National Park Service
U.S. Department of the Interior

Environmental Assessment
March 2003

Project to Replace the Failing Wastewater Treatment Facility

Wind Cave
National Park · South Dakota

Environmental Assessment

Project to Replace the Failing Wastewater Treatment Facility

Summary

The Wind Cave National Park wastewater treatment lagoons are currently undersized and poorly located to accommodate the wastewater generated by park facilities. The existing evaporation ponds have 3.2 acres of surface area, and are located at the base of a west-facing slope. This site is partially protected from wind and sun making evaporation poorly effective. Total inflow to the ponds consists of 2.5 million gallons of wastewater per year, and 1.6 million gallons of rainfall. At the current location, evaporation rates are not sufficient to remove this total annual input.

Over the past 12 years, the ponds have filled to capacity three times. Effluent from the ponds was then discharged onto designated “spray fields” within the park. This process requires a discharge permit from the South Dakota Department of Environment and Natural Resources. The state has notified the Park Service that one time permits to discharge will no longer be issued, and that a permanent means for resolving the park’s wastewater problem must be sought. In addition, water quality testing of cave waters has revealed in the past the presence of contaminants found in untreated wastewater. Although no cave passages have been found directly below the current lagoons, there is a good chance that they exist at this location and a breach of the liner could contaminate these resources.

The park has taken measures to reduce wastewater generation throughout the park. Thus far, improvements have been made in the wastewater collection system to reduce infiltration, and bathroom fixtures have been replaced with low flow and low flush models. To complete the wastewater system upgrades necessary to meet state requirements, the park is considering three potential action alternatives:

- Construct a new pipeline to transmit untreated sewage to Hot Springs for treatment (the Preferred Alternative);
- Construct a wastewater treatment plant that discharges treated water under a National Point Discharge Elimination System (NPDES) permit; or
- Construct new, larger evaporation ponds in a location that does not restrict size and allows for greater evaporation rate to fully remove inputs of wastewater and precipitation.

Unlike the no action alternative, the action alternatives would ensure adequate treatment of current and projected future flows of wastewater from the Wind Cave facilities. Implementation of any of the action alternatives would result in beneficial impacts to natural resources and the human environment at the park.

Public Comment

If you wish to comment on the environmental assessment, you may mail comments to the name and address below or email comments to: wica_planning@nps.gov. This environmental assessment will be on public review for 30 days. Please note that names and addresses of people who comment become part of the public record. **If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment.** We will make all submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

Superintendent
Wind Cave National Park
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PURPOSE AND NEED

BACKGROUND

Wind Cave National Park is located in western South Dakota, on the southern edge of the Black Hills. The park was established in 1903 to protect Wind Cave from commercial exploitation. Since the original designation, the purpose of the park has been expanded from cave preservation alone to protection of both surface and subsurface resources. The primary feature of the park remains the cave, recognized worldwide as a significant site. The Visitor Center receives about 110,000 visitors annually, with 95,000 entering the cave for ranger-led tours.

The park has several facilities, for both the visiting public and park staff. These include the Visitor Center, park headquarters, park housing, maintenance facilities, and the Elk Mountain Campground. Visitation to the park is highest in the summer months, when up to 6,500 people come to the Visitor Center each day. All wastewater generated by these facilities is processed in three wastewater lagoons, located about 1½ miles from the Visitor Center.

The park's wastewater treatment facility is undersized and poorly located to accommodate the wastewater generated by park facilities and rainfall inputs. The existing evaporation ponds have 3.2 acres of surface area (when full), and are located at the base of a west-facing slope. This site is partially protected from wind and sun. Total inflow to the ponds consists of approximately 2.5 million gallons of wastewater per year, and 1.6 million gallons of rainfall, for a total of 4.1 million gallons. The annual evaporation rate for the site of the existing ponds, about 40 inches per year, removes 3.5 million gallons, leaving a net inflow of 0.6 million (or 600,000) gallons per year. Since on an annual basis, the amount of water entering the facility exceeds the amount evaporated, over time the facility fills to capacity.

In 1993, 1.6 million gallons of wastewater were discharged from the full ponds by pumping the water over an adjacent slope and spraying it on the prairie. Three years later in 1996, the two ponds were full again. Emergency funding was obtained to construct a third evaporation pond. Before construction of the third cell was finished, 600,000 gallons of wastewater had to be discharged, again by land application, to prevent the ponds from overflowing.

Installation of the third pond increased total capacity to 6.1 million gallons. But, by 1999, all three of the evaporation ponds were again full. During the summer and fall of 1999, 2.6 million gallons of wastewater were discharged. Another 1.6 million gallons were spray irrigated in the spring of 2000. When the South Dakota Department of Environment and Natural Resources issued the emergency discharge permit for the 2000 land application, the park was informed that future requests for discharge permits would be denied. The park was directed to find a permanent solution to the wastewater treatment problem. A copy of this correspondence can be found in Appendix A.

The park's wastewater collection system piping was recently upgraded to double-wall construction to eliminate infiltration and inflow, as well as leakage over the cave. Bathroom fixtures throughout the park have been replaced with equipment that uses less water. Despite these improvements, the lagoons are still anticipated to reach capacity in 2005.

The South Dakota Department of Environment and Natural Resources is concerned that due to the very high percolation rates in the area soils, groundwater will be contaminated by

the wastewater discharged from the park's facility. The drinking water supply for the park comes from the Madison aquifer, located below and about 1 mile downstream from the wastewater evaporation ponds and the area where wastewater was applied to the land. Wastewater reaching the groundwater aquifer could elevate nitrogen levels in the groundwater. Nitrate and nitrite are primary contaminants for which public drinking water systems are monitored. Even though the last land applications were permitted discharges, it is unknown what, if any, damage the discharged wastewater has done to the groundwater supply, and subsequently to cave resources.

Avoidance of percolation of wastewater is of critical importance to preservation of the Wind Cave formations and ecosystem. The cave is an extremely low energy system, adapted to darkness and low inputs of nutrients. Cave waters tested for the presence of wastewater have shown elevated levels of wastewater components, including nitrogen (a vital plant nutrient), sodium, and chloride. It is likely that wastewater unnaturally elevates the energy available to microbes and other life forms in the cave. Any additional water that unnaturally enters the cave also could cause irreparable damage to speleothems and other delicate geologic features.

To comply with state regulation and to provide long-term protection of park resources, the park has undertaken the redesign of the wastewater treatment facility. This environmental assessment analyzes three alternatives for redesigning the wastewater treatment facility.

PURPOSE AND NEED FOR THE PROJECT

The primary purposes of the project are compliance with state regulations by eliminating surface discharge of wastewater and protection of park resources. Replacing the failing wastewater treatment facility would meet several objectives directly related to the mandates for the establishment of Wind Cave National Park. These objectives were identified by NPS staff in initial project planning phases (NPS 2001b).

- The project would enhance protection of the cave, one of the primary park resources, by reducing the potential for cave formations and biota to be affected by tainted groundwater.
- The project would provide for visitor enjoyment by removing the highly visible and unsightly wastewater treatment lagoons from their current site immediately adjacent to the park's main access highway.
- The project would protect public health, safety, and welfare by eliminating the potential for surface discharge of wastewater, and thereby reduce the possibility that wastewater contaminants would reach groundwater that serves as the source for the park's drinking water.
- The project would result in cost-effective, environmentally responsible, and beneficial development for the park by providing a long-term solution to the park's need for wastewater treatment to meet state and federal requirements.

Description of the Park and Geographic Location

The park encompasses 28,295 acres of prairie ecosystem, underlain by one of the world's longest caves (Wind Cave National Park, R. Horrocks, personal communication 2002). Wind Cave is estimated to be 40 to 60 million years old, and is well known for its outstanding display of boxwork, an unusual cave feature composed of thin blades of calcite

that resemble honeycomb (NPS 2001c). In addition, the park has at least 20 other, smaller caves (NPS 2001c).

The surface features of the park include expanses of mixed-grass prairie, ponderosa pine and riparian ecosystems. The gently rolling landscape of the park is a transition zone between plains and mountains, and supports a great diversity of plant and animal species (NPS 1994). The park is well-known for the resident bison herd, as well as for opportunities to view mule deer, pronghorn, elk, prairie dogs, birds and a variety of small mammals.

The cultural resources of Wind Cave National Park include evidence of Plains Indian cultures, records of early cave exploration and tourism, Civilian Conservation Corps structures, and properties listed on the National Register of Historic Places.

The park is seven miles north of Hot Springs, SD and is bounded by Custer State Park on the north, Black Hills National Forest on the west, and by private property on the south and east. The park is one of a variety of destinations for Black Hills visitors. Attractions in the immediate area include Mount Rushmore National Memorial, Jewel Cave National Monument, Crazy Horse Memorial, the Mammoth Site in Hot Springs, and Badlands National Park (see Figure 1).

Summary of Enabling Legislation

Wind Cave National Park was established in January 1903 (32 Statute 765) as a 10,532-acre area to protect Wind Cave and the underground resources of this unique site. It was the seventh national park and the first one created to protect a cave. The original legislation applied only to the cave and surface developments needed to manage and care for the cave (NPS 1994). The parklands at that time were small and there were no bison, elk, or pronghorn. These big game species were introduced later, as park boundaries expanded.

The purpose of Wind Cave National Park has evolved from cave preservation to protection of both subsurface and surface ecosystems. In 1912, establishment of the Wind Cave National Game Preserve provided a permanent range for bison and “such other native American game animals as may be placed therein.” Herds of bison and elk were re-established, as the need to preserve and protect big game species was realized. In 1935, management of the game preserve was transferred from the Department of Agriculture, to Wind Cave National Park. In 1946, the park was expanded to over 28,000 acres to maintain a viable population of a variety of big game, especially pronghorn (NPS 1994).

Figure 1. Regional Map of Wind Cave National Park

Description of the Project Area

Three action alternatives are analyzed in this assessment. The alternatives include installing a wastewater main to convey wastewater to Hot Springs for processing, construction of new, non-discharging wastewater treatment lagoons, and installation of a wastewater treatment plant with effluent discharge.

The proposed actions would take place over a variety of sites. These sites include the rolling hills and native prairie found throughout Wind Cave National Park and on lands adjacent to the park. The description of each alternative includes a map of the proposed project area (see “Alternatives Considered” section).

The existing wastewater lagoons are located in the Wind Cave Canyon. Prior to installation of the lagoons, the site was dominated by the mixed grass system of the native prairie. This site would be the location of the new wastewater treatment plant described in Alternative C. The location of the lagoons, with Highway 385 immediately adjacent on the west, and the steep slopes to the north and east restrict further expansion of the lagoons and limit the size of any facility that could be placed at this location.

Approximately 80 feet above the existing lagoons, on the ridge bench to the northeast, is the proposed location for the new, larger lagoon installation. This option is described as Alternative D. This site is a mixed grass prairie, frequented by bison and large ungulates for grazing. This site has not been previously disturbed.

The Preferred Alternative (Alternative B), installation of a new sewer main to Hot Springs, would be located both on park land and outside the park boundary. Within the park, the sewer main would follow the Highway 385 road right-of-way from the existing lagoon site to the connection point with the Hot Springs sewer system. The entire length of this area has been previously excavated for construction of the highway. This corridor is composed of gently rolling hills that support a mix of native and non-native grasses and forbs.

PLANNING CONTEXT

Relationship to Other Wind Cave National Park Plans

The *1993 Wind Cave Resource Management Plan* and the 1994 *Final General Management Plan/Environmental Impact Statement* outline the direction for proposed actions to protect park resources and enhance visitor experiences at the park. In addition, the Preferred Alternative includes actions that could affect land use immediately south of the park in Custer and Fall River Counties. Specific plans that relate to the actions proposed in this environmental assessment are summarized in Table 1.

The project to replace the failing wastewater treatment facility represents a continued commitment to preserve valuable park resources. The proposed action alternatives would not conflict with any ongoing or planned management activities within the park. Preservation of cave resources and compliance with the Clean Water Act and state regulatory requirements would further the objective of long-term protection and sustainable management of vital park resources.

Table 1: Project's Relationship to Other Plans

Management Activity	Relationship to Proposed Action
Utility reconstruction project to replace water and sewer lines serving the Visitor Center, housing and maintenance areas. Septic tanks and sewage leach fields serving the campground restrooms replaced with a collection system and forced main to connect to the main sewer system serving the headquarters area (General Management Plan/EIS 1994). This project was completed in 2001.	Prior to completion of the water and sewer line project, water quality testing indicated that nutrients found in sewage were entering the cave system. Leaky sewer lines were replaced with dual-walled polyethylene pipe. This project and the proposed action both address water quality and protection of cave resources. In concert, these projects would contribute positively to actions designed to protect the cave ecosystem from unnatural contaminants.
Project to prevent pollution from entering Wind Cave by replacing the asphalt parking surface, installing a new stormwater conveyance system, and treating the first flush of runoff captured from the parking lot, prior to discharge into the environment (GMP/EIS 1994, Environmental Assessment: Project to Prevent Polluted Runoff from Entering Wind Cave 2002).	This project to prevent polluted runoff from entering the cave also fulfills park mandates to protect park resources. Cave waters have tested positive for hydrocarbon pollution found in gasoline and petroleum products such as asphalt. By replacing the aging asphalt parking surface with concrete and installing a stormwater treatment unit, the cave will be better protected from pollutants commonly found in urban runoff. The stormwater treatment included in this action will contribute beneficially to projects designed to improve surface water quality at the park and protect Wind Cave.

Table 1: Project's Relationship to Other Plans	
Develop a comprehensive exotic vegetation management plan and accompanying compliance documentation (1994 GMP/EIS). This project is currently underway.	Disturbance in the park has led to increased presence of weeds in the developed area. After installation of the wastewater treatment facility or wastewater transmission main is complete, park staff would evaluate the need to implement weed control measures to ensure regrowth of native vegetation in disturbed areas.
Land use planning, zoning, and development in Custer and Fall River Counties.	Implementation of the Preferred Alternative would require installation of a new sewer line outside the park boundary. Providing new utility lines along road corridors has been known to affect development patterns. The potential for effects to land use are discussed as a summary topic at the end of the resource impact analyses.

Regulations and Policies

The Environmental Assessment is written within a complex set of regulations and policies. The plan must not only comply with requirements of the National Environmental Policy Act, but must also do so within the parameters of other legislation that governs land use within Wind Cave National Park (see Table 2, below).

National Park Service Organic Act

In 1916, this act established the National Park Service in order to "promote and regulate the use of parks…" and defined the purpose of the national parks as "to conserve the scenery and natural and historic objects and wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." This law provides overall guidance for the management of Wind Cave National Park.

Water Quality Regulations

Wastewater treatment systems in the National Park Service must operate in accordance with *Director's Order #83: Public Health and Safety,* the Clean Water Act (40 CFR 125), and the Primacy Agency (the agency designated by federal law as having oversight responsibilities) requirements. In South Dakota, the South Dakota Department of Environment and Natural Resources is the Primacy Agency, responsible for enforcement of the Clean Water Act. If the park again needs to employ surface discharge, and the state does not issue a special discharge permit, any discharge will be in violation of state and federal Environmental Protection Agency regulations.

The Prohibition of Impairment of Park Resources and Values

National Park Service Management Policies 2001 provides guidance on addressing impairment: Impairment is an impact that, "in the professional judgment of the responsible NPS manager, would harm the integrity of park resources of values, including those that would otherwise be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources that would be affect, the severity, duration, and timing of the impact, the direct and indirect effects of the impact, and the cumulative effects of the impact in question with other impacts."

Any park resource can be impaired, but am impact would be more likely to result in impairment if it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

An impact would be less likely to result in impairment is it is an unavoidable results, which cannot reasonably be mitigated, of an action necessary to preserve or restore the integrity of vital park resources.

ISSUES AND CONCERNS

National Park Service internal discussions led to identification of the main issues to be addressed in this environmental assessment. Eliminating the need for periodic surface discharge from the wastewater treatment lagoons and improving protection of cave resources are the primary objectives of the wastewater treatment system rehabilitation project. Impact topics identified for assessment were: cave resources, endangered and threatened species, air quality, soils, vegetation, surface water quality, wildlife, cultural resources, economics, public health and safety, park operations, and visitor use and experience.

The following problems with the current wastewater treatment facility were discussed at the value analysis meeting as issues the project must address:

- All treatment, storage, and disposal methods must assure no percolation into the cave or drinking water aquifers
- Avoid creation of any artificial environments such as unnatural lush vegetation, chronically wetted soils, or unseasonal flows in ephemeral drainages
- Address the visual impact of the existing lagoons on the landscape
- Minimize (to the extent possible) new surface disturbance by locating facilities in previously disturbed areas.

IMPACT TOPICS

Impact topics were used to focus the evaluation of the potential consequences of the proposed actions and no action alternative. Impact topics were identified based on legislative requirements, topics specified in *Director's Order #12 and Handbook* (NPS 2001a), and park-specific resource information. The impact topics for the project to replace the failing wastewater treatment facility at Wind Cave National Park are presented in Table 2. The rationale for dismissing topics follows the table.

Table 2: Impact Topics Retained for the Project to Replace the Failing Wastewater Treatment Facility

Impact Topic	Relevant Regulations or Policies
Biological and physical resources	
Air quality	Federal Clean Air Act (CAA), CAA Amendments of 1990 (CAAA), NPS *Management Policies 2001,* South Dakota State Statute 34A
Cave resources	Federal Cave Resources Protection Act of 1988, 43 CFR Part 37 Cave Management, NPS *Management Policies 2001*
Endangered or threatened species and critical habitats	Endangered Species Act; NPS *Management Policies 2001*
Soils	NPS *Management Policies 2001*
Vegetation	NPS *Management Policies 2001*
Surface Water Quality	Clean Water Act, Executive Order 12088; NPS *Management Policies 2001*
Wildlife	NPS *Management Policies 2001*
Cultural resources	Section 106; National Historic Preservation Act; 36 CFR 800; National Environmental Policy Act; Executive Order 13007; Director's Order 28; NPS *Management Policies 2001*
Socioeconomic considerations	
Economics	40 CFR 1500 Regulations for Implementing NEPA
Park operations	NPS *Management Policies 2001*
Possible conflicts with land use plans, policies, and controls for the area	National Environmental Policy Act, 40 CFR 1502 and 1506 Regulations for Implementing NEPA, NPS *Management Policies 2001*
Public health and safety	NPS *Management Policies 2001*
Sustainability and long-term management	National Environmental Policy Act, 40 CFR 1500 Regulations for Implementing NEPA, NPS *Management Policies 2001*
Visitor use and experience	Organic Act 1916; NPS *Management Policies 2001*

Rationale for dismissal of selected topics

Ecologically critical areas: Wind Cave National Park does not contain any designated ecologically critical areas, wild and scenic rivers, or other unique natural resources, as described in the Wild and Scenic Rivers Act, 36 CFR 62 criteria for national natural landmarks, or NPS *Management Policies 2001*.

Natural soundscapes: NPS Director's Order #47 *Soundscape Preservation and Noise Management* and NPS *Management Policies 2001* direct NPS managers to protect, maintain, or restore natural soundscapes unimpaired by inappropriate or excessive noise.

Under this directive, noise is defined as appropriate or inappropriate relative to the purpose of the park, the level of visitor services available, and to activities pursued by visitors.

Neither the no action nor any of the action alternatives addressed in this analysis would introduce long-term, inappropriate noise levels to the park. The proposed actions largely occur in areas with an existing level of development, including highways, roads, and park facilities. The temporary nature of noise produced during construction or revegetation and restoration activities is appropriate in developed areas, and would not be expected to produce adverse effects on the human or natural environment. No actions are proposed that would introduce long-term noise sources to remote or undeveloped portions of the park, and none of the proposed actions would alter the baseline, ambient noise level at Wind Cave National Park.

Night sky/lightscapes: The NPS Night Sky Initiative and NPS *Management Policies 2001* direct the Park Service to "preserve to the greatest extent possible, the natural lightscapes of parks, which are natural resources and values that exist in the absence of human-caused light." The park service is currently developing the Night Sky Initiative to formulate a policy to protect views of the stars and planets in our national parks.

To meet this directive, overnight lighting shall not be used. Any action proposed in this analysis would restrict the use of lighting to those areas where security and safety are required. Low-impact techniques would be utilized and shields would be installed to prevent degradation of the night sky view and avoid disruption of the physiological processes of plants and animals. Neither the no action alternative nor any of the action alternatives would be likely to affect appreciation of the night sky or interfere with activities of nocturnal creatures. For these reasons, night sky is dismissed as an impact topic for further consideration.

Prime and unique agricultural lands: Prime farmland, as defined by the Council on Environmental Quality 1980 memorandum, has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique agricultural land is land other than prime farmland that is used for production of specific high-value food and fiber crops. These designations are established by the Natural Resource Conservation Service following soil and resource analyses. No lands within Wind Cave National Park have been defined as prime or unique agricultural lands.

Wetlands and Floodplains: The proposed project areas within and outside Wind Cave National Park do not contain any designated or functional wetlands as described in Executive Order 11990, the Clean Water Act Section 404, or by NPS Director's Order #77-1. The areas of any proposed action also lie outside the 100 and 500-year designated floodplains for the perennial streams of Wind Cave National Park, Custer County, or Fall River County (Wind Cave National Park, B Muenchau, personal communication 2002), and are not subject to management under Executive Order 11988 or the Clean Water Act.

Wilderness: Wind Cave National Park does not contain nor is it adjacent to any designated or proposed wilderness areas. Approximately 96.5 percent of the park's surface is included in the "natural zone" (NPS 1994). Within this area, signs of human use and development are widely present and easily visible. Highway 385 transects the park, and is traveled by over one million people each year. Wind Cave National Park is not under consideration for wilderness designation under the 1964 Wilderness Act, Director's Order 41, or NPS *Management Policies 2001.*

Environmental justice: Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires that all federal agencies address the effects of policies on minorities and low-income populations and communities. None of the alternatives would have disproportionate health or environmental effects on minorities or low-income populations as defined in the Environmental Protection Agency's Draft Environmental Justice Guidance (July 1996).

Indian trust resources: Indian trust assets are owned by Native Americans but held in trust by the United States. Requirements are included in the Secretary of the Interior's Secretarial Order No. 3206, "American Indian Tribal Rites, Federal – Tribal Trust Responsibilities, and the Endangered Species Act," and Secretarial Order No. 3175, "Departmental Responsibilities for Indian Trust Resources." Indian trust assets do not occur within the project area.

Natural, depletable, or energy resource requirements and conservation potential: As directed by NPS *Management Policies 2001,* the park service strives to minimize the short- and long-term environmental impacts of development and other activities through resource conservation, recycling, waste minimization, and the use of energy-efficient and ecologically responsible materials and techniques. Each of the action alternatives requires energy and materials for construction and day-to-day operations. Quantification of the energy required for by the different options is not addressed in this assessment. Specific impacts to the cultural and natural environment are addressed by impact topic.

SCOPING

Several Native American tribes have demonstrated interest in the areas within Wind Cave National Park. The following tribes were contacted by letter on 19 April 2002, regarding this project. A copy of the letter sent to the tribal representatives can be found in Appendix A.

Arapaho Business Committee
Cheyenne River Sioux Tribe
Cheyenne-Arapaho Tribes of Oklahoma
Crow Creek Sioux Tribal Council
Crow Tribal Council
Flandreau Santee Sioux Executive Committee
Fort Belknap Community Council
Fort Peck Tribal Executive Board
Lower Brule Sioux Tribal Council
Northern Cheyenne Tribal Council
Oglala Sioux Tribal Council
Ponca Tribe of Nebraska
Rosebud Sioux Tribal Council
Santee Sioux Tribal Council
Shoshone Business Committee
Sisseton-Wahpeton Sioux Tribal Council
Spirit Lake Tribal Council
Standing Rock Sioux Tribe
Three Affiliated Tribes Business Council
Yankton Sioux Tribal Council

The U.S. Fish and Wildlife Service was contacted regarding this project on 19 June 2002. The Service agreed with the park's finding of no effect on endangered and threatened species.

During development of this environmental assessment, the park contacted the South Dakota State Historic Preservation Officer (SHPO) regarding this project on 19 April 2002. A copy of the letter sent to the SHPO can be found in Appendix A.

The public was invited to comment on the project in a press release issued on February 21, 2002. A copy of the press release can be found in Appendix A. No new issues were identified by the public as a result of the request for public input.

ALTERNATIVES CONSIDERED

A range of alternatives designed to address the wastewater treatment needs of Wind Cave National Park were evaluated during the Value Analysis session held in April 2002. During the Value Analysis workshop, an interdisciplinary team analyzed the advantages and drawbacks of each design option. Several of the original options were rejected because they had the potential to produce artificial environments, would have been difficult or impossible to obtain required permitting from the state of South Dakota, or increased surface disturbance and system management considerations. The alternatives dismissed from consideration are addressed in the section "Alternatives Considered and Dismissed."

Although the option of continuing current management/no action does not solve the wastewater treatment issues at the park, current conditions are used as the baseline against which the action alternatives are analyzed. This is the context for determining the relative magnitude and intensity of impacts (NPS 2001a). The no action alternative is referred to as "Alternative A, Continue Current Management/No Action" for the purposes of this environmental assessment.

The Value Analysis for this project led to the development of three action alternatives, which are analyzed in this assessment. These alternatives meet the primary project objectives of eliminating the need for periodic surface discharge from the wastewater treatment lagoons and improving protection of cave resources from nutrient-rich water. The table below summarizes the actions and the area disturbed under each action.

Table 3: Alternative Descriptions

Alternative	Descriptions/Treatment	Acres Disturbed	Acres Rehabilitated
A	Continue current management/no action	0	0
B	Install a force/gravity main to convey wastewater to Hot Springs SD for treatment at municipal facility	36[1]	41 (including 5 for the existing lagoons)
C	Construct a new wastewater treatment facility with discharge of effluent to Wind Cave Canyon drainage	1	5 (existing lagoons)
D	Relocate and enlarge the lagoons to improve function and meet requirements to evaporate the full volume of annual influent	22	5 (existing lagoons)

1 Of the 36 acres disturbed in this alternative 15 acres are inside the park boundary and 21 acres are outside the park.

For each alternative, all applicable state and local construction and discharge permits would be obtained by the park prior to project implementation. The park has been in contact with a variety of agencies and regulatory authorities regarding the proposed project. These entities include, but are not limited to, the South Dakota Department of Environment and Natural Resources, the State Engineer's Office, Town of Hot Springs, South Dakota Department of Transportation, Custer County, Fall River County, and the South Dakota Water Resources Department.

ALTERNATIVE A, CONTINUE CURRENT MANAGEMENT/NO ACTION

The current wastewater treatment system at Wind Cave National Park consists of three lined lagoons that are intended to allow evaporation of all influent, without discharge. The ponds total 3.2 acres in size and are located in the Wind Cave Canyon, on the east side of Highway 385. The site is highly visible from the highway, with the pond berms, liners, and tall chain-link fencing standing out prominently against the backdrop of native prairie vegetation.

The park facilities served by the wastewater treatment plant include the Visitor Center, park headquarters, park housing, maintenance facilities, and the Elk Mountain Campground. Visitation to the park is highest in the summer months, when up to 25,000 gallons per day of effluent are generated. Wastewater inputs to the ponds total about 2.5 million gallons per year, with precipitation adding another 1.6 million gallons. To function properly, the ponds would need to evaporate at least 4.1 million gallons per year.

The ponds are poorly located, being sheltered from wind and receiving only part of the day's sunlight. These conditions combine to produce insufficient evaporation to remove the annual inputs of wastewater and precipitation. The existing ponds exhibit an average annual evaporation of about 3.5 million gallons, resulting in an annual net inflow of 600,000 gallons. The lagoons have reached capacity three times in the past 12 years. Wastewater was discharged under a special state permit by spray application onto plots of native prairie. The state has informed the park that such permits will no longer be issued and that a permanent solution must be sought.

Prior to 1989, the wastewater treatment system consisted of two unlined lagoons. Effluent infiltrated directly into the surrounding soils, thus preventing overflow. In 1989, the ponds were lined to prevent wastewater from infiltrating into the soil and potentially polluting groundwater and cave resources. Since the liner installation, evaporation has been the only means to eliminate wastewater from the ponds, and they have reached capacity every three to four years.

In 1993, 1.6 million gallons were discharged from the ponds by spraying it on the prairie. In 1996, the two ponds were full again. Emergency funding was obtained to construct a third pond. Before construction was complete, 600,000 gallons of wastewater had to be discharged to prevent overflow.

The third pond increased facility capacity to 6.1 million gallons. In 1999, the facility reached capacity and 4.2 million gallons were discharged during the fall of 1999 and summer of 2000. When the state issued the permit for the 2000 land application, the park was informed that no more permits would be issued. The park must develop a solution to their wastewater treatment needs. At current loading rates, the ponds will reach capacity again in the year 2005.

Wastewater treatment systems in the National Park Service must operate in accordance with Director's Order 83 and the Clean Water Act (40 CFR 125), as enforced by the states. The South Dakota Department of Environment and Natural Resources is concerned that surface water and groundwater will be contaminated by discharges from the park's wastewater facility. The park's drinking water comes from a well located about 1 mile downstream from the wastewater lagoons. If effluent reaches the water well, nitrate and nitrite could become elevated. However, to date, the park's drinking water has not been found to contain elevated levels of nutrients or bacteria.

ALTERNATIVE B, THE PREFERRED ALTERNATIVE

Under the Preferred Alternative, a wastewater transmission line would be installed to convey the park's sewage to Hot Springs, SD for treatment. A new lift station would be constructed in the maintenance area, at the lower end of the existing gravity sewer system. [A "lift station" is a pump used to move water to higher elevations.] A new pipeline would be constructed, beginning at the new lift station, routed along and within the Highway 385 right-of-way, and would connect with the city's sewage collection system, west of Highway 385 at the north end of town. The total distance of the installation is approximately 9.8 miles. Figure 2 depicts the route of installation proposed for the wastewater main included in the Preferred Alternative.

A 6-inch force main would be installed for 8.6 miles of the total distance. [A "force main" is a pressurized line that uses pumps, rather than gravity alone, to move flow through the piping.] Along the length of the force main, air and vacuum release valves, placed in approximately 6-foot by 6-foot concrete vaults, accessible from the surface, would be installed to provide a means of controlling air quantities in the force main to facilitate pumping and drainage of the pipeline. Exposed vents from the air control valves would be designed to resist forces imposed on them by bison inside the park boundary. Pipe material for the force main would be high density polyethylene with butt-fused joints. This pipe material and jointing method eliminates gasketed slip joints used in other common piping materials that sometimes allow plant roots to enter and develop leaks. Two water meters will be installed on the force main. The first meter would be installed in the piping immediately after the lift station pumps. The second meter would be installed on the force main just outside the park boundary. By comparing the quantities on the two meters, any leaks that might develop in the pipeline inside the park boundary would be detected and repaired.

Approximately 1.2 miles from the connecting point with the city system (near the junction of Highway 385 and Argyle Road), an equalization basin would be installed and the pipeline would switch from a pressurized force main to a gravity main. For the final 1.2 miles of line installation, a 10-inch PVC gravity sewer line with standard concrete manholes spaced at 400-foot intervals would be installed.

Installation of the main would be accomplished using traditional trenching techniques. A corridor, approximately 30 feet wide, would be disturbed in order to excavate the trench and allow room for associated installation activities. The pipe would be placed at a depth to avoid freezing and allow adequate space for venting vaults – approximately 6 feet below the surface in this environment.

Upon completion, ownership of the system outside the boundary of Wind Cave National Park would be transferred to the town of Hot Springs. The town would then be responsible for operations and maintenance of the majority of the line, with the park taking responsibility for operations of the line within the park (Wind Cave National Park, S. Schrempp. personal communication 2002).

Approximately 36 acres would be disturbed with implementation of the Preferred Alternative. Of these 36 acres, about 15 acres are within the boundary of Wind Cave National Park and 22 acres are outside the park. All surface disturbances would be regraded to original contour and revegetated with native species within the park or those designated by the South Dakota Department of Transportation outside the park. The existing wastewater lagoons would be removed, and the site would be rehabilitated. These

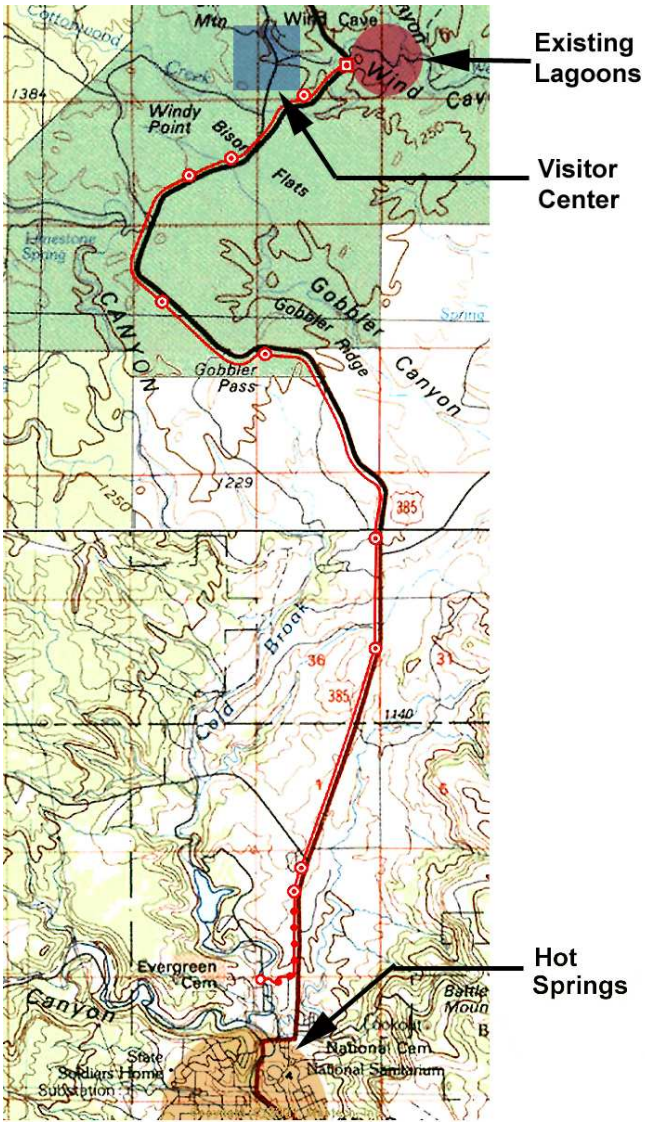
restoration efforts would restore approximately 5 acres to native vegetation. The area would be regraded to approximate the natural contours and planted with a mix of native grasses and forbs.

The option of transporting wastewater from Wind Cave National Park to Hot Springs is possible because the existing municipal wastewater treatment system at Hot Springs has excess capacity. The town's Veterans Administration Hospital recently closed their on-site laundry facility, and this resulted in reduced flows at the wastewater treatment plant. The city is working with the park to provide access to the municipal system. Hot Springs currently treats approximately 550,000 gallons of wastewater per day (Town of Hot Springs, D. McClure, personal communication 2002). The park's contribution of 25,000 gallons per day, maximum, represents an increase in treatment demand of about 5 percent.

Once the park's wastewater reaches the municipal plant, it would be treated with the city's sewage, and discharged on a spray irrigation field, located above the Cheyenne River, east of town. Two-hundred acres of privately owned hay and forage are irrigated with the treated effluent. This discharge method is fully compliant with South Dakota Department of Environment and Natural Resources regulations for water pollution control.

The Preferred Alternative meets the park's need to provide a long-term solution to their wastewater treatment needs. This alternative protects cave resources by eliminating the potential for nutrient-rich water to enter delicate cave systems or reach the park's water wells. The visual intrusion of the existing lagoon site would be removed. Park maintenance and operation burdens would be reduced, and an existing facility would be used for wastewater treatment. In addition, this alternative would not create artificial environments, and would not produce long-term disturbance within Wind Cave National Park. The Preferred Alternative is consistent with National Park Service Management Policies, 2001 which states: "[9.1.5]…The Service will use municipal or other utility systems outside parks whenever economically and environmentally practicable, and it may participate, when authorized, in cost-sharing with municipalities and others in meeting new, expanded, or replacement park utility needs."

Figure 2. Proposed Route of Wastewater Main for the Preferred Alternative



ALTERNATIVE C, NEW WASTEWATER TREATMENT FACILITY WITH SURFACE DISCHARGE

Alternative C provides the option of fully treating the park's wastewater by mechanical means and discharging the treated effluent into an existing natural drainage within the park. This method of treating wastewater is commonly used by municipalities, and requires several steps to produce an effluent that can safely be discharged into the environment. The first step, primary treatment, is settling which allows heavy solids to settle and scum to rise. The scum and sludge are separated and receive discrete handling. [Sludge is transported to a landfill designated for such disposal, or may be used as fertilizer, under special permit from the state and/or locality.] This removes about half of the organic material and prepares the wastewater for secondary treatment.

During secondary treatment, natural bacteria consume organic compounds from the effluent, then settle out and are removed. This process eliminates up to 90 percent of the original organic content of the wastewater. The third stage, known as tertiary treatment, would use chemicals to remove phosphorus and nitrogen from the water, and may also include filter beds and other types of treatment that use microbes to remove nutrients. Chlorine added to the water kills any remaining bacteria, and the water is discharged.

These processes are widely used and well understood. Providing this service at the park would require installation of a “package plant” with components designed and engineered to treat and discharge the park’s wastewater. These components would be housed in a building constructed adjacent to the existing treatment lagoons. This building would be designed to mimic the style of the Civilian Conservation Corps era maintenance buildings, across the road to the west.

Wastewater would be brought into the plant from the existing gravity sewer system. The effluent would be discharged into the Wind Cave Canyon drainage, which drains in an easterly direction, toward Beaver Creek. Discharge would be to the surface, with installation of a stepped or cascading drainage. This would improve oxygenation of the discharge water and reduce the possibility for erosion (RTW Engineers, M. Sherrill, personal communication 2002).

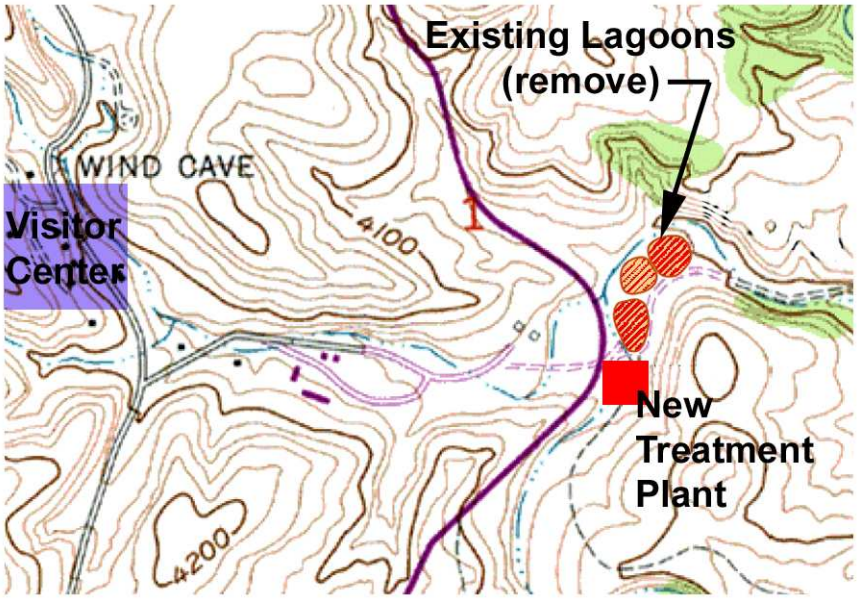
The quantity of discharged effluent would be greatest during the summer visitation season, when approximately 25,000 gallons per day would be treated. [For comparison, this quantity of effluent is equivalent to that produced by 190 residents of Hot Springs.] During most of the year, the park produces less than 10,000 gallons of wastewater per day. A National Discharge Elimination System (NPDES) permit would be required to discharge the effluent. In addition a licensed operator is required to manage the system and regular, periodic effluent testing and reporting are necessary.

The existing treatment lagoons would be demolished, and the site would be regraded and revegetated with native plants. Installation of the treatment plant building would require less than one acre of disturbance. The rehabilitation of the existing lagoons would return 5 acres to productivity.

Alternative C meets the parks needs of eliminating state permitting for periodic spray irrigation of partially treated effluent. It also provides a safe and effective means of treatment for wastewater generated by park facilities. It would remove the visual intrusion of the existing lagoon site adjacent to the highway. However, discharge of effluent into Wind Cave Canyon does not eliminate the potential for treated wastewater to affect cave resources. Although the treated effluent would meet all discharge standards for nutrients and contaminants, it may contain chlorine and residual disinfectant components. The effluent from the wastewater treatment plant would also be an unnatural source of water that could have a negative effect on the cave formations and ecosystems and surface ecology as it would represent a significant increase to surface flow regimes.

Figure 3, below, indicates the location of the new wastewater treatment plant, relative to the existing lagoons.

Figure 3. Location of New Treatment Plant Proposed under Alternative C



ALTERNATIVE D, RELOCATE LAGOONS TO NEW SITE

In order to utilize non-discharging lagoon treatment methods for managing wastewater at Wind Cave National Park, larger lagoons would be constructed at an appropriate site. Because there is no room to expand at the current location, and because evaporation rates here are low, a new site would be chosen. The proposed action identifies a location just north and east of the existing lagoons, approximately 80 feet higher in elevation. This site is on a ridge bench where winds are stronger and there is increased exposure to sunlight. The new ponds would allow full evaporation of the sewage flows annually (see Figure 4).

The new, non-discharging lagoons would be approximately 14 acres in size. Construction would require excavation to a depth of approximately 6 feet. Earthen berms (levees) would serve as the walls of the lagoons. A geotextile liner would be installed to prevent infiltration of wastewater into the surrounding soils. [Geotextile fabrics are specifically engineered to be flexible, impermeable, and provide a long service life.] The lagoons would be managed by alternating use to allow drying of wastewater and removal of sludge for processing. Heavy -duty fencing would be installed to prevent wildlife entry.

A new lift station would be installed at the current lagoon site (at the base of the gravity collection system). This pump unit would move wastewater from the collection system, through a new main, to the new ponds. In addition, a one lane gravel service road would be constructed to the site from the road that provides access to the existing lagoons.

Under Alternative D, the existing lagoons would also be removed and the site rehabilitated. This reclamation effort would return 5 acres to native vegetation. The project, overall, would generate approximately 22 acres of disturbance.

Figure 4. Location of New Wastewater Lagoons Proposed under Alternative D

Installation of larger, properly sited lagoons would provide adequate capacity to meet the park's wastewater treatment needs. However, the continued presence of such ponds does not fully eliminate the potential for pollution to enter cave resources or reach the park's water well. In the event that the lagoons were to develop leaks or overflow, wastewater could potentially enter local groundwater. Wastewater lagoons are also known to draw wildlife, and special protective measures would need to be taken to prevent access by bison and elk at this site. In addition, the proposed location is visible from popular hiking areas, and this could continue to affect visitor experience.

Mitigation Measures

During implementation of any action alternative, best management practices and mitigation measures would be used to prevent or minimize potential adverse effects associated with construction activities. These practices and measures would be incorporated into the project construction documents and plans to ensure that major adverse impacts would not occur. Mitigation measures undertaken during construction activities would include, but are not limited to:

Natural Resources

- Limit the area disturbed to the minimum needed to complete the proposed action.
- Provide fuel and oil services for construction machinery in a designated area. This would include secondary containment for all fuel storage tanks and on-site availability of a specialized "spill kit" with capacity to contain a 95-gallon fuel spill.
- If limestone bedrock were encountered and it becomes necessary to remove portions of the formation, extra effort would be made to look for voids or cave passages. Should any passages be found, work would stop immediately and the Cave Resources

Management staff contacted. The appropriate course of action would then be determined, on a case-by-case basis.

- Contractor would implement stormwater pollution prevention plan measures prior, during and following ground disturbing activities. The primary measure used to control stormwater runoff would be installation of temporary silt fencing. Silt fences are made of synthetic fabric and are placed in drainage contours to trap sediments generated during construction.
- State-listed plant species occurring near the proposed project area would be flagged for avoidance during construction activities.
- No trenching or excavation would occur within the prairie dog colony between the dates of March 29 and May 16. This would protect the newborns and young prior to their emergency from burrows.

Visitor Experience/Public Health and Safety

- Prepare bulletins to educate visitors on the purpose of projects.
- Provide traffic flow control, signage and flagging to protect visitor and staff safety during construction activities.

Cultural Resources

- The Highway 385 corridor has been surveyed for cultural resources, with Section 106 clearance recommended for Alternative B (see Appendix B). In the unlikely event that previously unknown resources are uncovered, standard mitigation measures would be used.
- The locations of construction activities described for Alternatives C and D would be surveyed for cultural resources prior to implementation of any project activities. In the event that cultural resources were discovered, standard mitigation measures would be used.
- Avoid historical sites/structures and archeological sites whenever possible.
- Educate personnel about the nature of the cultural resources at the project site and the need for protection.
- Monitor construction, and include stop-work provisions in construction documents should archeological, paleontological, or cave resources be uncovered.
- In construction areas near state-listed plant species (Hopi tea), identify, flag and avoid these species to eliminate potential adverse effects.

ALTERNATIVES CONSIDERED AND DISMISSED

Value Analysis of all design alternatives led to the dismissal of several design alternatives. These alternatives included components that failed to meet the project objectives. The nature of the dismissed features, and the rationale for their rejection, are outlined below.

Retain existing lagoons and discharge effluent to subsurface irrigation field. A subsurface irrigation system (leach field) consists of small, perforated, flexible piping installed beneath the soil surface at vegetation root depth (about 24 inches in this environment). The piping would distribute the daily discharge from the ponds over a broad area.

The quantity and quality of discharge required to maintain the existing ponds could present permitting problems for the park. Discharge of up to 25,000 gallons per day via a leach field would require installation of 30 acres of subsurface irrigation piping in previously undisturbed land. South Dakota currently permits subsurface leach fields up to 3 acres in size. Installation of a 30-acre system would require special review and may not be permittable. In addition, the quality of effluent delivered to the irrigation system may not meet South Dakota water quality standards. Effluent from lagoons may contain elevated nutrients (nitrogen and phosphorus) that exceed state water quality criteria, and additional treatment may be needed.

Subsurface irrigation discharge with new wastewater treatment plant and new lagoon system. Consideration was also given to using subsurface irrigation to discharge effluent from a new treatment plant and new lagoons. These options would also require 30 acres of piping installation in previously undisturbed land. The effects of discharging nutrient-rich irrigation water to native prairie are not fully known. The additional water could produce a change in vegetation. This could draw grazing wildlife to the site. If moist soils were present, the site could be used as a bison wallow, and the system would be damaged by such activities. If fencing were used to control wildlife access, maintenance would be increased by the need to mow the fenced area.

The piping used for these systems is subject to root and soil infiltration. Constriction of the piping can slow or block the flow and dispersal of the discharge. Maintenance, repair, and even replacement of components are required to keep these systems in proper working order. The disturbance of virgin prairie and questions regarding reliability led to dismissal of this option.

Covered lagoons. This option would have retained the existing ponds and installed retractable covers to prevent precipitation from entering the ponds. The covers would be closed at the beginning of a precipitation event, and would be opened when the event ended. The covers would remain open during dry weather. Eliminating rainfall input would reduce the total inflow to the lagoons by nearly half. This would allow the lagoons to function as intended. However, installation of the covers would produce added visual intrusion at the site. The ponds are already highly visible to visitors from the highway. In addition, retaining the lagoons would not eliminate the potential for wastewater to enter cave systems or drinking water aquifers. Because this option does not address these important objectives, this alternative was dismissed.

Directional drilling to install a portion of the force main within the park. Original discussions of force main installation included the option of directional drilling to install 8,200 linear feet of force main from the ridge above Bison Flats, south across the flats, to the Highway 385 park entrance on Gobbler Ridge. Up to six staging areas would have been placed along the reach, with road access provided. This action would nave crossed previously undisturbed native prairie and ponderosa pine forest. In addition, the technology of directional drilling does not have the proven success of traditional trench installation for sewage mains. The probability of failure for this action was estimated to be fairly high. To assure the system functions properly and to eliminate the disturbance to previously undisturbed grassland and forest, this option was dismissed from further consideration.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

As stated in Section 2.7.D of *Director's Order #12 and Handbook* (NPS 2001a), the environmentally preferred alternative is the alternative that would promote the national

environmental policy expressed in the National Environmental Policy Act (NEPA) (Sec. 101 (b)). This includes alternatives that:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

In the National Park Service, the no action alternative may also be considered in identifying the environmentally preferred alternative.

Alternative B fully addresses these six criteria and meets the park's need to implement a long-term solution to their wastewater treatment needs. This alternative provides protection of cave resources by removing wastewater from the park and eliminating the potential for nutrient-rich water to enter delicate cave systems. This option also enhances protection of public health and safety by removing untreated wastewater from the park. The visual impact of the existing lagoon facility is removed. In addition, this alternative would not result in creation of artificial environments, and would not produce long-term disturbance within Wind Cave National Park.

Alternatives A, C, and D all have the potential to affect cave resources by allowing infiltration of treated or untreated effluent into local groundwater, and subsequently into cave systems. Alternatives A and C continue to process raw wastewater upgradient of the drinking water wells, and do not fully protect public health and safety from nutrients and microbes commonly found in wastewater.

Therefore, Alternative B, the Preferred Alternative, is the environmentally preferred alternative.

Table 4: Objectives, Issues, Concerns and the Ability of the Alternatives to Address Them

Issue or Concern	Alternative A: Continue Current Management/No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
All treatment, storage, and disposal methods must assure no percolation into cave systems or drinking water aquifers.	If the existing treatment ponds were to rupture or leak, untreated or partially treated wastewater could pass through soils and the underlying porous karst topography and enter cave systems or drinking water aquifer.	The Preferred Alternative fully addressed this need as it removes wastewater from the park and eliminates the risk of nutrient-rich water entering cave systems from wastewater treatment ponds.	Discharge of treated effluent does not meet the primary concern for protecting cave resources. If infiltrating effluent were to reach cave passages, residual chemicals and the low level of nutrients still present in the water could affect cave resources.	By constructing larger ponds on the benched terrace above the existing location, the potential for wastewater to enter the cave system is reduced, but not eliminated. Properly sized ponds would be unlikely to overtop, and the elevated location would require any leaked wastewater to travel further through soils and rock material to reach cave systems.
Avoid creation of any artificial environments such as unnatural lush vegetation, chronically wetted soils, or unseasonal flows in ephemeral drainages.	Continued presence of the treatment lagoons provides an unnatural pond where water birds congregate, and supports small populations of water-dependent species such as salamanders.	By transporting wastewater to Hot Springs, and abandoning treatment within park boundaries, no artificial environments will be created. The existing lagoons would be demolished and reclaimed to native prairie vegetation.	The package plant would discharge up to 25,000 gallons per day of treated effluent. In this semi-arid environment, this has the potential to change vegetation in the vicinity of the discharge point, and create wetted soils for 2-3 months each year.	New lagoons at the hilltop site would require heavy fencing to exclude large mammals. The continued presence of ponds would be an unnatural attraction for waterfowl and other water-dependent species. This alternative fails to address this issue.

Any proposed new facility must address the visual impact of the existing lagoons on the landscape.	The existing lagoons are highly visible, being located adjacent to the main park road (US Highway 385). The black pond liners and heavy fencing are intrusive and stand-out against the landscape.	The Preferred Alternative fully addresses this need by eliminating treatment within the park and restoring the existing lagoon site to native vegetation.	The package plant would require construction of a small structure, designed to mimic the Civilian Conservation Corps buildings at other park locations. It would be placed at the lagoon site, and would be visible from the road. The existing lagoons would be reclaimed and planted with native vegetation. This alternative partially meets the need to reduce the visual impacts of the existing facility.	The new location is not visible from the highway. However, visitors who chose to hike in the area would encounter the new, larger lagoons. This alternative only partially addresses the need to remove the visual impact of wastewater treatment at the park.
Minimize new surface disturbance by locating facilities in previously disturbed areas.	Continuation of the no action alternative would not result in new disturbance within the park.	Under the Preferred Alternative, all new disturbance is confined to the existing road right-of-way. This area has been previously disturbed for road construction and utility installation. Demolition of the existing ponds and reclamation of this site would restore approximately 5 acres of native prairie.	Installation of a new package plant would require about one acre of construction disturbance, located within previously disturbed areas. Effluent discharge to the Wind Cave Canyon drainage could potentially affect vegetation over the long-term.	This alternative requires the largest area of long-term disturbance. The new ponds would be approximately 14 acres in size, and a new access road would be needed. This disturbance would take place on previously unbroken prairie. Overall, this alternative would create 22 acres of disturbance. This alternative fails to minimize surface disturbance.

SUMMARY OF IMPACTS

Table 5 briefly summarizes the effects of each of the alternatives on the impact topics that were retained for analysis at Wind Cave National Park. More detailed information on the effects of the alternatives is provided in the “Affected Environment and Environmental Consequences” section.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Cave resources	The potential for wastewater with elevated nutrients and metal content to periodically reach cave resources and affect the ecosystem and cave formations would continue under Alternative A. This would produce localized, long-term, adverse effects on cave resources of minor intensity.	Alternative B would result in long-term, minor, beneficial effects to cave resources. Eliminating the potential for wastewater to enter cave resources would better protect the low-energy cave system by reducing the nutrients available to algae and other cave organisms. Construction activities associated with installation of the new wastewater main are not expected to affect cave resources.	Replacing the existing lagoons with a package treatment plant would produce long-term, localized, negligible to minor, beneficial effects on cave resources. These benefits would result from the reduced potential for nutrients to enter cave resources, thus diminishing unnatural energy inputs to the low energy environment. The limited excavation associated with this alternative would not be likely to produce short-term effects on cave resources.	Alternative D would reduce, but not eliminate, the potential for nutrient-rich, untreated wastewater to reach cave resources. The continued risk would produce long-term, localized, negligible to minor, beneficial effects on the park's cave resources. Construction at the elevated location would be unlikely to produce short-term effects on cave resources.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Surface water quality	Because the existing lagoons are located outside the floodplain, continued current management would not likely have measurable effects on surface water quality within the park or the Wind Cave Canyon drainage. However, if the lagoons were to overtop or leak, the park would be in violation of the Clean Water Act, and would be subject to enforcement by the South Dakota Department of Environment and Natural Resources. This would produce localized, short and long-term adverse effects on water quality of moderate intensity.	Under the Preferred Alternative, benefits to water quality would be localized, moderate and both short- and long-term. These benefits would result by eliminating the need for periodic emergency discharge of untreated wastewater and by ensuring that the park complies with state and federal regulations regarding management of wastewater. During construction activities, increased erosion could potentially deliver sediment to local surface waters, but this would be difficult to measure. Short-term adverse effects on water quality would therefore be negligible.	The discharge of relative clean effluent from a new package wastewater treatment plant would not be likely to produce measurable changes in the quality of local surface waters. Removal of the existing lagoon facility would eliminate the need for emergency wastewater management, the potential for overflow and accidental discharge, and the possibility of non-compliance with the Clean Water Act. Together, these would result in localized, long-term, moderate benefits on water quality. The short-term adverse effects that could be generated by construction activities would be mitigated by best management practices. Only negligible adverse effects on surface water quality would be anticipated.	The size and location of the new ponds would reduce the need for periodic emergency management of untreated wastewater. In addition, the park would remain in compliance with all state and federal wastewater regulations. This would yield a long-term, beneficial effect on water quality of moderate intensity. During construction of the new ponds and rehabilitation of the existing lagoons site, construction activities could increase erosion. Sediment delivery to local surface waters would be reduced by implementation of best management practices. Therefore, short-term adverse effects during construction would be negligible.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Air quality	Because there is no construction or other activities that would generate dust or fumes, Alternative A would have no effect on local air quality.	During project implementation, air quality would be adversely affected at a negligible to minor level in the vicinity of construction activities due to dust and equipment emissions. There would be no effects to long-term air quality.	Short-term effects to air quality would result from construction activities and include generation of dust and fumes from construction equipment. These adverse effects would be localized, short-term, and of negligible to minor intensity. There would be no long-term effects to air quality.	Alternative D would produce negligible to minor adverse effects on air quality in the vicinity of the new wastewater treatment ponds during construction activities.
Soils	Continued presence of the existing wastewater lagoons would result in approximately 5 acres of long-term loss of soil productivity. This would produce negligible, localized, adverse effects on soil resources of the park.	Under the Preferred Alternative, short-term adverse effects on soils would result from disturbance and revegetation efforts. Because the project area has been previously excavated, effects on soils would be negligible. Over the long-term, localized beneficial effects of negligible intensity would result from reclamation of the existing lagoon site.	Alternative C would produce negligible, short-term, adverse effects on soil resources due to construction and reclamation activities. Long-term, beneficial effects of negligible intensity would result from reclamation of the existing wastewater lagoon site.	Alternative D would generate minor, long-term loss of soil productivity as a result of lagoon installation and access road development on previously undisturbed soils. A negligible amount of beneficial effect would result from reclamation of the existing lagoon site.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Vegetation	Under the no action alternative, no disturbance would occur, and there would be no effects to vegetative communities at Wind Cave National Park.	Construction of the new wastewater transmission main would result in direct, short-term, minor, adverse effects on vegetative communities. Upon completion of the project, the corridor would be reclaimed and revegetated. At the existing wastewater lagoon site, reclamation efforts would restore approximately 5 acres of native vegetation, resulting in a negligible, long-term, beneficial effect to park vegetation.	Installation of a new package plant would result in vegetation disturbance resulting from construction activities. These adverse effects would be direct, short-term, and of negligible intensity. Discharge of treated effluent into Wind Cave Canyon could change growth patterns and species composition in a limited area, producing localized, long-term, moderate, adverse effects. Reclamation of the lagoon site would restore a small acreage of native vegetation, resulting in long-term, negligible, beneficial effects.	Under Alternative D, approximately 22 acres would be excavated for lagoon citing and road construction. Disturbance of this quantity of previously unbroken native prairie for installation of infrastructure would result in minor, long-term, direct, adverse effects to vegetation resources.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Endangered and threatened species	Because there is no surface disturbance or construction associated with continuation of current management, the no action alternative would have no effect on endangered and threatened species.	Alternative B would have no effect on the American burying beetle or the bald eagle because these species do not occur in the project area. Due to the location of construction activities, black-tailed prairie dog may be affected, but is not likely to be adversely affected. The state sensitive plant species, Hopi Tea, will be marked and avoided, and this species is not likely to be affected.	Actions proposed under Alternative C occur within the developed area adjacent to Highway 385. None of the listed species of Wind Cave National Park are known to utilize this area. This alternative would have no effect on endangered and threatened species.	None of the threatened or endangered species with potential to be present at Wind Cave National Park are known to occur in the area of potential effects included in Alternative D. Therefore, this alternative would have no effect on endangered and threatened species.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Wildlife	Under the no action alternative, there would be no construction activities, and the seasonal pond environment would persist. This would provide a direct, localized, negligible benefit to individuals of water-dependent species. Occasional use of spray fields would be discontinued, and this would not be likely to produce detectable changes on large mammals that graze in the area.	The pipeline installation, construction, pond demolition, and site rehabilitation associated with Alternative B would produce minor, short-term, adverse effects on wildlife. Once construction is complete and the corridor is revegetated, wildlife use would be expected to return to pre-disturbance levels. Removal of the artificial pond habitat of the wastewater lagoons would adversely affect water-dependent species at a negligible level for the long-term.	Disturbance caused by construction of the package plant, demolition of the existing ponds, and revegetation efforts would produce highly localized, short-term, negligible, adverse effects on wildlife. Loss of the artificial pond habitat would produce long-term, negligible, adverse effects on water-dependent species that utilize local water bodies. Discharge of treated effluent would provide a modest amount of surface water, which would yield a localized, long-term, negligible to minor benefit for wildlife.	Long-term disturbance of 22 acres of prairie would result in negligible, adverse impacts to grazing animals, while waterfowl would experience long-term, negligible benefits from the availability of additional surface water. Installation of the new facility and reclamation of the existing lagoons would produce localized, short-term, minor effects on wildlife caused by construction activities.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Cultural resources	The no action alternative does not require ground disturbance, changes in historic structures or landscapes, or actions that would affect ethnographic resources. Therefore, no impacts to cultural resources would be anticipated from implementation of Alternative A.	No new adverse impacts or cumulative impacts on archeological, historical, or ethnographic sites would be anticipated under the Preferred Alternative. With mitigation, only minor short-term adverse impacts would occur to the landscape.	No new adverse impacts or cumulative impacts on archeological, historical, or ethnographic sites would be anticipated under this alternative. Only minor short-term adverse impacts would occur to the landscape during construction, and the new building would have a negligible impact on the viewshed.	It is anticipated that adverse impacts on any of the park's cultural resources from implementation of this alternative would be negligible to minor, assuming development of suitable mitigating measures and completion of Section 106 procedures.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Public health and safety	The no action alternative would continue the potential for the park's drinking water supply to be contaminated by wastewater components. This risk would result in moderate, long-term, adverse effects on public health and safety.	By removing the existing evaporative ponds and transporting wastewater to a municipal wastewater treatment facility, the risk of contaminating the park's drinking water supply is eliminated. This would result in long-term benefits to public health and safety of moderate intensity. The construction associated with installation of the wastewater main may adversely affect traffic, but effects on public health and safety would be negligible and short-term.	Construction of a new package plant to treat the park's wastewater would eliminate the potential for the park's drinking water supply to be contaminated by components of raw sewage. This would result in long-term benefits to public health and safety of moderate intensity. The construction associated with installation of the new plant would have no effect on public health and safety, because activities would not affect traffic or visitor and staff movements through the park.	Construction of new wastewater lagoons at an elevated site would reduce, but not eliminate the potential for wastewater to impact the park's drinking water wells. This reduced risk, compared to existing conditions, would produce long-term, localized, minor, beneficial effects on water quality at Wind Cave National Park. Construction of the new lagoons would not take place in areas not commonly accessed by visitors or staff. Therefore, construction would not measurably affect public health and safety at the park.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Park operations	Continuation of current management would have adverse effects on park operations. Effects would be caused by reductions in water use in park facilities, emergency management of untreated wastewater, and the potential need to implement new drinking water treatment methods. These adverse effects would be short and long-term, and of minor to moderate intensity.	By moving wastewater treatment to existing facilities outside the park, the need for management of near-capacity lagoons would be eliminated. Routine upkeep of the wastewater main within park boundaries is not expected to notably increase the burden on maintenance staff. Implementation of the Preferred Alternative would result in long-term, beneficial effects on park operations of moderate intensity.	When compared to the no action alternative, installation of the new package plant would eliminate management of the lagoons, but require licensed operation and permit reporting. Overall this would yield a beneficial effect on park operations that would be long-term and of minor intensity.	When compared to the no action alternative, construction of larger evaporative ponds at a new location would produce long-term benefits to park operations of minor intensity. These would result as emergency management measures cease, and routine upkeep activities for the new facility occur.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Visitor use and experience	The visual impact of the wastewater treatment lagoons adjacent to the main park highway would produce a long-term, localized, adverse effect of minor intensity. In the event that water use is limited to prevent lagoon overtopping, restricted hours of operations and reduced availability of services would produce moderate, short-term, adverse effects on the visitor experience.	The Preferred Alternative would benefit the visitor experience by eliminating the visual intrusion of the existing wastewater treatment lagoons. This effect would be direct, long-term, localized, and of minor intensity. By removing the need for emergency lagoon management, there would be no potential for a reduction in visitation hours, water use limitations, or restricted visitor services. This would result in short-term, moderate benefits to the visitor experience.	Alternative C would directly benefit the visitor experience by replacing the existing, unsightly wastewater treatment lagoons with a small building designed to blend with the nearby CCC construction. This effect would be long-term, localized, and of minor intensity. Eliminating emergency lagoon management would produce short-term, moderate benefits because there would be no potential to reduce visitation hours, limit water use, or suspend activities such as camping.	Installation of new lagoons at a less visible sight would reduce effects on visitor experience somewhat. Because the new ponds would be visible to hikers and other trail users, beneficial effects would be long-term, but of negligible to minor intensity. By removing the need for emergency reductions in wastewater generation, there would be no potential for water use restrictions, reduced visitation hours, or campground closure. This would result in short-term, moderate benefits to the visitor experience.

Table 5: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Alternative	Alternative C: New Facility with Surface Discharge	Alternative D: Relocate Lagoons to New Site
Economics	Implementation of Alternative A would not be likely to result in detectable changes in the local or regional economy. In the event that the wastewater lagoons reach capacity, changes in park operations or wastewater hauling activities would not be expected to generate appreciable changes in economic activity.	Construction of the wastewater main is a modest sized project, and selection of a local contractor to perform the work is not guaranteed. Short-term, indirect, negligible to minor economic benefits would result during implementation, but these may be difficult to measure. Long-term, direct, negligible to minor benefits would result from use of the existing wastewater facility and payment of user fees to the town of Hot Springs.	If a local contractor were selected to install the package plant and demolish the existing treatment lagoons, short-term, local, beneficial economic effects would result, but these would be of negligible intensity.	Installation of new ponds and an access road is a relatively small construction project, and performance by a local contractor is not guaranteed. If a local contractor were selected, short-term, local, beneficial economic effects would result, but these would be of negligible intensity.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

A determination of the probable consequences (or impacts) of each alternative on park resources was made in accordance with the National Environmental Protection Act (NEPA). In addition, the effects to historic properties are considered in accordance with the National Historic Preservation Act (NHPA). This section begins with a description of the methodologies and assumptions for each topic. The analysis for each impact topic includes a description of the resource being affected, identification of impacts of the various actions comprising the alternative, characterization of the impacts, an assessment of cumulative impacts, and a conclusion.

REGULATIONS AND POLICIES

The regulations and policies associated with park management, the *Wind Cave Final General Management Plan / Environmental Impact Statement* (1994) and the *Statement for Management: Wind Cave National Park* (1994), are incorporated by reference to eliminate repetitive information. A list of regulations and policies relevant to the impact topics is provided in Table 2.

METHODOLOGY

For each impact topic, the analysis includes a brief description of the affected environment and an evaluation of effects. The impact analyses were based on professional judgment using information provided by park staff, relevant references and technical literature citations, and subject matter experts.

The impact analysis involved the following steps:

- Identify the area that could be affected.
- Compare the area of potential effect with the resources that are present.
- Identify the intensity (negligible, minor, moderate or major), context (local, parkwide, regional), duration (short- or long-term), and type (direct or indirect) of effect, both as a result of this action and from a cumulative effects perspective. Identify whether effects would be beneficial or adverse. The criteria used to define the intensity of impacts associated with the analyses are presented in Table 6.
- Impact analyses will include implementation of mitigation measures taken to protect resources. Examples of these measures are outlined in the “Mitigation Measures” section in the description of the alternatives.
- Cumulative effects are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7).
- Determine whether impairment would occur to resources and values that are considered necessary and appropriate to fulfill the purposes of Wind Cave National Park.

Table 6: Project Impact Threshold Definitions

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Cave resources	No changes would occur or changes in cave formations and biota would be below or at the level of detection, and if detected, would have effects that would be considered slight.	Changes in cave formations and biota may be measurable, although the changes would be small, and the effects would be localized. No cave resource protection measures would be necessary.	Changes in cave formations and biota would be measurable. Formations would be affected by deterioration, altered chemical composition, or changed depositional patterns. The effects would be localized. Cave resource protection measures would be necessary and the measures would likely be successful.	Changes in cave formations and biota would be measurable, would have substantial consequences, and be noticed throughout the cave system. Cave resource protection measures would be necessary and the success of the measures could not be guaranteed.	Caves within National Park areas are managed as non-renewable resources. All effects to cave resources are considered to be long-term and irreversible.
Air quality	No changes would occur or changes in air quality would be below or at the level of detection, and if detected, would have effects that would be considered slight.	Changes in air quality would be measurable, although the changes would be small, and the effects would be localized. No air quality mitigation measures would be necessary.	Changes in air quality would be measurable, would have consequences, although the effect would be relatively local. Air quality mitigation measures would be necessary and the measures would likely be successful.	Changes in air quality would be measurable, would have substantial consequences, and be noticed regionally. Air quality mitigation measures would be necessary and the success of the measures could not be guaranteed.	Short-term – Occurs only during proposed implementation activities Long-term – Persists beyond the period of implementation activities
Soils	Soils would not be affected or the effects to soils would be below or at the lower levels of detection. Any effects to soil productivity or fertility would be slight.	The effects to soils would be detectable. Effects to soil productivity or fertility would be small, as would the area affected. If mitigation was needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.	The effect on soil productivity or fertility would be readily apparent and would result in a change to the soil character over a relatively wide area. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.	The effect on soil productivity or fertility would be readily apparent and would substantially change the character of the soils over a large area in and out of the park. Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.	Short-term – Recovers in less than 3 years Long-term – Takes more than 3 years to recover

Table 6: Project Impact Threshold Definitions

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Vegetation	No native vegetation would be affected or some individual native plants could be affected as a result of the alternative, but there would be no effect on native species populations. The effects would be on a small scale, and no species of special concern would be affected.	The alternative would temporarily affect some individual native plants and would also affect a relatively minor portion of that species' population. Mitigation to offset adverse effects, including special measures to avoid affecting species of special concern, could be required and would be effective.	The alternative would affect some individual native plants and would also affect a sizeable segment of the species' population and over a relatively large area. Mitigation to offset adverse effects could be extensive, but would likely be successful. Some species of special concern could also be affected.	The alternative would have a considerable long-term effect on native plant populations, including species of special concern, and affect a relatively large area in and out of the park. Mitigation measures to offset the adverse effects would be required, extensive, and success of the mitigation measures would not be guaranteed.	Short-term – Recovers in less than 3 years Long-term – Takes more than 3 years to recover
Surface water quality	Surface water quality would not be affected, or changes would be either non-detectable or if detected, would have effects that would be considered slight and localized.	Changes in surface water quality would be measurable, although the changes would be small and the effects would be localized. No mitigation measure associated with water quality would be necessary.	Changes in surface water quality would be measurable but would be relatively local. Mitigation measures associated with water quality would be necessary and the measures would likely succeed.	Changes in surface water quality would be readily measurable, would have substantial consequences, and would be noticed on a regional scale. Mitigation measures would be necessary and their success would not be guaranteed.	Short-term – Following treatment, recovery would take less than one year Long-term – Following treatment, recovery would take longer than one year

Table 6: Project Impact Threshold Definitions

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Endangered and threatened species (Note: Section 7 of the Endangered Species Act requires use of the indicated specific wording when quantifying potential effects to listed species.)	No Effect: Impacts would not affect listed or protected species or designated critical habitat.	May Affect/Is Not Likely to Adversely Affect: Effects on special status species would be discountable (i.e., adverse effects are unlikely to occur or could not be meaningfully measured, detected, or evaluated) or completely beneficial.	May Affect/Likely to Adversely Affect: Adverse effects to a listed species might occur as a direct or indirect result of the proposed action and the effect would either not be discountable or completely beneficial. Moderate impacts to species would result in a local population decline due to reduced survivorship, declines in population, and/or a shift in the distribution; no direct casualty or mortality would occur.	Likely to jeopardize the continued existence of a species/Adversely modify critical habitat: Effects could jeopardize the continued existence of a listed or proposed species or adversely modify designated critical habitat within and/or outside the park boundaries. Major impacts would involve a disruption of habitat and breeding grounds of a protected species such that direct casualty or mortality would result in removal of individuals of a protected species from the population.	Plants Short-term - Recovers in less than 1 year Long-term - Takes more than 1 year to recover Animals Short-term - Recovers in less than 1 year Long-term - Takes more than 1 year to recover
Wildlife	Wildlife would not be affected or the effects would be at or below the level of detection, and the changes would be so slight that they would not be of any measurable or perceptible consequence to the wildlife species' population.	Effects to wildlife would be detectable, although the effects would be localized, and would be small and of little consequence to the species' population. Mitigation measures, if needed to offset adverse effects, would be simple and successful.	Effects to wildlife would be readily detectable, and localized, with consequences at the population level. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.	Effects to wildlife would be obvious and would have substantial consequences to wildlife populations in the region. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.	Short-term – Recovers in less than 1 year Long-term – Takes more than 1 year to recover

Table 6: Project Impact Threshold Definitions

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Cultural resources	The impact is at the lowest levels of detection – barely perceptible and not measurable.	For archeological resources, the impact affects an archeological site(s) with modest data potential and no significant ties to a living community's cultural identity. The impact does not affect the character defining features of a National Register of Historic Places eligible or listed structure, district, or cultural landscape.	For archeological resources, the impact affects an archeological site(s) with high data potential and no significant ties to a living community's cultural identity. For a National Register eligible or listed structure, district, or cultural landscape, the impact changes a character defining feature(s) of the resource but does not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized.	For archeological resources, the impact affects an archeological site(s) with exceptional data potential or that has significant ties to a living community's cultural identity. For a National Register eligible or listed structure, district, or cultural landscape, the impact changes a character defining feature(s) of the resource, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register.	Short-term – Effects on the natural elements of a cultural landscape may be comparatively short-term (e.g., three to five years until new vegetation grows or historic plantings are restored, etc.) Long-term – Because most cultural resources are non-renewable, any effects on archaeological, historic, or ethnographic resources, and on most elements of a cultural landscape would be long-term.
Economics	No effects would occur or the effects to socioeconomic conditions would be below or at the level of detection.	The effects to socioeconomic conditions would be detectable. Any effects would be small and if mitigation is needed to offset potential adverse effects, it would be simple and successful.	The effects to socioeconomic conditions would be readily apparent. Any effects would result in changes to socioeconomic conditions on a local scale. If mitigation is needed to offset potential adverse effects, it could be extensive, but would likely be successful.	The effects to socioeconomic conditions would be readily apparent and would cause substantial changes to socioeconomic conditions in the region. Mitigation measures to offset potential adverse effects would be extensive and their success could not be guaranteed.	Short-term – occurs only during the road modifications. Long-term – occurs after road modifications are complete.

Table 6: Project Impact Threshold Definitions

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Park operations	Park operations would not be affected or the effect would be at or below the lower levels of detection, and would not have an appreciable effect on park operations.	The effect would be detectable, but would be of a magnitude that would not have an appreciable effect on park operations. If mitigation was needed to offset adverse effects, it would be relatively simple and would likely be successful.	The effects would be readily apparent, and would result in a substantial change in park operations in a manner noticeable to staff and the public. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.	The effects would be readily apparent, would result in a substantial change in park operations in a manner noticeable to staff and the public and be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed, would be extensive, and their success could not be guaranteed.	Short-term – Effects occur only during proposed implementation activities Long-term – Effects persist beyond the period of implementation activities
Public health and safety	Public health and safety would not be affected, or the effects would be below detection levels.	The effect would be detectable, but would not have an appreciable effect on public health and safety. No state or federal criteria established to protect human health would be violated. If mitigation was needed, it would be relatively simple and would likely be successful.	The effects would be apparent, and would result in noticeable effects to public health and safety on a local scale. Or, state or federal criteria for human health protection would potentially be violated. Mitigation measures would probably be necessary and would likely be successful.	The effects would be readily apparent and would result in substantial, noticeable effects to public health and safety on a regional scale. Or, state or federal criteria for protection of human health would be violated. Extensive mitigation measures would be needed, and their success would not be guaranteed.	Short-term – Effects lasting for the duration of the treatment action Long-term – Effects lasting longer than the duration of the treatment action

Table 6: Project Impact Threshold Definitions

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Visitor use and experience	Visitors would not be affected or changes in visitor use and/or experience would be below or at the level of detection. The visitor would not likely be aware of the effects associated with the alternative.	Changes in visitor use and/or experience would be detectable. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.	Changes in visitor use and/or experience would be readily apparent. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes.	Changes in visitor use and/or experience would be readily apparent and have important consequences. The visitor would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.	Short-term – occurs only during the treatment action Long-term – occurs after the treatment action

Cultural Resource Analysis Method

For the purposes of this document, cultural resources include prehistoric and historic archeological sites, buildings, structures, districts, objects, artifacts, historic cultural landscapes, traditional cultural properties, or any other physical evidence of human activity considered important to a culture, subculture, or community for historic, traditional, religious, scientific, or other reasons. For ease of discussion for this Environmental Assessment, cultural resources have been divided into (1) prehistoric and historic archeological resources, (2) historic structures and architectural features, (3) cultural landscapes (4) ethnographic resources (including traditional cultural properties and Native American concerns), and (5) collections. The term "*Historic Properties"* includes only that subset of cultural resources that are listed in, or eligible for, the National Register of Historic Places. However, for purposes of this Environmental Assessment, potentially eligible and unevaluated resources (i.e., cultural resources that have not been evaluated for National Register of Historic Places eligibility) would be afforded the same level of protection as listed or eligible historic properties.

Cultural landscapes represent a complex subset of cultural resources. A cultural landscape is a reflection of human adaptation and use of natural resources. Historic cultural landscapes may be expressed in a variety of ways such as patterns of settlement or land use, systems of circulation and transportation, buildings and structures, parks and open space, etc. A cultural landscape by definition occupies a geographic area that incorporates natural and cultural elements that are associated with a historic activity, event, or person. The National Park Service recognizes four categories:

- historic designated landscapes (i.e., incorporates a deliberate human element to the modification and use of a particular piece of land);
- historic vernacular landscapes (reflects on values and attitudes about land over time);
- historic sites (sites significant for their association with important events, activities, and people), and
- ethnographic landscapes (landscapes associated with contemporary groups that use the land in a traditional manner).

Ethnographic resources may include traditionally used or associated sites, structures, objects, landscapes and natural resources valued by ethnographic groups and defined by the group as significant to their present way of life. Continuing use of ethnographic resources is often essential to the survival of family, community or regional cultural systems, including belief patterns and economic and religious practices. Traditional cultural properties are those ethnographic resources that are either listed in or eligible for inclusion in the National Register of Historic Places.

Collections may include a wide range of archeological resources, objects, museum displays, specimens, and archival and manuscript collections, including photographs and field notes. These resources provide baseline data on park resources.

Impacts to cultural resources are described in terms of type, context, duration, and intensity, as described above, which is consistent with the regulations of the Council on Environmental Quality (CEQ 1978) that implement the National Environmental Policy Act.

These impact analyses also are intended to comply with the requirements of NEPA, NPS *Director's Order #28: Cultural Resource Management*, and with Section 106 of the National Historic Preservation Act. In accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 of the NHPA (36 CFR Part 800, Protection of Historic Properties), impacts to cultural resources were identified and evaluated by:

- Determining the area of potential effects;
- Identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the National Register of Historic Places;
- Applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and
- Considering ways to avoid, minimize, or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of either *adverse effect* or *no adverse effect* must also be made for affected cultural resources. An *adverse effect* occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualify it for inclusion in the National Register. For example, this could include diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the alternative that would occur later in time, be farther removed in distance, or be cumulative (36 CFR Part 800.5, *Assessment of Adverse Effects*). A determination of *no adverse effect* means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the National Register.

Council on Environmental Quality regulations (CEQ 1978) and *Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2001a) call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, such as reducing the intensity of an impact from major to moderate or minor. Any resulting reduction in intensity of impact because of mitigation, however, is an estimate of the effectiveness of mitigation under the National Environmental Policy Act only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effect remains adverse.

A Section 106 summary is included in the impact analysis for cultural resources. The summary is intended to meet the requirements of Section 106 and is an assessment of the effect of implementing the alternative on cultural resources, based on the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations.

Cumulative Effects Analysis Method

The Council on Environmental Quality (CEQ 1978) regulations for implementing the National Environmental Policy Act require assessment of cumulative effects in the decision-making process for federal projects. Cumulative effects are considered for both the no action and proposed action alternatives.

Cumulative effects were determined by combining the effects of the alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to

identify other past, ongoing, or reasonably foreseeable future actions at Wind Cave National Park and in the surrounding region. Other actions that have the potential to have a cumulative effect in conjunction with this project to reduce the potential for pollutants to enter cave resources, improve visitor experience, and enhance public health and safety include:

- Other actions by the National Park Service to implement the Wind Cave General Management Plan (1994);
- Any development actions by the National Park Service in the park;
- Resource development on both public and private lands in the vicinity, such as mining, timbering, and other activities that could adversely affect surface water quality; and
- Conversion of private lands outside the park to other uses, such as pasturage, agricultural production, transportation corridors, and urban development.

Impairment Analysis Method

National Park Service *Management Policies 2001* (NPS 2000) requires analysis of potential effects to determine whether or not actions would impair park resources or values. The impairment that is prohibited by the Organic Act is an impact that "would harm the integrity of park resources or values, including opportunities that otherwise would be present for the enjoyment of those resources or values." The determination as to whether an impact meets this definition of impairment depends on the resource(s) affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in concert with other impacts.

An impact to any park resource may constitute an impairment. An impact would we more likely to result in impairment if it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

A determination on impairment is included in the impact analysis section for all impact topics relating to park resources and values.

CAVE RESOURCES

Affected Environment

Wind Cave was formed over many millions of years by a variety of geologic processes. The main cave development occurred 40 to 60 million years ago within the Madison Limestone (locally known as the Pahasapa Limestone), a formation deposited in a shallow sea over 300 million years ago (Wind Cave National Park, R. Horrocks, personal communication 2002). The Black Hills have over 100 known caves. Wind Cave is one of the largest and the most complex of these cave systems. The cave is named for the characteristic movement of wind in and out of the entrances as exterior barometric pressure changes (NPS 1994).

Over 100 miles of cave passages are known (NPS 2001c), but the full extent of the cave system is unknown.

Wind Cave is acknowledged by many speleologists as rare and significant. The cave's length, complexity, and multiple levels make it one of the most complicated maze caves in the world. Wind Cave contains many formations, called speleothems, including the majority of the world's known boxwork, a calcite formation resembling honeycomb. Other common speleothems include frostwork, moonmilk, popcorn, flowstone, and occasional stalactites and stalagmites (Wind Cave National Park, R. Horrocks, personal communication 2002).

A small portion of Wind Cave has been developed for visitor access. An artificial opening was created and two elevators were installed. Small passages within the cave were enlarged to accommodate placement of concrete walkways, electrical service for lighting, and stairways. A 1.4-mile trail is in place, with 0.8 miles of this length surfaced with concrete (NPS 1994). The cave currently receives approximately 95,000 visitors annually. Casual visitors may choose between a variety of ranger-led tours within the two upper levels of the cave (NPS 2001c).

Although the cave was formed by the dissolving action of water over millennia, today the cave, as well as other caves within the park, is relatively dry. It contains little standing or flowing water (NPS 1994). In the lower reaches of the cave, approximately 432 feet below the surface, standing water is present, consistent with the area's groundwater table. The movement of surface water into the cave has been tested. Infiltration studies show that it takes from 8 hours to several years for surface water to reach various parts of the cave (Davis 1996).

Several water quality testing programs have shown that surface pollutants do reach Wind Cave. Alexander and Davis (1985) found elevated levels of sodium, chloride and nitrate in cave waters (see Table 7, below). These findings were indicative of pollution from leaking sewage transmission lines. The association of these findings with the presence of sewage in the cave was further supported by water quality testing performed after slip lining of the sewage transmission piping. Once slip lining was complete, cave waters no longer carried elevated quantities of pollutants commonly found in untreated wastewater.

Other water quality testing has shown that pollutants reach the cave from a variety of surface sources. These tests underscore the vulnerability of the cave to events that affect water quality. In 1992, waters throughout the cave were found to contain elevated concentrations of copper, lead, chromium, and nickel. These high concentrations resulted from a severe wildfire that occurred in 1991, upstream of the cave. It is suspected that heavy rains had transported burned sediment from this site to the groundwater of the cave system (Davis 1996).

Table 7. Concentrations of Contaminants in Wastewater, Rainfall, and Cave Waters

	Estimated Concentration in Domestic Wastewater (parts per million) (Crites & Tchobanoglous 1998)	Estimated Concentration in Rainfall (parts per million) (Dunne & Leopold 1978)	Wind Cave Analysis (parts per million) (Alexander & Davis 1985)
Nitrate	18-20	0.1-2.0	10.5
Phosphorus	3.5-9	0.01-0.03	"elevated" (no value given)
Sodium	40-70	Less than 20	102
Chloride	30-100	Less than 10	18

In 1994, elevated levels of pentachlorophenol (0.24 parts per billion) were detected at one water quality testing site within the cave. For many years, used fence posts were collected and burned at the site above this cave passage. The posts had been treated with pentachlorophenol (penta) or with a copper-chromium-arsenic (CCA)[a] mixture. Upon finding penta in cave waters, the burning was immediately halted. By 1996, levels of penta in cave waters beneath the pile and burn site were reduced to barely measurable (less than 0.02 parts per billion) (WW Engineering 1996).

In 1996, dye tracing was used to determine the ability of surface pollutants to reach cave passages. A red fluorescent dye was added to runoff from a simulated 1-inch storm event. The dye reached cave passages in as little as 6 hours, or in as long as one year. At all sites, the dye was persistent, remaining detectable for months to years. The park's cave management philosophy includes the assumption that if dye can be carried into cave waters and passages, pollution can also reach these sites.

The cave was surveyed for biota in 1992 and 1995 (Moore 1996). Surveys identified bacteria, fungi, amoebae, protozoa, nematodes, collembolans (springtails), mites, deer mice, woodrats and one bat species. The mammals were present near entrances, with bats found within 500 yards of the natural entrance (NPS 1999). Some of the invertebrates are highly-specialized and cave-adapted species (Wind Cave National Park, R. Horrocks, personal communication 2002). Moore (1996) analyzed the sensitivity of organisms collected in Wind Cave and reported that these cave organisms are susceptible to pollutants and nutrient enrichment.

[a] Pentachlorophenol is an oil-borne preservative used to prevent or slow decay or insect damage to wood products. CCA is the most common chemical used in pressure treatment of lumber to prevent insect attack and decay (American Wood Preservers Institute 2000).

Cave resources that have been lost or damaged since the cave was discovered are not known. Systematic studies of the cave ecosystem were not performed during early explorations. Artificial entrances have altered natural cave air flow patterns. This can change the cave climate and endanger formations and biota. Lint deposited by visitors accumulates along the cave tour routes. Over 5 million visitors have left particles of fiber, hair and skin in the cave. Lint is predominantly organic material, and becomes an unnatural food source for cave invertebrates. This can alter the species composition and change species ranges. Lint also holds moisture, which can accelerate dissolution of underlying rock (NPS 1994, 1998b).

Algal growths are also present in the cave. These unnatural growths are generally associated with lighting provided to illuminate cave formations and with walkway lights. The presence of algae is an aesthetic problem, and it also creates an artificial food source for cave biota and can secrete weak acids that increase rock dissolution (NPS 1994). Algae contain chlorophyll, and respond to nutrient inputs as plants would.

Impacts of Alternative A, Continue Current Management/No Action

The potential for nutrients leached or discharged from the current wastewater treatment facility to reach the low energy cave system is the main concern regarding cave resources. Addition of nitrogen and phosphorus, which are both found in wastewater, can encourage the growth of algae and other plants where light is available. They can also become an unnatural energy source for the microbial cave life. In turn, algae can accelerate the dissolution of rock formations (NPS 1994).

No cave water quality testing was performed in conjunction with spray-field irrigation. However, there would be the potential for nutrients to reach the cave during these emergency management actions. Although no cave passages have been found directly below the current lagoons, there is the potential that they exist at this location and a breach of the liner could contaminate those resources. As described in the Affected Environment, the cave has been exposed to wastewater prior to lining of sewage collection system. [Changes in algal growth have not been quantified, but resource specialists note an increase in algae in the cave over the past several years. This could result from a combination of cave lighting and nutrient inputs. (Wind Cave National Park, R. Horrocks, personal communication 2002)]. The potential addition of nutrients to the cave system due to current wastewater management represents a long-term, localized, minor, adverse effect on cave resources of the park.

Cumulative effects. Caves are at risk from a variety of human actions. Creating access points can alter air flow and change the overall cave environment, land use above cave resources can alter flow patterns and water quality, and lint and lighting can alter cave species composition. The changes in the cave system that have resulted from these actions are long-term, adverse, and likely of minor intensity.

Recently, the park has initiated projects to improve water quality and reduce potential impacts to cave resources caused by water pollution. Slip-lining of the wastewater collection piping has reduced the potential for nutrients to enter the cave, and upcoming improvements to stormwater management at the Visitor Center will reduce effects of parking lot pollution. Continuation of the no action alternative would make no beneficial contribution to these other park plans to protect cave resources. The cumulative effect of Alternative A would be adverse, and minor.

Conclusion. The potential for wastewater with elevated nutrients and metal content to periodically reach the cave and affect the ecosystem and cave formations would continue under Alternative A. This would produce localized, long-term, adverse effects on cave resources of minor intensity.

Alternative A would not produce major adverse impacts on cave resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of cave resources or values as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Alternative

Under the Preferred Alternative, wastewater would be removed from the park and transported to Hot Springs for treatment. The transmission main would be constructed to minimize risk of leakage. By removing the evaporation ponds and transporting raw wastewater from the park, cave resources would receive the highest level of protection from infiltration of untreated wastewater. This would yield localized, long-term, beneficial effects of minor intensity.

Installation of the main would require trenching and excavation within the park boundaries. The proposed trench line passes above known cave passage at three locations. These sites are within Bison Flats, south of the existing wastewater treatment facility, and east of Highway 385. There are no plans to penetrate the Madison limestone formation to install the main. However, in the unlikely event that cave passages were discovered, specific cave protection mitigation measures would be undertaken (see "Mitigation Measures" in the discussion of the Alternatives). It is not anticipated that construction activities would affect cave resources.

Cumulative effects. As discussed for Alternative A, Wind Cave has been adversely affected by a variety of activities including development for visitation and aboveground land use practices. However, the NPS is undertaking efforts to reduce contaminant loading to the cave by lining the sewage collection piping and treating stormwater runoff from the Visitor Center parking lot. Because the Preferred Alternative removes the potential for wastewater to enter the cave, it would contribute beneficially to cumulative effects on the cave system, at a minor level.

Conclusion. Alternative B would result in long-term, minor, beneficial effects to cave resources. Eliminating the potential for wastewater to enter cave resources would better protect the low-energy cave system by reducing the nutrients available to algae and other cave organisms. Construction activities associated with installation of the new wastewater main are not expected to affect cave resources.

Alternative B would not produce major adverse impacts on cave resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of cave resources or values as a result of the implementation of Alternative B.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

The package plant would discharge relatively clean water into the Wind Cave Canyon drainage. During much of the year, the quantity of wastewater generated by the park is less than 10,000 gallons. It is not likely that flows of this magnitude would reach cave resources. However, park staff are concerned that the maximum summer discharge rate of 25,000 gallons per day could establish a temporary, artificial wet area, with eventual infiltration into cave systems. If the passages where the water would enter are dry, this could temporarily change the local environment to that of a wet cave. As discussed in the Affected Environment, the park's caves are largely dry. Introducing new sources of water could change local biotic community and alter dissolution/deposition patterns of sensitive cave formations.

Alternative C reduces the risk of nutrient-rich water reaching cave passages compared to the no action alternative, and would likely produce localized, long-term, beneficial effects on cave resources of negligible to minor intensity.

Installation of the package plant and stepped or cascading drainage would require minimal surface excavation. It is not anticipated that construction activities associated with Alternative C would directly affect cave resources.

Cumulative effects. Because Alternative C reduces the potential for nutrient loading to cave systems, it would contribute beneficially to other park plans and projects (see Alternative A) designed to protect vital park resources. The intensity of this contribution would be negligible to minor and long-term.

Conclusion. Replacing the existing lagoons with a package treatment plant would produce long-term, localized, negligible to minor, beneficial effects on cave resources. These benefits would result from the reduced potential for nutrients to enter cave resources, thus diminishing unnatural energy inputs to the low energy environment. The limited excavation associated with this alternative would not be likely to produce short-term effects on cave resources.

Alternative C would not produce major adverse impacts on cave resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of cave resources or values as a result of the implementation of Alternative C.

Impacts of Alternative D, Relocate Lagoons to New Site

The benched hilltop proposed for location of the new lagoons is approximately 80 feet higher in elevation than the existing lagoon site. This location is not above known cave passages. The new lagoons would be constructed and lined to prevent overflow and leakage. However, in the event of liner failure or extreme precipitation untreated wastewater could escape from the ponds. Although the likelihood of contaminated water from the new lagoons reaching cave passages is reduced under this alternative, the risk remains.

Therefore, the benefits from this alternative would be long-term, localized and of negligible to minor intensity, compared to the no action alternative.

Because this site is located on a hilltop, well above known cave passages, it is unlikely that construction activities would affect cave resources.

Cumulative effects. As discussed for Alternative A, Wind Cave has been affected by exploration, visitation, and local land use. The changes in the cave system that have resulted from these actions are long-term, adverse, and likely of minor intensity. Under Alternative D, the potential for wastewater components to reach cave systems are reduced, but not eliminated. The contribution of Alternative D to park projects to protect cave resources would be beneficial, but negligible to minor.

Conclusion. Alternative D would reduce, but not eliminate, the potential for nutrient-rich, untreated wastewater to reach cave resources. The continued risk would produce long-term, localized, negligible to minor, beneficial effects on the park's cave resources. Construction at the elevated location would be unlikely to produce short-term effects on cave resources.

Alternative D would not produce major adverse impacts on cave resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of cave resources or values as a result of the implementation of Alternative D.

SURFACE WATER QUALITY

Affected Environment

The need for action and environmental effects of the existing wastewater lagoons are tied to precipitation rates. A brief discussion of rainfall patterns is presented to provide the reader with an understanding of the rainfall that contributes nearly half of the annual inputs to the wastewater treatment lagoons.

The park lies within a semi-arid, prairie ecosystem. As shown in Table 8, the park receives an average of 18.6 inches of precipitation each year. Nearly half of precipitation comes in the form of thunderstorms during May, June, and July. This coincides with high visitation, when the greatest quantities of wastewater are generated at the park. Winter months are quite dry.

Wind Cave National Park is within the Niobrara River basin, which is part of the greater Missouri River watershed. Flow generally moves southeastward out of the park to join larger tributaries (EPA 2001). Surface water at Wind Cave National Park is relatively scarce. There are three perennial streams within the park – Beaver Creek, Highland Creek, Cold Springs Creek (NPS 1994). None of the streams are gauged inside the park. Both Beaver Creek and Highland Creek have adequate flow and water quality to support trout populations (Wind Cave National Park, B. Muenchau, personal communication 2002).

Table 8: Summary of Precipitation Data for Wind Cave National Park

Month	Average PPT in inches*	Gallons of rainfall added to lagoons each month[b]
Jan	0.37	32,148
Feb	0.57	49,526
Mar	0.98	85,150
Apr	2.04	177,251
May	3.21	278,909
June	3.15	273,696
July	2.56	222,432
Aug	1.87	162,480
Sept	1.46	126,856
Oct	1.26	109,478
Nov	0.66	57,346
Dec	0.51	44,313
Annual Totals	18.64	1,619,586

* park precipitation data covering 1963 through 2001

Ephemeral flows from Wind Cave Canyon, the park's fourth major drainage, are tributary to Beaver Creek. The canyon bottom is typically dry and contains running water only during heavy precipitation events (Wind Cave National Park, B. Muenchau and S. Schrempp, personal communication 2002). The canyon has several small pools and springs, but no wetlands are known within the drainage (NPS 1994).

The karst geology of the area plays an important role in the hydrology of the park. "Karst" is a landscape underlain by limestone that conducts groundwater well and is also gradually dissolved by the water it transports. Karst topography includes streams that may disappear and reappear due to the presence of subsurface channels (Cave Conservancy of the Virginias 1999). This is the case with Beaver and Highland Creeks, which both sink and disappear where they cross the Madison Limestone (Wind Cave National Park, B. Meunchau, personal communication 2002). The park contains several seeps and springs, with several developed as dependable water supply, primarily for bison and elk (NPS 1994).

Along the length of Highway 385 from the park to Hot Springs, there are no streams, wetlands, or floodplains. The landscape adjacent to the road is a rolling prairie now

[b] These conversion factors were used to calculate the precipitation contribution to the 3.2 acre ponds: 1) each acre contains 43,560 square feet; and 2) each cubic foot of water contains 7.48 gallons.

supporting a mixture of native and non-native grasses. Adjacent land uses include open grazing lands, home sites, and small businesses and industry.

Surface water quality in the park is generally good. Stream water quality testing in 1998 showed surface waters did not exceed the fresh water standards established by the EPA for major pollutants such as nitrate, sulfate, nickel, and zinc. The tested water exceeded drinking water standards only for lead (55 micrograms per liter tested, and 15 micrograms per liter safe drinking water standard) (Wind Cave National Park, B. Muenchau, personal communication 2002). The source of metal contamination of surface waters are likely natural and related to the mineral bearing rock formations of the Black Hills region.

Because the park's domestic water supplied by local groundwater, groundwater quality is discussed in the "Public Health and Safety" section of this document. Water quality within the cave was discussed earlier in the "Cave Resources" section.

Impacts of Alternative A, Continue Current Management/No Action

The wastewater lagoons are currently located above the floodplain in the Wind Cave Canyon drainage. The site is elevated above the 100-year floodplain, and the ponds are bounded by berms. During normal operations, the ponds are below capacity and it is unlikely that wastewater would be directly discharged into the natural drainage. Storm events generating flows in Wind Cave Canyon that would flood the lagoon site have not been recorded (Wind Cave National Park, B. Muenchau, personal communication 2002).

Although the lagoons have not directly discharged to the environment in the past, this has only been avoided by spray field irrigation under special permit. South Dakota has indicated that the park will likely not be permitted such discharge again. If the ponds were to discharge, the park would be in violation of the Clean Water Act. During a wastewater discharge event, adverse effects would be regulatory, and could result in enforcement action by the South Dakota Department of Environment and Natural Resources.

Under the Clean Water Act, state governments are responsible to enforce regulations to safeguard our nation's water quality. Individuals and entities that violate clean water regulations are subject to prosecution and fine. Failure to provide a long-term wastewater solution could result in non-compliance by the park. This could invoke action by the South Dakota Department of Environment and Natural Resources. Such a situation would be unacceptable to the National Park Service.

Under current management, the possibility of violating the Clean Water Act would produce short and long-term, moderate, adverse effects on surface waters of the park.

Cumulative effects. Overall, water quality at Wind Cave National Park is good, and water is suitable for use as a potable drinking water supply and for support of fish and wildlife. Upstream grazing, mining, and timber harvest may affect surface water quality to a degree, but these activities have not impaired waters or precluded their use. The park has recently upgraded the wastewater collection piping and is planning to install a stormwater treatment system at the Visitor Center parking lot. Together, these projects would produce minor benefits to local water quality. Continuation of the no action alternative would make no beneficial contribution to these other park plans.

Conclusion. Because the existing lagoons are located outside the floodplain, continued current management would not likely have measurable effects on surface water quality within the park or the Wind Cave Canyon drainage. However, if the lagoons were to overtop or leak, the park would be in violation of the Clean Water Act, and would be subject to enforcement by the South Dakota Department of Environment and Natural Resources. This would produce localized, short and long-term adverse effects on water quality of moderate intensity.

Alternative A would not produce major adverse impacts on water quality or hydrology whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other NPS planning documents. Consequently, there would be no impairment of water quality or hydrology as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Alternative

Removing the wastewater lagoons and restoring the site would end the need for emergency discharge of untreated wastewater and would eliminate the chances for the park to violate the Clean Water Act. Alternative B would provide a localized, long-term benefit to water quality of moderate intensity.

During project implementation, construction activities would have the potential to increase erosion, and therefore sedimentation, during excavation. Best management practices would be used to reduce any effect to local surface waters (see "Mitigation Measures"). It is not anticipated that installation of the new wastewater main would measurably affect water quality. Therefore, short-term adverse effects would be negligible.

Sewage treatment at Hot Springs includes use of treated wastewater for irrigating 200 acres of hay and forage by a private landowner. The fields are located above the Cheyenne River, downstream of the Fall River confluence. Wastewater is ponded over winter, and the full volume of the town's treated wastewater is used for irrigation throughout the summer. As outlined earlier, the park's maximum daily wastewater contribution of 25,000 gallons would represent an increase of less than 5 percent in the town's treatment volume. It is not anticipated that the small addition would measurably alter hydrology of the Cheyenne River. The Preferred Alternative would produce no detectable effects on hydrology outside the park.

The wastewater treatment method used by Hot Springs is fully compliant with state regulations. No water quality concerns relating to the town's use of the irrigation fields have been raised. The relatively small contribution of wastewater from the park would produce no effects on overall water quality in the Cheyenne River or downstream water bodies.

Cumulative effects. As discussed for the no action alternative, the park's water quality is generally good, and water is suitable for its designated uses. Other park projects and plans, such as upgrading stormwater management at the Visitor Center parking lot, will benefit local water quality. Implementation of the Preferred Alternative would contribute to these benefits by reducing the potential for the park to violate the Clean Water Act. Beneficial effects would be localized, long-term and of moderate intensity.

Conclusion. Under the Preferred Alternative, benefits to water quality would be localized, moderate and both short- and long-term. These benefits would result by eliminating the need for periodic emergency discharge of untreated wastewater and by ensuring that the park complies with state and federal regulations regarding management of wastewater.

During construction activities, increased erosion could potentially deliver sediment to local surface waters, but this would be difficult to measure. Short-term adverse effects on water quality would therefore be negligible.

Alternative B would not produce major adverse impacts on water quality, hydrology, floodplains or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other NPS planning documents. Consequently, there would be no impairment of water quality or hydrology as a result of the implementation of Alternative B.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

The new package plant would discharge up to 25,000 gallons of treated effluent per day into the Wind Cave Canyon drainage. Discharge would be to the surface, with installation of a stepped or cascading drainage. This would improve oxygenation of the discharge water and reduce the potential for erosion (RTW Engineers, M. Sherrill, personal communication 2002). However, during high visitation season, a wet area could be present just downstream of the discharge point.

The water produced by the wastewater treatment package plant would be suitable for discharge into the environment under South Dakota regulations. The plant would be managed in accordance with state and federal regulations and would require a National Pollution Discharge Elimination System (NPDES) permit (see "Park Operations" for a more complete discussion). The relatively clean water discharged from the package treatment plant would not pose a threat to the environment, surface water quality, or human health, and would not likely have measurable effects on local surface water quality.

Removal of the lagoons would eliminate both the need for emergency management of untreated wastewater and the potential for overflow and accidental discharge. In addition, the park would remain in compliance with requirements of the Clean Water Act. This would produce moderate, localized benefits to water quality of long-term duration.

Short-term water quality effects could be generated by construction activities. Increased erosion during excavation and revegetation of the lagoon site could result in sediment delivery to the Wind Cave Canyon drainage. However, best management practices would be used to limit sedimentation. Negligible adverse effects would be anticipated during project implementation.

Cumulative effects. Water quality in the park will be enhanced by other projects, such as upgrading the stormwater management system at the Visitor Center. Implementation of Alternative C would contribute to water quality benefits by eliminating the ponds containing raw wastewater. These beneficial effects would be localized, long-term and of moderate intensity.

Conclusion. The discharge of relatively clean effluent from a new package wastewater treatment plant would not be likely to produce measurable changes in the quality of local surface waters. Removal of the existing lagoon facility would eliminate the need for emergency wastewater management, the potential for overflow and accidental discharge, and the possibility of non-compliance with the Clean Water Act. Together, these would result in localized, long-term, moderate benefits on water quality.

The short-term adverse effects that could be generated by construction activities would be mitigated by best management practices. Only negligible adverse effects on surface water quality would be anticipated.

Alternative C would not produce major adverse impacts on water quality or hydrology whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of water quality or hydrology as a result of the implementation of Alternative C.

Impacts of Alternative D, Relocate Lagoons to New Site

New wastewater lagoons located on the benched hilltop above Wind Cave Canyon would be approximately 14 acres in size. This location was chosen for the increased exposure to sunlight and wind, which would allow the natural evaporation rate of approximately 55 inches per year (Dunne & Leopold 1978) to properly remove wastewater inputs. This design would eliminate the tendency for capacity to be exceeded, which has occurred in the past. The ponds would be operated as a non-discharging facility, and the park would comply with all state and federal wastewater management regulations (see "Park Operations").

Because the ponds would be lined, there would be little interaction between the 14 acres of surface water and local overland flow or groundwater. In addition, the site is approximately 80 feet higher in elevation than the existing lagoons, well above the Wind Cave Canyon floodplain. The presence of the new, larger ponds would not be expected to have detectable effects on local water quality. This represents a long-term benefit of moderate intensity.

During removal of the existing lagoons and development of the new site, construction activities would have the potential to increase erosion. Best management practices would be used to reduce the likelihood of sediment reaching local surface waters. Therefore, short-term adverse effects would be negligible.

Cumulative effects. Good water quality at the park would be enhanced by implementation of Alternative D. The reduced risk of non-compliance would contribute beneficially to other park plans and projects (discussed earlier) to improve local water quality in the park.

Conclusion. The size and location of the new ponds would reduce the need for periodic emergency management of untreated wastewater. In addition, the park would remain in compliance with all state and federal wastewater regulations. This would yield a long-term, beneficial effect on water quality of moderate intensity.

During construction of the new ponds and rehabilitation of the existing lagoons site, construction activities could increase erosion. Sediment delivery to local surface waters

would be reduced by implementation of best management practices. Therefore, short-term adverse effects during construction would be negligible.

Alternative D would not produce major adverse impacts on water quality or hydrology whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of water quality or hydrology as a result of the implementation of Alternative D.

AIR QUALITY

Affected Environment

Wind Cave National Park enjoys a Class I clean air status. The Class I status applies to 156 national parks and wilderness areas, as stipulated in the Clean Air Act amendments of 1977. Under this designation, very limited increases in pollution are permitted in the vicinity (NPS 1994). This high air quality is a valuable park resource, enhancing visitation by providing clean air and high visibility to match the prairie ecosystem experience. In 1999, the park began participating in IMPROVE – the Interagency Monitoring of Protected Visual Environments program. This program seeks to establish visibility conditions, identify emission responsible for impairing visibility, document trends and assess progress toward goals. The parks air quality monitoring station collects data on particulate matter, lead, ozone (O_3), sulfur dioxide (SO_2), nitrate (NO_3^-), and several other airborne contaminants (NPS 2002a). To date, the park's air quality has not been found to exceed any national ambient air quality standards.

In the immediate vicinity of park boundaries, air quality is also high. Because both adjoining counties have populations of less than 7500, urbanization has not yet affected local air quality. Dust and occasional fumes, generated by construction activities, sawmills, or gravel mining, can occasionally be detected in areas adjacent to such activities.

The existing wastewater lagoons are located approximately one-mile east of the Visitor Center adjacent to US Highway 385. Approximately 800,000 visitors arrive at the park each year using this highway. The primary transportation method for most visitors is the automobile. Traffic is not concentrated in a manner that would make auto emission fumes noticeable along the highway.

Impacts of Alternative A, Continue Current Management/No Action

The no action alternative does not include construction or other activities that would generate dust or smoke. There would be no effect on air quality under this alternative. (The potential for effects from odors are discussed in the "Visitor Use and Experience" section.)

Cumulative effects. Several sources of air pollution in the Black Hills area produce more than 100-tons of pollutants per year, and these may contribute to occasional haze in the park. These include coal-fired electrical plants, cement plants, refineries, and sawmills (NPS 1994). The no action alternative would not contribute to cumulative adverse effects on air quality.

Conclusion. Because there is no construction or other activities that would generate dust or smoke, Alternative A would have no effect on local air quality.

Alternative A would not produce major adverse impacts on air quality or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of air quality or values as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Alternative

Installation of the new force main would require excavation and the presence of construction equipment in the highway corridor. Construction activities would generate fugitive dust and emissions from equipment. In addition, reclamation of the existing pond site would also require earth-moving and construction activities. These activities would produce localized, short-term, adverse effects on air quality of negligible to minor intensity. There would be no long-term effects on air quality.

Cumulative effects. As discussed for Alternative A, regional air quality can be affected by several sources of pollution. The Preferred Alternative would contribute to local, short-term adverse effects on air quality at a negligible to minor level.

Conclusion. During project implementation, air quality would be adversely affected at a negligible to minor level in the vicinity of construction activities due to dust and equipment emissions. There would be no effects to long-term air quality.

Alternative B would not produce major adverse impacts on air quality or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of air quality or values as a result of the implementation of Alternative B.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

Under this alternative, the construction of the building to house the package plant and reclamation of the existing ponds would generate fugitive dust and equipment emissions. This would result in localized, short-term, adverse effects on air quality of negligible to minor intensity.

Cumulative effects. Construction activities would contribute to localized, short-term, cumulative air quality impacts at a negligible to minor level.

Conclusion. Short-term effects to air quality would result from construction activities and include generation of dust and fumes from construction equipment. These adverse effects would be localized, short-term, and of negligible to minor intensity. There would be no long-term effects to air quality.

Alternative C would not produce major adverse impacts on air quality or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of air quality or values as a result of the implementation of Alternative C.

Impacts of Alternative D, Relocate Lagoons to New Site

Construction of the new lagoon facility and access road would generate dust and emission fumes that would have localized effects. The more remote location of this action makes it less likely that visitors would encounter the effects. Alternative D would produce short-term adverse effects on air quality of negligible to minor intensity.

Cumulative effects. The cumulative effects of Alternative D are similar to those discussed for the action alternatives above.

Conclusion. Alternative D would produce negligible to minor adverse effects on air quality in the vicinity of the new wastewater treatment ponds during construction activities.

Alternative D would not produce major adverse impacts on air quality or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of air quality or values as a result of the implementation of Alternative D.

SOILS

Affected Environment

Soils in the park are generally silty to loamy types derived from the underlying gypsum red shales. Site-specific soil types are related to the geology, relief and vegetation present at the site. Evidence of erosion is present along road cuts and at other disturbed sites within the park (NPS 1994). There are no prime or unique agricultural soils within the park.

The wastewater treatment lagoons are located at the base of a slope, above the floor of Wind Cave Canyon. Slope soils are deep, cobbly loam and stony clay. Soils in the canyon floor are deep and finely textured (NPS 1994). The slope above the lagoons appears stable and shows no evidence of erosion from drainage, slumping, or mass movement.

Soils of the Highway 385 corridor have been disturbed by road construction and utility installation. The right-of-way has been excavated and filled to provide an appropriate grade

for the highway, and now contains fill material and road base. The right-of-way supports both native and non-native grasses, and there is little evidence that substantial erosive processes are acting in the corridor.

On the ridge bench, at the proposed site for the new lagoons, soils are silty loam. The site slopes gently to the southeast, and supports native grasses. The site is commonly grazed by bison and elk, but has no exposed soil or evidence of active erosion.

Impacts of Alternative A, Continue Current Management/No Action

Soils at the existing wastewater lagoon site have been disturbed by construction of the ponds and the adjacent access road. The lagoon liners and wastewater inflows have covered, compacted, and kept sun and air from underlying soils for many years. The condition of the soil microbes and nutrient levels at this site are unknown. However, it is unlikely that the characteristics of productive local soils have been retained under these conditions.

The presence of wastewater treatment facilities has resulted in approximately 5 acres of long-term disturbance and loss of productivity at this site. This has resulted in negligible to minor, long-term, localized effects on the soil resources of the park.

Cumulative effects. The park has undertaken several infrastructure improvement projects including upgrading the water distribution and sewage collection systems, and upgrading the Visitor Center parking lot and stormwater treatment system. These actions are largely confined to previously disturbed sites, resulting in negligible to minor, short-term adverse effects on soil resources of the park. The no action alternative would not contribute to adverse cumulative effects on soil resources.

Conclusion. Continued presence of the existing wastewater lagoons would result in approximately 5 acres of long-term loss of soil productivity. This would produce negligible, localized, adverse effects on soil resources of the park.

Alternative A would not produce major adverse impacts on soil resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of soil resources or values as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Alternative

Installation of the sewer main would generate approximately 36 acres of disturbance within the Highway 385 right-of-way. This corridor has been previously excavated and disturbed for road construction and utility installation. The areas disturbed would be reclaimed and replanted. Within the park, native grasses would be seeded, and outside the park a seed mix specified by the South Dakota Department of Transportation would be used. In addition, reclamation of the existing lagoon site would restore approximately 5 acres to productivity. As a result, the Preferred Alternative would produce negligible, short-term, adverse effects from construction and revegetation efforts. However, the long-term effects would be beneficial, localized, and of negligible intensity as productivity at the lagoon site is restored.

Cumulative effects. As discussed for Alternative A, other park plans have generated modest amounts of short-term soil disturbance within the park. The Preferred Alternative would contribute negligibly to adverse, short-term disturbance. Over the long-term, the contribution of this alternative to cumulative effects on soils would be beneficial, but of negligible intensity.

Conclusion. Under the Preferred Alternative, short-term adverse effects on soils would result from disturbance and revegetation efforts. Because the project area has been previously excavated, effects on soils would be negligible. Over the long-term, localized beneficial effects of negligible intensity would result from reclamation of the existing lagoon site.

Alternative B would not produce major adverse impacts on soil resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of soil resources or values as a result of the implementation of Alternative B.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

Installation of the housing for a new package plant would require about 1 acre of disturbance adjacent to the existing lagoons. This area has been previously disturbed during lagoon construction and expansion. The presence of the building would produce a negligible amount of long-term loss of soil productivity at the site. Reclamation of the existing treatment lagoons would produce long-term, beneficial effects of negligible intensity.

Discharge of up to 25,000 gallons of treated water into Wind Cave Canyon would likely produce negligible adverse effects on soils, as the canyon naturally serves as an ephemeral drainage. The discharge rate would be approximately 1.4 gallons per minute during high visitation season.

Cumulative effects. As discussed above, other park plans have generated modest amounts of short-term soil disturbance within the park. Alternative C would contribute negligibly to such adverse, short-term disturbance. The beneficial contribution of this alternative would be long-term, but also of negligible intensity.

Conclusion. Alternative C would produce negligible, short-term, adverse effects on soil resources due to construction and reclamation activities. Long-term, beneficial effects of negligible intensity would result from reclamation of the existing wastewater lagoon site.

Alternative C would not produce major adverse impacts on soil resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of soil resources as a result of the implementation of Alternative C.

Impacts of Alternative D, Relocate Lagoons to New Site

The site proposed for the location of new, larger wastewater treatment lagoons has not previously been disturbed for development. The new lagoons would occupy approximately 14 acres, and require development of an access road. Total long-term disturbance for this alternative is estimated at 22 acres. Soil would be lost to productivity beneath the lagoon lining and for road installation. This quantity of long-term disturbance would produce localized adverse effects of minor intensity. Reclamation of the existing lagoon site would produce long-term benefits of negligible intensity, as this 5 acre-site is returned to productivity.

Cumulative effects. Previous and ongoing park plans have generated short-term soil disturbance within the park. Alternative D would contribute little to short-term adverse effects, but would generate a minor amount of long-term soil disturbance and loss of productivity. Overall, this option would contribute at a minor level to loss of soil productivity within the park.

Conclusion. Alternative D would generate minor, long-term loss of soil productivity as a result of lagoon installation and access road development on previously undisturbed soils. A negligible amount of beneficial effect would result from reclamation of the existing lagoon site.

Alternative D would not produce major adverse impacts on soil resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of soil resources as a result of the implementation of Alternative D.

VEGETATION

Affected Environment

The dominant vegetation types at Wind Cave National Park are the mixed-grass prairie, ponderosa pine stands, and riparian communities. Approximately 75 percent of the park is classified as a prairie ecosystem, dominated by blue grama, (*Bouteloua gracilis*), western wheatgrass (*Pascopyron smithii*), and little bluestem (*Schizachyrium scoparium*). This system also supports a variety of forbs and shrubs. Yucca (*Yucca glauca*), prairie clover (*Dalea aurea*), prickly pear (*Opuntia polycantha)*, black-eyed Susan (*Rudbekia hirta*), and cinquefoil (*Potentilla hippiana*) add color, fragrance, and thorns to the vegetative community (NPS 2001c).

The remaining 25 percent of the park are woodlands. As elevation increases, ponderosa pine (*Pinus ponderosa*) communities appear on north-facing slopes. Other conifers include Rocky Mountain juniper (*Juniperus scopulorum*) and common juniper (*Juniperus communis*). Along streams and in canyon bottoms, deciduous trees, including green ash (*Fraxinus pennsylvanica Marsh*), boxelder (*Acer negundo*), bur oak (*Quercus macrocarpa*), plains cottonwood (*Populus deltoides*), American elm (*Ulmus americana*), and paper birch (*Betulae papyriferia*) are common.

A total of 495 species of vascular plants have been recorded at Wind Cave National Park. Of the plants found in the park, 95-100 species are exotic, with three of these species classified as noxious weeds by the state of South Dakota or Custer County. Canadian thistle (*Cirisum arvense*), leafy spurge (*Euphorbia esula*), cheatgrass (*Bromus tectorum*), Kentucky bluegrass (*Poa pratense*), dandelion (*Taraxacum officinale*), smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), yellow sweet clover (*Melilotus officinalis*), and white clover (*Melilotus lupulina*) are often found in disturbed areas. Most of the non-natives occur as small populations, and park staff are implementing a comprehensive weed management program to control their presence (Marriott 1999).

To reduce hazardous fuels and imitate the natural fire cycle, prescribed burns are regularly performed in the park. Approximately 2000 acres are burned each year. Grasslands are treated every six to seven years, and forested areas are treated every 15 to 25 years. Manual fuels reduction is also performed to reduce the potential for catastrophic fire (NPS 1994).

Vegetation at the proposed action sites varies somewhat, but is dominated by the native prairie ecosystem. The existing lagoons are surrounded by native grasses and shrubs. Above the lagoons, on the ridge bench to the northeast, the site supports both prairie species and ponderosa pines. This site provides desirable forage for bison, elk and mule deer. The Wind Cave Canyon also supports grasses, but has higher densities of shrubs and trees than the adjacent prairie. Along the US Highway 385 corridor, a mix of native and non-native grasses grow. The seed mix was selected by the state of South Dakota, and contains a majority of native grasses species, with alfalfa as a nitrogen fixer. Several wildflowers were included in the mix, but these have largely failed to grow in the road corridor (South Dakota Department of Transportation, D. Krause, District Engineer, personal communication 2002).There are few shrubs and no trees present adjacent to the road.

Impacts of Alternative A, Continue Current Management/No Action

Continuing current management would not require disturbance of vegetation or soils. In the past, spray irrigation has been used to discharge partially treated effluent on unbroken, native prairie. This has resulted in increased plant growth at the irrigation site (S. White, Wind Cave National Park, personal communication 2002) The increased availability of water and nutrients resulted in short-term, negligible beneficial effects to native prairie grasses and forbs (equivalent to application of fertilizer). Because the state of South Dakota will no longer permit such discharge for management of park wastewater, such impacts would not be expected to occur in the future. The no action alternative would not be expected to effect vegetative communities of the park.

Cumulative effects. The park controls weeds under its exotic vegetation management plan and controls fuels under its fire management program. The park also endeavors to prevent development on undisturbed lands. This project involves no disturbance or new construction and would not affect vegetation. The no action alternative would make neither a beneficial nor an adverse contribution to effects of other park plans and projects on vegetative communities.

Conclusion. Under the no action alternative, no disturbance would occur, and there would be no effects to vegetative communities at Wind Cave National Park.

Alternative A would not produce major adverse impacts on vegetation resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of vegetation resources as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Alternative

The Preferred Alternative includes excavation of a trenchline adjacent to Highway 385 from the existing lagoon site to the town of Hot Springs – a distance of approximately 9.8 miles. Construction activities would remove vegetation within the trenchline and disturb vegetation in a corridor approximately 30 feet wide, for a total disturbed area of about 36 acres. Within the park, the road right-of-way supports native grasses and forbs. Outside the park, the right-of-way supports a mix of native and non-native grasses.

Once the wastewater main is installed, the area would be regraded and revegetated. Native plants would be used within the park boundaries. Outside the park, South Dakota Department of Transportation guidelines would direct plantings used for reclamation. A seeding rate of 20 pounds per acre would be used in the highway right-of-way, with the species mix as follows (D. Krause, personal communication 2002).

Grasses:
- 6 pounds intermediate wheatgrass
- 4 pounds green needlegrass
- 3 pounds side oats grama
- 3 pounds slender wheatgrass
- 1 pound thick spike wheatgrass
- 1 pound alfalfa

Wildflowers
- 1 pound black-eyed Susan
- ½ pound blue flax
- dash dotted gayfeather

This seeding mix is well suited for the area, and would help limit establishment of exotic plants in the corridor. Although disturbance can introduce weed species, park staff would monitor the area and eradicate any weed species that may enter the park after the installation of the main is complete. Installation of the new main would produce short-term, minor, adverse effects to vegetation resources.

Removal of the existing lagoons would provide the opportunity to reclaim approximately 5 acres. This alternative would also permanently remove the possibility of discharging nutrient-rich wastewater onto native prairie. These changes would provide negligible, long-term beneficial effects for native vegetative communities.

Cumulative effects. As discussed for the no action alternative, the park maintains exotic vegetation and fire management plans. In combination with these and other plans, the disturbance associated with the Preferred Alternative would contribute negligibly to adverse effects on vegetative communities. In addition, a negligible long-term benefit would accrue from reclamation of the existing wastewater lagoons.

Conclusion. Construction of the new wastewater transmission main would result in direct, short-term, minor, adverse effects on vegetative communities. Upon completion of the project, the corridor would be reclaimed and revegetated. At the existing wastewater lagoon site, reclamation efforts would restore approximately 5 acres of native vegetation, resulting in a negligible, long-term, beneficial effect to park vegetation.

Alternative B would not produce major adverse impacts on vegetation resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of vegetation resources as a result of the implementation of Alternative B.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

The new package treatment facility would be located next to the existing lagoons, and effluent would be discharged to the Wind Cave Canyon drainage. This site is immediately adjacent to Highway 385, and has largely been impacted by previous disturbance and development. Installation of the facility would require disturbance of approximately one acre, where grasses and shrubs would be removed or trampled. Effects on vegetation would be negligible, short-term, and adverse.

Use of the lagoons would be discontinued, and the area would be reclaimed using native vegetation. This would result in long-term, beneficial effects of negligible intensity.

The drainage at this site supports grasses, shrubs, and several deciduous trees. Effluent discharge would be continuous, and provide up to 25,000 gallons per day of additional water for this vegetation. In this semi-arid environment, this quantity of water, delivered daily for 2 to 3 months per year, could alter plant growth rate and species composition near the discharge point. Availability of additional water, especially in hot summer months, would produce highly localized benefits to vegetation.

Riparian zones (both wet and dry) make up a small percentage of the overall acreage at Wind Cave National Park. Wind Cave Canyon is a mostly dry riparian zone, but does have standing water in some areas. Increasing water flow within the drainage would have long-term effects on both the species composition and the distribution of riparian vegetation within the Canyon.

Wind Cave Canyon experiences disturbance from both foot and vehicle traffic which have introduced populations of Canada thistle and other non-native plant species. Park visitors hike the Wind Cave Canyon Trail. Park Maintenance employees travel the gravel road in the drainage bottom, to access the park's water supply (well). Park Law Enforcement employees travel the gravel road to access their shooting range. Disturbance resulting from traffic and related trail and road maintenance, coupled with increased moisture, could lead to a dramatic increase in the noxious weed problem existing within the Canyon.

These effects would be long-term and of moderate intensity.

Cumulative effects. As described for Alternative A, the park is controlling exotics and managing fuels in accordance with approved park plans. Alternative C would contribute to short-term, adverse effects on park vegetation resources at a negligible level. Availability of

additional water and reclamation of the wastewater lagoon site would result in long-term beneficial effects of minor intensity.

Conclusion. Installation of a new package plant would result in vegetation disturbance resulting from construction activities. These adverse effects would be direct, short-term, and of negligible intensity. Discharge of treated effluent into Wind Cave Canyon could change growth patterns and species composition in a limited area, producing localized, long-term, minor, adverse effects. Reclamation of the lagoon site would restore a small acreage of native vegetation, resulting in long-term, negligible, beneficial effects.

Alternative C would not produce major adverse impacts on vegetation resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of vegetation resources as a result of the implementation of Alternative C.

Impacts of Alternative D, Relocate Lagoons to New Site

Alternative D would generate approximately 22 acres of disturbance by construction of 14 acres of treatment ponds and a new access road. These activities would take place on previously unbroken prairie. Removal of native plant communities at these sites would result in minor, long-term, adverse effects to park vegetative resources.

Under this alternative, the existing lagoons would be abandoned and reclaimed, as for the other action alternatives. This would return approximately 5 acres to native vegetation, and result in long-term, negligible benefits to local plant communities.

Cumulative effects. As discussed for the other alternatives, the park is managing exotics and fuels, which include some disturbance of vegetation. Because Alternative D requires the largest area of disturbance, and because that disturbance is located on virgin prairie, this alternative would contribute at a minor level to adverse, long-term effects on park vegetation resources.

Conclusion. Under Alternative D, approximately 22 acres would be excavated for lagoon citing and road construction. Disturbance of this quantity of previously unbroken native prairie for installation of infrastructure would result in minor, long-term, direct, adverse effects to vegetation resources.

Alternative D would not produce major adverse impacts on vegetation resources whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of vegetation resources as a result of the implementation of Alternative D.

ENDANGERED AND THREATENED SPECIES

Affected Environment

Four federally listed threatened, endangered or candidate animal species may reside in the park. One of these species, the black-tailed prairie dog, resides within the project area. There are no plant species at Wind Cave National Park that are eligible for federal protection. However, one plant monitored as a species of concern by the state of South Dakota, Hopi tea, occurs along Highway 385, adjacent to the project area of the Preferred Alternative.

The historical range of the black-footed ferret included Custer County and Wind Cave National Park. This species is the most endangered mammal in the United States. Black-footed ferrets are highly dependent on prairie dog colonies for habitat and prey (NPS 1994). The last observation of black-footed ferrets in the park was in 1977. An extensive survey, conducted in 1990, failed to locate members of this species in the park (Wind Cave National Park, B. Muenchau, personal communication 2002). The potential for interaction between ferret reintroduction and the wastewater treatment project are addressed later in this section.

The black-tailed prairie dog is the most abundant and widely distributed prairie dog species (FWS 2000). Wind Cave National Park currently has 1600 acres of prairie dog colonies distributed throughout the park. The species is thriving and expanding. The park has approximately 3300 acres of potential habitat (grasslands with less than 15 percent slope). Current park management allows for natural expansion of prairie dog towns (Wind Cave National Park, B. Muenchau, personal communication 2002).

The largest single prairie dog colony in the park extends along both sides of Highway 385 for a distance of almost one mile, just south of the turn off to the Visitor Center. This colony occupies about 700 acres and is home to thousands of prairie dogs. This site provides wildlife viewing of the dogs and their predators, including coyotes and raptors. In addition the animals that reside here frequently cross the highway, and are occasionally killed by passing vehicles.

In South Dakota, the bald eagle is a migrant and wintering species. No nesting sites are known to occur in the park. Migrating eagles are observed in the park in open valleys and roosting in large trees within floodplains during winter months (Wind Cave National Park, B. Muenchau, personal communication 2002). They are currently regarded as casual and transient visitors to the park. The nearest bald eagle concentration occurs at Angustora Reservoir, approximately 15 miles south of the park (NPS 1994).

The American burying beetle was recorded historically in 35 states, as well as along the southern edges of Ontario, Quebec and Nova Scotia. Records indicate that the decline of the population was underway, if not complete, by 1923. The American burying beetle is now found in five states: Nebraska, South Dakota, Rhode Island, Oklahoma and Arkansas (Ratcliffe 2001). The South Dakota Natural Heritage Program has documented an approximately 1000 square mile area in southern Tripp, and Gregory counties with substantial populations of the American burying beetle (Wind Cave National Park, B. Muenchau, personal communication 2002). One historic siting was recorded 150 miles east of Wind Cave National Park, but there have been no documented occurrences within the park (NPS 1994).

Table 9, below, indicates the federally listed species and their habitat requirements.

South Dakota State Species of Concern

Hopi tea (*Thelesperma megapotamicum*) is a globally common member of the Aster family that occurs rarely in the state of South Dakota, which is at the northern end of its natural range. Hopi tea is a perennial herb found on dry sandy soils in open sites. At Wind Cave, Hopi tea is found in grasslands and open woodlands, usually on steep westerly or southerly facing slopes. Four occurrences of the plant have been documented at the park. Although the species is not sufficiently rare to warrant active management, existing populations should be left undisturbed (Marriott 1999). One occurrence of Hopi tea has been documented just west of the US Highway 385 right-of-way, one-half mile south of the wastewater treatment lagoons.

Table 9: Federally Listed Endangered, Threatened, and Candidate Species for Wind Cave National Park, South Dakota

Common Name ***Scientific Name***	**Listing Status**	**Designated Critical Habitat**	**Habitat Requirements**
Black-footed ferret *Mustela nigripes*	Endangered	No	The ferret lives in association with prairie dog colonies.
Black-tailed prairie dog *Cynomys ludovicianus*	Candidate	No	Prairie dogs inhabit prairies from Canada to Mexico.
Bald eagle *Haliaeetus leucocephalus*	Threatened	Yes, but no habitat in the park	The bald eagle ranges over most of the north American continent, from as far north as Alaska and Canada, south to northern Mexico.
American burying beetle *Nicrophorus americanus*	Endangered	No	The American burying beetle is largely restricted to areas most undisturbed by human influence.

Impacts of Alternative A, Continue Current Management/No Action

Under the no action alternative, there would be no surface disturbance or construction activities. This alternative would have no potential to affect any listed species or species of concern at Wind Cave National Park.

Cumulative effects. The park provides an environment of protection for the wildlife species and ecosystems of the Black Hills region. The cumulative effect of this refuge and habitat preservation on the endangered and threatened species of the area are beneficial, long-term, and of minor intensity. Other park plans and projects, such as rehabilitation of the Visitor Center parking lot and installation of a stormwater management system, do not include impacts to habitat for endangered or threatened species. Implementation of the no action alternative would not contribute to the cumulative benefits that Wind Cave National Park provides to endangered and threatened flora and fauna.

Conclusion. Because there is no surface disturbance or construction associated with continuation of current management, the no action alternative would have no effect on endangered and threatened species.

Alternative A would not produce major adverse impacts on endangered and threatened species or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of endangered and threatened species or values as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Alternative

Under the Preferred Alternative, the sewer main would be installed through approximately 0.8 miles of the black-tailed prairie dog colony that straddles US Highway 385. Construction activities would include trenching and excavating to install the main, and reclamation of the corridor to include regrading and replanting. The actions have the potential to temporarily displace prairie dogs, to destroy a small number of burrows and tunnels, and could result in death of individual animals. The actions would be carried out adjacent to the road, and would not occur in previously undisturbed prairie. In addition, no disturbance would take place within the colony between March and May to prevent disturbance to offspring prior to burrow emergence in late spring.

Because the Preferred Alternative includes the potential to affect individual black-tailed prairie dogs, and could result in fatality of a few individual animals, this alternative may affect, but is not likely to adversely affect this species. This finding was supported by the U.S. Fish and Wildlife Service during consultation regarding this project (U.S. Fish and Wildlife Service, S. Larson, personal communication 2002).

The black-footed ferret was last seen in the park in 1977, and has been considered extirpated for many years. Informal consultation with South Dakota representatives of the U.S. Fish and Wildlife Service has produced specific actions to be taken to avoid impacts to black-footed ferrets. Implementation of the Preferred Alternative would require that prior to trenching through the prairie dog colony, a night survey would be conducted to determine if ferrets are using the area to be excavated. In the event that ferrets were found near the project area formal consultation with the U.S. Fish and Wildlife Service would be initiated.

The bald eagle has been reported to use riparian areas of Wind Cave National Park during seasonal migration. No known nests are present in the park. Under the Preferred Alternative, installation of the new sewer main would occur within the highway right-of-way, and the existing lagoons would be removed from the Wind Cave Canyon drainage. The lagoon site is adjacent to Highway 385, and the park maintenance facilities are across the road. Because of the highly developed nature of the location, it is unlikely that bald eagles utilize this site. The short-term nature of the actions proposed under the Preferred Alternative would have no effect on bald eagles.

The American burying beetle has not been recorded in the park, and the closest recorded occurrence was approximately 150 miles to the east. Alternative B would have no effect on this species.

Hopi Tea occurs in one location adjacent to the proposed project area. About one-half mile south of the existing wastewater lagoons, within the Highway 385 right-of-way, a stand of Hopi Tea has been recorded. During installation of the sewer main through this area, these plants would be flagged for avoidance. With this mitigation, no effects to this plant species would be anticipated.

Cumulative effects. Current management of endangered and threatened species at Wind Cave includes protection for species and their habitats. Other park plans that include construction activities would have no effect on listed species or their habitats. Implementation of the Preferred Alternative would contribute adversely, at a negligible level, to cumulative effects on listed species and their habitats.

Conclusion. Alternative B would have no effect on the American burying beetle or the bald eagle because these species do not occur in the project area. Due to the location of construction activities, black-tailed prairie dogs may be affected, but is not likely to be adversely affected. In the event that black-footed ferrets are found in the prairie dog colony adjacent to Highway 385, formal consultation would be initiated with the U.S. Fish and Wildlife Service and appropriate mitigation measures would be instituted ensuring the action would have no effect on this species. The state sensitive plant species, Hopi Tea, would be marked and avoided, and this species is not likely to be affected.

Alternative B would not produce major adverse impacts on endangered and threatened species or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of endangered and threatened species or values as a result of the implementation of Alternative B.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

Black-tailed prairie dogs do not occur at the existing lagoon site or within Wind Cave Canyon drainage. The habitat here is not suitable for colony development (steep slopes and rocky drainage). Because black-footed ferrets are dependent on prairie dogs, activities at this site would have no potential to either benefit or harm black-tailed prairie dogs or black-footed ferrets. Implementation of Alternative C would have no effect on either of these species.

Bald eagles use riparian areas of Wind Cave National Park during seasonal migration. Nesting does not occur in the park. Alternative C includes installation of a small building to house the package treatment plant at the existing lagoon site, and discharge of treated effluent into Wind Cave Canyon drainage. The existing lagoons would be removed and the site reclaimed. Bald eagles are not known to forage, roost, or rest here. The short-term construction activities and long-term presence of the small treatment building in this previously developed location would have no effect on bald eagles.

The American burying beetle has not been observed in this region of South Dakota, and Alternative C would have no effect on this species.

The patch of Hopi Tea approximately one-half mile south of the existing wastewater treatment lagoons is outside the area of potential effect under Alternative C. This alternative would not affect this state sensitive plant species.

Cumulative effects. Current management of endangered and threatened species at Wind Cave includes protection for the species and their habitats. Ongoing management would provide a negligible to minor beneficial effect for these species. Implementation of Alternative C would not contribute, either adversely or beneficially, to effects on protected species.

Conclusion. Actions proposed under Alternative C occur within the developed area adjacent to Highway 385. None of the listed species of Wind Cave National Park are known to utilize this area. This alternative would have no effect on endangered and threatened species.

Alternative C would not produce major adverse impacts on endangered and threatened species or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of endangered and threatened species or values as a result of the implementation of Alternative C.

Impacts of Alternative D, Relocate Lagoons to New Site

Black-tailed prairie dogs do not occur at the existing lagoon site or on the benched hilltop where the new lagoons would be sited. Because black-footed ferrets are associated with prairie dogs, they would also not occur at this location. The actions proposed under Alternative D would, therefore, have no effect on the black-tailed prairie dog or the black-footed ferret.

The nearest occurrence of the American burying beetle was recorded approximately 150 miles east of the park, and Alternative D would have no effect on this species.

Bald eagles use riparian areas of the park during seasonal migration. There are no known nests in the park. Alternative D includes construction of new lagoons on the hilltop to the northeast of the existing ponds, removal of the existing lagoons, and site reclamation. The sites designated for construction activities under this alternative are not those used by eagles. Implementation of Alternative D would have no effect on bald eagles.

The patch of Hopi Tea south of the existing wastewater treatment lagoons is outside the area of potential effect under Alternative D. This alternative would not affect this state sensitive plant species.

Cumulative effects. Current management of endangered and threatened species at Wind Cave includes protection for the species and their habitats. Ongoing management would provide a negligible to minor beneficial effect for these species. Implementation of Alternative C would not contribute, either adversely or beneficially, to effects on protected species.

Conclusion. None of the threatened or endangered species with potential to be present at Wind Cave National Park are known to occur in the area of potential effects included in

Alternative D. Therefore, this alternative would have no effect on endangered and threatened species.

Alternative D would not produce major adverse impacts on endangered and threatened species or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of endangered and threatened species or values as a result of the implementation of Alternative D.

WILDLIFE

Affected Environment

The mixture of prairie and forest ecosystems at Wind Cave National Park supports a variety of wildlife. Thirty-eight mammals and 130 bird species have been reported in the park (NPS 1999). Large mammals commonly viewed in the park include bison (*Bison bison*), elk (*Cervus elephus*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and pronghorn (*Antilocarpa americana*). The park maintains the bison and elk herds at conservative levels to avoid resource degradation by overgrazing. Surplus animals are managed under the park's 1938 Surplus Animal Disposal Act.

Coyotes (*Canis latrans*) are the primary predator, with bobcats (*Felis rufus*) and badgers (*Taxidae taxus*) also found in the park (NPS 1994). In recent years, mountain lion (*Felis concolor*) sightings have increased in the park, with the likelihood that a lion population has established itself in the area (Wind Cave National Park, D. Roddy, personal communication 2002).

Numerous reptiles and amphibians inhabit the park, but no lizards have been recorded here. Common reptiles include the snapping turtle (*Chelydra serpentina*), wandering garter snake (*Thamnophis elegans*), and prairie rattlesnake (*Crotalus viridis*). Amphibians include the blotched tiger salamander (*Ambystoma tigrium*), Woodhouse's toad (*Bufo woodhousei*), and the Great Plains toad (*Bufo cognatus*) (NPS 1994).

Many birds find the park suitable for residence or migratory use. Wrens, swallows, mourning doves, meadowlarks, and mallards are commonly sighted. Resident raptors, red-tailed hawk, golden eagle, and American kestrel prey on the many small mammals in the park. Shorebirds, including killdeer and spotted sandpipers, frequent the area in summer months. The beautiful western tanager and mountain bluebird are also sighted in the park during the summer (NPS 2001c).

Wind Cave is used by a variety of mammals, most of which are found in relatively close proximity to cave entrances (within 600 feet) and along cave tour routes. Rodents utilize the cave for refuge, nesting and possibly foraging. Deer mice (*Peromysucs maniculatus*) and evidence of wood rats (*Neotoma cinerea*) have been reported near the entrance. In addition, salamanders, frogs, and a variety of snakes have all occasionally been reported near the natural entrance (Wind Cave National Park, B. Muenchau, personal communication 2002).

Several bat species have been recorded in the park, including: the long-eared bat (*Myotis evoits*), small-footed myotis (*Myotis ciliolabrum*), little brown myotis (*Myotis lucifugus*), fringed myotis (*Myotis thysanodes*), long-legged myotis (*Myotis volans*), big brown bat (*Eptesivus fuscus*), and silver-haired bat (*Lasionycteris noctivagans*). Most of these species use the upper reaches of the cave for daytime hibernation. However, many also utilize mines, buildings or natural formations such as crevices or holes in trees for resting (Moore 1996, Turner 1974). None of the vertebrate species depend on cave waters, and none utilize the lower reaches of the main cave system.

Locations of the proposed actions are visited by many of the park's wildlife species. Rabbits and other small mammals are common year round, near the wastewater treatment lagoons. Raptors and other predators that feed on these animals are also found in the vicinity. Deer access and utilize this area, too. Bison and elk are excluded from this site, as well as the Visitor Center and other developed sites, by heavy fencing.

The ridge bench above the lagoons on the northeast supports ponderosa pines and grassland. This site provides desirable grazing conditions for the parks ungulates. Bison and elk can be viewed here from nearby hiking trails.

The US Highway 385 corridor supports native and non-native grass species suitable for forage. However, the presence of the road, traffic, and lack of tree cover makes it undesirable for large mammal species habitat. Deer and pronghorn do forage here occasionally. Small mammals are common along the road, and scavengers can be seen scavenging roadkill along the highway.

Impacts of Alternative A, Continue Current Management/No Action

The presence of the wastewater lagoons has created an artificial, seasonal pond that draws waterfowl (ducks) and supports a population of tiger salamanders. The continued presence of the ponds would produce negligible to minor benefits to individuals of such water-dependent species, but overall would have no effect on populations. The lagoons are heavily fenced to prevent entry by large mammals such as deer.

In the past, partially treated effluent has occasionally been sprayed onto the native prairie for emergency discharge. This has created increased forage production, and drawn large mammals (bison, in particular) to the site to graze (Wind Cave National Park, S. White, personal communication 2002). This has provided periodic, temporary, negligible benefits for individual bison that graze in the area.

Cumulative effects. The park will soon begin upgrading the Visitor Center parking lot and installing a new stormwater management system. Water and wastewater conveyance has recently been upgraded. Such projects generate negligible to minor, short-term disturbance of wildlife during construction activities. Disturbed areas are reclaimed and replanted with native vegetation. Prescribed fire and fuels management also cause short-term, localized, adverse effects on wildlife. The no action alternative would not contribute, adversely or beneficially, to effects of other plans and projects on wildlife of Wind Cave National Park.

Conclusion. Under the no action alternative, there would be no construction activities, and the seasonal pond environment would persist. This would provide a direct, localized, negligible benefit to individuals of water-dependent species. Occasional use of spray fields

would be discontinued, and this would not be likely to produce detectable changes on large mammals that graze in the area.

Alternative A would not produce major adverse impacts on wildlife resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of wildlife resources as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Alternative

The Highway 385 right-of-way is used by grazing wildlife and small animals along the length of the corridor to Hot Springs. Within the park, bison and mule deer can be seen grazing near the road. Rodents also use this area, and raptors and other predators (coyotes) occasionally forage there in search of prey. Outside the park, the road right-of-way is fenced on both sides to contain livestock or mark private property lines. There are no bison outside the park. Passing traffic makes this area less than optimal for resting or denning activities. The scarcity of trees along the corridor make the potential for roosting or nesting unlikely.

Installation of the water transmission main includes trenching with heavy equipment, and blasting of bedrock may be required at limited locations (South Dakota Department of Transportation, D. Krause, personal communication 2002). Such actions would cause wildlife to avoid the area during construction. In addition, reclamation efforts may require 2 to 3 years to effectively revegetate disturbed areas. As a result, the direct, short-term effects on wildlife would be minor and adverse, as species avoid the area. Once construction is complete and the corridor is revegetated, wildlife use would be expected to return to pre-disturbance levels.

Removal of the existing lagoons would reduce the open water available to waterfowl (ducks) and eliminate the habitat for tiger salamanders now found in the lagoons. This would have adverse impacts on individuals of these species, but would have negligible long-term effects on species populations in their natural ranges.

Cumulative effects. Other plans and projects with the potential to affect wildlife are described for the no action alternative, above. The Preferred Alternative would contribute, at a minor level, to short-term adverse effects on wildlife due to the disturbance associated with construction activities. Because other plans and projects do not alter the availability of surface water, loss of the artificial pond would stand alone in adversely affecting individual members of water-dependent species.

Conclusion. The pipeline installation, construction, pond demolition, and site rehabilitation associated with Alternative B would produce minor, short-term, adverse effects on wildlife. Once construction is complete and the corridor is revegetated, wildlife use would be expected to return to pre-disturbance levels. Removal of the artificial pond habitat of the wastewater lagoons would adversely affect water-dependent species at a negligible level for the long-term.

Alternative B would not produce major adverse impacts on wildlife resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing

legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of wildlife resources or values as a result of the implementation of Alternative B.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

During construction, installation of the package plant, demolition of the existing ponds, and revegetation efforts would produce short-term, negligible, adverse effects. Wildlife would likely be temporarily displaced by the increased level of human activity and noise. Mobile species would likely avoid the area during construction activities. Rodents that inhabit this site may be displaced, but could return to the area after installation is complete. Effects to wildlife due to construction would be short-term and localized. Because of the small area of concentrated activity, the intensity of adverse effects would likely be negligible.

The pond habitat for tiger salamanders and waterfowl would be lost, permanently. This would produce long-term, negligible, adverse effects on water-dependent species that utilize the park or local water bodies. The loss of pond habitat to salamanders would be mitigated by the increase of moist habitat within the drainage as a result of constant surface discharge.

The discharge of treated effluent would be to the surface, and would use a stepped or cascading drainage to improve water quality and reduce the potential for erosion. The presence of fresh water would likely draw animals, especially during dry winter months and when flow is highest during the heat of summer. Water quality would be sufficient to serve as a drinking water source for animals. Given the scarcity of surface water within Wind Cave National Park, this water source would provide localized benefits to wildlife of negligible to minor intensity. Because the flow would be continuous, the effects would be long-term.

Cumulative effects. Park plans and projects that include short-term disturbance to wildlife are described above. Alternative C would contribute, at a negligible level, to short-term adverse effects on wildlife due to construction disturbance. Cumulative effects of loss of surface water on the lagoons would be the same as those described for Alternative B.

Conclusion. Disturbance caused by construction of the package plant, demolition of the existing ponds, and revegetation efforts would produce highly localized, short-term, negligible, adverse effects on wildlife. Loss of the artificial pond habitat would produce long-term, negligible, adverse effects on water-dependent species that utilize local water bodies. Discharge of treated effluent would provide a modest amount of surface water, which would yield a localized, long-term, negligible to minor benefit for wildlife.

Alternative C would not produce major adverse impacts on wildlife resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of wildlife resources or values as a result of the implementation of Alternative C.

Impacts of Alternative D, Relocate Lagoons to New Site

Installation of new ponds and an access road would disturb 22 acres of virgin prairie, and introduce a permanent facility at a location known to produce good forage for large ungulates, including bison and elk. The lagoons would be heavily fenced to prevent entry by these large animals. Construction activities at this site would produce short-term, minor effects on wildlife during installation of the new lagoons and demolition and reclamation of the existing facility.

Long-term effects of this alternative would be species-dependent. Grazing animals would be adversely affected long-term, at a negligible level from the loss of 22 acres of forage. Water-dependent species, such as ducks, would benefit in the long-term by gaining access to 14 acres of open surface water. It is unlikely that a population of tiger salamanders would establish at the new location, as it is outside the Wind Cave Canyon drainage and well above the floodplain.

Cumulative effects. Other infrastructure plans and projects with the potential to affect wildlife are described above. Alternative D would contribute, at a minor level, to short-term adverse effects on wildlife due to the disturbance associated with construction activities. An artificial surface water habitat is maintained under this alternative, and it would not contribute to long-term negligible adverse effects on water-dependent species.

Conclusion. Long-term disturbance of 22 acres of prairie would result in negligible, adverse impacts to grazing animals, while waterfowl would experience long-term, negligible benefits from the availability of additional surface water. Installation of the new facility and reclamation of the existing lagoons would produce localized, short-term, minor effects on wildlife caused by construction activities.

Alternative D would not produce major adverse impacts on wildlife resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of wildlife resources or values as a result of the implementation of Alternative D.

CULTURAL RESOURCES

Affected Environment

Prehistoric Resources

Wind Cave National Park is located between the centers of two prehistoric culture areas: the Middle Missouri River Valley to the east and the High and Northern Plains to the north and west. Early people were attracted to the Black Hills because they offered shelter in the winter, the climate was slightly cooler in the summer than the surrounding country, and good hunting and sources of quality stone for tools were found in the area.

Important types of sites found in and near Wind Cave National Park include prehistoric rock shelters, artifact scatters, kill sites, lithic reduction sites (tool manufacture), and stone circles. Historic period sites in the area are primarily related to pre-park homesteading and to Civilian Conservation Corps presence during the 1930s.

The earliest archeological sites are assigned to the Early Archaic period between 6,000 and 3,500 B.C. Surveys have located three prehistoric sites in the general vicinity of the project. Site 39CU877 is composed of a series of stone circles identified as tepee rings; site 39CU912 is a prehistoric artifact scatter; and site 39CU913 is a single stone circle. These sites are outside of the area of potential effect (NPS 1998a, NPS 2002b).

Ethnographic Resources

During and shortly before the time of Euroamerican exploration and settlement, the area was used by a number of tribes. The earliest named inhabitants of the Black Hills were the Kiowa, later succeeded by the Crow, and then the Ponca tribe. The Dakota Sioux arrived in the Black Hills during the latter part of the 1700s, and the Cheyenne were reportedly in the area in 1804.

A number of Native American tribes have aboriginal, historical, and cultural ties to the land within the Black Hills, which includes Wind Cave. These tribes include: Cheyenne River Lakota, Crow Creek Lakota, Flandreau Santee Lakota, Lower Brule Lakota, Oglala Lakota, Rosebud Lakota, Sisseton-Wahpeton Lakota, Yankton Lakota, Assiniboine and Lakota, Crow tribe of Montana, Spirit Lake Lakota, Northern Arapaho and Shoshone (Eastern Band), Northern Cheyenne, Standing Rock Lakota, Arapaho Tribe of the Wind River Reservation, Cheyenne-Arapaho Tribes of Oklahoma, Santee Sioux Tribe of the Nebraska Santee Reservation, and the Three Affiliated Tribes. The Black Hills occupy a very special place in the history, creation stories, and religious beliefs of these groups.

A study of the history of tribal and European American occupancy of the Black Hills and adjacent areas is currently underway, and will further clarify and document tribes' relationship to the park and its resources. Other than Wind Cave itself, no ethnographic resources have been specifically identified within the area of potential effect for this project.

Historic Resources

Civilian Conservation Corps (CCC) workers began to arrive at Wind Cave in 1934, and a camp was established in the area now occupied by the park's seasonal housing. Many of the improvements in the park were constructed by the CCC. The CCC established the visual character of the park's developed zone with landscaping, stone retaining walls, and the construction of the elevator building.

Seventeen of the park's buildings are included in and contributing to the Administrative and Utility Area Historic District, which is listed on the National Register of Historic Places. The cave entrance/stairs, and miscellaneous landscape features, including the road, trail, rock walls, and culverts are within the district and also contribute to its significance. Buildings added during the 1930s and 1940s are within the historic district. Following their construction, the exterior facades of the existing (earlier) structures were modified and stuccoed to blend with the rustic style of the newer buildings.

The district is significant under National Register Criterion A for its association with the Civilian Conservation Corps. The buildings also have local significance for their exemplary representation of National Park Service Rustic Architecture in which the materials and design reflect the philosophy of incorporating natural landscape elements into planning and design. The District and its landscape features have been documented as part of the

historic and land use studies (Long 1992, Western History Research 1994), and by completion of the National Register forms.

None of the proposed alternatives analyzed would affect the cultural resources of the park, as they are outside the proposed project areas.

Cultural Landscape

The cultural landscape at Wind Cave National Park has not been inventoried; thus there is no cultural landscape report available for the park and no landscapes have been formally evaluated as eligible for the National Register of Historic Places. However, the historic buildings, parking area, lawns, and ponderosa pine trees, set against the backdrop of the rugged, tree-covered terrain of the adjacent hills and ravines, convey a special sense of place and history to the visitor.

The various features contained within the historic district, including stone walls, curbs, road, trails, and culverts, are contributing features that help define the character of this historic scene. The landscape features are locally significant under Criterion A for their association with the development of the area to protect Wind Cave as an important natural feature, to make this resource more accessible, and to interpret the resource to a visiting public (NPS 1992a).

The landscape features exemplify the NPS philosophy of applying design concepts of rustic architecture to landscaping, and are also locally significant under Criterion C. As a collection of features, the landscaping plays a significant role in Wind Cave Development, and contributes to the historic character of the area (NPS 1992a).

Previous Investigations

A search of the park's GIS database was completed in September 2002 to identify previous surveys and sites that might be within the project area. In 1988, Dan Flemmer surveyed the US Highway 385 corridor from the town of Hot Springs to just north of Gobbler Knob in Wind Cave National Park, locating two archeological sites: 39CU912 and 39CU913 (NPS 1998a, 2002b). Another segment of the project area was surveyed in the fall of 2002 by Jennifer Galindo, Midwest Archeological Center (NPS), assisted by Hawk Thunder Hawk, a student volunteer. No cultural resources were located within the area of potential effect for the highway corridor. Neither the approximately 20-acre site proposed for new evaporative ponds, nor the proposed access road to the ponds has been surveyed for archaeological resources.

Impacts of Alternative A, Continue Current Management/No Action

Continuation of existing conditions would not have any new impacts on prehistoric or historic archeological resources. Continuation of current management would not affect the historic structures at the Visitor Center or ethnographic resources within the park. Because there is no construction or excavation associated with this alternative, there would be no effects to unknown resources, and no potential for discovery or new findings.

Cumulative impacts. The park has recently completed water and wastewater piping system upgrades and is planning to replace the Visitor Center parking lot. Regionally, non-renewable cultural sites continue to be affected by development, vandalism, and erosion. Overall, the activities outside of the park, combined with the in-park infrastructure

improvements, have the potential for long-term, adverse effects on cultural resources. However, Alternative A does not include ground disturbance, so it would not contribute to local or regional cumulative effects on cultural resources.

Conclusion. The no action alternative does not require ground disturbance, changes in historic structures or landscapes, or actions that would affect ethnographic resources. Therefore, no impacts to cultural resources would be anticipated from implementation of Alternative A.

Alternative A would not produce major adverse impacts on cultural resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other NPS planning documents. Consequently, there would be no impairment of cultural resources or values as a result of the implementation of this alternative.

Impacts of Alternative B, the Preferred Alternative

The Preferred Alternative would require excavation of a trench adjacent to the highway, with surface disturbance (e.g., vegetation disturbance and soil compaction) anticipated within a corridor up to 25 feet in width. This corridor has been surveyed for archeological and historic resources, and none were found within the area of potential effect. No ethnographic sites have been identified within the project area. In addition, the entire length of the proposed wastewater main was previously disturbed by highway construction and utility installation so few, if any, *in situ* sites or features would be expected.

Construction activities would have a minor adverse impact on the landscape within the park and along the highway by creating a narrow band of disturbed earth. However, with mitigation measures such as reseeding, this impact would be short term; e.g., as soon as the vegetation re-grows on the trenched area, there would be no impact on the landscape.

Cumulative effects. As described for Alternative A, the park's ongoing improvement programs and regional development projects have the potential to adversely impact cultural resources. However, under Alternative B, no known archeological, ethnographic, or historic resources would be affected. Mitigating measures such as stop-work provisions in contracts would help ensure that previously unidentified buried sites are not inadvertently damaged. Adverse impacts to the cultural landscape would be temporary, so would not contribute to long-term cumulative effects.

Conclusion. No new adverse impacts or cumulative impacts on archeological, historical, or ethnographic sites would be anticipated under the Preferred Alternative. With mitigation, only minor short-term adverse impacts would occur to the landscape.

Alternative B would not produce major adverse impacts on cultural resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other NPS planning documents. Consequently, there would be no impairment of cultural resources or values as a result of the implementation of this alternative.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

This site has been surveyed for archeological and historic resources, and none were found within the area of potential effect, and no ethnographic sites have been identified within the project area. In addition, this area has had a great deal of previous disturbance during construction of the existing sewage lagoons and the nearby roadways. Minor, short-term adverse impacts to the landscape would occur at the lagoon area during and immediately after construction; that is, newly graded areas would contrast sharply with the surrounding vegetation. This impact would be short term; e.g., as soon as the vegetation re-grows, there would be little or no impact on the natural landscape viewed by visitors.

The new facility would be relatively small, would not be visible from the park's historic district, and would be designed to blend unobtrusively with its surroundings. The building style and materials would be similar to those in the nearby maintenance area to help ensure that any long-term adverse impacts on the historic scene would be negligible.

Cumulative effects. As described for Alternative A, the park's ongoing improvement programs and regional development projects have some potential to adversely impact cultural resources. There would be no cumulative effects from implementation of this alternative because no known archeological, ethnographic, or historic resources would be affected, and adverse impacts to the cultural landscape would be temporary.

Conclusion. No new adverse impacts or cumulative impacts on archeological, historical, or ethnographic sites would be anticipated under this alternative. Only minor short-term adverse impacts would occur to the landscape during construction, and the new building would have a negligible impact on the viewshed.

Alternative C would not produce major adverse impacts on cultural resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other NPS planning documents. Consequently, there would be no impairment of cultural resources or values as a result of the implementation of this alternative.

Impacts of Alternative D, Relocate Lagoons to New Site

This 22 acre area has not been surveyed for cultural resources, so the presence/absence, location, condition, and National Register significance of area resources are unknown. Under Alternative D, excavation and lining of the proposed evaporative ponds and construction of an access road and fencing could have the potential for long-term adverse impacts on presently unidentified cultural resources, especially archaeological resources. However, should Alternative D be chosen for implementation, cultural resource surveys would be conducted prior to development of final site plans and before any ground disturbance occurs. The National Register significance of any resources located during the surveys would be evaluated in consultation with the South Dakota State Historic Preservation Officer (SHPO). The National Park Service would develop mitigating measures, with special emphasis on avoidance of cultural sites/resources, in consultation with the SHPO. Section 106 procedures would be completed prior to project implementation to help ensure that any long-term adverse impacts (under NEPA) would be negligible to minor in nature.

Cumulative Impacts. Should there be an adverse effect on cultural resources from this alternative, the overall cumulative impact still would be negligible, given development of mitigation measures such as site avoidance, and because of the relatively small area potentially affected.

Conclusion. It is anticipated that adverse impacts on any of the park's cultural resources from implementation of this alternative would be negligible to minor, assuming development of suitable mitigating measures and completion of Section 106 procedures.

Alternative D would not produce major adverse impacts on cultural resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other NPS planning documents. Consequently, there would be no impairment of cultural resources or values as a result of the implementation of this alternative.

SECTION 106 SUMMARY

This environmental assessment provided detailed descriptions of four alternatives (including a no action alternative), analyzed the potential impacts associated with possible implementation of each alternative, and described the rationale for choosing the Preferred Alternative. Also contained in the environmental assessment are mitigation measures that would help avoid adverse effects on cultural resources.

Under Alternatives A, B, and C, no historic properties would be affected. The proposed project lies outside the Wind Cave National Park Administrative and Utility Area Historic District, so implementation of any of the alternatives would not affect the district resources. No traditional cultural properties have been recorded within the project area, but consultation with concerned tribes is continuing to ensure no resources are harmed (see "Consultation and Coordination" section of this document).

The area proposed for development under Alternative D has not been inventoried. Should Alternative D be chosen for implementation, cultural resource surveys would be conducted prior to development of final site plans and before any ground disturbance occurs. The National Register significance of any resources located during the surveys would be evaluated in consultation with the South Dakota State Historic Preservation Officer (SHPO). If needed, the National Park Service would develop mitigating measures, with special emphasis on avoidance of cultural sites/resources, in consultation with the SHPO. Section 106 procedures would be completed prior to project implementation to help ensure that there would be no adverse effect.

Formal consultation with the South Dakota State Historic Preservation Office has been initiated (see correspondence in Appendix A), and the SHPO has been made aware of the need to survey, document, and evaluate resources should Alternative D be chosen for implementation (Wind Cave National Park, T. Farrell, personal communication 2002). A copy of this environmental assessment will be forwarded to the tribes and to the SHPO for review and comment, as well as to seek SHPO concurrence with NPS determinations of effect on historic properties.

Pursuant to 36CFR800.5, implementing regulations of the National Historic Preservation Act (revised regulations effective January 2001), addressing the criteria of effect and

adverse effect, the National Park Service finds that with identified mitigation measures, no historic properties eligible for or listed on the National Register of Historic Places would be affected by the implementation of the project to replace the failing wastewater treatment facility under Alternatives A, B, or C. A separate Section 106 action would be necessary in the event that Alternative D is chosen for implementation.

In the unlikely event that cultural resources are discovered during project implementation treatment, work would be halted in the vicinity of the resource, and procedures outlined in 36 CFR 800 would be followed.

PUBLIC HEALTH AND SAFETY

Affected Environment

The primary public health and safety concern associated with the existing wastewater ponds is the potential for contaminating the park's drinking water well. The park's domestic water supply is provided by a well within the Wind Cave Canyon drainage, about 1 mile downgradient from the wastewater lagoons. The well is placed at a depth of 788 feet below the surface. The static water level in the well is 170 feet (Wind Cave National Park, S. Schrempp, personal communication 2002).

The quality of water from the domestic well has remained good since installation of the well in 1956. Water quality in this well has consistently tested below maximum drinking water contaminant levels (Wind Cave National Park, S. White and S. Schrempp, personal communication 2002).

If components of untreated wastewater were to reach the well, elevated levels of nitrogen and phosphorus would likely be found in the raw well water (Crites and Tchobanglous 1998). To date, no such elevations have been recorded, and nitrogen and phosphorus content of the well water has not varied greatly. The park routinely samples (2 per month) water from the public water system and tests for coliform bacteria, a group of microorganisms that colonize in the human intestinal tract, and are commonly found in domestic wastewater. In the past ten years, there has been only one sample that tested positive for total coliform bacteria, and it was assumed to be a false positive result since extensive repeat sampling failed to detect the presence of the bacteria (Wind Cave National Park, S. Schrempp, personal communication 2002). Table 10 below shows a typical water quality testing result from the drinking water well in Wind Cave Canyon.

Table 10. Well Water Quality at Wind Cave National Park*

Constituent	Results^	EPA Drinking Water Standard
Nitrate as Nitrogen	0.48 mg/L	10 mg/L
Nitrite as Nitrogen	Less than 0.05 mg/L	1.0 mg/L
Phosphate as Phosphorus	0.02 mg/L	0.2 mg/L

*Laboratory testing performed May 2001 by Energy Laboratories, Inc.
^Results and standards given in milligrams per liter or parts per million.

Visitors and staff rely on the wastewater system to safely convey and treat effluent from all park facilities. The existing treatment lagoons provide this function for the majority of the time, but approximately every 3 to 4 years the lagoons reach capacity. On these occasions,

specially permitted discharge of untreated effluent has been required. Using spray fields located on a hillside approximately 1 mile from the Visitor Center, above the location of the treatment lagoons, excess wastewater has been applied to native prairie.

It is not healthy for humans or wildlife to come into contact with untreated wastewater. Raw effluent may contain pathogens that cause typhoid fever, dysentery, cholera, diarrhea and hepatitis. There are no other sites in the park where humans or wildlife would come in contact with untreated wastewater. The wastewater lagoons themselves are protected by high, chain-link fences. When the wastewater collection system at the Elk Mountain Campground was replaced, six leach field systems were eliminated.

Impacts of Alternative A, Continue Current Management/No Action

The current wastewater treatment system is functional, but not adequately sized or sited for current inputs. The evaporation ponds will likely be full to capacity in 3 years, requiring emergency management measures. In the event that additional spray discharge is required, wastewater could contaminate the drinking water supply. Once contaminated, the groundwater source may no longer be suitable for drinking water. Although there have been no measured impacts to well water quality and no reported illnesses due to consumption of the drinking water, the potential for contamination exists. If the drinking water source were to be contaminated, park staff would be exposed to greater risk than visitors. Employees use the same drinking water supply as visitors, but consume it every work day. Over time, this would result in long-term, localized adverse effects of moderate intensity.

Cumulative effects. Park staff endeavor to provide a safe environment for visitors to Wind Cave National Park. Maintenance activities to repair and upgrade park facilities may increase the risks of traffic incidents somewhat. These actions pose negligible adverse effects to public health and safety. Because the no action alternative continues the potential for wastewater contaminants to reach the park's water supply, it would contribute to localized adverse effects, on a long-term basis, and at a moderate level.

Conclusion. The no action alternative would continue the potential for the park's drinking water supply to be contaminated by wastewater components. This risk would result in moderate, long-term, adverse effects on public health and safety.

Impacts of Alternative B, the Preferred Alternative

By transporting wastewater to the Hot Springs municipal facility for treatment and removing the existing wastewater lagoons, the potential for contamination of the park's drinking water supply is greatly reduced. This would yield a long-term benefit to public health and safety of moderate intensity.

Construction required to install the wastewater main would affect travel on US Highway 385 between Hot Springs and the park over the short-term. Flagging and traffic control measures would be used to reduce hazards during project implementation. Use of appropriate mitigation would result in localized, negligible, short-term adverse effects on public health and safety.

Cumulative effects. Routine construction activities undertaken to maintain park facilities may result in short-term, negligible adverse effects to public health and safety by increasing the possibility of traffic incidents. Alternative B contributes beneficially to public health and

safety by eliminating the potential for the park's drinking water to be contaminated. This would produce a cumulative, long-term benefit of moderate intensity.

Conclusion. By removing the existing evaporative ponds and transporting wastewater to a municipal wastewater treatment facility, the risk of contaminating the park's drinking water supply is greatly reduced. This would result in long-term benefits to public health and safety of moderate intensity.

The construction associated with installation of the wastewater main may adversely affect traffic, but effects on public health and safety would be negligible and short-term.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

Construction of a new package plant to treat the park's wastewater would eliminate the potential for groundwater sources of drinking water to be contaminated by wastewater components. The treated effluent discharge from the plant would be relatively clean and would meet all state and federal standards for discharge into the environment, as per an National Pollutant Discharge Elimination System (NPDES) permit. This would produce long-term, moderate benefits to public health and safety.

Construction of the new wastewater treatment plant would be contained within the existing lagoon site. No interference with traffic or other park activities would be anticipated. Installation of the new package plant would have no adverse, short-term effects on public health and safety.

Cumulative effects. Potential traffic hazards associated with routine park maintenance are discussed above. Alternative C eliminates the potential for the park's drinking water to be contaminated, and provides a long-term, moderate benefit to public health and safety.

Conclusion. Construction of a new package plant to treat the park's wastewater would eliminate the potential for the park's drinking water supply to be contaminated by components of raw sewage. This would result in long-term benefits to public health and safety of moderate intensity.

The construction associated with installation of the new plant would have no effect on public health and safety because activities would not affect traffic or visitor and staff movements through the park.

Impacts of Alternative D, Relocate Lagoons to New Site

Elevation of the wastewater lagoons to the new site would reduce the potential for leakage and overflow to impact the park's drinking water wells. Runoff or infiltration from this site would still drain into Wind Cave Canyon, but the increased elevation reduces the potential for nutrients and pathogens to reach local groundwater. The reduced risk associated with Alternative D would produce long-term, localized, minor, beneficial effects on public health and safety at Wind Cave National Park.

Construction of the new lagoons would take place in areas not accessed by visitors and not commonly accessed by the majority of park staff. It is doubtful that the activities would measurably affect public health and safety at the park.

Cumulative effects. The risks associated with park maintenance activities are discussed above. Alternative D reduces, but does not eliminate the potential for contamination of the park's drinking water supply. When compared to the existing conditions, this would result in a long-term, minor benefit to public health and safety.

Conclusion. Construction of new wastewater lagoons at an elevated site would reduce, but not eliminate the potential for wastewater to impact the park's drinking water wells. This reduced risk, compared to existing conditions, would produce long-term, localized, minor, beneficial effects on water quality at Wind Cave National Park.

Construction of the new lagoons would take place in areas not commonly accessed by visitors or staff. Therefore, construction would not measurably affect public health and safety at the park.

PARK OPERATIONS

Affected Environment

The superintendent at Wind Cave National Park is responsible for the full scope of managing the park, its staff and residents, all of its programs, and its relations with persons, agencies, and organizations interested in the park. Park staff provide the full scope of functions and activities to accomplish management objectives and meet requirements in law enforcement, emergency services, public health and safety, science, resource protection and management, visitor services, interpretation and education, community services, utilities, housing, fee collection, and management support.

In South Dakota, evaporative lagoon facilities are classified as Class 1 wastewater treatment. The state requires that management of the facility be performed by qualified personnel certified to operate Class 1 facilities. Staff responsible for wastewater treatment at the park are currently certified to operate the lagoon system (South Dakota Dept. of Environment and Natural Resources, R. Kittay, personal communication 2002).

Maintenance and operations activities associated with wastewater management include: monitoring of flow rates and maintenance of the collection system and the lagoons themselves. The maintenance staff at the park now conduct routine maintenance and repair. Periodic sludge removal and transport to other facilities are performed by a contractor, with the sludge delivered to a licensed processor for proper handling.

Impacts of Alternative A, Continue Current Management/No Action

Under continued current management, the lagoons would continue to fill and present the danger of overtopping and discharge into the environment. In the event that the ponds were to reach capacity, park operations would be managed to address the situation. It is likely that water use would be limited by reducing Visitor Center hours and restricting water-using activities of park staff (Wind Cave National Park, S. Schrempp, personal communication 2002). Park facility and maintenance staff would be responsible to ensure that water use is reduced. This would result in short-term, moderate, adverse effects on park operations.

In the event that a long-term solution to the park's wastewater treatment needs is not implemented, there would be the potential for contaminants from the wastewater lagoons to reach the park's drinking water wells. If components of wastewater were detected in the raw

well water, the designation of the water source would be changed from “groundwater” to “groundwater directly under the influence of surface water” (South Dakota Dept. of Environment and Natural Resources, R. Kittay, personal communication 2002). Such a regulatory change would require that the park institute new water treatment processes for their domestic supply. Installation of a more complex water treatment and employment of a properly certified operator would produce long-term, adverse effects on park operations of minor intensity.

In the past, park maintenance staff have periodically needed to install the spray irrigation system for emergency discharge of effluent from the treatment lagoons. Although this task is not technically difficult, several days are required to install the system. In addition, bison are drawn to the spray field, and damage system components by digging and wallowing. Continual repair of this system has added to the operations burden during spray field discharge (Wind Cave National Park, S. White, personal communication 2002). This has produced short-term adverse effects on park operations of minor intensity.

Because the South Dakota Department of Environment and Natural Resources will no longer permit spray discharge, another alternative would need to be found to manage excess effluent. One such option, pumping wastewater into trucks and hauling it to other treatment facilities, would be labor-intensive. Implementing new techniques to manage wastewater would produce short and long-term, adverse effects of moderate intensity.

Cumulative effects. Installation of the new parking lot surface at the Visitor Center is expected to have beneficial effects on park operations by providing a long-lasting, low-maintenance parking surface. Because the no action alternative does not reduce or eliminate the periodic need to manage near-capacity lagoons, it would make no beneficial contribution to park operations.

Conclusion. Continuation of current management would have adverse effects on park operations. Effects would be caused by reductions in water use in park facilities, emergency management of untreated wastewater, and the potential need to implement new drinking water treatment methods. These adverse effects would be short- and long-term, and of minor to moderate intensity.

Impacts of Alternative B, the Preferred Alternative

The Preferred Alternative would have beneficial effects on park operations because wastewater treatment would no longer occur within the park. Maintenance and facility staff would no longer be required to periodically install spray irrigation equipment, and the potential for the lagoons to reach capacity would be eliminated.

Park staff would be responsible to maintain the wastewater main within park boundaries. This would require staff to access the piping through the pressure release points and use specialized pipe cleaning equipment. Such activities would occur approximately once each year. These activities are not expected to add substantially to the park operations burden. Under this alternative, additional certification for a wastewater treatment facility operator would no longer be required.

It is unlikely that park operations would be affected during construction of the wastewater treatment main. The wastewater lagoon facility would continue to operate until line installation was complete. Switch over would occur quickly as the existing collection system

is connected to the new main. This would be accomplished outside visitation hours and would require about 4 hours to complete (RTW Engineers, M. Sherrill, personal communication 2002).

Cumulative effects. By relieving park staff of responsibility for managing wastewater from the lagoons, this alternative contributes to improved park operations in conjunction with installation of the new Visitor Center parking lot. Overall, the cumulative effect of Alternative B would be beneficial, long-term, and of minor to moderate intensity.

Conclusion. By moving wastewater treatment to existing facilities outside the park, the need for management of near-capacity lagoons would be eliminated. Routine upkeep of the wastewater main within park boundaries is not expected to notably increase the burden on maintenance staff. Implementation of the Preferred Alternative would result in long-term, beneficial effects on park operations of moderate intensity.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

The benefits of discontinuing use of the existing lagoons would be as discussed for Alternative B, above.

Installation of a new package treatment plant would require that a licensed operator manage the facility. Discharges of treated effluent would be regulated by a National Pollutant Discharge Elimination System (NPDES) permit. Maintenance of an NPDES permit requires regular testing and reporting of water quality to meet established permit requirements. Because requirements are established on a case-by-case basis, the exact frequency and components to be tested are not known at this time. However, staff hours would need to be dedicated to operation of and compliance for the facility.

Installation of the new package plant would require review by the South Dakota Department of Environment and Natural Resources to determine the appropriate level of operator certification. In most cases, plants that discharge under an NPDES permit are Class 2 or 3 facilities (South Dakota Dept. of Environment and Natural Resources, R. Kittay, personal communication 2002). Such a designation would require that park staff be adequately trained to operate the facility, or that qualified staff be recruited. Such changes in staff requirements would have an adverse effect on park operations of short-term duration and minor intensity. However, the long-term effect of eliminating the existing ponds would be beneficial, long-term and of minor intensity.

As with the Preferred Alternative, the existing lagoons system would continue to be used until the package plant installation was complete. Access to and management of the lagoons would not be hindered during construction. Switch over to the new treatment system would be accomplished in a matter of hours during hours without visitation. No effects on park operations would be expected during construction of the new package plant.

Cumulative effects. Improvements at the Visitor Center parking lot are expected to reduce maintenance of the deteriorating asphalt surface. This would benefit park operations over the long-term. Alternative C, in conjunction with other plans to improve park operations, would provide a long-term benefit of minor proportions.

Conclusion. When compared to the no action alternative, installation of the new package plant would eliminate management of the lagoons, but require licensed operation and

permit reporting. Overall this would yield a beneficial effect on park operations that would be long-term and of minor intensity.

Impacts of Alternative D, Relocate Lagoons to New Site

Expansion and relocation of the lagoons would eliminate the need for periodic discharge or management of untreated wastewater. This would benefit park operations. Because the new evaporative lagoons system would not discharge, the new facility would be Class 1. No new certifications or staff would be required to operate the facility.

Routine maintenance would be required on the lift station (pump) to elevate wastewater to the new site, and on the new access road. The lagoons would need to be heavily fenced to exclude wildlife, and this would likely need occasional repair because of bison activities. Overall, the effect on park operations compared to current management would be beneficial, and of minor intensity.

Cumulative effects. In conjunction with other park plans to reduce maintenance and facility workload, Alternative D would provide long-term, minor benefits to park operations.

Conclusion. When compared to the no action alternative, construction of larger evaporative ponds at a new location would produce long-term benefits to park operations of minor intensity. These would result as emergency management measures cease, and routine upkeep activities for the new facility occur.

VISITOR USE AND EXPERIENCE

Affected Environment

Cave tours are the primary ranger-led visitor activity at Wind Cave National Park. Camping, hiking, picnicking, scenic driving, and observing wildlife are also popular. The Visitor Center is the principal contact point where visitors begin tours, view educational exhibits, and gather information used to continue their visit to the interior of the park. About 110,000 visitors enter the Visitor Center each year, and about 95,000 participate in cave tours. Park interpretive staff also lead prairie hikes and a campfire program during the summer visitation season.

The park, as a whole, is visited by over 600,000 users each year, with the majority pursuing other recreational opportunities (NPS 1999). The Elk Mountain Campground has 75 sites and is well-utilized during the summer, but the camp is seldom full.

The existing wastewater lagoons are located immediately to the east of Highway 385, about 1.5 miles from the Visitor Center. They are a prominent sight to visitors entering the park along this main route. In addition, they are visible from popular hiking trails that provide access to this portion of the park. Although visible, no odors from the facility have been noted by park staff or reported by visitors (Wind Cave National Park, T. Farrell, personal communication 2002).

Impacts of Alternative A, Continue Current Management/No Action

The wastewater lagoons are highly visible from Highway 385 within Wind Cave National Park. The black pond liners, raised berms, and high chain-link fencing can readily be seen from the road. The installation stands in stark contrast to the surrounding native prairie and hillsides. Although the facility is a visual intrusion, air quality at the site has not been a problem, with neither visitors nor staff reporting offensive odors. The continued presence of the lagoons at this location would produce a long-term, localized, minor, adverse effect on the Wind Cave National Park visitor experience.

In the event that water use is restricted to reduce input to the existing wastewater lagoons, visitation hours could be shortened, and camping temporarily suspended. Such actions taken for emergency management of near-capacity ponds would produce short-term adverse effects of moderate intensity.

Cumulative effects. The park has recently completed or is planning several projects to ensure that visitors are adequately served and that cave resources receive long-term resource protection. Improvements to the water/wastewater piping systems and improvements at the Visitor Center parking lot will contribute minor, long-term, beneficial effects to the visitor experience. Continuation of the no action alternative would not contribute to these benefits, but would detract from them by perpetuating an adverse effect.

Conclusion. The visual impact of the wastewater treatment lagoons adjacent to the main park highway would produce a long-term, localized, adverse effect of minor intensity. In the event that water use is limited to prevent lagoon overtopping, restricted hours of operations and reduced availability of services would produce moderate, short-term, adverse effects on the visitor experience.

Impacts of Alternative B, the Preferred Alternative

By transporting wastewater from the park to Hot Springs, all treatment facilities would be removed. The existing lagoon site would be regraded and replanted with native vegetation. Only a small “pump house” would be left at the site to contain a pump for pressurizing the force main. This small structure would be designed to mimic the sandstone Civilian Conservation Corps (CCC) buildings located in the maintenance area on the opposite side of the highway. These improvements to the visual landscape would likely result in minor, long-term, localized, beneficial effects on the visitor experience.

This alternative eliminates the potential for emergency management of near-capacity lagoons. The potential to reduce visitation hours, limit water use within the park, or suspend visitor services would be removed. This would produce moderate, short-term benefits on the visitor experience.

Cumulative effects. Other park plans and projects to enhance the visitor experience are discussed for Alternative A. The Preferred Alternative would contribute beneficially to these other plans, on a minor, long-term basis.

Conclusion. The Preferred Alternative would benefit the visitor experience by eliminating the visual intrusion of the existing wastewater treatment lagoons. This effect would be direct, long-term, localized, and of minor intensity.

By removing the need for emergency lagoon management, there would be no potential for a reduction in visitation hours, water use limitations, or restricted visitor services. This would result in short-term, moderate benefits to the visitor experience.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

Installation of a new package plant would require construction of a small building to house the system components and use of a discharge trench in the canyon drainage. The building would be designed to blend with the existing sandstone Civilian Conservation Corps buildings located across the highway. The existing lagoons would be removed and the site would be regraded and replanted with native vegetation. When compared to continued presence of the existing lagoons, these changes would likely produce long-term, localized, beneficial effects on the visitor experience.

The benefits to the visitor experience of eliminating the need for emergency lagoon management are the same as those discussed for the Preferred Alternative, above.

Cumulative effects. Other park plans and projects to enhance the visitor experience are discussed above. Alternative C would contribute beneficially to these other plans, on a minor, long-term basis.

Conclusion. The Preferred Alternative would directly benefit the visitor experience by replacing the existing, unsightly wastewater treatment lagoons with a small building designed to blend with the nearby CCC construction. This effect would be long-term, localized, and of minor intensity.

Eliminating emergency lagoon management would produce short-term, moderate benefits because there would be no potential to reduce visitation hours, limit water use, or suspend activities such as camping.

Impacts of Alternative D, Relocate Lagoons to New Site

Under this alternative, the existing lagoon site would be rehabilitated to native prairie. This would produce a beneficial effect on the visitor experience. However, larger lagoons located on the benched hilltop would be visible from two popular hiking trails (Wind Cave National Park, T. Farrell personal communication 2002). The ponds would be approximately 13 acres in size, bermed and lined, and enclosed by a heavy chain-link fence. Although no longer visible to the majority of park visitors who pass by on the road, hikers and wildlife watchers using this area would likely be somewhat affected by the presence of the new lagoons. When compared to existing conditions, overall benefits to visitor experience would be beneficial, long-term, localized, and negligible to minor.

By providing properly sized and located lagoons, the potential to implement water use restrictions as an emergency management tool would be eliminated. The visitor benefits associated with this are as discussed for the Preferred Alternative, above.

Cumulative effects. Projects that would contribute to positive visitor experience include upgrading the Visitor Center parking area and improving water distribution and wastewater collection systems. Alternative D would contribute beneficially to these other plans, on a minor, long-term basis.

Conclusion. Installation of new lagoons at a less visible sight would reduce effects on visitor experience somewhat. Because the new ponds would be visible to hikers and other trail users, beneficial effects would be long-term, but of negligible to minor intensity.

By removing the need for emergency reductions in wastewater generation, there would be no potential for water use restrictions, reduced visitation hours, or campground closure. This would result in short-term, moderate benefits to the visitor experience.

ECONOMICS

Affected Environment

Wind Cave National Park lies within Custer County in southwestern South Dakota. The park's gateway community, Hot Springs, is 7 miles to the south in Fall River County. The two counties have about the same population – between 7000 and 7500. However, Custer County grew by 18 percent between 1990 and 2000, while Fall River County grew by only 1.4 percent (US Census 2001). Native Americans total 3 percent of Custer County's population, and 6 percent of the population of Fall River County. Annual income in the two counties is somewhat less than the state average of $32,354. Custer County's average is $31,095 and Fall River County averages $28,440 (US Census 2001).

Agriculture, timber harvest, mining, and tourism are the leading industries in Custer County. The county has a large percentage of U.S. Forest Service (USFS) land, and the USFS is a major employer. Hot Springs is the site of a Veterans' Administration Hospital and retirement home, with almost half of the town's employment in government (NPS 1994).

Wind Cave is part of a regional group of national parks and other recreational sites located in the southern Black Hills. The most visited of the national parks in the area is Mt. Rushmore, with over 1.8 million recreational visits each year. Badlands National Park receives nearly 1 million visitors, and Wind Cave recorded over 640,000 visits in 2001. Jewel Cave, about 25 miles west of the park receives about 125,000 visitors annually. The Black Hills National Forest and Angostura Reservoir State Recreation Area also draw local and regional visitors, and are important to the economy of the region. The opportunities to view natural scenery, pursue recreation, and experience western history make the Black Hills a major national tourist destination (NPS 1994).

Impacts of Alternative A, Continue Current Management/No Action

Under current management, wastewater would continue to be treated at the existing lagoons, with occasional emergency management when the ponds are full to capacity. Because the state of South Dakota will no longer permit spray field discharge of partially treated wastewater, the park would need to evaluate operations in the event the ponds were to approach capacity. Visitor Center hours would be reduced, cave tours would be limited, and staff hours trimmed. This would produce short-term, adverse economic effects of negligible intensity.

If untreated wastewater were to be discharged from the lagoons from overflow or berm failure, the park could be fined by the state Department of Environment and Natural Resources. Fines are established on a case-by-case basis, with the amount of the fine based on the severity of the infraction (South Dakota Dept. of Environment and Natural

Resources, R. Kittay, personal communication 2002). Payment of such a fine would have adverse effects on the park's operating budget, but would not affect the local economy.

If the park were to implement hauling of wastewater to another location (municipal or other national park facility), a local trucking service would be used. This would benefit the vendor and staff, but would not be likely to have a measurable effect on the local economy. The periodic, short-term beneficial effects would be negligible.

Cumulative Effects. Wind Cave National Park is one of several national and state attractions in the southern Black Hills. Tourism and recreation activities at the park contribute beneficially to the local economy. Infrastructure improvements recently completed or soon to begin would generate economic benefits during construction activities, better protect park resources, and provide services that support visitation. It is unlikely that the no action alternative would have detectable effects on the economic benefits generated by the park.

Conclusion. Implementation of Alternative A would not be likely to result in detectable changes in the local or regional economy. In the event that the wastewater lagoons reach capacity, changes in park operations or wastewater hauling activities would not be expected to generate appreciable changes in economic activity.

Impacts of Alternative B, the Preferred Alternative

Alternative B is made possible by excess wastewater treatment capacity at the town of Hot Springs. Recently, the Veteran's Hospital contracted laundry services with an outside vendor. As a result, the municipal wastewater plant now has unused treatment capacity. The town has been supportive of the proposed Preferred Alternative, and would benefit from user fees paid by the park for treatment of its wastewater. Because the treatment capacity and wastewater treatment staff are already in place, and because the park would contribute less than 5 percent of total treatment volume, the economic benefit would be of negligible to minor intensity, but of long-term duration.

Installation of the new wastewater transmission main would generate benefits associated with construction activities. Crew salaries, equipment costs, locally supplied materials, and fuel purchases would be paid during implementation. However, this project is of a modest size, and the contractor selection process may not result in hiring a local firm. Some local economic benefits would result, but they may be difficult to quantify. Therefore, the beneficial effects of construction activities would be negligible to minor, and of short-term duration.

As discussed in the "Possible Conflicts with Land Use Plans, Policies, and Controls" portion of this document, installation of a force main along the Highway 385 corridor is not likely to spur development. The cost of connecting to the pressurized main, absence of land use controls in Fall River County, and availability of lots large enough to support septic tank usage would not lead to the assumption that development would result from implementation of the Preferred Alternative. For these reasons, it is expected that long-term economic effects would be negligible.

Cumulative effects. This alternative incorporates use of an existing facility outside the national park boundary and provides wastewater treatment for park visitors and staff. In conjunction with rehabilitation of the Visitor Center parking lot (including stormwater

management) and recent upgrades to the potable water and wastewater collection systems, it supports the park's role in the regional economy by providing visitor services and protecting cave resources. Because of the variety of resources available for visitation in the southern Black Hills (see Alternative A), the contribution of this project to the local and regional economy would be beneficial, but of negligible intensity.

Conclusion. Construction of the wastewater main is a modest sized project, and selection of a local contractor to perform the work is not guaranteed. Short-term, indirect, negligible to minor economic benefits would result during implementation, but these may be difficult to measure. Long-term, direct, negligible to minor benefits would result from use of the existing wastewater facility and payment of user fees to the town of Hot Springs.

Impacts of Alternative C, New Wastewater Treatment Facility with Surface Discharge

Alternative C would fully treat and discharge wastewater within Wind Cave National Park. Construction of the package plant and demolition of the existing lagoons would be performed by a construction contractor. In the event a local contractor were selected to perform the work, short-term economic benefits would result. Because the size of the project is modest, these benefits may be difficult to measure. Local and regional economic benefits would therefore be short-term and of negligible intensity.

Cumulative effects. Alternative C would not diminish the tourism and recreation opportunities available at the park that contribute beneficially to the local and regional economy. In conjunction with other infrastructure improvements, park resources would be better protected, and visitation supported (see cumulative discussion for Alternative A). It is unlikely that Alternative C would have detectable effects on the economic benefits generated by the park.

Conclusion. If a local contractor were selected to install the package plant and demolish the existing treatment lagoons, short-term, local, beneficial economic effects would result, but these would be of negligible intensity.

Impacts of Alternative D, Relocate Lagoons to New Site

Alternative D would fully treat wastewater within Wind Cave National Park. Installation of new, larger lagoons and a one-way access road would be performed by a construction contractor. In the event that a local contractor were selected to perform the work, short-term economic benefits would result. Because the size of the project is modest, these benefits may be difficult to measure. Local and regional economic benefits would therefore be short-term and of negligible intensity.

Cumulative effects. The cumulative economic effects of Alternative D would be similar to those discussed for Alternative C.

Conclusion. Installation of new ponds and an access road is a relatively small construction project, and performance by a local contractor is not guaranteed. If a local contractor were selected, short-term, local, beneficial economic effects would result, but these would be of negligible intensity.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

Sustainability is the result achieved by doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. The NPS Guiding Principles of Sustainable Design (1993) directs NPS management philosophy. It provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of biodiversity, and encourages responsible decisions. The guidebook articulates principles to be used in the design and management of visitor facilities that emphasize environmental sensitivity in construction, use of nontoxic materials, resource conservation, recycling, and integration of visitors with natural and cultural settings.

The park's existing wastewater treatment facility is not adequately processing current inputs. Emergency management actions have repeatedly been required to prevent discharge or untreated wastewater directly into the environment. In addition, this situation is not compliant with state or federal requirements for wastewater management. The no action alternative clearly does not support NPS policies regarding sustainable management of park facilities.

The proposed action alternatives analyzed in this environmental assessment present a range of solutions to the park's wastewater treatment needs. Each of these alternatives offers environmental benefits when compared to the no action alternative. However, elements of the Preferred Alternative would produce the most sustainable, long-term option for wastewater management.

The Preferred Alternative utilizes an existing treatment facility, reduces park maintenance burden, provides a wastewater treatment method that is fully compliant with state and federal regulations, eliminates an artificial lagoon environment from the park, and produces no long-term disturbance inside Wind Cave National Park. For these reasons, implementation of the Preferred Alternative would conform to NPS policy mandating protection of resources into perpetuity.

Unavoidable Adverse Impacts

Each of the action alternatives analyzed in this environmental assessment include unavoidable adverse impacts. For example, construction required for implementation of Alternatives B, C or D would cause temporary soil and vegetation disturbance. In addition, wildlife would likely avoid the construction areas until work was complete. Appropriate measures would be taken to limit effects, such as: timing actions to avoid disturbing wildlife during breeding and rearing of young, reclaiming disturbed areas, and use of best management practices to protect natural and cultural resources.

POSSIBLE CONFLICTS WITH LAND USE PLANS, POLICIES, AND CONTROLS

Whenever actions taken by the Park Service have the potential to affect the planning, land use, or development patterns on adjacent or nearby lands, the effects to these activities must be considered. Under the Preferred Alternative, a new sewer main would be constructed along the highway leading from the park to Hot Springs. Providing such utility services has been shown to affect community development and growth patterns (Platt 1996).

The lands along Highway 385 immediately south of the park, in Custer County, are largely privately owned and are used for ranching and as home sites. To date, development pressure along the park boundary has not been great, and high-density home development has not occurred. The majority of homes on the Highway 385 corridor have multi-acre lots with septic systems and leach field discharge of effluent to meet wastewater needs. In Custer County, a one-acre minimum lot size is required for installation of a septic tank and leach field, and additional site-specific restrictions may apply based on soil testing and nature of the development.

Completion of the wastewater force main would provide the option of using municipal wastewater treatment to homeowners along the utility corridor. To obtain these services, a wastewater line and lift station would be installed by the homeowner. (Note: The lift station would be necessary because each line that joins a pressurized line must also be pressurized to assure proper function.) Installing approximately one-half mile of sewer line and a pump to pressurize household waste would be a rather costly undertaking for an individual homeowner. In addition, once access to the main were obtained, regular monthly fees would apply (Town of Hot Springs, D. McClure, personal communication 2002).

Custer County has discussed the option of requiring that all new development along the highway utilize the new main. The design engineer estimates that the new line could potentially serve up to 100 or 125 individual homes (RTW, M. Sherrill, personal communication 2002). However, home sites platted under existing regulation would still have the option of developing individual septic and leach field systems. Therefore, the presence of the new sewer main may not have appreciable effects on development patterns along the highway corridor.

About 4 miles north of Hot Springs, Highway 385 enters Fall River County. Here, closer to town, there is more development along the highway corridor than is present in Custer County. These homes also use septic tanks and leach fields to process wastewater. The same requirements for sewer lines and the need for individual lift stations would also apply to these users. Because of the system requirements, it is not anticipated that the presence of the main would have substantial effects on development in Fall River County. Currently, Fall River County has no formal planning process, and development outside city limits is largely unregulated (Fall River County, D. Peterson, personal communication 2002).

If the no action alternative, or Alternatives B, C or D were implemented, there would be no conflict with local land use plans. Under any of these options, wastewater would be treated and discharged within the park boundaries. None of these actions would either encourage or deter development outside the park.

CONSULTATION/COORDINATION

AGENCIES/TRIBES/ORGANIZATIONS/INDIVIDUALS CONTACTED

Tribes. The Native American tribes listed in the table below have demonstrated interest in the areas within Wind Cave National Park. Letters were sent to these tribes and tribal contacts regarding this project in April 2002.

Arapaho Business Committee	Oglala Sioux Tribal Council
Cheyenne River Sioux Tribe	Ponca Tribe of Nebraska
Cheyenne-Arapaho Tribes of Oklahoma	Rosebud Sioux Tribal Council
Crow Creek Sioux Tribal Council	Santee Sioux Tribal Council
Crow Tribal Council	Shoshone Business Committee
Flandreau Santee Sioux Executive Committee	Sisseton-Wahpeton Sioux Tribal Council
Fort Belknap Community Council	Spirit Lake Tribal Council
Fort Peck Tribal Executive Board	Standing Rock Sioux Tribe
Lower Brule Sioux Tribal Council	Three Affiliated Tribes Business Council
Northern Cheyenne Tribal Council	Yankton Sioux Tribal Council

The list of recipients and a copy of the letter sent to the tribal representatives can be found in Appendix A. No responses were received from the tribal contacts.

State Historic Preservation Office. The park contacted the South Dakota Historic Preservation Officer (SHPO) by letter on 19 April 2002 regarding development of a new wastewater treatment facility. A copy of the letter sent to the SHPO can be found in Appendix A. In response to cultural resource survey needs, the Midwest Archeological Center performed a survey of the proposed route for the wastewater main, as described under Alternative B, the Preferred Alternative. A copy of the report is attached as Appendix B. The SHPO made no reply to the scoping letter.

U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service was contacted by letter regarding this project on 19 June 2002. The Service agreed with the park's finding of no effect on endangered and threatened species.

LIST OF PREPARERS

Name	Role on project	Title	Office
		National Park Service	
Stoll, Linda	Planning & Design	Superintendent	Wind Cave National Park
Schrempp, Steve	Planning & Design	Facility Manager	Wind Cave National Park
Horrocks, Rod	Planning & Design	Cave Specialist	Wind Cave National Park
Roddy, Dan	Planning & Design	Resource Management Specialist	Wind Cave National Park
Farrell, Tom	Planning & Design	Chief of Interpretation	Wind Cave National Park
Curtin, Marie	Planning & Design	Biological Sciences Technician	Wind Cave National Park
Muenchau, Barb	Planning & Design	Biological Sciences Technician	Wind Cave National Park
		Parsons	
Bryant, Jacklyn	Project Manager	Environmental Scientist	Denver
Rhodes, Diane	Contributing Author	Cultural Resource Specialist/Archeologist	Denver

LIST OF RECIPIENTS

Federal Agencies and Government

Advisory Council on Historic Preservation
Dept. of Agriculture
- U.S. Forest Service

Dept. of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management
- National Park Service
  - Badlands National Park
  - Jewel Cave National Monument
  - Mt. Rushmore National Memorial
- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
  - Region VIII

U.S. Congressional Representatives from South Dakota

State and Local Agencies and Governments

Custer County Commissioners
Fall River County Commissioners
South Dakota State Historic Preservation Officer
Tribal Historic Preservation Officer(s)
South Dakota Department of Environment and Natural Resources

Indian Tribes

Arapaho Business Committee
Cheyenne River Sioux Tribe
Cheyenne-Arapaho Tribes of Oklahoma
Crow Creek Sioux Tribal Council
Crow Tribal Council
Flandreau Santee Sioux Executive Committee
Fort Belknap Community Council
Fort Peck Tribal Executive Board
Lower Brule Sioux Tribal Council
Northern Cheyenne Tribal Council
Oglala Sioux Tribal Council
Ponca Tribe of Nebraska
Rosebud Sioux Tribal Council
Santee Sioux Tribal Council
Shoshone Business Committee
Sisseton-Wahpeton Sioux Tribal Council
Spirit Lake Tribal Council
Standing Rock Sioux Tribe
Three Affiliated Tribes Business Council
Yankton Sioux Tribal Council

REFERENCES

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Fall River County

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RTW Engineers

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2002 Kittay, Rob, certification coordinator. Surface Water Quality Program. Telephone communication 20 December.

Town of Hot Springs

2002 McClure, Duane, wastewater plant manager. Telephone communication 3 Sept.

U.S. Department of the Interior, National Park Service

Wind Cave National Park

Communications with Wind Cave National Park staff include conversations, telephone communication, and electronic mail exchanges over the period of January 2002 through January 2003.

Curtin, Marie. Biological Sciences Technician.

Horrocks, Rod. Cave Specialist.

Muenchau, Barbara. Wildlife Biological Technician.

Roddy, Dan. Resource Management Specialist.

Schrempp, Steve. Park Facility Manager.

Stoll, Linda. Park Superintendent.

White, Steve. Park Facilities.

Ziemann, Denny. Chief Ranger.

U.S. Fish and Wildlife Service

2002 Larson, Scott. South Dakota Field Office, Pierre SD. Telephone conversations over the period of April 2002 through November 2002.

APPENDIX A:
LETTERS AND OTHER COORDINATION DOCUMENTATION

United States Department of the Interior

NATIONAL PARK SERVICE
Wind Cave National Park
RR 1, Box 190
Hot Springs, South Dakota 57747

IN REPLY REFER TO:
H4217(WICA)

April 19, 2002

«Salutation» «FirstName» «MI» «LastName» «SR», «JibTitle»
«TribeName»
«Address1»
«Address2»
«City», «State» «ZipCode»

Subject: Section 106 Consultation, Replace Failing Wastewater Treatment Facility, Wind Cave National Park

Dear «Salutation» «LastName»:

The purpose of this letter is to provide you advance notice that the National Park Service is beginning to plan for reconstruction of the wastewater treatment system at Wind Cave National Park. The primary purpose of the project is to replace the existing wastewater treatment system, which consists of three total containment evaporation ponds (3 acres total evaporation area). In the past twelve years, the ponds have filled to capacity three times and required wastewater be discharged out of the ponds by spray irrigation of adjacent grasslands. In 1996, an attempt was made to solve this problem by adding the third pond, thus increasing the evaporation area. The topography of the site posed several problems however. First, the steep walls in Wind Cave Canyon, where the existing ponds are located severely limited size of the pond expansion. Second, the walls of the canyon tend to shield the ponds from prevailing winds, significantly reducing the evaporation rates of the ponds. In the past, each time a discharge was required, the South Dakota Department of Environmental and Natural Resources (SD DENR) granted a temporary wastewater irrigation permit. When the SD DENR approved the latest permit in July of 2000, they stated that "because of concerns raised by the ground water program approval of future requests for irrigation of wastewater in this area will likely not be granted". At the current rate of loading the existing wastewater treatment system will reach maximum capacity in 4 years (2005). If a new or alternative wastewater treatment system is not online by 2005, the existing facility will likely be out of compliance with state and federal environmental protection regulations (40 C.F.R. 125, Clean Water Act of 1972 and 14 SDR 86).

Current alternatives being considered include:
I. Construct new, properly sized evaporation ponds in a location more suitable for effective evaporation
2. Construct a wastewater treatment plant in the park that discharges treated water .
3. Construct a pumping station and pipeline to transmit wastewater to nearby municipal plant in Hot Springs for treatment.

Alternative No. 1 would require constructing two 5-acre evaporation ponds (10 acres total evaporation area), located on a bench on the ridge north of the existing ponds. The existing ponds would be demolished and the site restored. A small lift station would be constructed to pump the wastewater from the end of the gravity sewer main, up to the new evaporation ponds. Total area of new site disturbance for this alternative would be 22 acres.

Alternative No. 2 would require constructing a wastewater treatment plant in the park, at the location of the existing evaporation ponds. The existing ponds would be demolished and the site restored. The effluent from the wastewater treatment plant would be discharged into the Wind Cave Canyon drainage, or into a sub-irrigation system located on the ridge to the south. New site disturbance for this alternative would be less than one acre if direct discharge is used, or 32 acres if sub- irrigation of the effluent is used.

Alternative No. 3 would require constructing a lift station at the end of the gravity sewer main in the park, and a ten-mile long pipeline that would be connected to the City of Hot Springs wastewater system. This alternative would disturb about 12 acres of area inside the park, most of which is within the highway right-of-way and has been previously disturbed.

The park is aware that American Indians value Wind Cave itself as a very special place, so we want to be sure that the project will not affect it or other ethnographic resources valued by your tribe. Therefore, this letter is to formally initiate Government-to-Government consultation with your office in accordance with legislation, Executive Orders, regulations, and policy, including sections 101 and 106 of the National Historic Preservation Act of 1966 as amended, 36 CFR 800, National Park Service *Management Policies* and Director's Order 28, *Cultural Resources Management* (especially Chapter 10, Ethnographic Resources).

We have begun planning work required by Section 106 of the National Historic Preservation Act, and we have begun work on an environmental assessment that will study and assess the impacts to these features and determine any required mitigation. We believe that your participation will result in better planning for cultural resources management, and will help ensure that cultural resources valued by your tribe are adequately considered during the planning and design process and in preparation of the accompanying environmental assessment. We look forward to receiving your input on our plans and any concerns you have about the project. We would be pleased to discuss this project further, either by telephone or in a meeting.

If you have any questions, please contact me or Tom Farrell, our Section 106 Compliance Coordinator. We can both be reached at (605) 745-4600.

Sincerely,

/S/ Linda L. Stoll

Linda L. Stoll
Superintendent

Enclosures (3)

cc: NPS-MWR-Craig Kenkel

cc: Parsons-Denver- J. Bryant

Anthony Addison, Chairman
Arapaho Business Committee
P.O. Box 396
Fort Washakie. WY 82514

Madonna Archambeau, Chairperson
Yankton Sioux Tribal & Claims Committee
P.O. Box 248
Marty, SD 57361

Clifford Birdinground, Chairman
Crow Tribal Council
P.O. Box 400
Crow Agency, MT 59022

Gregg Bourland, Chairman
Cheyenne River Sioux Tribe
P.O. Box 590
Eagle Butte, SD 57625

Andrew Grey, Chairman
Sisseton-Wahpeton Sioux Tribal Council
P.O. Box 509
Agency Village, SD 57262

Tex Hall, Chairman
Three Affiliated Tribes Business Council
HC 3, Box 2
New Town, ND 58763

Arlyn Headdress, Chairman
Fort Peck Tribal Executive Board Council
P.O. Box 1027
Poplar, MT 59255

Michael Jandreau, Chairman
Lower Brule Sioux Tribal Council
P.O. Box 187
Lower Brule, SD 57339

William Kindle, President
Rosebud Sioux Tribal Council
P.O. Box 430
Rosebud. SD 57570

Sebastian Lebeau, Historic Preservation Officer
Cheyenne River Sioux Tribe
P.O. Box 590
Eagle Butte, SD 57625

Fred LeRoy, Chairman
Ponca Tribe of Nebraska
P.O.. Box 288
Niobrara, NE 68760

Phillip Longie, Chairman
Spirit Lake Tribal Council
P.O. Box 359
Fort Totten, ND 58335

Tim Mentz, Historic Preservation Officer
Standing Rock Sioux Tribe
P.O. Box D
Fort Yates, ND 58538

Charles Murphy, Chairman
Standing Rock Sioux Tribal Council
P.O. Box D
Fort Yates, ND 58538

James Pedro, Chairman
Cheyenne-Arapaho Tribes of Oklahoma
P.O. Box 38
Concho. OK 73022

Ivan Posey, Chairman
Shoshone Business Committee Council
P.O. Box 217
Fort Washakie, WY 82514

Thomas Ranfranz, President
Flandreau Santee Sioux Executive Committee
P.O. Box 283
Flandreau, SD 57028

Roxane Sazue, Chairperson
Crow Creek Sioux Tribal
P.O.. Box 50
Fort Thompson, SD 57339

Jerri Small, President
Northern Cheyenne Tribal Council
P.O. Box 128
Lame Deer, MT 59043

Ben Speak Thunder, Chairman
Fort Belknap Community Council
RR1, Box 66
Harlem, MT 59526

Roger Trudell, Chairman
Santee Sioux Tribal Council
Route #2
Niobrara, NE 68760

John Yellow Bird Steele, President
Oglala Sioux Tribal Council
P.O. Box H
Pine Ridge, SD 57028

IN REPLY REFER TO:
H4217(WICA)

United States Department of the Interior

NATIONAL PARK SERVICE
Wind Cave National Park
RR 1, Box 190
Hot Springs, South Dakota 57747

April 19, 2002

Mr. Jay D. Vogt, SHPO
State Historic Preservation Office
Attn: Section 106 Review and Compliance Coordinator
Cultural Heritage Center
900 Governors Drive
Pierre, South Dakota 57501

Subject: Section 106 Consultation, Replace Failing Wastewater Treatment Facility, Wind Cave National Park

Dear Mr. Vogt:

The purpose of this letter is to provide you advance notice that the National Park Service is beginning to plan for reconstruction of the wastewater treatment system at Wind Cave National Park. The primary purpose of the project is to replace the existing wastewater treatment system, which consists of three total containment evaporation ponds (3 acres total area). In the past twelve years, the ponds have filled to capacity three times and required wastewater be discharged out of the ponds by spray irrigation of adjacent grasslands. In 1996, an attempt was made to solve this problem by adding the third pond, thus increasing the evaporation area. The topography of the site posed several problems however. First, the steep walls in Wind Cave Canyon, where the existing ponds are located severely limited size of the pond expansion. Second, the walls of the canyon tend to shield the ponds from prevailing winds, significantly reducing the evaporation rates of the ponds.
In the past, each time a discharge was required, the South Dakota Department of Environmental and Natural Resources (SD DENR) granted a temporary wastewater irrigation permit. When the SD DENR approved the latest permit in July of 2000, they stated that "because of concerns raised by the ground water program approval of future requests for irrigation of wastewater in this area will likely not be granted". At the current rate of loading the existing wastewater treatment system will reach maximum capacity in 4 years (2005). If a new or alternative wastewater treatment system is not online by 2005, the existing facility will likely be out of compliance with state and federal environmental protection regulations (40 C.F.R. 125, Clean Water Act of 1972 and 14 SDR 86).

Current alternatives being considered include:
1. Construct new, properly sized evaporation ponds in a location more suitable for effective evaporation
2. Construct a wastewater treatment plant in the park that discharges treated water.
3. Construct a pumping station and pipeline to transmit wastewater to nearby municipal plant in Hot Springs for treatment.

Alternative No. 1 would require constructing two 5-acre evaporation ponds (10 acres total area), located on a bench on the ridge north of the existing ponds. The existing ponds would be demolished and the site restored. A small lift station would be constructed to pump the wastewater from the end of the gravity sewer main, up to the new evaporation ponds. Total area of new site disturbance for this alternative would be 22 acres.

Alternative No. 2 would require constructing a wastewater treatment plant in the park, at the location of the existing evaporation ponds. The existing ponds would be demolished and the site restored. The effluent from the wastewater treatment plant would be discharged into the Wind Cave Canyon drainage, or into a sub-irrigation system. New site disturbance for this alternative would be negligible if direct discharge is used, or 32 acres if sub-irrigation of the effluent is used.

Alternative No. 3 would require constructing a lift station at the end of the gravity sewer main in the park, and a ten-mile long pipeline that would be connected to the City of Hot Springs wastewater system. This alternative would disturb about 12 acres of area, most of which is within the highway right-of-way and has been previously disturbed.

Portions of this project lies within the Wind Cave National Park Administrative and Utility Area Historic District, an area that contains 17 structures considered eligible for the National Register of Historic Places.

In addition, the park is aware that American Indians value Wind Cave itself as a very special place, so letters initiating Government-to-Government consultation have been sent to tribes who have expressed an interest in the park, and, as applicable, Tribal Historic Preservation Officers.

We don't expect any of the existing historic structures to be directly impacted by this project, but the alternatives under consideration will require construction of new a building in the vicinity of existing historic structures in the maintenance area adjacent to highway US385. We have begun drafting an environmental assessment that will study and assess the impacts to these features and determine required mitigation. We look forward to receiving your input in the planning process and any concerns you may have now regarding this project. The draft environmental assessment will be ready for review in late November. Once you receive the draft document, you will have 30 days to complete your review and return any additional comments.

We believe that your participation will result in better planning for cultural resources management, and will help ensure that cultural resources are adequately considered during the preparation of the plan and accompanying environmental assessment. Should you have any questions or desire additional information, please contact Tom Farrell, our Section 106 Compliance Coordinator at (605) 745-4600.

Sincerely,

Linda L. Stoll
Superintendent

Enclosures (3)
cc: NPS-MWR- Craig Kenkel
cc: Parsons-Denver-J. Bryant

IN REPLY REFER TO:
H4217(WICA)

United States Department of the Interior

NATIONAL PARK SERVICE
Wind Cave National Park
RR 1, Box 190
Hot Springs, South Dakota 57747

June 26, 2002

Mr. Scott Larson
U.S. Department of the Interior
Fish and Wildlife Service
Ecological Services Division
420 S. Garfield Avenue, Suite 400
Pierre, South Dakota 57501-5408

Dear Mr. Larson:

Wind Cave National Park (WICA) is preparing an Environmental Assessment to address the proposed Wastewater Treatment and Disposal Systems for the park and would like to request an informal consultation on the project.

At present, the Wastewater Treatment System consists of two lined evaporation ponds constructed in 1989, and a third pond that was added in 1993. In the past twelve years, the evaporation ponds have filled to capacity three times and required wastewater to be discharged by spraying it on the ground. Each time the South Dakota Department of Environmental and Natural Resources (DENR) granted a "one time" discharge permit. This is no longer an option. The South Dakota DENR has informed the park that requests for discharge permits in the future would be denied and instructed the park to find an alternative solution to the waste water treatment problem.

The three primary alternatives, each with sub-alternatives, that are being considered are:

1. Construct new evaporation ponds in a location that does not restrict the size.
    a. Construct new evaporation ponds followed by sub-irrigation of plots of native grasses to dispose of periodic excess effluent.
    b. Retain the existing evaporation ponds and pump the excess effluent to sub-irrigated plots.
    c. Add opening/closing roof over evaporation ponds to eliminate addition of precipitation and still allow evaporation.
2. Construct a wastewater treatment plant that discharges treated water.
    a. Construct a new wastewater treatment plant followed by storage and sun-irrigation disposal with no discharge.
    b. Demolish existing evaporation ponds and construct new wastewater treatment plant with discharge to sub-irrigation disposal.

3. Construct pumping station(s) and a pipeline to transmit sewage to Hot Springs for treatment.
    a. Construct a new lift station, force main and gravity main to transmit sewage to hot Springs with a combination open cut trench and horizontal directional drilling to minimize the surface resource damage and shorten total pipe length.
    b. Construct a new lift station force main and gravity main to transmit sewage to Hot Springs with the gravity portion, outside Park boundaries, over sized to provide service to future users.

The park preferred alternative is alternative 3-b. It appears this alternative will best meet the long-term cost and Choosing By Advantage (CBA) criteria considerations. It minimizes the potential for percolation of sewage or sewage effluent into the cave, reduces the long term operation and maintenance costs, removes the need to meet NPDES requirements and negates the need to hire and retain a qualified, licensed wastewater treatment plant operator.

According to our records, the following federally listed or proposed species occur within the park.

Name	Status	Expected Occurrence
Bald eagle (Haliaeetus leucocephalus)	Threatened	Migration, Winter Resident,
Black-tailed prairie dog (Cynomys ludovicianus)	Candidate	Resident (common, 1,600 acres of colonies)

The preferred alternative would disturb a 0.8 miles x 20 foot area (maximum) adjacent to US Highway 385, that goes through the 646 acre Bison Flats prairie dog town. All effort will be made to keep the digging within the barrow area along the highway. No digging would take place from March – May, prior to the emergence of the young.

Wind Cave National Park has determined that this would not likely adversely effect the population of prairie dogs, nor is it likely to jeopardize the population.

We have also determined that this project will not effect the bald eagle population that migrates through the Park. We hope you concur with our determination. Please call Barbara Muenchau of my staff at 605-745-1150 if you have any questions. Thank you.

Sincerely,

Linda Stoll
Superintendent

United States Department of the Interior

IN REPLY REFER TO:
H4217(WICA)

June 26, 2002

NATIONAL PARK SERVICE
Wind Cave National Park
RR 1, Box 190
Hot Springs, South Dakota 57747

Mr. Doug Backlund
Wildlife Biologist
SD Game Fish and Parks
Foss Building
523 East Capitol
Pierre, South Dakota 57501

Subject: Replace Failing Wastewater Treatment Facility, Wind Cave National Park

Dear Mr. Backlund:

The purpose of this letter is to provide you with advance notice that the National Park Service is beginning to plan for rehabilitation of the wastewater treatment system at Wind Cave National Park. The primary purpose of the project is to assure that the park complies with all applicable state and federal requirements for wastewater handling, and provide a reliable, long-term treatment system to serve visitors and staff. Rehabilitation of the wastewater treatment system would also protect the cave from nutrient pollution commonly found in effluent, and assure that the cave ecosystem is protected for the enjoyment of future generation.

The existing wastewater treatment system consists of two total containment evaporation ponds constructed in 1989, and a third pond that was added in 1996. In the past twelve years, the current evaporation ponds have filled to capacity three times and required wastewater be discharged out of the ponds by spray irrigation of adjacent grasslands. Each time a discharge was required, the South Dakota Department of Environment and Natural Resources (DENR) granted a temporary wastewater irrigation permit. This is no longer an option. The South Dakota DENR has informed the park that requests for discharge permits in the future would be denied and instructed the park to find an alternative solution to the waste water treatment problem. Constraints at the site of the existing pond location do not allow for additional expansion of the current system. At the current rate of loading, the existing wastewater treatment system will reach maximum capacity in 3 years (2005).

Current alternatives being considered include:
1. Construct new, properly sized evaporation ponds in a location more suitable for effective evaporation
2. Construct a wastewater treatment plant in the park that discharges treated water.
3. Construct a pumping station and pipeline to transmit wastewater to nearby municipal plant in Hot Springs for treatment.

Alternative No. 1 would require constructing two 5-acre evaporation ponds (10 acres total area), located on a bench on the ridge north of the existing ponds. The existing ponds would be demolished and the site restored. A small lift station would be constructed to pump the wastewater from the end of the gravity sewer main, up to the new evaporation ponds. Total area of new site disturbance for this alternative would be 22 acres.

Alternative No. 2 would require constructing a wastewater treatment plant in the park, at the location of the existing evaporation ponds. The existing ponds would be demolished and the site restored. The effluent from the wastewater treatment plant would be discharged into the Wind Cave Canyon drainage, or into a sub-irrigation system. New site disturbance for this alternative would be negligible if direct discharge is used, or 32 acres if sub-irrigation of the effluent is used.

Alternative No. 3 would require constructing a lift station at the end of the gravity sewer main in the park, and a ten-mile long pipeline that would be connected to the City of Hot Springs wastewater system. This alternative would disturb about 12 acres of area, most of which is within the highway right-of-way and has been previously disturbed.

We have begun drafting an environmental assessment that will study and assess the impacts to these alternatives and determine required mitigation. We look forward to receiving your input in the planning process and any concerns you may have now regarding this project. The draft environmental assessment will be ready for review in late November. Once you receive the draft document, you will have 30 days to complete your review and return any additional comments.

The park has completed initial scoping and a value analysis, which suggests Alternative No. 3 would best meet the parks' needs. It appears this alternative will minimize resource impacts within the park, utilize existing infrastructure and facilities, and promote cooperative planning. It will also reduce the potential for percolation of sewage or sewage effluent into the cave, reduce long-term operation and maintenance costs, remove the need to meet NPDES requirements and negate the need to hire and retain a qualified, licensed wastewater treatment plant operator.

Alternative 3 would disturb a 0.8 miles x 20 foot area (maximum) adjacent to US Highway 385, that goes through the 646 acre Bison Flats black-tailed prairie dog town. All effort will be made to keep the digging within the barrow area along the highway. No digging would take place from March – May, prior to the emergence of the young prairie dogs.

A few plants of Hopi Tea (*Thelesperma filifolium*) and a small population of Easter or Hooker's daisy (*Townsendia excapa. T. hookeri*) are also near the area that may be disturbed. These areas will not be touched.

The Park has determined that this project will not effect any Federal or State T&E populations that are in the Park, nor will it likely adversely effect nor jeopardize any population of State or Federal Candidate species, or South Dakota Natural Heritage listed plant or animal species. We have conducted an informal conference with the US Fish and Wildlife Service regarding this project, and they have concurred with our findings.

We believe that your participation will result in better planning for natural resources management, and will help ensure that natural resources are adequately considered during the preparation of the plan and accompanying environmental assessment.

Should you have any questions or desire additional information, please contact Barbara Muenchau in our Resource Management Division at (605) 745-1150.

Sincerely,

/S/ Linda L. Stoll

Linda L. Stoll
Superintendent

Enclosures (3)

cc: Parsons-Denver- J. Bryant

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

July 13, 2000

Steven Schrempp
US Department of the Interior
National Park Service – Wind Cave National Monument
Hot Springs, SD 57747

Re: Temporary Wastewater Irrigation

Dear Mr. Schrempp:

Thank you for submitting the information necessary for irrigation of wastewater from the Wind Cave National Monument wastewater treatment facility. The South Dakota Department of Environment and Natural Resources (DENR) approves the one-time disposal of wastewater by irrigating the proposed land. You will be required to comply with the following restrictions and best management practices:

1. The application rate must be controlled to prevent any surface runoff of the effluent and in no case the application rate shall exceed 1/4 inch/hr. You shall prevent runoff from entering any waters of the state. The application rate is based on the South Dakota Design Criteria for Disposal of Effluent by Irrigation.

2. The maximum application of wastewater shall be limited to 2 inches/acre/wk. To prevent ground saturation and runoff, no application is permitted during periods of heavy or prolonged rainfall, snow cover or when the ground is frozen. A buffer zone of 100 feet shall be established between the irrigation site and any road or stream.

3. The irrigation equipment shall, to the extent feasible, be installed in such a manner as to minimize human contact due to wind drift of the effluent and formation of aerosols.

4. Appropriate warning signs shall be posted around the border of the irrigation site to inform the public of the nature of the water and advise against trespassing. At least one sign shall be provided on each side of the site and one for every 500 feet of its perimeter.

5. If Wind Cave does not own the land to be irrigated, permission must be obtain from the landowner and comply with any additional landowner requirements.

You must collect and analyze a representative sample of the wastewater effluent on a monthly basis while irrigating. The analyses shall include Total Nitrogen, Nitrates, Nitrites, Sulfates,

Chlorides, pH, Temperature, TDS, and Fecal Coliform. Submit the results to DENR, Surface Water Quality Program by the 28th day of the month following the month that the sample was collected. Records of the application rate should be kept onsite for review if the department conducts an inspection.

The Ground Water Quality program also reviewed this application for one time irritation. Because of concerns raised by the ground water program approval of future requests for irrigation of wastewater in this area will likely not be granted.

If you have any questions, please contact me.

Sincerely,

Eric Meintsma, P.E.
Natural Resources Engineer
Surface Water Quality Program
Phone (605) 773-3351

cc: Anita Yan, DENR-GWQ

NATIONAL PARK SERVICE

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Release Date: 02/21/02
Contact Name: Tom Farrell 605/745-1130

Planning Begins for Wastewater Treatment System

Wind Cave National Park Superintendent Linda Stoll announced today that the park is initiating a planning process to correct problems with the park's current wastewater treatment system. The current system consisting of three total containment evaporation lagoons has filled to capacity three times in the past twelve years and the system is projected to reach maximum capacity by 2005.

Alternatives currently under review include relocating and improving the existing lagoons, building a wastewater treatment plant in the park, or connecting into the city of Hot Springs' system. During this early planning phase, the park is requesting public input regarding the alternatives being considered, issues or concerns related to each of the proposed alternatives, and any new alternatives that should be considered. Please send your comments to Wind Cave National Park Superintendent, RR 1 Box 190, Hot Springs SD 57747.

Pictured above is one of the current lagoons.

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APPENDIX B

ARCHEOLOGICAL PROJECT REPORT

ARCHEOLOGICAL PROJECT REPORT

PARK: Wind Cave National Park
DATE: September 25, 2002

[] PRELIMINARY REPORT - TARGET DATE FOR FINAL REPORT:

[X] FINAL NEGATIVE FINDING REPORT

[] SMALL PROJECT REPORT

PROJECT and/or REPORT TITLE: Archeological Survey of the Proposed Location for a Waste Water Line From Wind Cave National Park to Hot Springs South Dakota

PARK: Wind Cave National Park

PROJECT/PACKAGE:

DATES OF FIELDWORK: September 21, 2002

PURPOSE OF ARCHEOLOGICAL WORK PER SOW and PROJECT DESIGN:

The park is planning to install a 10-mile long waste water line from Wind Cave National Park to the town of Hot Springs. The proposed route runs along the existing road shoulder across mainly disturbed ground within 30 feet of the road.

ARCHEOLOGICAL PROJECT LOCATION AND AREA OF INVENTORY OR EXTENT OF TESTING (see attached topographic map delineating the area surveyed):

The proposed project location begins at a manhole located within the park at UTM 623709E, 4823318N (NAD27) near the WICA fire station. The line then runs within an existing trench along a gravel road for approximately 400 feet then turns toward the paved highway forming a new trench for approximately 60 feet at which point it follows along the west side of the Highway 385 shoulder for approximately nine miles to UTM 623480E, 481155 IN then west along the north shoulder of a paved residential road for about ¼ of a mile to a manhole at the end of the road at UTM 623036E, 4811466N.

ARCHEOLOGICAL PROJECT PERSONNEL:

Jennifer Galindo, MA, Midwest Archeological Center, Lincoln, Nebraska

Louie Thunder Hawk, Volunteer in the Park (VIP) participant, Rosebud, South Dakota

ENVIRONMENTAL DESCRIPTION OF PROJECT AREA:

The project area is located in the southern Black Hills of South Dakota within the northern plains region. The current project runs along the west shoulder of Highway 385 for approximately four miles through the park and another six miles south of the park into the town of Hot Springs. The route is almost entirely within previously disturbed ground. The proposed route passes through two major physiographic zones, the Limestone Plateau in the park and the Red Valley south of the park. The soils within the Limestone Plateau belong to the Vanocker-Sawdust-Paunsaugunt soil association (USDA 1985). These are well drained loamy soils formed from weathered limestone and calcareous sandstones. The red soils within the Red Valley zone belong to the Nevee-Gypnevee-Rekop soil association (USDA 1985). They are well drained soils made up of sandstones, clays and shales of the Sundance and Spearfish formations (Froiland 1990). Mixed grass prairie is the predominant vegetation along the route with occasional cactus and yucca. The elevation along the project area ranges from 4250 feet to 3600 feet above mean sea level.

GENERAL DESCRIPTION OF THE ARCHEOLOGICAL PROJECT and METHODS:

The author is currently in year four of a five-year archeological survey project within Wind Cave National Park and has an up-to-date GIS database delineating all previous archeological surveys and recorded sites within the park and the surrounding area. A search of this database was completed on September 19, 2002, to identify any previous surveys conducted or sites recorded within or near the current project area.

In 1988, Dan Flemmer surveyed the Highway 385 corridor from the town of Hot Springs to just north of Gobbler Knob in Wind Cave National Park (Flemmer 1988). For this survey he conducted pedestrian transect surveys, at no greater than 30 meter transect intervals, extending 60 meters away from the road shoulder along both sides of the highway.

Since the current project area south of the park, from the park boundary to the turnoff onto the residential road at UTM 623480E, 481155 IN within the town of Hot Springs, was already surveyed by Flemmer in 1988, and the 30' distance from the road shoulder that will be effected by the current project is within already disturbed soils, this five mile section of the proposed route was not resurveyed. We did, however, walk a single transect along the north side of the residential road from the highway intersection west to the manhole at the end of the road where the current project will end. Also surveyed, by walking a single transect line along the proposed route, was the four mile corridor along the west side of Highway 385 within the park boundary, and the short section from the highway to the manhole near the WICA fire station. The transects were walked along the border of the undisturbed ground along the highway even though, along most of the route, the undisturbed area began further back from the road shoulder than the 30 foot span that will be effected by the current project. Ground visibility was approximately 10% over most of the area however all exposed areas such as rodent back dirt piles, game trails, and eroded areas, were carefully examined for artifacts. One extensive prairie dog town along the route provided excellent ground visibility.

DESCRIPTION OF CULTURAL RESOURCES LOCATED:

No cultural resources were located within the right of way of the proposed project.

NATIONAL REGISTER EVALUATION OF CULTURAL RESOURCES LOCATED:

No cultural resources were located.

EFFECTS OF PROJECT ON RESOURCES:

This project will have no effect on cultural resources.

LOCATION OF ARTIFACTUAL MATERIALS (should not usually be collected) AND RECORDS FROM THE WORK:

Photographs and field notes are archived at Wind Cave National Park.

REFERENCES CITED:

Flemmer, Dan

1988 An Intensive Cultural Resources Survey of the Proposed Highway 385 Project Hot Springs to Wind Cave National Park, Custer and Fall River Counties, South Dakota. Manuscript on file, National Park Service, Midwest Archeological Center, Lincoln, Nebraska.

Froiland, Sven

1989 *Natural History of the Black Hills and Badlands.* Center for Western Studies, Augustana College, South Dakota.

U.S. Department of Agriculture (USDA)

1985 *Soil Survey of Custer and Pennington Counties, Black Hills Parts, South Dakota.* Soil Conservation Service, Washington, DC.

SUMMARY MANAGEMENT RECOMMENDATIONS:

[] CLEARANCE NOT RECOMMENDED (explain):

[X] CLEARANCE RECOMMENDED (explain): Development at this location will have no effect on cultural resources.

[] CLEARANCE RECOMMENDED WITH CONDITIONS (explain):

ENCLOSURES:

[X] USGS TOPOGRAPHIC MAP (1:250,000 scale)

[] ARCHEOLOGICAL BASE MAP

[] PROJECT DESIGN DATA

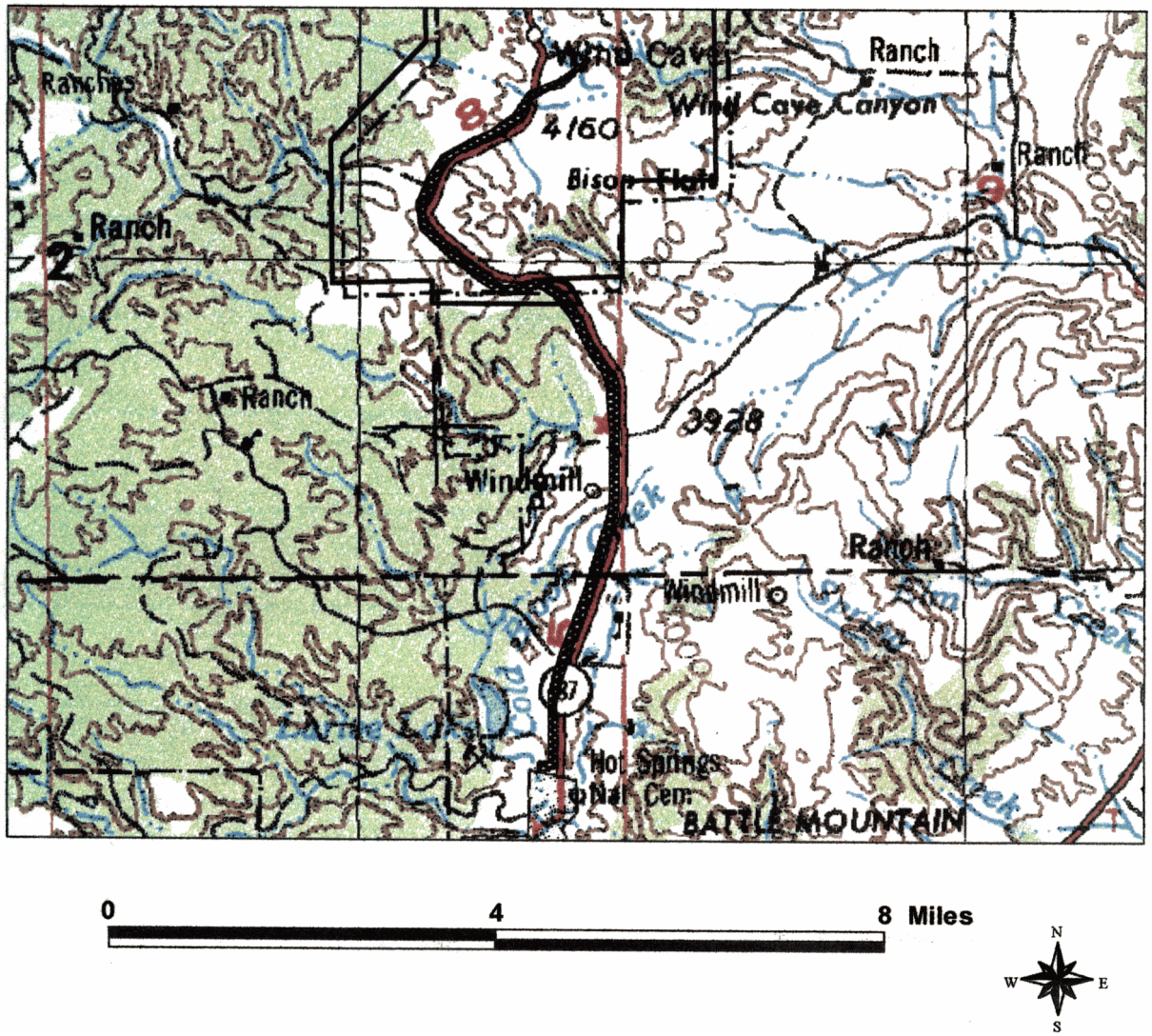
[] PROJECT MAP SCALE

[] SITE FORMS AND PHOTOGRAPHS

PREPARED BY: Jennifer Galindo

ORGANIZATION: Midwest Archeological Center, NPS, Lincoln, NE

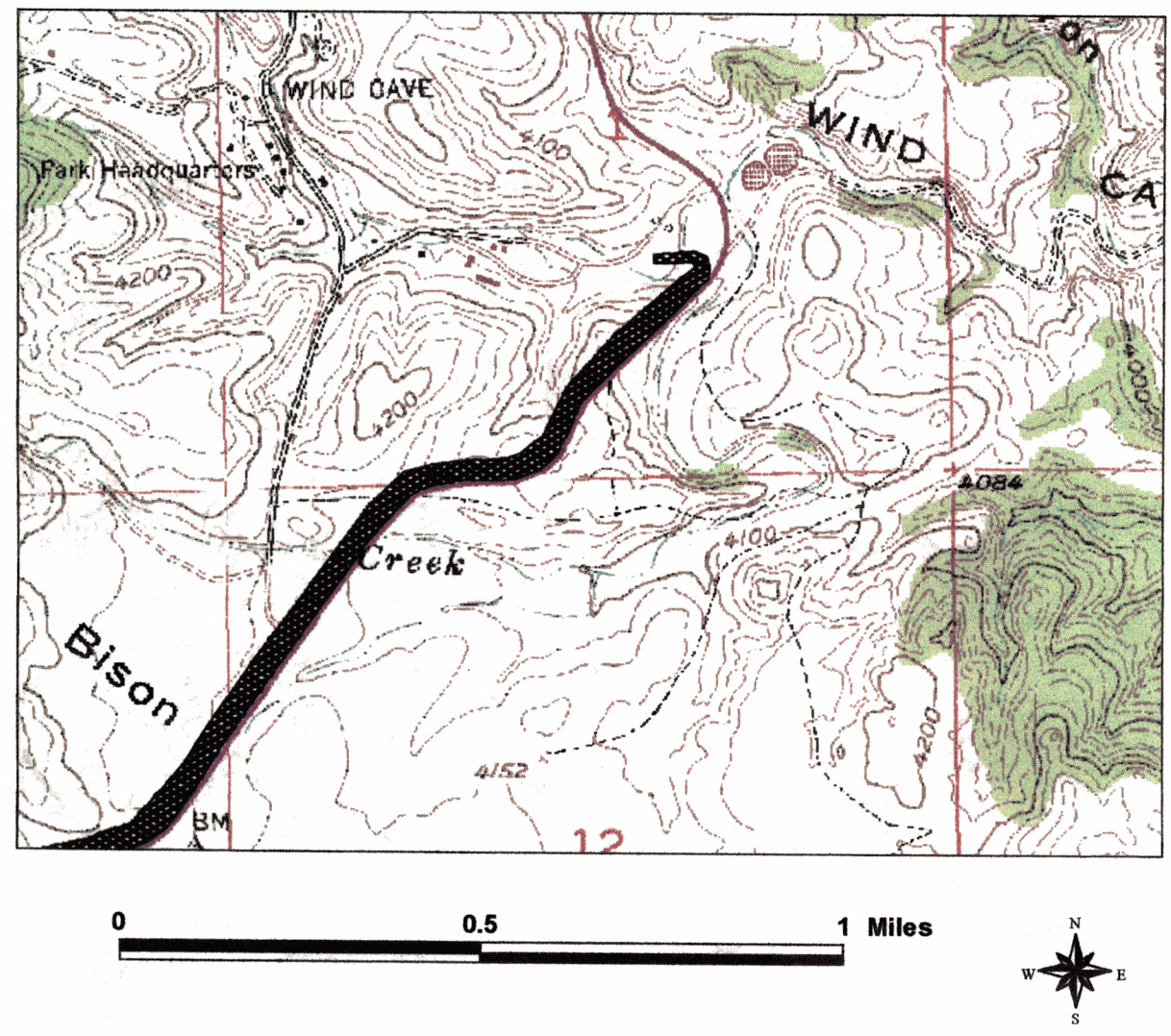
DATE: September 25, 2002



Location of the Archeological Survey for the Proposed Waste Water Line from Wind Cave National Park to Hot Springs South Dakota

Black Hatching Delineates the Surveyed Area.

Hot Springs 1:250,000 Scale Topographic Map



Close-up of the Section of the Proposed Waste Water Line near the WICA Fire Station to Highway 385.

Black Hatching Delineates the Surveyed Area

Wind Cave 7.5' Topographic Quadrangle