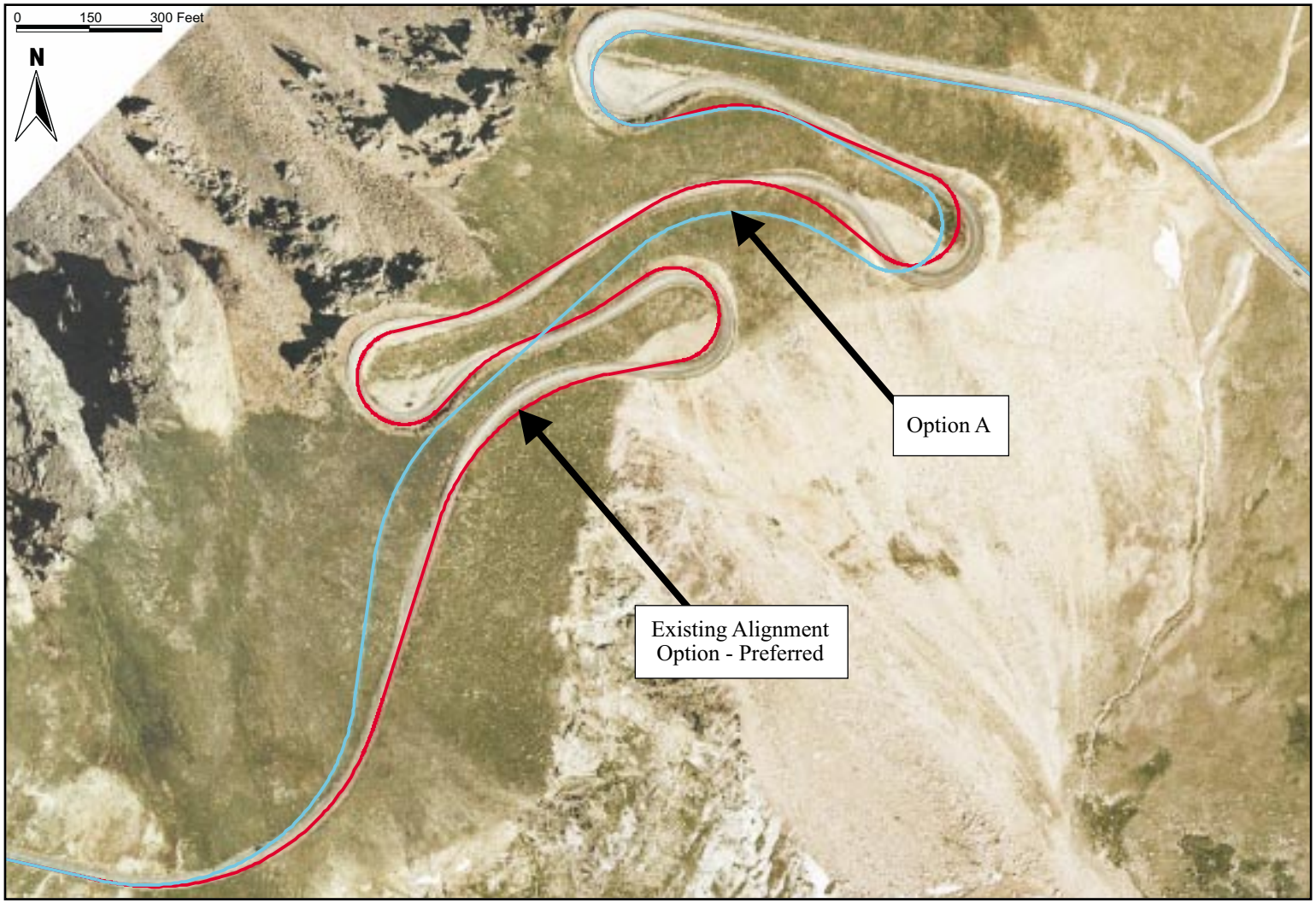


Figure 5. Options for Frozen Lake area.



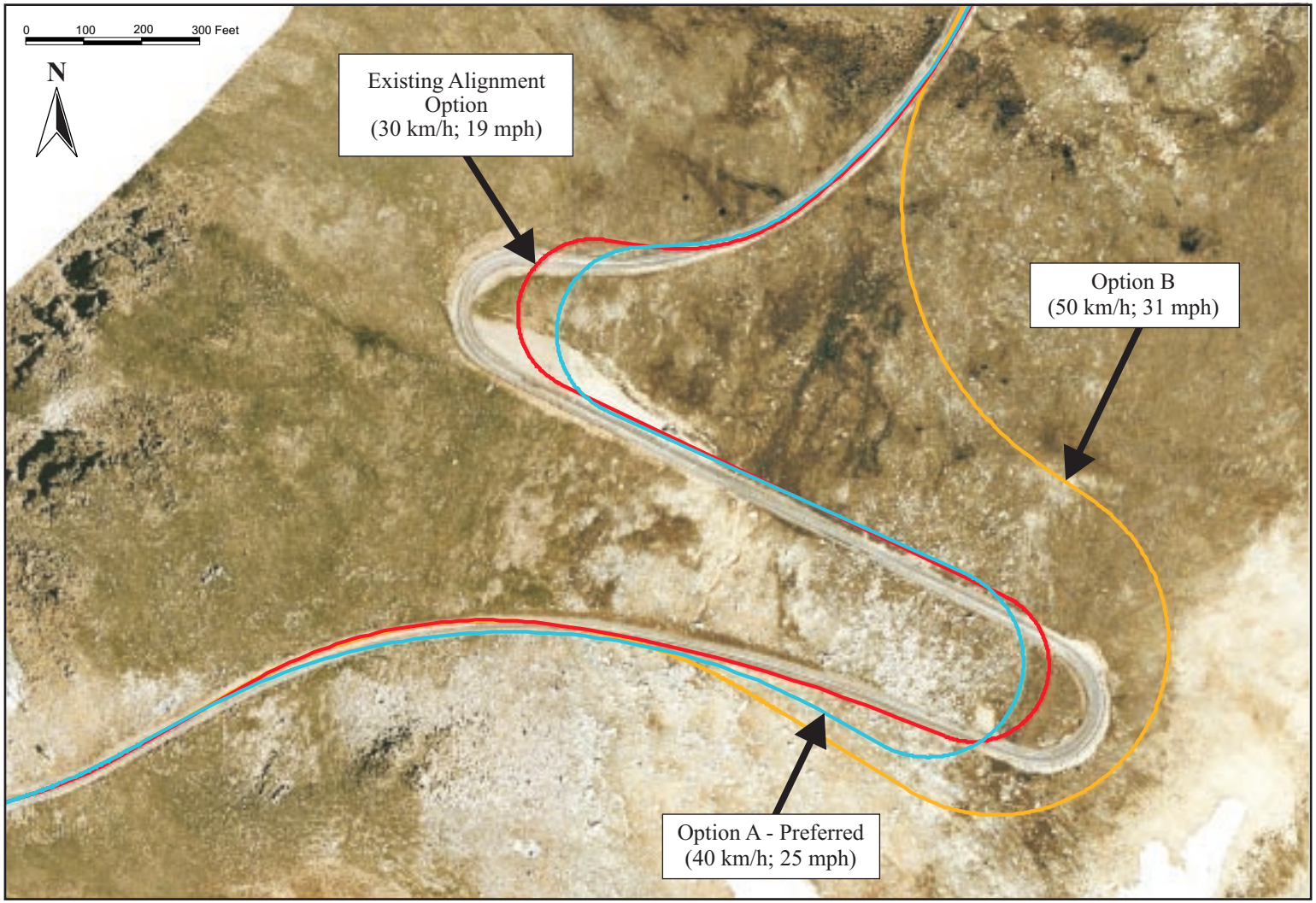
The Existing Alignment Option is the option that most closely follows the existing road alignment.

Figure 6. Options for Bar Drift area.



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

Figure 7. 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.)† 9.6 m (32 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.)	1.2 m (4 ft.) † 0.6 m (2 ft.)
Number of Pullouts	114	79	37	63	32	67
Number of Switchbacks	12	12	12	9	10	12
Disturbed Area Summary						
New disturbed area	0 ha (0 ac.)	78 ha (194 ac.)	70 ha (173 ac.)	73 ha (180 ac.)	71 ha (177 ac.)	75 ha (186 ac.)
Abandoned road segments	0 ha (0 ac.)	6 ha (14 ac.)	4 ha (9 ac.)	6 ha (14 ac.)	7 ha (16 ac.)	7 ha (18 ac.)
Estimated Construction Cost	$0	$45,700,000	$44,400,000	$50,800,000	$47,600,000	$48,300,000
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	Retaining Wall 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.) with 1.2 m (4 ft.) shoulders from the beginning of the project to the road closure gate past Long Lake and 8.4 m (28 ft.) with 0.6 m (2 ft.) shoulders from the gate to the end of the project.

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 Little Bear Creek bridge #2, which would be left in place. Alternative 2 would avoid wetlands to the extent practical by widening to the side with the fewest wetlands. Other alternatives would address other resources besides their primary emphasis in a similar manner.

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

- 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 by a maintaining agency
- Support management of National Forest lands adjacent to the road, including maintaining the Scenic Byway/All-American Road intrinsic qualities

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 adequately address 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. 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 a narrower roadway in the western portion of the project, would not accommodate this traffic mix safely.

All build alternatives would provide a roadway that could be reasonably maintained by a maintaining agency. Alternatives 2, 4 and portions of Alternative 6, however, could be maintained in a more cost effective and safe manner (maneuver-ability of equipment, snow storage, reduced traffic conflicts, etc) because they would have a wider roadway.

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 portion of the project in Alternatives 2, 4, and 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 portion of the project, would not support the SNF's management goals in this area and are not practicable alternatives.

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 maintenance necessary on the bridges would not be completed. Existing pullouts would remain in their same location and condition. Maintenance responsibilities would remain with the Department of the Interior. Alternative 1 would not fulfill the three primary needs for the reconstruction described in Chapter 1.

Traffic volume on the Beartooth Highway is projected to increase above current levels by about 3 percent annually. By 2025, traffic volume on the segment proposed for reconstruction is projected to be 1,972 vehicles per day. As the traffic volumes increase, the existing problems associated with the road, described in detail in Chapter 1, would become worse.

Funding for maintenance would need to increase to maintain the road because of its deteriorated condition. Responsibility for future road maintenance would remain an issue 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.

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, environmental issues associated with the existing condition of the road, including the area's economy, safety and traffic operations, maintenance and jurisdiction, wetlands, and cultural resources 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 will 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 2004 through 2006, if a build alternative is approved and selected in the

Record of Decision in early 2003. 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. It is proposed that the second project phase would be constructed in 2006 through 2008.

Alternative 2–Recreation and Cultural Resource Emphasis

Alternative 2 has a recreation and cultural resource emphasis. This alternative is designed primarily 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 the minimum width considered safe for use by bicyclists, 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 8, Alternative 2 would have the following alignment options; design speeds are shown in parentheses:

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

(All figures showing the alternatives are presented beginning on p. 41 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 segment 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 pullouts to permit the viewing of scenic areas would provide travelers an opportunity to safely pull off the road to sightsee or play. Recreation-related pedestrian use of the road shoulder, especially in the vicinity of pullouts, is better accommodated by this alternative. Alternative 2 would have 79 pullouts, the most of any of the build alternatives. 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 9, Alternative 3 would have the following alignment options:

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

This alternative would have 37 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, 63 pullouts would be provided where beneficial for traffic operations, safety or maintenance purposes. The estimated construction cost of Alternative 4 is $50,800,000. As shown in Figure 10, Alternative 4 would have the following alignment options:

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

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 (32) 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 11, Alternative 5 would have the following alignment options:

- Beartooth Ravine Option A (55 km/h)
- Top of the World Store Option A (60 km/h)
- Little Bear Lake Fen Bridge Option (60 km/h)
- Frozen Lake Existing Alignment Option (40 km/h)

- Bar Drift Option A (30 km/h)
- Albright Curve Existing Alignment Option (30 km/h)

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 preferred alternative (Alternative 6), the proposed project would consist of reconstructing the existing roadway to either 8.4 m (28 ft.) or 9.6 m (32 ft.) wide. The roadway would consist of two 3.6 m lanes with two 1.2 m shoulders (12 ft. lanes with 4 ft. shoulders) west of the road closure gate, and two 3.6 m lanes with two 0.6 m shoulders (12 ft. lanes with 2 ft. shoulders), east of the road closure gate. As shown in Figure 12, Alternative 6 would include the following alignment options:

- Beartooth Ravine Option A (55 km/h)
- Top of the World Store Option A (60 km/h)
- Little Bear Lake Fen Retaining Wall Option (60 km/h)
- Frozen Lake Existing Alignment Option (40 km/h)
- Bar Drift Existing Alignment Option (30 km/h)
- Albright Curve Option A (40 km/h)

Cut-and-fill slopes would be selected to provide a balance between roadside safety, long-term revegetation concerns, and minimal new disturbance. Alternative 6 would have 67 pullouts that would access popular recreational or scenic amenities while also providing adequate sight distance and safety amenities associated with Alternative 4. The estimated construction cost of Alternative 6 is $48,300,000. The reasons why the various elements and options of Alternative 6 are preferred are discussed in the following sections.

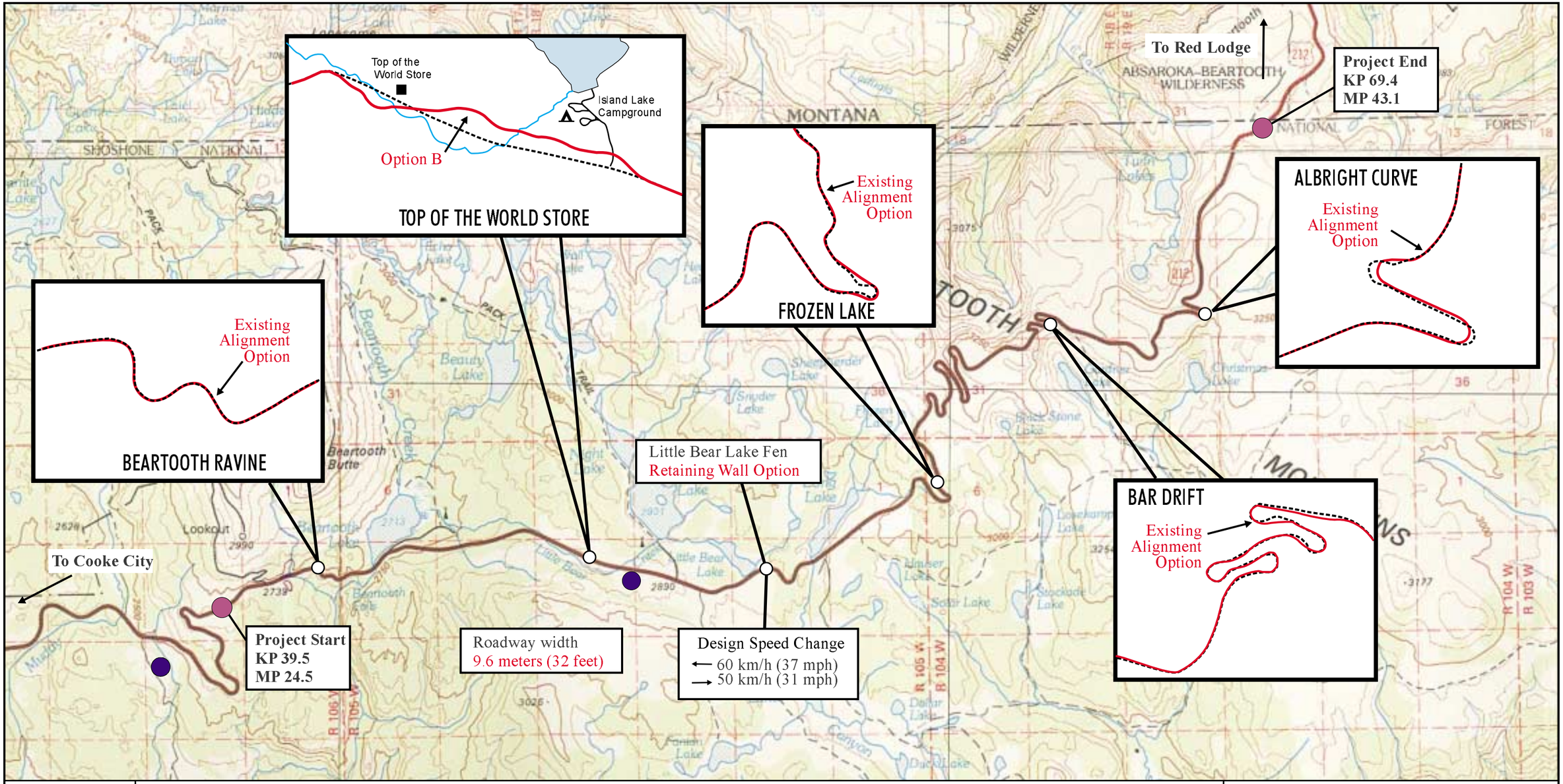
Rationale for the Preferred Alternative

Roadway Width

The preferred roadway width is 9.6 m (32 ft.) west of 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 portion, the preferred shoulder width is 1.2 m (4 ft.); in the eastern portion, the preferred shoulder width is 0.6 m (2 ft.).

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, snow-mobiling, 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 segment 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 Long Lake campgrounds. Because of their proximity to the road, Beartooth Lake and Long Lake are frequent stopping spots for tourists.



ERO

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

½ mile 0 1 mile

½ km 0 1 kilometer

Figure 8
Major Components of Alternative 2
Recreation and Cultural Resource Emphasis

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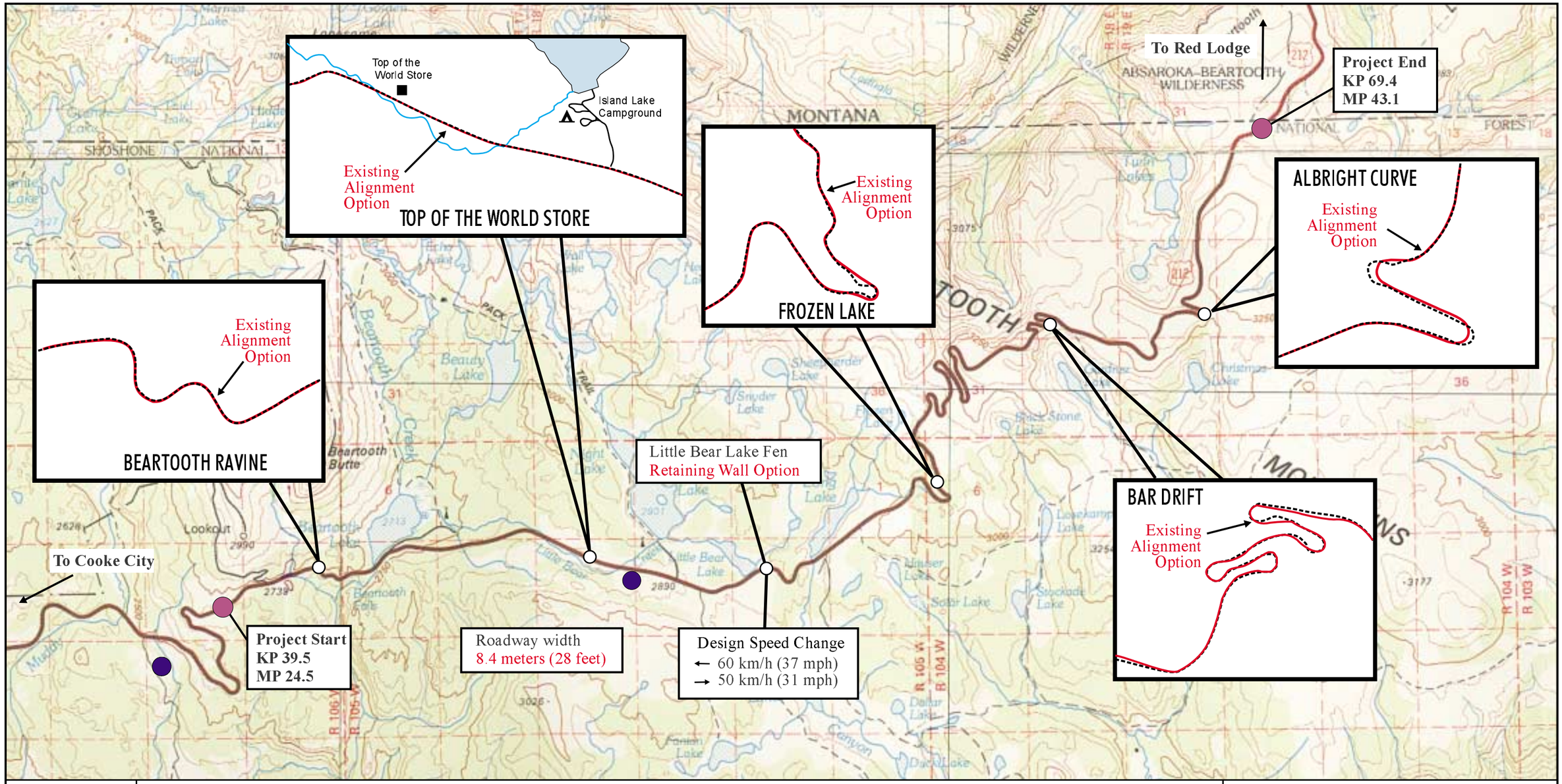

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------- Existing road

Proposed alignment

Materials source

Project start and end

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NORTH

Scale: 1:100,000

½ mile 0 1 mile

½ km 0 1 kilometer

Figure 9
Major Components of
Alternative 3
Wildlife Resource Emphasis

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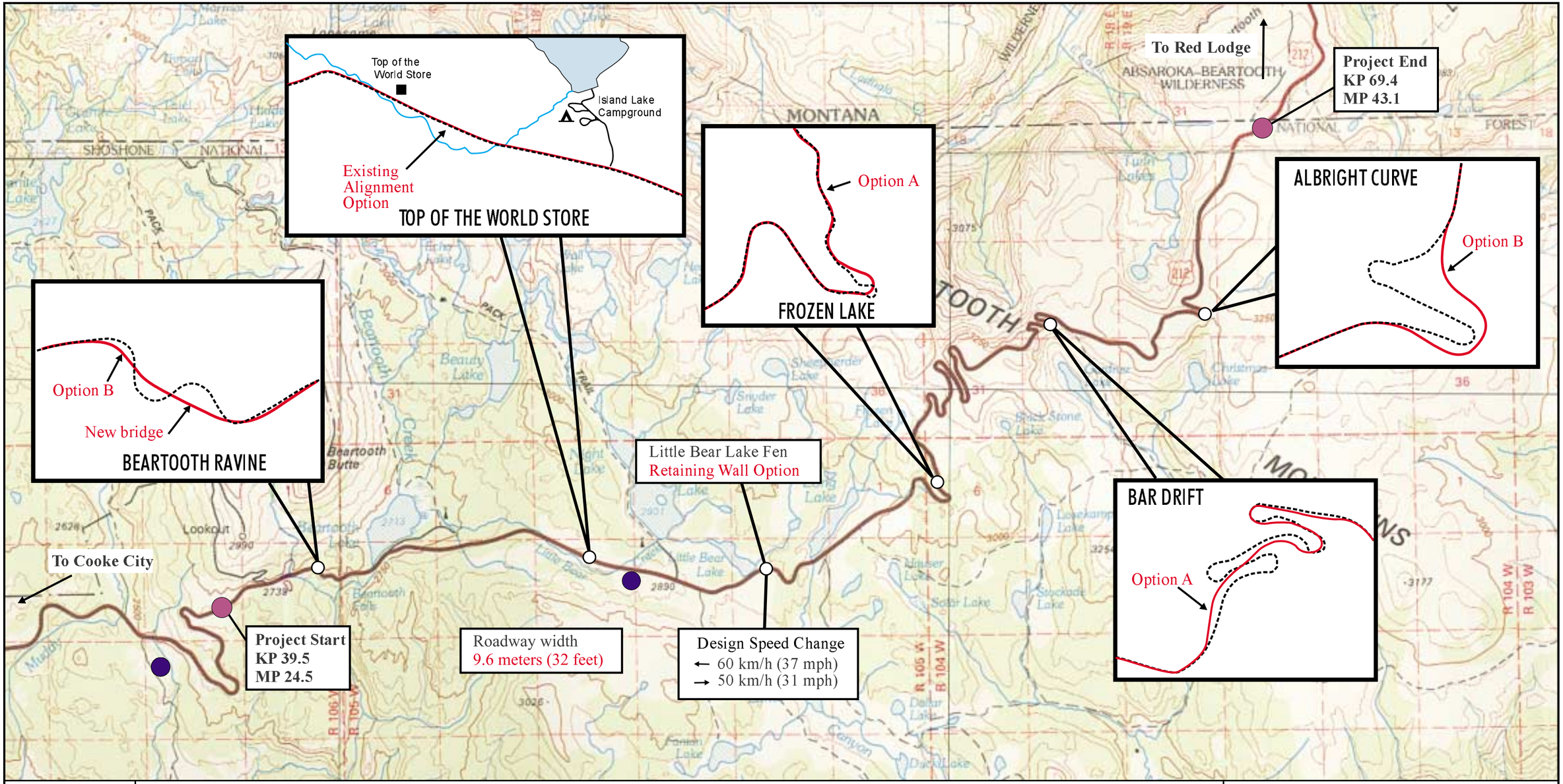

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------- Existing road

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 10
Major Components of
Alternative 4
Highway Operations, Safety
and Maintenance Emphasis

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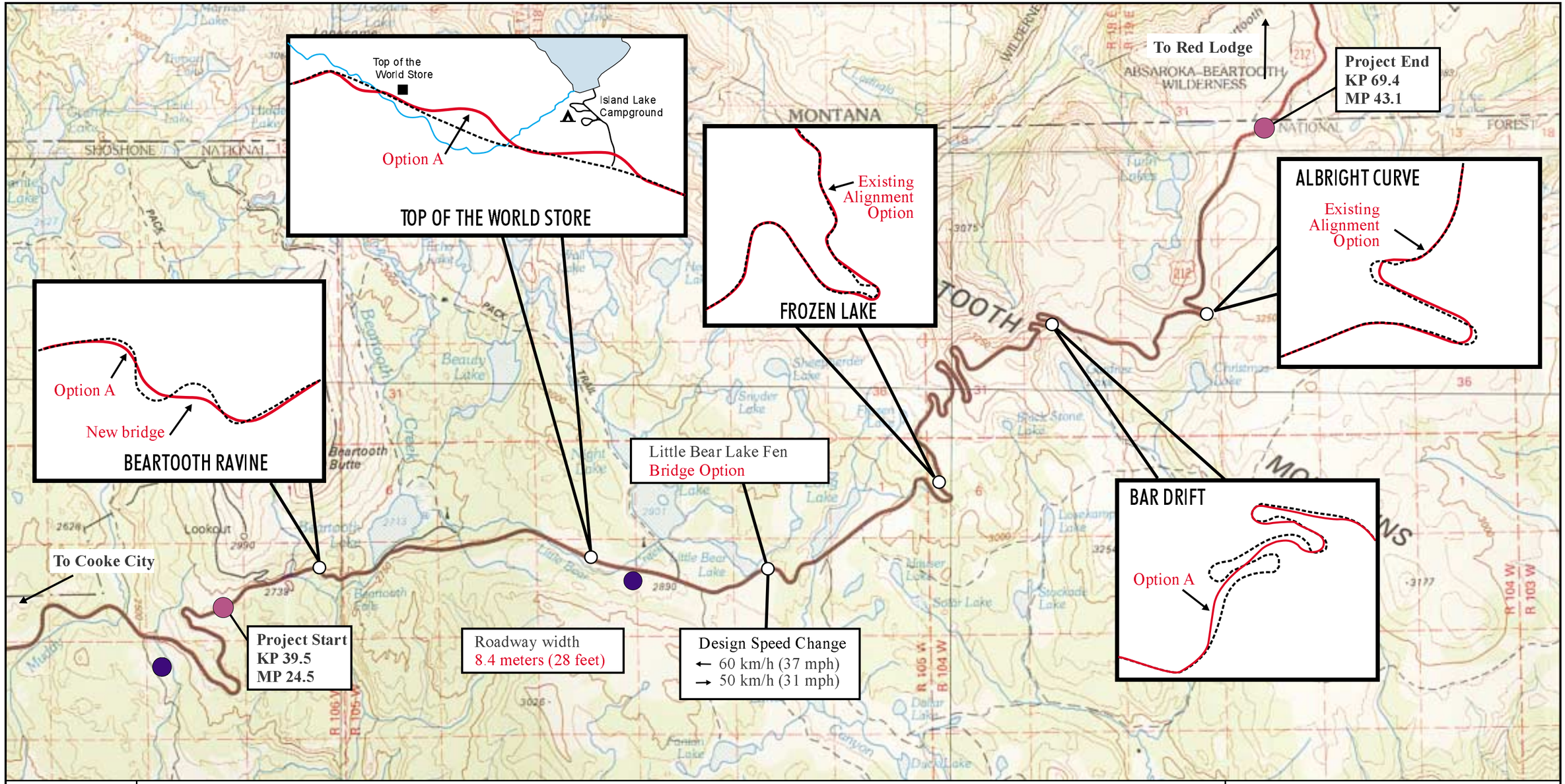

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Fax: 830-1199

------- 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

½ mile 0 1 mile

½ km 0 1 kilometer

Figure 11
Major Components of
Alternative 5
Biological Resource Emphasis

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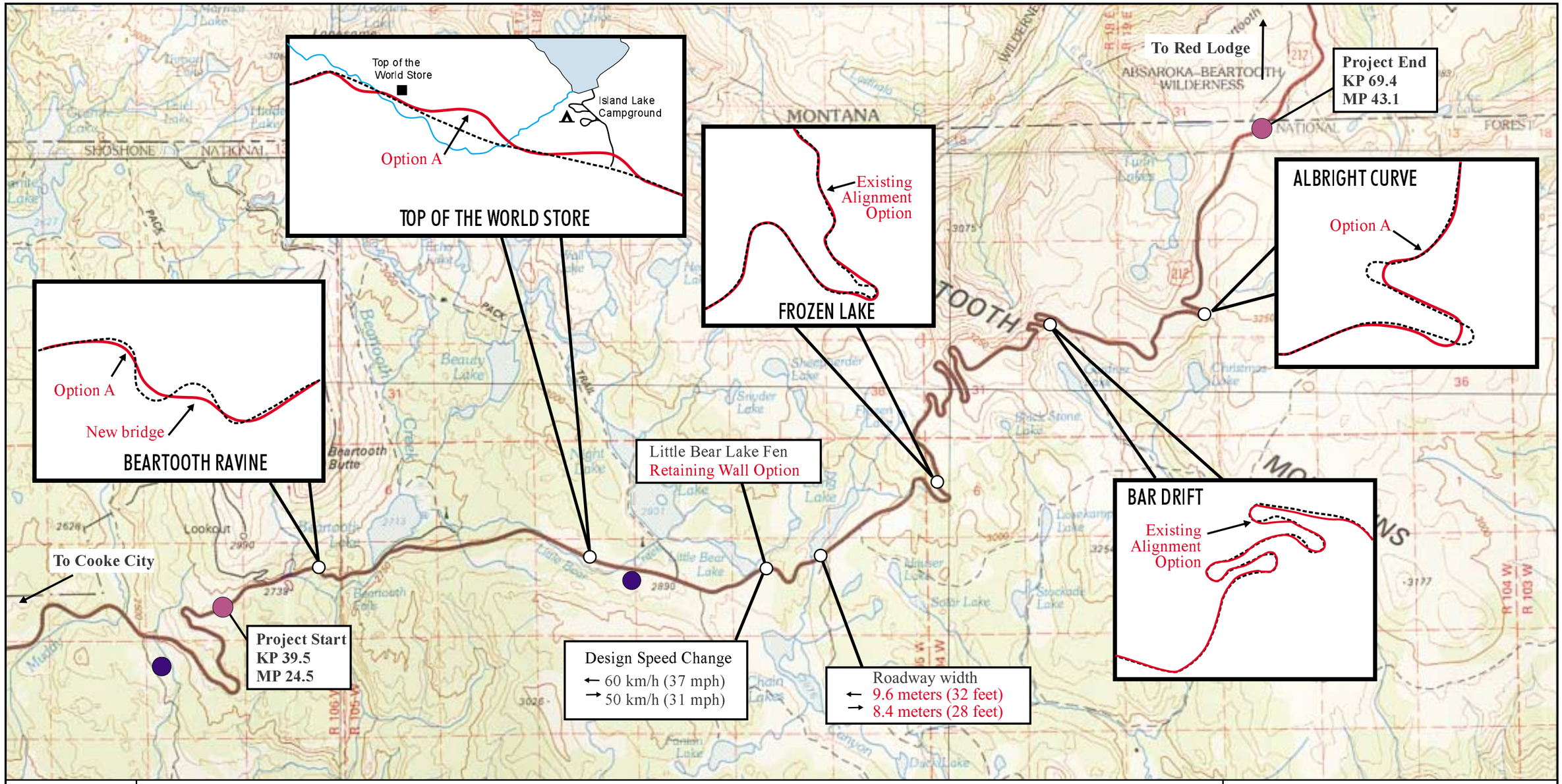

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(303) 830-1188
Fax: 830-1199

------- 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

½ mile 0 1 mile

½ km 0 1 kilometer

Figure 12
Major Components of
Alternative 6
Blended Emphasis (Preferred)

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Top of the World Store, the only location offering supplies, is between Island Lake and Beartooth Lake.

In the western segment, travelers are more likely to park 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. A shoulder 1.2-m (4-ft.) or wider is essential to accommodate these uses safely in combination with through traffic use of the roadway. Alternatives that would have shoulders narrower than 1.2 m (4 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 Accommodating Projected Traffic* 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 weather at all times of the year limit road use primarily to driving and viewing. The SNF discourages over-snow recreation east of Long Lake due to frequent hazardous weather events. Because of the more limited roadside activities in the eastern portion of the project, wider shoulder widths are less essential. A narrower shoulder width in the alpine areas would balance recreational uses, safety and traffic operations with minimizing environmental effects in the alpine portion of the project.

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 2). The environmental effects of the three options would be similar. An environmental advantage of Option A would be better accommodation of wildlife movement by providing a bridge that would allow movement beneath.

The design speed in the segment 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 bridge in Option A would be more easily constructed than 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.

Option A would best balance safety and traffic operations with environmental protection. The estimated construction cost of the preferred Option A at 9.6 m (32 ft.) is $10.4 million. The estimated construction cost of the Existing Alignment Option is $6.3 million, and $10.9 million for Option B (Appendix D).

Top of the World Store

The preferred option at the Top of the World Store is Option A (Figure 3). Option A would have the least wetland impacts, and would offer the most opportunity to restore wetlands affected by the existing road. Option A would best address the flooding and icing problems associated with the Little Bear Creek bridge #1. Because Option A

would have more curves than the other two options considered, it would have the slowest operating speeds 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 9.6 m (32 ft.) is $4.0 million. The estimated construction cost of the Existing Alignment Option is $5.9 million, and $5.1 million for Option B (Appendix D).

Little Bear Lake Fen

The preferred option at Little Bear Lake fen is the Retaining Wall Option (Figure 4). The Retaining Wall Option would be constructed without filling into the adjacent fens, and the hydrology supporting the fen would not be affected over the long term. The estimated construction cost of the Retaining Wall Option is $2.1 million. Both the Retaining Wall and Bridge options would have similar environmental effect, but the estimated construction cost of the Retaining Wall Option is $1.4 million less (Appendix D).

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 5), the new alignment would diverge from the existing alignment at the switchback to increase sight distance.

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.

At the Bar Drift (Figure 6), the Existing Alignment Option would disturb 1.5 ha (3.8 ac) more alpine meadows between the switchbacks, thus requiring more revegetation than Option A. Option A at the Bar Drift would abandon 0.8 ha (1.9 ac.) of existing roadway. No existing road segments 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. 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 D).

Albright Curve

The preferred alternative at Albright Curve is Option A, which would have a design speed of 40 km/h (25 mph) (Figure 7). The design speed in the segment 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. 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

Roadway Cross Sections

Most of the road would be reconstructed using the typical section (Figure 13). The paved roadway would be either 8.4 m (28 ft.) or 9.6 m (32 ft.), depending on the alternative selected. 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 surfaced foreslope on a slope of 1:6 (vertical:horizontal). Ditches would be constructed of native soil material.

Two other sections, paved ditch and retaining wall, would be used at selected locations where warranted. Paved ditches would be used where necessary to control ditch erosion and/or minimize disturbance of the typical ditch section. Paved ditches would be 1.5 m (5 ft.) wide beyond the roadway shoulder on a slope of 1:8. Paved ditches generally would be used at locations where they currently exist and where there is existing evidence of ditch erosion problems.

In steep embankment, retaining wall, or other hazardous locations, a guardrail section (Figure 14) would be used to prevent errant vehicles from leaving the road. Guardrails would be placed on the embankment side 0.6 m (2 ft.) from the shoulder's edge. Because of the protection that would be provided by the guardrail, the foreslope would be steeper (typically 1:2) than the typical section. 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 15). 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.

In the Retaining Wall Option at the Little Bear Lake fen, the road would be constructed on two retaining walls built within the existing road footprint. Hydrology supporting the fen would be maintained by constructing weep holes in the retaining walls or by installing subsurface drainage pipes.

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. The new asphalt pavement would be 90 to 110 mm (3½ to 4 in.) thick and the new aggregate base would be 150 to 250 mm (6 to 10 in.) thick (Figure 13).

In some locations where rock is present, rock blasting would be necessary to provide the necessary 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 when blasting occurs. Excavated rock would be used as 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

Figure 13. Typical cross section of existing and proposed road in forested areas.

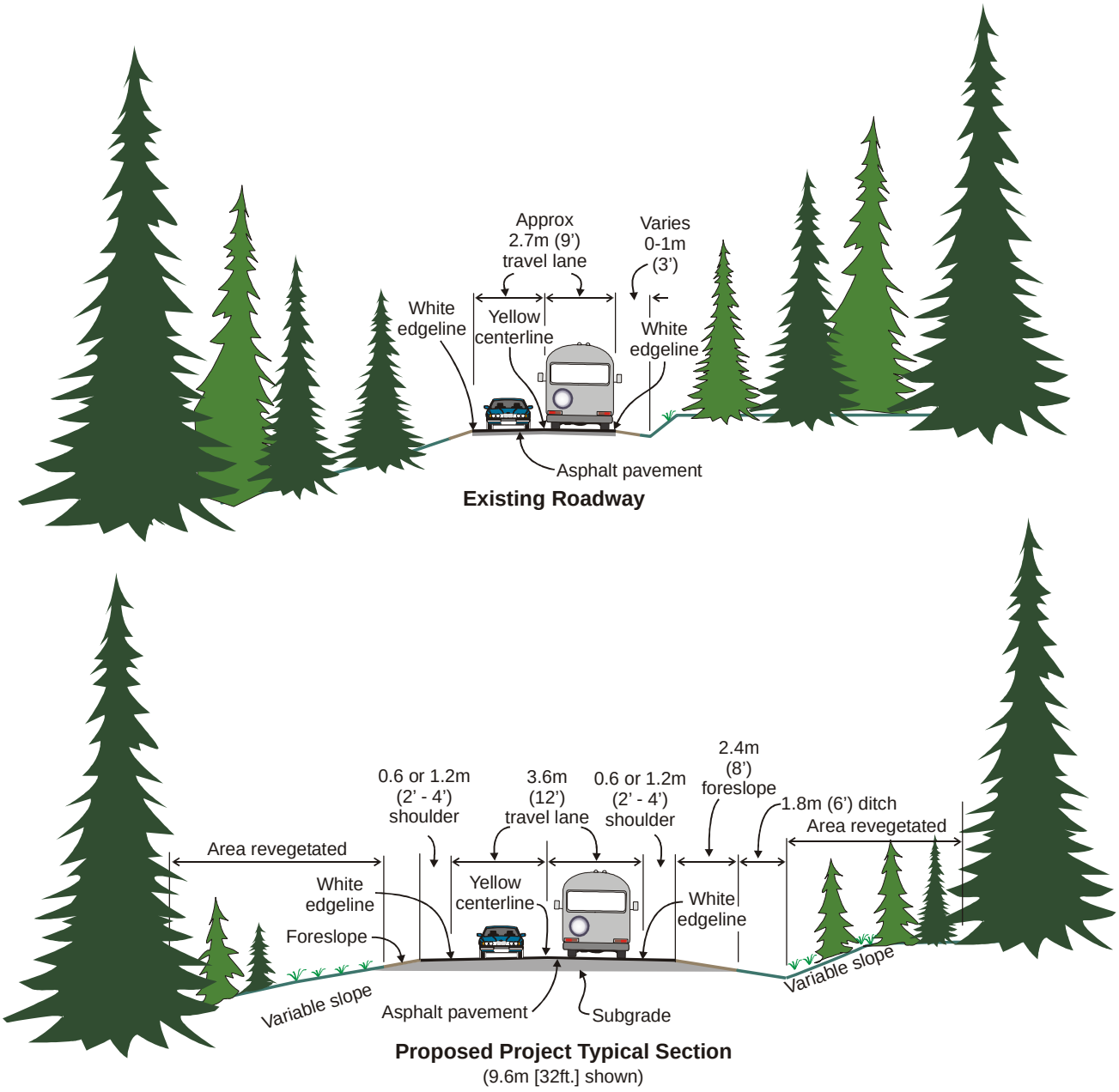


Figure 14. Guardrail section.

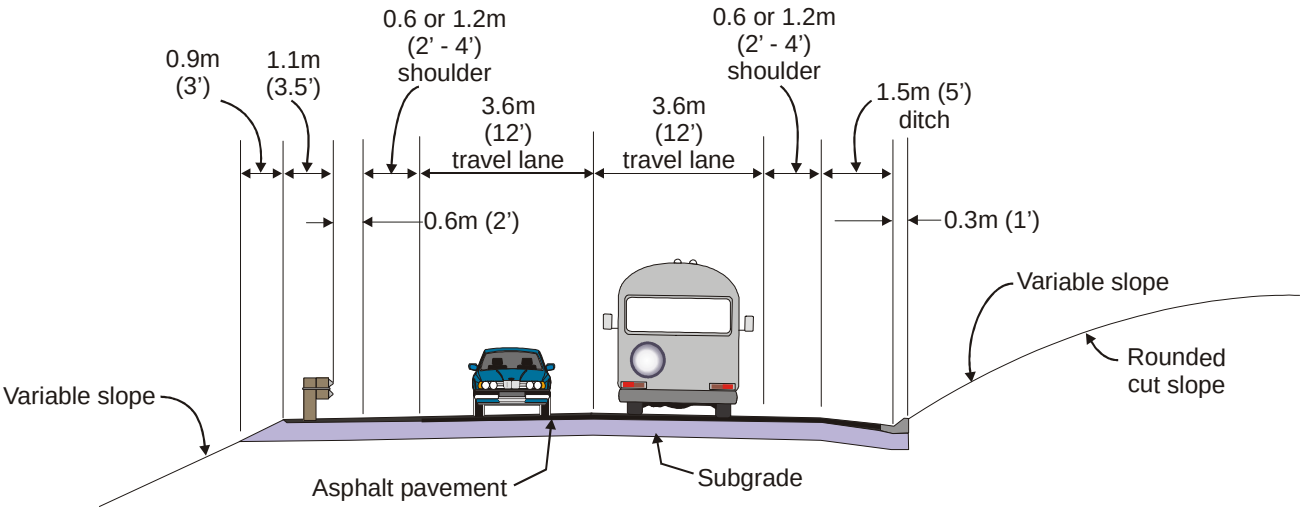
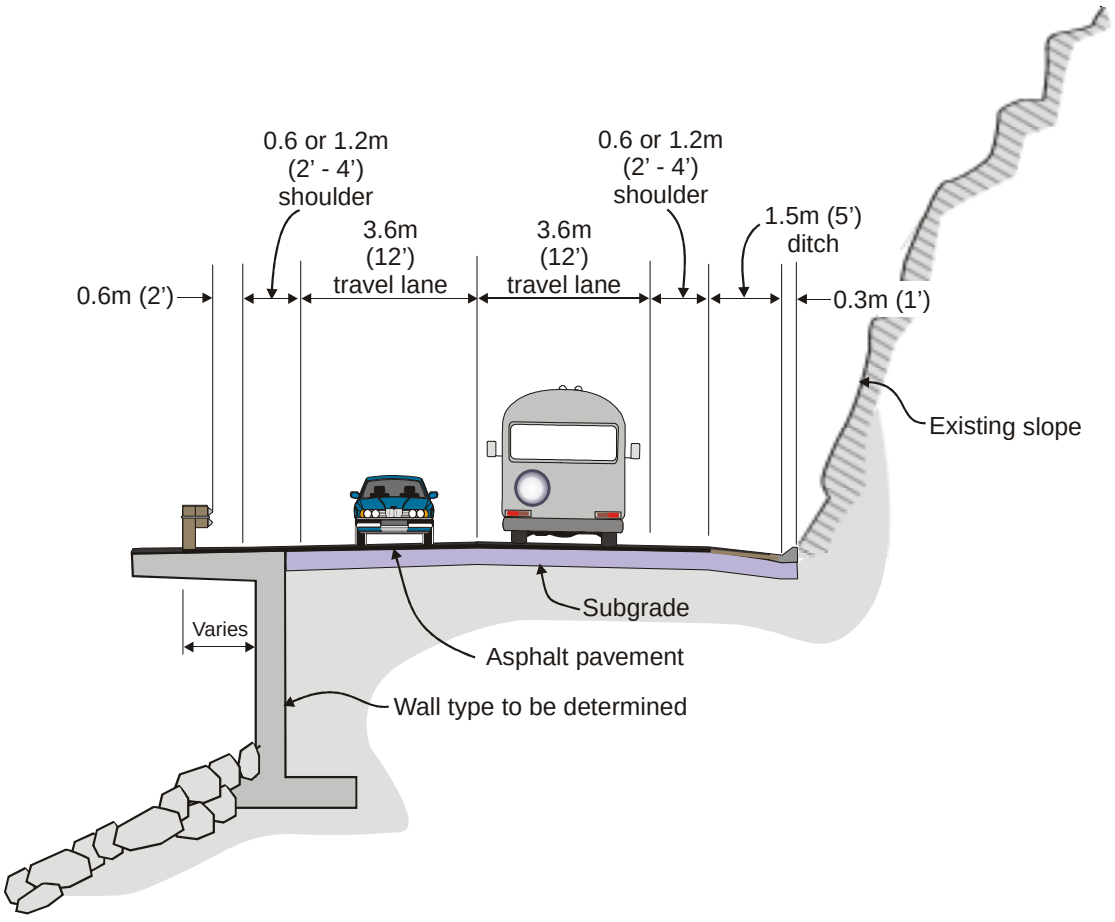


Figure 15. Retaining wall section.



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 incorporated in the Landscaping and Revegetation Plan. Components of these plans include the implementation of measures to minimize the loss of soil material before, during, and after construction. General erosion control measures would include minimizing the area of disturbance to defined construction limits and limiting the time bare soil is exposed. 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, replacing the four existing historic bridges. 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. Bridge length would vary, depending on the span required. 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. Water would not be diverted out of any stream for bridge construction, but stream flows may be temporarily rerouted within the streambed during construction.

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 in the middle of Little Bear Creek (see red line on Figure 3). Driven pilings would be used to provide support for the bridge abutments. At all bridge locations, 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.

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 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.

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)
- West Summit Rest Area road (KP 59.50)
- Forest Service Road No. 149 to Sawtooth Lake (KP 48.00)
- Forest Service access to sheep corrals (KP 49.10)
- Forest Service Road No. 150 to dispersed recreation (KP 50.00)
- Forest Service Road No. 120 to Morrison Jeep Road and trailhead (KP 50.50)

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.

Pullouts and Parking Areas

The existing road has numerous pullouts along its length. Pullouts provide locations where travelers can safely park and enjoy the scenery, or where slower vehicles can pull over and let other vehicles pass. For all build alternatives, larger pullouts and interpretive sites with pull-in parking would be built at the following locations:

- Beartooth Ravine (KP 41.3)
- Beartooth Lake (KP 42.4)
- 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)
- Shoshone/Custer National Forest Interpretive Area (KP 68.6)

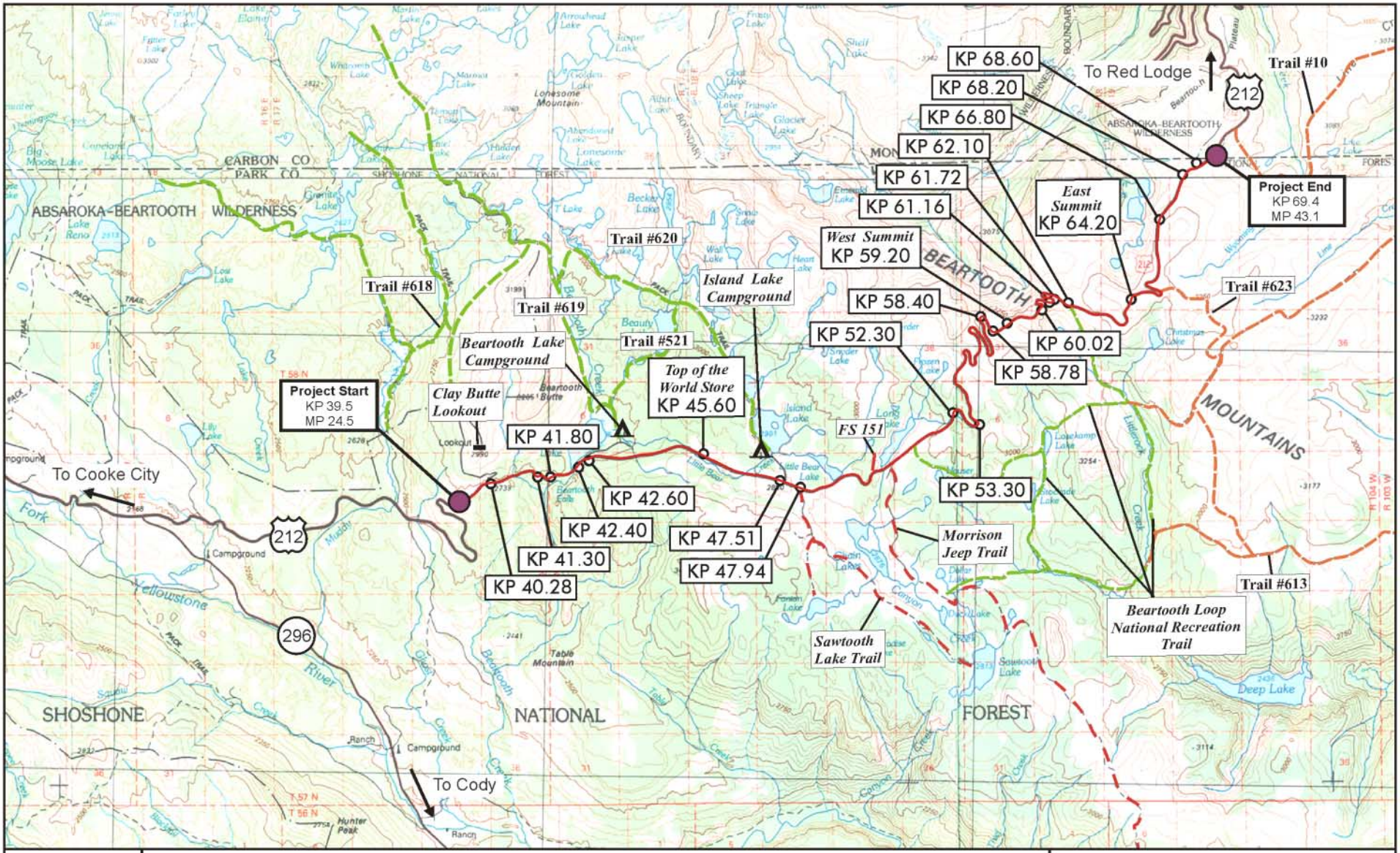
Conceptual designs for five pullouts and interpretive areas are presented in Appendix E. The size of these pullouts would vary with the alternative, depending on the alternative's emphasis. All pullouts and parking areas would be designed in compliance with the American Disabilities Act. In addition to the above locations, 11 other existing pullouts are common to all alternatives (Figure 16).

- 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

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), which has been underway since 1995. 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



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Segment 4 of the Beartooth Highway
Jeep Trails
Hiking Trails

1/2 Inch = 1 Mile

N

Figure 16
Pullouts Common to All Alternatives

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day closures may be needed for certain operations, such as rock blasting, and bridge and retaining wall construction, and a special 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. 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.

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.

Typical delays would be between ½ and 1 hour.

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. The FHWA anticipates that truck traffic on WY 296 and U.S. 212 west of the project would increase by 10 to 20 truck trips per day on average during the construction period. During certain construction operations, truck traffic could increase to 80 to 100 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.

Revegetation

A Landscaping and Revegetation Plan that will address revegetation of the entire corridor, and landscaping in specific areas will be developed. The preparation of the Landscaping and Revegetation Plan is underway, and will be completed during final design.

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 placed on the disturbed cuts and fills during the same season. Special procedures would be used to handle soils from wetlands.

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, and the area reclaimed. The area would be graded to match the existing topography and revegetated. In most of the abandoned road segments, suitable soils underlie the existing road fill. Where soil is needed for successful revegetation, suitable soils would be transported from disturbed areas of 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.

Results of the revegetation research conducted since 1999 are being used in developing 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 were conducted at three high-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. Plans are being developed for the following vegetation communities:

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

Trees would be planted in areas that are currently forested. An area cleared of trees, called a clear zone, would be maintained in forested areas. The clear zone would be about 3 m (10 ft.) from the white stripe at the edge of the travel lane.

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, with some wetland creation. Off-site mitigation would consist of wetland creation, preservation, and restoration. The FHWA would mitigate all 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.

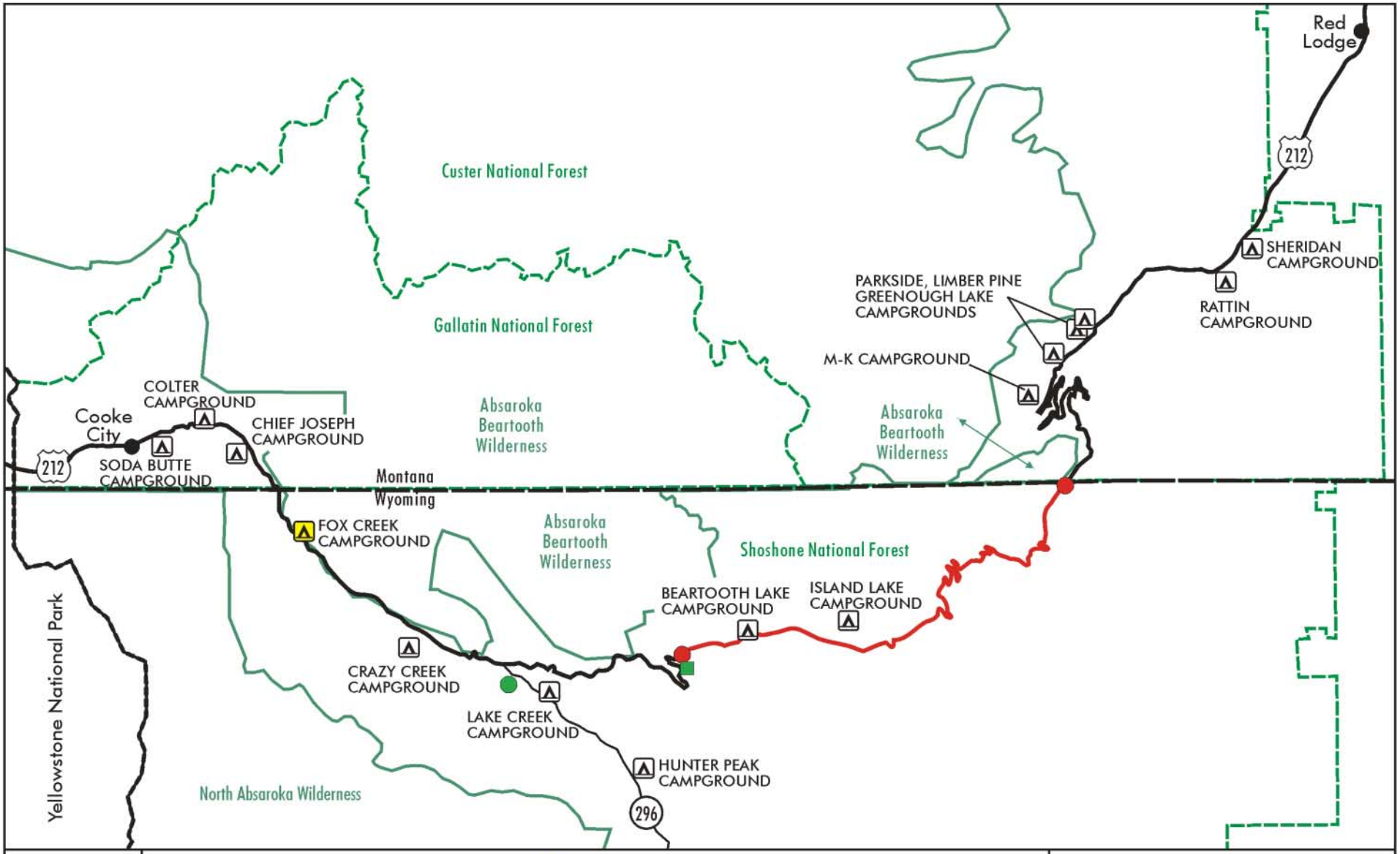
Other Ancillary Facilities

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.

The FHWA and the SNF are proposing the Fox Creek Campground as the preferred workcamp site (Figure 17). The campground would be expanded by 5 campsites, from 27 to 32 campsites. The expansion would accommodate up to 96 workers, depending on the number of people per site. The campground would be closed to the public during the 6-year construction period. To be available for construction crews starting in 2004, the campground would be rebuilt to current standards during 2003. The campground would be modified to accommodate recreational vehicles and trailers, and potable water and sewer facilities would be added. Electrical power would be provided from the nearby Cooke City power line.



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Source: 1:100,000 BLM topographic maps

521-workcamps.cdr

Figure 17
Proposed Fox Creek and Scenic Byway Junction Workcamp Sites

Other existing campsites along U.S. 212 would continue to be open to the public during construction. The SNF and the FHWA would develop, design and enforce specific measures to prevent adverse impacts on the grizzly bear from the workcamp. Measures would include food storage regulation, on-site management during workcamp use, and other measures used effectively at similar workcamp locations in the SNF and YNP. After road reconstruction is completed, the SNF would manage the expanded Fox Creek Campground for public recreational use.

Another workcamp site being considered is the Scenic Byway Junction workcamp site, located south of the junction of U.S. 212 and WY 296 (Figure 17). 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 SNF may add a visitor's center in the future. The NPS maintenance facility, located east of the U.S. 212 and WY 296 junction would be closed permanently. If feasible, the buildings at the NPS facility would be removed and the area would be revegetated. Permanent facilities would depend on the long-term needs of the SNF and the road-maintaining agency, but could include an administrative office, crew quarters for about 26 people, and a vehicle maintenance, storage and repair shop facility. The facility would have potable water, a wastewater facility and parking. Electrical power would be provided from the nearby Cooke City power line. Other workcamp options considered but eliminated from detailed study are discussed in the *Options Considered but Eliminated* section.

Material Sources and Staging Areas

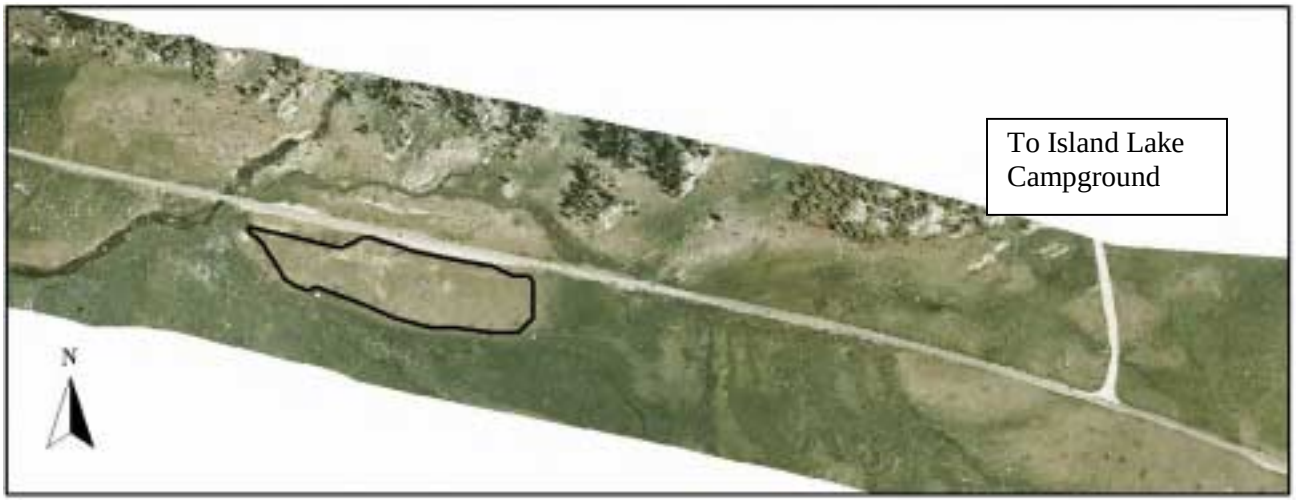
Some of the materials that would be needed for production of an aggregate base and pavement (i.e., surfacing materials) would be generated from excavation along the road corridor. If the excavated material is not suitable, the FHWA would use selected areas as a source for the required materials. The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

A site at Ghost Creek, located about 4 km (2.5 mi.) west of the project, would be the primary materials source (Figure 18). 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 19). 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 encounter ground water. Both sites would be graded and revegetated after they are no longer needed for construction.

Figure 18. Proposed Ghost Creek materials source.

Figure 19. Possible Island Lake moraine materials source.



Four areas have been identified as possible staging areas for equipment, personnel, and materials. Other areas may be identified in consultation with the SNF during construction. The four 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. Staging areas not subsequently used as roads or pullouts would be reclaimed after construction. The entrance to Forest Road 151 and the West Summit loop road would be paved.

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 on 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, would avoid or minimize effects on the road and the four bridges. Several options were considered that avoid or minimize effects on the four bridges. These options are discussed in the *Bridge Construction Options* section. The FHWA also considered two alignments at Long Lake bridge and eliminated one of the them. The eliminated alignment is discussed in the *Long Lake Bridge Alignments* 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.

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. 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, the road would be 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. The current inconsistent alignment combined with narrow travel lanes and lack of shoulders would continue to pose safety risks by giving motorists a false sense of security. 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. The issues of continuing maintenance and lack of jurisdiction would not be addressed. Without continued maintenance, the road and bridges may 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 the rehabilitation project would not address the narrow travel lanes and lack of shoulders, nor the underlying deficiencies causing the road's deterioration and would be only a temporary measure, the FHWA eliminated rehabilitation as an alternative for the reconstruction project.

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 7).

Little Bear Creek bridge #1 is not wide 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 1999).

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.

A divided highway would adversely affect the 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.

The FHWA examined the feasibility of a divided road at each bridge location. 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 bridge 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 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 any bridge along segment 4 as an interpretive site was not envisioned in the Beartooth All-American Road Corridor Management Plan, which planned interpretation 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 hydrologic 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. 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.

Roadway Widths

Two roadway width options (8.4 m, 28 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. The FHWA eliminated two other roadway width options (7.2 m, 24 ft.; and 10.2 m, 34 ft.) from detailed analysis.

A 10.2-m (34-ft.) width, consisting of 3.6-m (12-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 road would be the widest section on the entire Beartooth Highway. The area of disturbance and habitat loss

would be greater. Also, a wider road would be more costly to construct. The benefits of a wider road 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.

Two 7.2-m (24-ft.) options were considered, one with 3.6-m (12-ft.) travel lanes and no shoulders and one with 3.0-m (10-ft.) travel lanes and 0.6-m (2-ft.) shoulders. In both options, the road would be wider 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 buses. Vehicles, especially recreational vehicles and buses, would periodically track off the travel lanes, potentially affecting vehicular stability or causing pavement raveling. The absence of shoulders 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 would not meet the functional needs for the road and would not be considered safe for the type of road and the projected level of traffic. The lack of shoulders would lead to continued maintenance of the road pavement due to edge raveling. For these reasons, this option was eliminated.

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. The FHWA assessed the environmental effects of this 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 would be similar with both options, with the 7.2-m (24-ft.) roadway having 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. This option was eliminated because the 3.0-m (10-ft.)

travel lanes would not accommodate current and future traffic volumes, or adequately accommodate the range of vehicles types that use the road.

Bar Drift Realignment

A road segment 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 switch-backs would adversely affect the character of the road. The switchbacks are one of the features for which the road is considered eligible for listing on 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 located just

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 segments	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

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 located 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 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 and the Scenic Byway Junction sites. The options eliminated were:

- Permanent Campground Expansion or Development
- Temporary Campground Expansion
- Temporary Campground Use/No Campground Expansion
- 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 64 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 located at Pilot Creek.

This option was eliminated because the SNF did not want new or expanded facilities at any of the locations considered. Facility development at Crazy Creek, Lily Lake, and Beartooth Lake also was limited by the proximity to wetlands.

Temporary Campground Expansion Option

This option is the same as the Permanent Campground Expansion Option except the expansion would be 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 32 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 night construction would require construction workers to enter and leave the campground at hours different from tourists. The different schedules would result in user conflicts.

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.

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 2002, and the final phase is planned to be awarded in 2006. The road is expected to be reconstructed completely by 2009. 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. The construction will begin in 2003 and is expected to last 3 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.) portion 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

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, will increase. The demand for housing and government services 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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