

U.S. Department of the Interior
National Park Service
Regions 3, 4, 5



Loop Road at Cedar Pass Emergency Road Repair Environmental Assessment Badlands National Park South Dakota



May 2022

Executive Summary

Badlands National Park (the Park) has prepared an Environmental Assessment (EA) to evaluate the emergency repair of Loop Road at Cedar Pass which is a safety risk due to slope failure.

This EA has been prepared in compliance with the National Environmental Policy Act (NEPA) to provide a decision-making framework as follows: 1) Assess a reasonable range of alternatives to meet the purpose of the proposed action; 2) Evaluate potential issues and impacts to the natural and cultural resources of the Badlands National Park; and 3) Identify required mitigation measures designed to lessen the degree or extent of any potential adverse environmental impacts.

Two alternatives have been evaluated: Alternative A: No Action; and Alternative B: Repair and Stabilize Loop Road at Cedar Pass (Preferred Action). Under Alternative A, the trend towards slope failure would, leading to the likelihood of future closure due to health and safety risks. Under Alternative B, the National Park Service proposes stabilizing the embankment, improve drainage, and repaving the road surface. The alternatives are described in detail in Chapter 2.

This EA identifies the categories of resources, or Impact Topics, found within the project area that are most likely to be affected by the actions described within the alternatives. These topics have undergone a detailed analysis by agency staff to determine the most likely effects on the resources and the required mitigations to avoid resource damage. The Impact Topics are identified in section 1.4 of this document, and in [Table 1](#). The preferred action would not result in significant impacts to any resources within Badlands National Park.

Public Comment

This EA will be available for public comment for 15 days, from May 28, 2022 to June 11, 2022, through the NPS Planning, Environment and Public Comment (PEPC) website which provides access to current plans and related documents and is located here: National Park Service - PEPC – Badlands National Park ([nps.gov](https://www.nps.gov)).

Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment including your personal identifying information may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Contents

Chapter 1: Purpose of and Need for Action	4
1.0 Introduction.....	4
1.1 Purpose of and Need for the Action.....	4
1.2 Project Background	4
1.3 Project Area.....	5
1.4 Issues and Impact Topics.....	5
Chapter 2: Alternatives.....	6
2.0 Introduction	6
2.1 Alternative A: No Action.....	6
2.2 Alternative B: Repair and Stabilize Loop Road at Cedar Pass.....	6
2.2.1 Stabilization.....	6
2.2.2 Drainage Improvements.....	6
2.2.3 Re-pavement.....	6
Chapter 3:.....	7
Affected Environment and Environmental Consequences.....	7
3.0 Introduction.....	7
3.1 Trends and Reasonably Foreseeable Planned Actions.....	7
3.1.1 Trends.....	7
3.1.2 Reasonably Foreseeable Planned Actions	8
3.2 Cultural Resources.....	8
3.2.1 Affected Environment.....	8
3.2.2 Environmental Consequences	8
3.3 Geologic and Soil Resources	9
3.3.1 Affected Environment.....	9
3.3.2 Environmental Consequences	9
3.4 Indian Sacred Sites.....	10
3.4.1 Affected Environment.....	10
3.4.2 Environmental Consequences	10
3.5 Paleontological Resources	11
3.5.1 Affected Environment.....	11
3.5.2 Environmental Consequences	11
3.6.1 Affected Environment.....	12
3.6.2 Environmental Consequences	12

	Chapter 4: Mitigation and Minimization Measures	14
4.0	Introduction.....	14
4.1	General	14
4.2	Cultural Resources.....	14
4.3	Geology and Soils.....	15
4.4	Paleontological Resources	15
4.5	Vegetation	16
4.6	Visitor Use and Experience	16
4.7	Water Resources	16
	Chapter 5 Consultation and Coordination	17
5.0	Lead and Cooperating Agencies.....	17
5.1	Federal Agencies.....	17
5.2	State Agencies	17
5.3	Tribal Partners	17
5.4	Local Agencies.....	17
5.5	Other Environmental and Regulatory Requirements.....	17
	Acronyms and Abbreviations	18
	References	19
	Appendix A	i
	Figures and Tables	i
Table 1	.....	ii
Figure 1	.....	v
Figure 2	.....	vi
Figure 3	.....	vii
Figure 4	.....	viii
Figure 5	.....	ix
Figure 6	.....	x
Figure 7	.....	xi

Chapter 1: Purpose of and Need for Action

1.0 Introduction

The National Park Service (NPS) in cooperation with Federal Highway Administration (FHWA), Central Federal Lands Highway Division (CFL), is proposing to perform emergency stabilization repairs to a section of the Highway 240 Loop Road (Loop Road) and embankment near the Cliff Shelf Nature Trail along Cedar Pass in Badlands National Park (Park). The Park is located 70 miles from Rapid City, South Dakota, and is split into two main units (North Unit and South Unit). The South Unit is co-managed with the Oglala Sioux Nation. The Park's significant features include outstanding scenic vistas and unique landforms of the White River Badlands, its importance to the science of paleontology, its natural resources, and preservation of archeological and cultural history. Loop Road is the Park's primary road and was developed from an informal local road system that was roughly in place by 1912. As part of the proclamation authorizing Badlands National Monument in 1929, the State of South Dakota agreed to formalize and consolidate this road system. The Park was not officially designated until this work, primarily through the Works Progress Administration, was complete. The Loop Road is listed in the NPS List of Classified Structures (LCS) database and may eventually be nominated for listing in the National Register of Historic Places, along with its associated developed areas (NPS 2017a).

1.1 Purpose of and Need for the Action

The purpose of the project is to perform emergency repairs to the section of Loop Road at Cedar Pass which is showing signs of slope failure. Repairs would: 1) stabilize the embankment, 2) improve site drainage, 3) repave site road surface, 4) minimize the need for on-going road maintenance at this site and 5) minimize impacts to natural and cultural resources.

The emergency road repair is needed to mitigate human health and safety risks as a result of infrastructure failure. Visual and scientific monitoring of the Cliff Shelf Landslide area shows the landslide has remobilized and movement of the pavement has accelerated.

1.2 Project Background

Loop Road has a history of structural issues due to the Park's highly unstable and erosive soils. The road was built on an active landslide made of bentonite clay component which is expansive when wet. Above average precipitation during some years has resulted in an increase of erosion issues throughout the park. In 2002 an engineering study conducted by CFL determined that maintaining the current road alignment through Cedar Pass is unsustainable. This study produced several alignment alternatives which NPS and CFL are currently examining for further development (NPS 2018). While the Park does plan to address the realignment examined in the study, there is still a need for an immediate action to stabilize the roadway now to allow for safe passage. An Environmental Assessment (EA) completed in 2018 (NPS 2018) addressed the need to rehabilitate the section of Loop Road through Dillon Pass and Bigfoot Pass, however, it did not address Cedar Pass. Two buttresses have been constructed to support the Loop Road through Cedar Pass. One was constructed in 2015 and another in 2002.

Throughout the summer of 2021 park staff observed signs of distress along the road centerline and shoulder near a newly improved section of Headwall 12, including tension cracking along the west slope ([figure 1](#)). Soon after, a CFL geotechnical engineer conducted a site investigation and produced a Technical Memorandum (FHWA 2022). The investigation found a 180-foot section of roadway surface at risk of near-term failure as a result of the loss of integrity to the structural base ([figure 2](#)). During a follow-up site visit in April 2022 the roadway was re-evaluated and was found to have dropped 13-inches since September 2021 ([figure 2](#)).

1.3 Project Area

The project area is located approximately 4.5-miles southwest of the Northeast Entrance Station, just west of the Cliff Shelf Trail Parking Lot ([figure 3](#)). The project area can be broken into two sections: (1) area of failure, (2) area of potential disturbance. The area of failure is approximately 15,167 sq-ft, which includes the west slope and road surface ([figure 4](#)). The potential area of disturbance, also called the limit of disturbance (LOD), is approximately 71,458 sq-ft, encompassing both east and west slopes of Loop Road as well as the road surface ([figure 4](#)). The LOD is where active construction would take place with potential for minimal staging. The project plan also intends to maintain one lane for vehicle access in this area as long as slope and road conditions remain safe. Note the project area are estimations, figures are not engineer stamped drawings, rather graphics to help guide the EA analysis.

1.4 Issues and Impact Topics

Topics related to cultural, geologic & soil, Indian sacred sites, paleontologic, and visitor use, experience and safety are analyzed in detail in this EA. These topics were retained for detailed analysis either because (a) they are central to the proposal or of critical importance, (b) analyzing them will inform the decision-making process, and/or (c) because the environmental impacts associated with the issue are a point of contention (NPS 2015). Issues related to air quality, Indian trust, Indian sacred sites, socioeconomics, soundscapes, vegetation, visual, water resources, wildlife and wilderness resources have been dismissed from detailed analysis because they are not central to the proposal, do not assist with making a reasoned choice between alternatives, or are not a point of contention. [Table 1](#) below summarizes which topics were retained or dismissed and includes the rationale for dismissal.

Chapter 2: Alternatives

2.0 Introduction

This section describes the alternatives developed for emergency repair to a section of Loop Road in Cedar Pass. Two alternatives will be discussed: the no-action alternative and an action alternative. A no-action alternative is required by the National Environmental Policy Act as a baseline to compare proposed action alternatives. The action alternative presents a reasonable and feasible approach that meets the purpose of, and need for, action. This section also identifies the NPS proposed action and lists mitigation measures for the alternatives.

2.1 Alternative A: No Action

In Alternative A, the No Action alternative, no repairs beyond minimal patching would be implemented and the slope would continue to fail and degrade. The risk for road closure would increase as the Park would prioritize human health and safety.

2.2 Alternative B: Repair and Stabilize Loop Road at Cedar Pass

Alternative B proposes stabilizing the embankment, improving drainage, and repaving the road surface, including the following:

2.2.1 Stabilization

Alternative B would utilize an earthen buttress with an aggregate toe to provide lateral stability to a failing section of roadway surface along Cedar Pass. The stabilization would reduce the risk of roadway failure until the larger realignment project occurs, by ensuring that any future slope movement is countered by significant force on the opposing side ([figure 5-6](#)). Once the earthen buttress is complete, the roadway surface would be reconstructed to return the driving surface to previous acceptable levels. This repair would ensure that Cedar Pass is trafficable until long-term road alignment efforts are completed.

2.2.2 Drainage Improvements

This project would remove and replace culverts that have failed due to slope movement to ensure all hydrological requirements are met. The drainage systems would be replaced in kind until the long-term road alignment efforts are completed ([figure 5](#)).

2.2.3 Re-pavement

Upon installation of the buttress at Cedar Pass, Federal Highways would re-pave the section of Cedar Pass disturbed during construction ([figure 6](#)). Existing pavement surface would be demolished and the base layers recompactied via vibratory roller. Once compacted, a fresh layer of asphalt would be placed and re-striped in accordance with design documents.

Chapter 3: Affected Environment and Environmental Consequences

3.0 Introduction

This chapter describes existing environmental conditions in and around the project area and analyzes the potential impacts that could result by implementing any of the alternatives. The Affected Environment descriptions are followed by the Environmental Consequences analysis for each resource topic. The resource topics analyzed here correspond to the planning issues and concerns described in the Issue and Impact Topic section in Chapter 2.

In accordance with the Council on Environmental Quality (CEQ) regulations, the environmental consequences analysis includes the impacts potentially resulting from the proposed alternatives, while taking into consideration environmental trends and reasonably foreseeable planned actions (40 CFR 1502.16). The degree of the impacts is assessed in the context of the park's purpose and significance, and any resource-specific context that may be applicable (40 CFR 1508.27). Where appropriate, mitigating measures for adverse impacts are described and their effect on the severity of the impact is noted. The methods used to assess impacts vary depending on the resource being considered but are generally based on a review of pertinent literature and park studies, information provided by on-site experts and other agencies, professional judgment, and park staff knowledge and insight.

3.1 Trends and Reasonably Foreseeable Planned Actions

3.1.1 Trends

Climate Related Trends

The National Park Service recognizes the importance of understanding the effects of climate change on park resources across the country and of developing adaptive management strategies to address these effects. The impacts of global climate change are a growing concern for resource managers at Badlands National Park. By 2100, conditions here are projected to become warmer and drier. The average annual temperature in BADL is projected to increase by 3-5° C (approximately 5-9° F). Although the amount of precipitation is likely to increase slightly, conditions will likely become drier due to increased evapotranspiration. Extreme events (e.g., drought, heat waves, thunderstorms) are also likely to become more frequent as well (Amberg 2012).

Visitor Use Related Trends

The Park has experienced a steady increase in visitation Park-wide since 2017 with a small dip in 2020 due to the coronavirus pandemic. In 2021 the Park experience a record number of visitors Park-wide with a substantial increase in visitation to the Ben Reifel Visitor Center located about 5.5-miles south on Loop Road from the Northeast Entrance and a mile south on Loop Road from the project site. The impacts of proposed and reasonably foreseeable planned actions would result in beneficial effects to visitors Park-wide.

3.1.2 Reasonably Foreseeable Planned Actions

- Seal asphalt cracks on Loop Road, Interior Entrance Road and Conata Road - ongoing.
- Mill asphalt surfaces and apply hot mix to Cedar Pass hill – Summer 2022
- Replace deteriorated timber with concrete curbing and walkways in parking lots for visitor safety – April to August 2022
- Pavement preservation actions throughout the Park – April to August 2022

3.2 Cultural Resources

3.2.1 Affected Environment

The area of potential effect has been inventoried for archeology. A 1993 pedestrian inventory of the downslope portion of the APE found no archeological resources (NPS 1993). A cultural landscape report for the Cedar Pass area was completed in 2005 on determined the road is eligible for the National Register of Historic Places (NRHP) (NPS 2005). A pedestrian inventory in 2017 targeted areas along Loop Road slated for rehabilitation. In the Cedar Pass portion of Loop Road, steep slopes created challenges for survey coverage, but all portions of the APE likely to contain archeological resources were systematically surveyed with no resources found (NPS 2017b). If cultural materials exist outside of the surveyed areas, the likelihood of them being in a primary context is low due to steep slopes. As such, “it is unlikely the undertaking would affect unknown historic properties within the APE” (NPS 2017b:4).

3.2.2 Environmental Consequences

Alternative A: No Action Alternative

Under the No Action Alternative there would be no ground disturbance caused by construction activities or construction equipment. However, the No Action Alternative could have some adverse impacts on unknown archeological resources as a result of on-going erosion; these impacts could be permanent if damage ensues. The Park would continue to monitor the project area to confirm that no archeological resources have been exposed, and if any are found, would immediately notify the Midwest Archeological Center (MWAC) for direction on how to proceed.

This analysis incorporates the trends discussed in Section 3.2 and would not result in an increase in adverse impacts to cultural resources as a result of reasonably foreseeable future actions.

Alternative B: Repair and Stabilize Loop Road at Cedar Pass

Under Alternative B, construction activities and equipment would disturb the ground surface and subsurface. Alternative B has the potential to adversely impact unknown archeological sites and artifacts in the area of potential effect. Adverse impacts could be permanent if damage ensues. Mitigation measures to reduce the potential for adverse impacts can be found in Chapter 4.

This analysis incorporates the trends in Section 3.2 and would not result in an increase in adverse impacts to cultural resources as a result of reasonably foreseeable future actions.

3.3 Geologic and Soil Resources

3.3.1 Affected Environment

National Park Service policies require protection of geologic resources and processes. Badlands National Park is world-renown for its geology, preserving several dramatic, climatic changes of the past in its rock formations. These formations would not be present without the process of erosion, which continually shapes and modifies the landscape.

The project area is part of the Cedar Pass landslide complex, which includes three types of mass-wasting: landslides, slumps, and rockfalls. This is an active landslide complex estimated to be Quaternary in age, with most of the accumulation within the past few thousand years (Rahn 1993). The primary geologic strata affected are the Scenic and Poleslide Members of the Brule Formation. The area's path of movement is multidirectional, tending to move toward any area without a reinforced toe.

Badlands National Park's bedrock does not subscribe to the usual definition of bedrock. This bedrock is composed of paleosols, or ancient soil horizons. These highly erodible, dispersive soils are structurally unstable because clayey soils deflocculate in the presence of water and aeolian-deposited loessite soils lose cohesion when disturbed. This instability often results in problems for the Park's infrastructure.

3.3.2 Environmental Consequences

Alternative A: No Action Alternative

The Cedar Pass landslide complex will continue to slump and eventually fail. The area may experience an increased rate of erosion following slope failure, potentially creating cascading failure in the areas of proximity. However, the No Action alternative would have a negligible adverse impact to the topography and its associated geologic features and soils in the context of the vastness of the Park. Any adverse impacts would be permanent.

This analysis incorporates the trends discussed in Section 3.2 and would not result in an increase in adverse impacts to geologic resources and processes or to soils as a result of reasonably foreseeable future actions.

Alternative B: Repair and Stabilize Loop Road at Cedar Pass

Alternative B would not significantly affect or alter the character of the Badlands topography, including its geologic features and processes or soils given the small area of disturbance and proximity to the buttress installed in 2002.

Similar to Alternative A, Alternative B would have an adverse and permanent impact to geologic features and soils, however, in the context of the vastness of the Park, the overall impact would be less than negligible. This analysis incorporates the trends discussed in Section 3.2 and would not result in an increase in adverse impacts to geologic resources and processes or to soils as a result of reasonably foreseeable future actions.

3.4 Indian Sacred Sites

3.4.1 Affected Environment

Executive Order 13007 requires the NPS to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites. Continued access to, and use of, these sites is often essential to the survival of family, community, or regional cultural systems, including patterns of belief and sociocultural and religious life. In 2021 a Memorandum of Understanding (MOU) was signed to affirm the participating agencies commitment to Executive Order 13007 (DOI 2021).

The Park has no knowledge of any sacred sites within the project site area. However, the Park has initiated Tribal consultation to communicate that if a sacred site is identified or found, mitigations would be put in place to preserve or protect the resource.

3.4.2 Environmental Consequences

Alternative A: No Action Alternative

The Cedar Pass landslide complex would continue to slump and eventually fail. The area may experience an increased rate of erosion following slope failure, potentially creating cascading failure in the areas of proximity. As with the potential for the existence of archeologic and paleontological resources, potential adverse impacts to Indian sacred sites would also exist, if a sacred site is found to be in the project area. If the road fails, access through Cedar Pass would be limited or closed, which could also impact access to sacred sites in the area. The Park would continue to monitor the project site.

This analysis incorporates the trends discussed in Section 3.2 and could result in an increase in adverse impacts to Indian sacred sites as a result of reasonably foreseeable future actions.

Alternative B: Repair and Stabilize Loop Road at Cedar Pass

If the project area is determined to be an Indian sacred site, alternative B could have both short- and long-term adverse impacts to potential sacred site(s) during construction, as a result of dust and noise from construction, and permanent alterations to the slope. There would be a potential for increased traffic due to lane closures, as well as temporary access limitations for park staff, law enforcement, emergency services, and local agricultural traffic. However, in addition to detour routes being posted, seasonal timing would also be considered for construction schedules; this would enable construction to occur during months of lower visitation or to be scheduled to avoid Tribal events. Tribes have been invited to monitor the area before and during construction.

This analysis incorporates the trends discussed in Section 3.2 and would not result in an additional increase in adverse impacts to Indian sacred sites as a result of reasonably foreseeable future actions.

3.5 Paleontological Resources

3.5.1 Affected Environment

Badlands National Park is world renowned for its paleontologic resources. A report that accompanied the 1929 act creating the park described the Badlands as containing “vast beds of vertebrate remain.” The White River Badlands region contains the largest assembly of known late Eocene and Oligocene mammal fossils. The area is the birthplace of vertebrate paleontology in North America beginning with the description of a titanotherium mandible in 1846 by Dr. Hiram Prout. Since then, numerous important finds from the area have served to define the geologic period. Oligocene fossil remains include camels, three-toed horses, cat-like saber-tooth feliforms, oreodonts, antelope-like animals, rhinoceroses, false deer, rabbits, beavers, creodonts, land turtles, rodents and birds. Marine fossils are found in deposits of an ancient sea that existed in the region some 80 to 65 million years ago during the Cretaceous period. Fossils found in the Pierre Shale and Fox Hills Formations include ammonites, nautiloids, fish, marine reptiles and turtles. The spectacular vertebrate fossils preserved within the White River Badlands have been studied extensively since 1846 and are a part of museum collections throughout the world. Small percentages of Badlands National Park have been surveyed for fossil resources. Most of these areas consist of historic research sites (Clark et al., 1967) and small-scale projects completed by individual contractors and paleontological interns (Terry, 1995; Cicimurri, 1995; Lala 1996; Martin and McConnell, 1997; Martin and DiBenedetto, 1997,1998). A six-year baseline survey of fossil bone beds of the Brule Formation concluded in 2005. Since then, annual paleontological surveys have been conducted each summer, amounting to over 350 documented localities recorded in the park Geographical Information System (GIS) database.

3.5.2 Environmental Consequences

Alternative A: No Action Alternative

Under Alternative A, the Cedar Pass project area would continue to erode, exposing unforeseen fossil resources. As with the potential for the existence of archeologic resources, potential adverse impacts to palaeontologic resources would also exist, and would likely be permanent. The Park would continue to monitor the project area to confirm that no palaeontologic resources have been exposed, and if any are found, would notify the Park Paleontologist for direction on how to proceed.

This analysis incorporates the trends discussed in Section 3.2, and would not result in an increase in adverse impacts to palaeontologic resources as a result of reasonably foreseeable future actions.

Alternative B: Repair and Stabilize Loop Road at Cedar Pass

Under Alternative B, palaeontologic resources exposed at the surface and subsurface may experience severe damage from construction equipment, as vehicle or foot traffic can

potentially crush delicate fossil remains, resulting in permanent adverse impacts. Mitigation measures to reduce the likelihood of and degree of adverse impacts include on-site monitoring of the project area during construction, and salvage collection of exposed fossils. If fossils are uncovered, the monitor would immediately issue a “Stop-Work” order, document and collect the fossils, and allow construction to resume. If the salvage proves to be too cumbersome for the on-site monitor to handle alone, the monitor will notify the Park Paleontologist for direction on how to proceed. Excavation would resume only after clearance from the Park Paleontologist.

This analysis incorporates the trends discussed in Section 3.2 and would not result in an increase in adverse impacts to palaeontologic resources as a result of reasonably foreseeable future actions.

3.3 Visitor Use, Experience and Safety

3.6.1 Affected Environment

From 2017 to 2021, Badlands National Park averaged 1,035,085 visitors per year. Loop Road provides primary access to the park for visitors and serves an important function for farm-to-market and emergency services purposes. The park’s scenic landscape of the Badlands provides visitors with a unique experience. The Park also provides visitors with educational opportunities regarding the parks’ geological and paleontological wonders, as the Badlands geologic formation contains one of the world’s richest fossil beds (NPS 2017a). In addition to scenic driving, the park provides visitors with recreational opportunities such as access to the Cliff Shelf Trail and access to and from Ben Reifel Visitor Center from the Northeast Entrance Station.

Currently, Loop Road within the project area, is at risk of near-term failure which could cause the section of road to be reduced to one lane of traffic or be closed all together, this has the potential to detract from the overall visitor experience and use of the park. Visitors also face safety concerns due failing road conditions, increase in traffic due to lane or road closures.

3.6.2 Environmental Consequences

Alternative A: No Action Alternative

Under alternative A, the NPS would continue to monitor landslide movements, perform spot repairs, and conduct maintenance to the roadway. Visitors would continue to encounter rough driving conditions such as potholes, cracks, uneven pavement, and settlement on Loop Road through the project area. Additionally, the road would remain prone to landslide movements that could result in failure and subject visitors to more long-term closures. Failure of the roadway would require park visitors to seek other roads to access portions of the park, thereby reducing the quality of the visitor experience because of longer travel time. Alternative A, No Action could result in adverse impacts to visitor use and experience.

This analysis incorporates the trends discussed in Section 3.2 and could result in an additional increase in adverse impacts to visitor use, experience, and safety as a result of reasonably foreseeable future actions.

Alternative B: Repair and Stabilize Loop Road at Cedar Pass

Under alternative B, short-term adverse impacts would occur during construction, as well as dust and noise from construction. There would be a potential for increased traffic due to lane closures, as well as temporary access limitations for park staff, law enforcement, emergency services, and local agricultural traffic. However, in addition to detour routes being posted, seasonal timing also would be considered for construction schedules; this would enable construction to occur during months of lower visitation or to be scheduled to avoid special events like Sturgis motorcycle rally, thereby mitigating some impact to visitors. Alternative B would result in long-term beneficial impacts to visitor use, experience and safety through improved functionality and conditions of the roadway and slope.

This analysis incorporates the trends discussed in Section 3.2 and would not result in an additional increase in adverse impacts to visitor use, experience, and safety as a result of reasonably foreseeable future actions.

Chapter 4: Mitigation and Minimization Measures

4.0 Introduction

NPS places strong emphasis on avoiding, minimizing, and mitigating potentially adverse environmental impacts. To help ensure the protection of natural and cultural resources and the quality of the visitor experience, NPS would implement the following measures as part of the action alternative.

4.1 General

- Clearly state all resource protection measures in the construction specifications and instruct workers to avoid conducting activities outside the project area. Limit disturbance to roadsides, culvert areas, and other areas inside the project area. Clearly indicate areas of concern on construction drawings.
- Hold a preconstruction meeting to inform contractors about sensitive areas, including natural and cultural resources and provide procedures for identifying and addressing any unanticipated discoveries.
- Delineate construction zones outside existing disturbed areas with flagging and confine all surface disturbance to the construction zone.
- Site staging and storage areas for construction vehicles, equipment, materials, and soils in previously disturbed or paved areas approved by NPS. These areas shall be clearly identified in advance of construction.
- Require contractors to properly maintain construction equipment to minimize noise and emissions. Do not allow construction engines (including vehicles and equipment) to idle for extended periods, unless necessary.
- Remove all tools, equipment, barricades, signs, and surplus materials from the project area upon completion of the project.
- Develop a Spill Pollution Prevention Plan for the project to include spill prevention, fueling, hazardous material containment, hazardous material usage.

4.2 Cultural Resources

- Identify and delineate archeological or structural resources near the project area prior to project work.
- An archeologist who meets the Secretary of the Interior's professional qualification standards would monitor specific areas of ground disturbance indicated by NPS cultural resources staff or tribal partners.
- Continue to coordinate with the South Dakota State Historic Preservation Office throughout the course of the project if unknown cultural resources are discovered as a result of the actions associated with the action alternative.
- Continue to consult with affiliated Tribes regarding site monitoring needs, and if unknown cultural resources or sacred sites are discovered as a result of the actions associated with the action alternative.

- Stop all work on the project and contact the park Superintendent immediately if human remains are discovered during construction activities. As required by law, notify the coroner. Follow all provisions outlined in the Native American Graves Protection and Repatriation Act (1990).
- Ensure imported fill material are devoid of cultural materials before transporting into the Park.
- Continue to consult with the NPS Midwest Archeological Center (MWAC) regarding equipment staging areas and access routes to avoid known sites.

4.3 Geology and Soils

- Avoid or minimize disturbance to soils as much as possible.
- Evaluate existing topsoil for nonnative invasive plant infestations.
- Imported materials shall come from locally sourced areas and meeting the NPS requirements for soil types in the project area.
- Implement erosion control measures that provide for soil stability and prevent movement of soils during rain events (i.e., silt fences and tarps).
- Aerate any ground surface temporarily disturbed during construction and reseed or replant with native vegetation to reduce compaction and prevent erosion.
- Develop and adhere to a stormwater pollution prevention plan and project specifications including for active haul roads and staging areas and engage a qualified stormwater practitioner to ensure compliance.
- Ensure control materials are weed/weed seed and debris free to mitigate the spread of non-native, noxious invasive species.
- Ensure erosion control materials made of natural materials, such as erosion blanket made of jute instead of plastic.
- Ensure imported fill material are devoid of paleontologic materials before transporting into the Park.

4.4 Paleontological Resources

- A survey of the safely accessible area of the project site will be conducted.
- A paleontologist who meets the Secretary of the Interior's professional qualification standards would monitor specific areas of ground disturbance indicated by NPS natural resources staff.
- Ensure imported fill material are devoid of paleontologic materials before transporting into the Park
- Take all necessary steps and immediately notify NPS paleontologists if concealed paleontologic resources are encountered during construction. Implement paleontological mitigation measures, such as specimen collection, and minimize ground disturbance, where possible, where associated resources of scientific significance are found.

4.5 Vegetation

- Park will provide best management practices for revegetation of the site. This may include, seed type and weed/weed seed free materials.
- Park will provide best management practices to mitigate the introduction or spread of non-native, invasive species due to construction activities.
- No herbicide use shall take place during construction

4.6 Visitor Use and Experience

- Inform visitors in advance of construction activities via multiple methods, including the park's website, various signs, and the visitor center. Provide regular updates to the public about project progress and any associated delays.
- Develop provisions for emergency vehicle access through construction zones.
- Develop a traffic plan to manage for the project site during construction
- Develop a cohesive aesthetic treatment plan throughout the project area corridor where treatments, like retaining walls, are visible.

4.7 Water Resources

- Implement best management practices for drainage and sediment control to prevent or reduce nonpoint source pollution and minimize soil loss and sedimentation in drainage areas. These practices may include, but are not limited to, silt fencing, filter fabric, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas to minimize sedimentation and turbidity impacts as a result of construction activities. As much as practicable, do not use plastic materials. Leave erosion control measures in place at the completion of construction to avoid adverse impacts on water resources, after which time NPS staff would be responsible for maintenance and removal.

Chapter 5 Consultation and Coordination

5.0 Lead and Cooperating Agencies

An internal review of the Loop Road at Cedar Pass Emergency Road Repair Environmental Assessment has been conducted by the National Park Service staff at Badlands National Park and by staff at the Midwest Regional Office located in Omaha, Nebraska.

5.1 Federal Agencies

U.S. Fish and Wildlife Service
Endangered Species Act: Section 7 consultation

5.2 State Agencies

South Dakota State Historic Preservation Office
National Historic Preservation Act (Section 106)

5.3 Tribal Partners

Cheyenne River Sioux Tribe of the Cheyenne River Reservation
Crow Creek Sioux Tribe of the Crow Creek Reservation
Lower Brule Sioux Tribe of the Lower Brule Reservation
Oglala Sioux Tribe
Rosebud Sioux Tribe of the Rosebud Indian Reservation
Sisseton-Wahpeton Oyate of the Lake Traverse Reservation
Spirit Lake Dakota Nation
Standing Rock Sioux Tribe of North & South Dakota
Yankton Sioux Tribe of South Dakota

5.4 Local Agencies

City Council Meeting Interior, SD March 9, 2022

5.5 Other Environmental and Regulatory Requirements

A Notice of Availability of the Loop Road at Cedar Pass Emergency Road Repair Environmental Assessment will be available on the NPS public Planning, Environment & Public Comment (PEPC) website at www.parkplanning.nps.gov and a notice to local media outlets allowing 15 days for public comment.

Acronyms and Abbreviations

CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
FHWA-CFLHD	Federal Highway Administration, Central Federal Lands Highway Division
NEPA	National Environmental Policy Act
NPS	National Park Service
Park	Badlands National Park
SHPO	State Historic Preservation Office
USC	United States Code

References

Council on Environmental Quality, Executive Office of the President (CEQ)

- 2014 Memorandum for Heads of Federal Departments and Agencies: Effective Use of Programmatic NEPA Reviews. Executive Office of the President Council on Environmental Quality. December 18, 2014.

National Park Service, US Department of the Interior (NPS)

- 1993 Jones, Bruce Memorandum to Acting Chief, Midwest Archeological Center, May 11. Subject: Archeological Inventory and Evaluation, Badlands National Park, South Dakota, April 19 – May 4, 1993. On file, National Park Service, Midwest Archeological Center, Lincoln, Nebraska.
- 2000 Director's Order 47: Soundscape Preservation and Noise Management. NPS Office of Policy.
- 2002 Director's Order 77-1: Wetland Protection. NPS Office of Policy. 2003
Director's Order 77-2: Floodplain Management. NPS Office of Policy. 2006
Management Policies 2006. <http://www.nps.gov/policy/mp2006.pdf>
- 2005 Cedar Pass Developed Area Badlands National Park Cultural Landscape Report. Prepared for National Park Service Midwest Regional Office and Badlands National Park by John Milner Associates, Charlottesville, Virginia in association with Bah Vermeer Haecker Architects, Lincoln, Nebraska.
- 2009 Air Quality in National Parks: 2009 Annual Performance & Progress Report. Natural Resource Report. NPS/NRPC/ARD/NRR—2010/266.
- 2012 Amberg S and Others. 2012. Badlands National Park: Climate change vulnerability assessment. Natural Resource Report. Natural Resources Report NPS/BADL/NRR—2012/205. National Park Service. Fort Collins, Colorado
- 2015 NEPA Handbook. <http://www.nps.gov/applications/npspolicy/DOrders.cfm>
- 2017b Kleinman, Josh Memorandum to Archeologist Erin Dempsey, Midwest Archeological Center, through Museum Technician Megan Cherry, Badlands National Park, from Archeologist Josh Kleinman, Denver Service Center - Transportation Division, October 13. Subject: Trip Report, Section 106 Inventories and Condition Assessments at Badlands National Park, September 5-8, 2017. On file, National Park Service, Midwest Archeological Center, Lincoln, Nebraska.
- 2018 Cedar Pass Development Concept Plan and Environmental Assessment. Prepared by Badlands National Park and the NPS Midwest Regional Office. September 2018.

U.S. Department of Transportation, Federal Highway Administration (FHWA)

- 2022 Technical Memorandum; Cliff Shelf Emergency Repair Recommendations, Reinforced Soil Slope (RSS) Badlands National Park, SD NP BADL 10(10) Cedar Pass Slide Repair. Prepared by, Todd Hansen, Geotechnical Engineer, CFLHD, Lakewood CO. March 28, 2022

Appendix A

Figures and Tables

Table 1

Summarizes which topics were retained or dismissed and includes the rationale for dismissal.

Impact Topic	Retained	Dismissed	Rationale
Air Quality		X	The project would not increase vehicle trips to the park but would result in localized emissions and fugitive dust in the area during construction activities. However, emissions and fugitive dust would occur only during the construction period and would dissipate quickly. No long-term impacts on air quality are expected. Therefore, the topic was dismissed from detailed analysis in this document.
Cultural & Historic Resources	X		The project area has been surveyed for archeological resources and historic structures within the built environment (NPS-MWAC 2021; WSP 2021 [Preparer's Note: Citation for WSP 2021 pending completion of the built environment report.]). Although NPS would avoid impacts on known archeological sites, road construction could affect historic structures. Therefore, this impact topic is carried forward for detailed analysis.
Geology & Soils	X		Activities to repair the section of Loop Road could change the local topography, which may alter the park's geological landforms. Although the project would minimize areas contributing to surface runoff and erosion within the project area, the potential for soil compaction from the use of construction equipment could occur. Additionally, native soil would be disturbed, and locally sourced soils & materials imported from outside the park. Therefore, geology and soils are carried forward as an impact topic.
Indian Trust Resources		X	In accordance with the Environmental Compliance Memorandum 97-2, NPS must ensure that it explicitly addresses any anticipated effects on Indian trust resources in an environmental compliance document. If any effects are identified, NPS must consult with the affected tribe(s) on a government-to-government basis with respect to the impact from the project. However, if the project or action is expected to have either an insignificant impact or no impact on any Indian trust resources, the environmental compliance document must state the reason for dismissal. Since no Indian trust resources exist in the project area, the topic was dismissed from detailed analysis in this document.

Indian Sacred Sites	X	In accordance with Executive Order 13007, NPS must accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites. Continued access to, and use of, these sites is often essential to the survival of family, community, or regional cultural systems, including patterns of belief and sociocultural and religious life. No survey for sacred sites has been conducted at this location at this time. Consultation with the Tribes was initiated on April 14, 2022, the Park will continue to work with the Tribes to ensure compliance. Therefore, this impact topic is carried forward for detailed analysis.
Paleontological Resources	X	Ground disturbance associated with the project may affect paleontologic resources within the project area. The project area corridor is surrounded by moderately to highly fossiliferous strata and is mostly underlain by the Scenic and Poleslide Members of the Brule Formation, which are both fossiliferous and may contain important Oligocene vertebrate fauna. Therefore, this impact topic is carried forward for detailed analysis.
Socioeconomics	X	Based on an evaluation of preliminary impacts tied to socioeconomics, it was determined that this impact topic could be dismissed. There would be no noticeable socioeconomic effects across the alternatives and further analysis of the topic would not influence the selection of the preferred alternative.
Soundscapes	X	The project would occur where sounds from vehicular traffic and other human activities are historically common. During construction, anthropogenic noise would increase because of construction activities, equipment, vehicular traffic, and the presence of crews. Any sounds generated from construction would be temporary, lasting only as long as the construction activity is generating the sound(s), and would have no long-term, measurable effect on visitors, employees, or natural soundscape conditions. Therefore, the topic was dismissed from detailed analysis in this document
Vegetation	X	Unstable slopes and erosion along Scenic Loop Drive in the project area are currently affecting some vegetation. While many portions of road are atop steep slopes where disturbance to vegetation would be limited, areas disturbed by tree felling during construction activities would be reseeded or replanted with native vegetation that would enhance the adjacent roadway shoulders and embankments and improve the stabilization of the slope, where applicable. Additionally, fill material used during the project would meet FHWA-CFLHD engineering requirements to avoid the introduction of nonnative invasive plants. No known rare plants occur in the project area. Therefore, this impact topic was dismissed from detailed analysis in this document.

Visitor Use, Experience & Safety	X		Repairing the Loop Road section would improve visitor access to the area, enhance the visitor experience and decrease the safety risk by reducing unsafe road conditions, keeping the access and flow to vehicular traffic in the long-term. Impacts to visitor traffic and access would be temporary during construction. Furthermore, construction is proposed to start in the Fall when visitation rates are declining. If Loop Road was not repair conditions would continue to deteriorate, creating a larger safety issue which could result in a lane or full road closure. Therefore, this impact topic is carried forward for detailed analysis.
Visual Resources		X	Visual impacts from construction activities would be localized. Repair treatments to the existing road in the project area would become permanent features on the landscape, potentially detracting from the scenic resources of the park and affecting visual quality. However, the project would occur in areas where the presence of the road has already altered the natural setting and would not represent a noticeable departure from historic visual conditions. Furthermore, new structures would resemble the existing landscape in color and geological form to minimize visual disturbances. Therefore, this topic was dismissed from detailed analysis in this document
Water Resources		X	Surface water is present only briefly following precipitation events and quickly moves down steep ravines or into ground water. There are no natural or artificial channels, lakes, reservoirs, or impoundments found in the area of potential effect. Subsurface water is likely present, but not in identified locations. The area of potential effect is within a geologic slump containing many crevices and voids in which water may accumulate. Therefore, the topic was dismissed from detailed analysis in this document.
Wildlife (including species of concern)		X	Repairs to the existing road in the project area and reopening the road to vehicular traffic would have direct and indirect impacts on wildlife, including direct injury and mortality from vehicle collisions, altered behavior and patterns of habitat use, and increased human use and disturbance of wildlife (Gerow et al. 2010). The repair of the road would not introduce new impacts on most wildlife—these impacts already exist. Increased noise levels during the construction phase of this project could result in temporary increases in localized disturbances to wildlife. While the project could result in minimal, temporary impacts, it would not affect the viability or population dynamics of wildlife in the park. There will be no effect to any of the state or federally listed threatened or endangered species that occur in the Park. Therefore, the topic was dismissed from detailed analysis in this document.
Wilderness		X	No wilderness exists within the Project area. Therefore, the topic was dismissed from detailed analysis in this document.

Figure 1
Ariel photo of failure location from the CFLHD assessment conducted September 1, 2021



Figure 2

Comparison photos showing the road and slope failures noted in September 2021 (left) and April 2022 (right). Top photos showing the slope failure, left photo looking south/east (Sept. 21) the other looking north (April. 2022). Bottom photos showing the road slumping from September 2021 (left) to April 2022 (right).

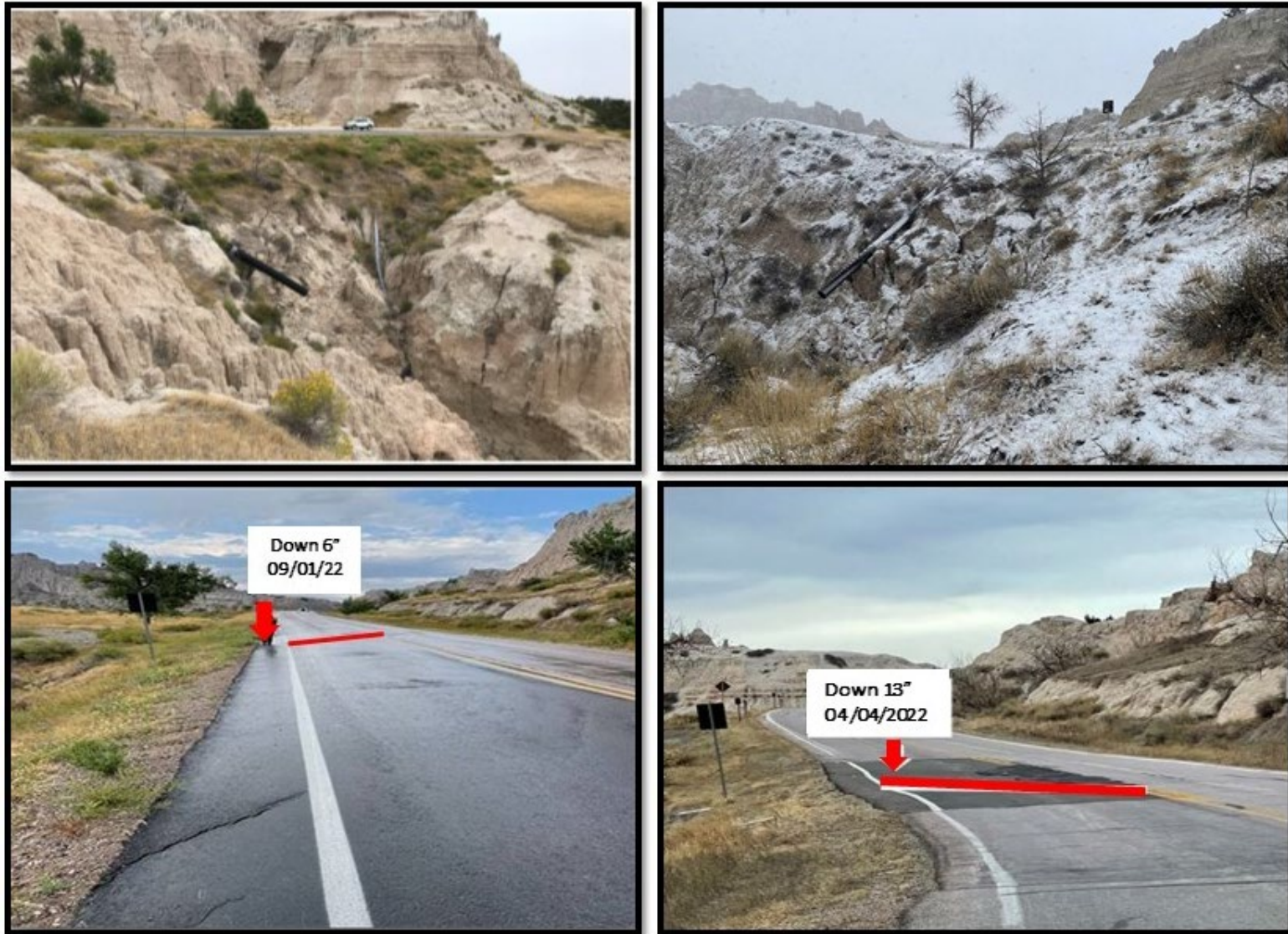


Figure 3
Project area

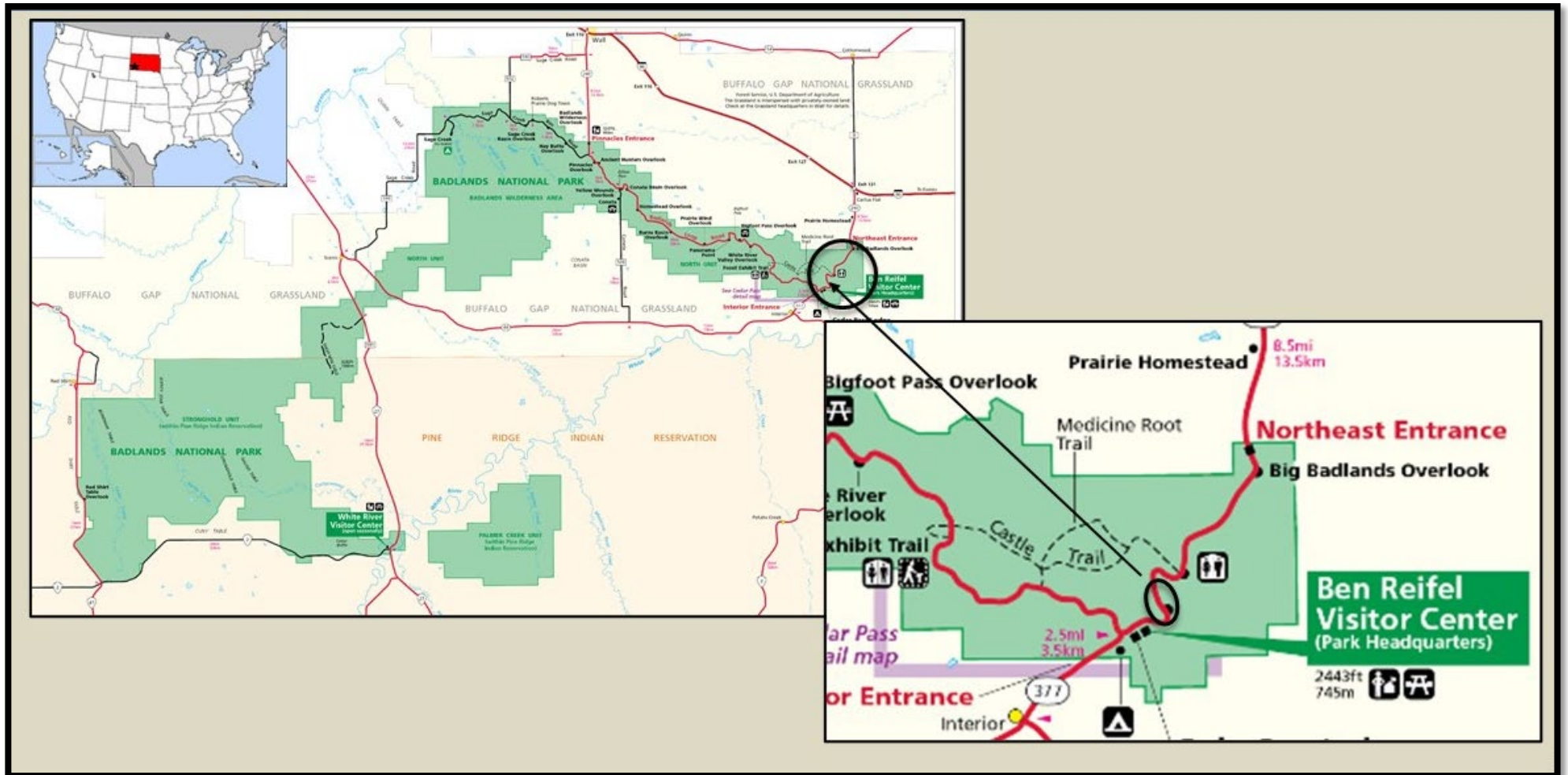


Figure 4

Project site, area of failure (red). Project site, area of potential disturbance (yellow)



Figure 5
Proposed concept for slope stabilization and drainage improvements

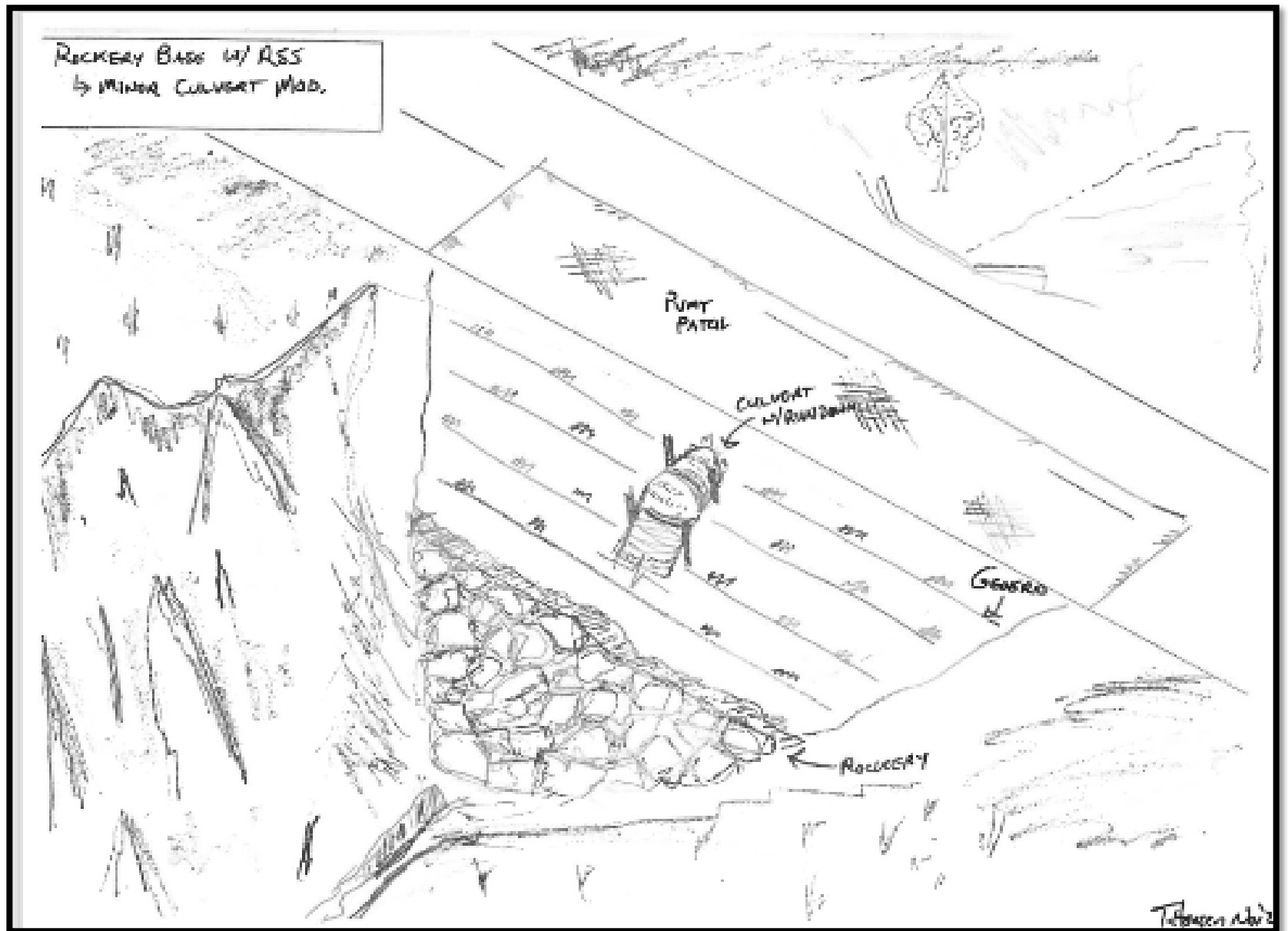


Figure 6
Proposed cut view of slope stabilization

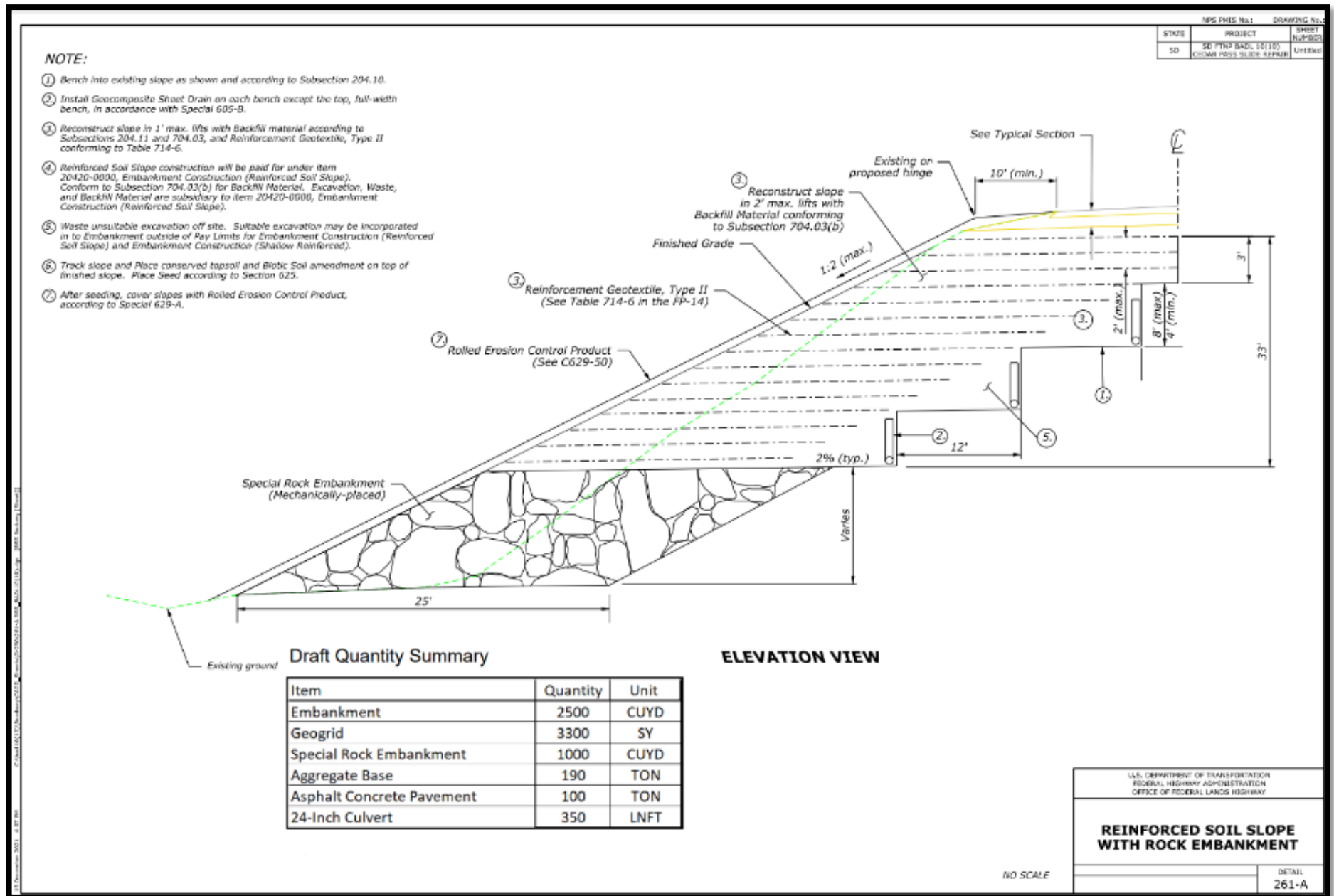


Figure 7
Proposed Concept for Road Repair

