

Carlsbad Caverns National Park

National Park Service
U.S. Department of the Interior

Carlsbad National Park
New Mexico



Environmental Assessment/ Assessment of Effect

Reconstruction of Visitor Center Parking Areas and
Rehabilitation of Walnut Canyon Entrance Road
Carlsbad Caverns National Park, Eddy County, New Mexico
January 2007



ENVIRONMENTAL ASSESSMENT/ ASSESSMENT OF EFFECT

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Prepared for
National Park Service



Prepared by
SWCA Environmental Consultants



**Carlsbad Caverns National Park
New Mexico**

**U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE**

**ENVIRONMENTAL ASSESSMENT/ASSESSMENT OF EFFECT
RECONSTRUCTION OF VISITOR CENTER PARKING AREAS AND
REHABILITATION OF WALNUT CANYON ENTRANCE ROAD
CARLSBAD CAVERNS NATIONAL PARK
EDDY COUNTY, NEW MEXICO**

EXECUTIVE SUMMARY

The National Park Service (NPS), Carlsbad Caverns National Park (Park), in cooperation with the Federal Highway Administration/Central Federal Lands Highway Division, proposes rehabilitation and reconstruction of the Visitor Center parking lots in the developed area above Carlsbad Cavern and rehabilitation of approximately 7.5 miles of Walnut Canyon Road (New Mexico Highway 7), the main entrance road to the Park. This action is needed because the current infrastructure of the roads and parking areas is from 30 to over 50 years old and suffers from deteriorated pavement as well as outdated construction materials and erosion control structures. Furthermore, parking lot runoff is contaminating the Park's groundwater, resulting in adverse impacts to the ecosystem of Carlsbad Cavern.

This environmental assessment examines two alternatives: no action and the NPS preferred alternative. The no action alternative is described as no rehabilitation or reconstruction of the entrance road and parking lots and continuation of current management and maintenance practices for the reasonably foreseeable future. The preferred alternative proposes to resurface the entire length of Walnut Canyon Road, formalize some social pullouts, obliterate and reclaim other social pullouts, reconfigure the parking area at the Rock Shelter Exhibit pullout, and reconstruct parking lots at Bat Cave Draw and the Visitor Center.

The no action alternative would result in continued negligible to moderate long-term adverse impacts to groundwater and Carlsbad Cavern from continuing contamination of groundwater resources by parking lot runoff. The preferred alternative would result in negligible to moderate beneficial groundwater effects by reducing or eliminating contamination of the surface water that flows into Carlsbad Cavern. The preferred alternative would adversely affect the Caverns Historic District and contributing cultural landscapes in this area. The preferred alternative would also result in moderate long-term adverse impacts to a section of historic masonry wall in the Bat Cave Draw parking area and moderate short-term adverse impacts to visitor experience during construction activities. All impacts would be localized, but functionally they would carry park-wide implications. The preferred alternative is also the environmentally preferred alternative.

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PURPOSE AND NEED

PROPOSED ACTION

The National Park Service (NPS), Carlsbad Caverns National Park (Park), located in Eddy County in southeastern New Mexico (Figure 1), in cooperation with the Federal Highway Administration (FHWA)/Central Federal Lands Highway Division, proposes modification of the developed area above Carlsbad Cavern because of contamination of the Park's groundwater system and deterioration of Walnut Canyon Road (New Mexico Highway 7), the main entrance to the Park. The NPS proposes to rehabilitate the western parking area and reconfigure/reconstruct the western parking area at the Visitor Center. Water-treatment devices (oil and grit separators) would be installed in the parking areas to remove large amounts of hydrocarbon-carrying sediment and virtually all of the free oil from the parking area runoff. The Bat Cave Draw parking lot would be reconfigured to remove most of the pavement and replace it with native vegetation. A water-treatment device similar to the ones to be placed in the Visitor Center parking areas would be installed here as well. Road rehabilitation would resurface approximately 7.5 miles of Walnut Canyon Road from Whites City, New Mexico, westerly to the Visitor Center (Figure 2 and Figure 3). Additionally, all paved pullouts and parking areas immediately associated with the roadway would be rehabilitated with new surfacing materials. The pullout at the Rock Shelter Exhibit would be redesigned to have a single access point where two currently exist; the second access would be obliterated, recontoured, and revegetated with native plants to match the surrounding terrain. There would be no night-time work anywhere in the project area, and any work proposed for weekends or holidays would require written authorization from the Park Superintendent.

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The proposed action comprises two distinct purposes and needs: (1) parking lot reconfiguration and (2) road rehabilitation. The purpose of the Visitor Center parking lot reconfiguration is to prevent the continuing contamination of portions of Carlsbad Cavern and the associated groundwater by parking lot runoff and to provide improved traffic circulation patterns for visitors and staff. The parking lot reconfiguration is needed to protect cave resources and groundwater from continuing exposure to contamination by parking area runoff. As part of the effort to prevent future contamination of the Carlsbad Cavern ecosystem and its associated groundwater and to provide a safe visitor experience, the proposed parking lot reconfiguration would reduce the paved parking surface and provide for control, collection, and treatment of parking lot runoff.

The purpose of the road rehabilitation is to replace the existing deteriorated pavement on the entrance road, the only access to the Park's Visitor Center from U.S. Highway 62/180. Due to the age of the asphalt cement materials on the road and paved ditches, as well as the increased weight load from recreational vehicles and buses, the existing pavement exhibits varying degrees

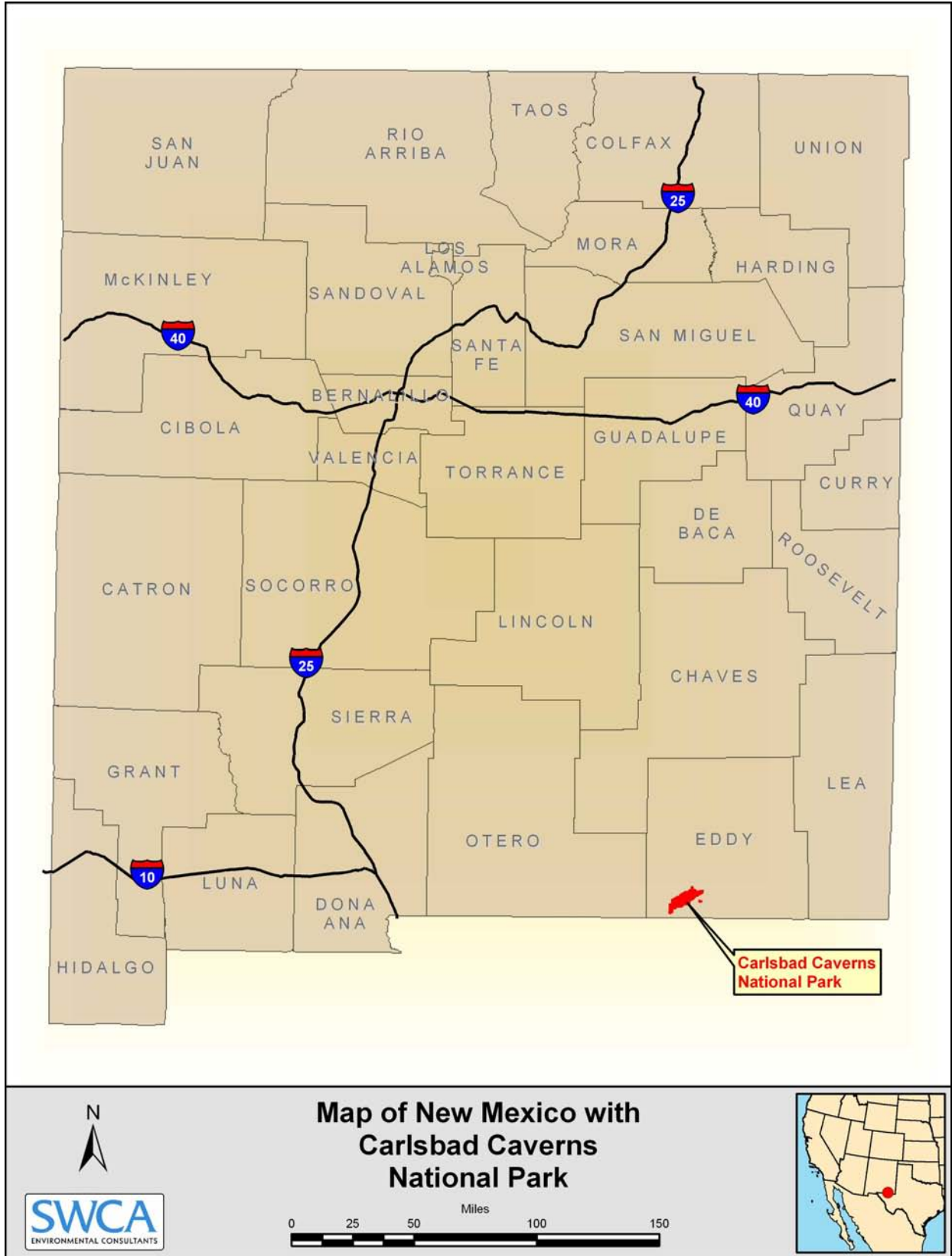
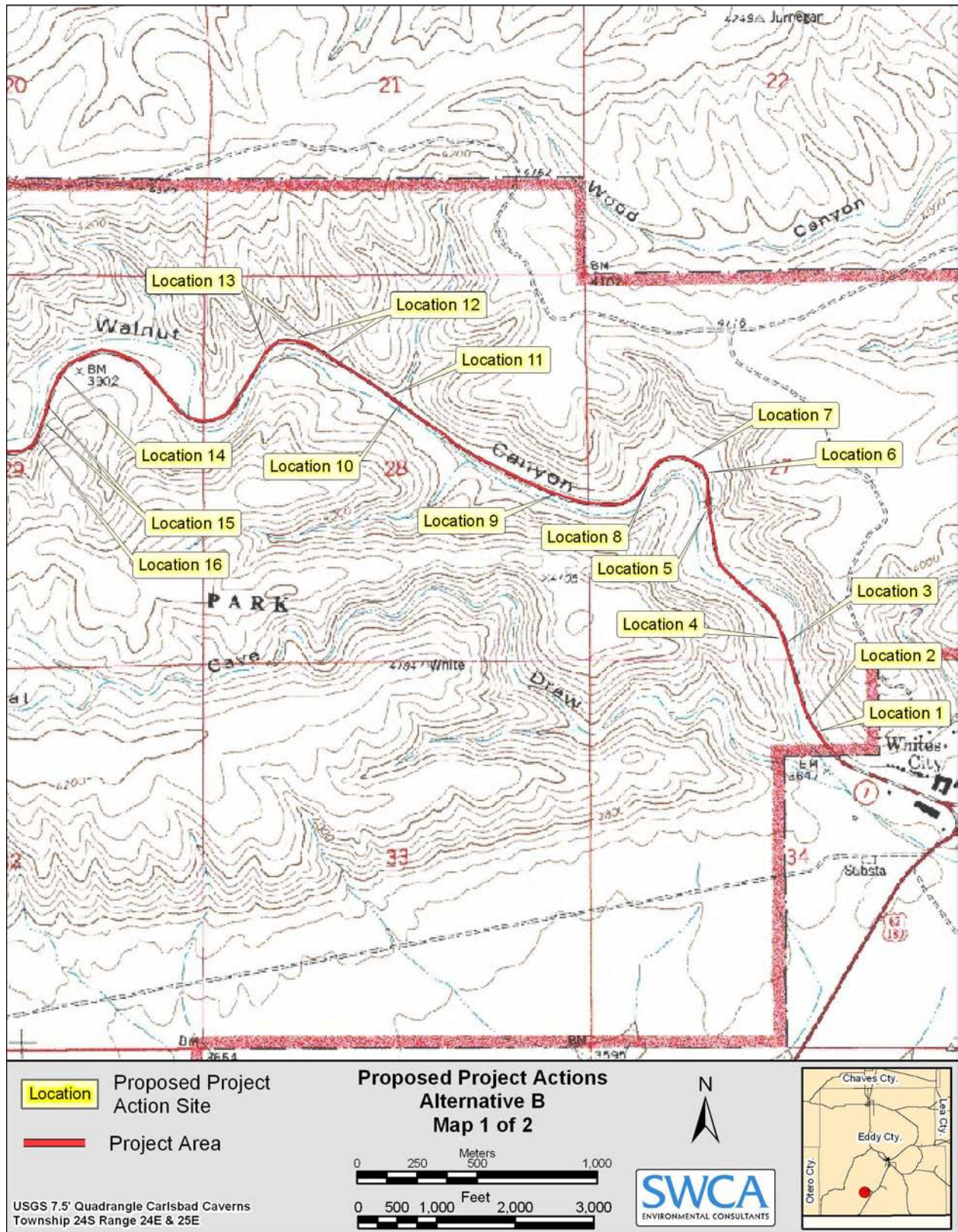
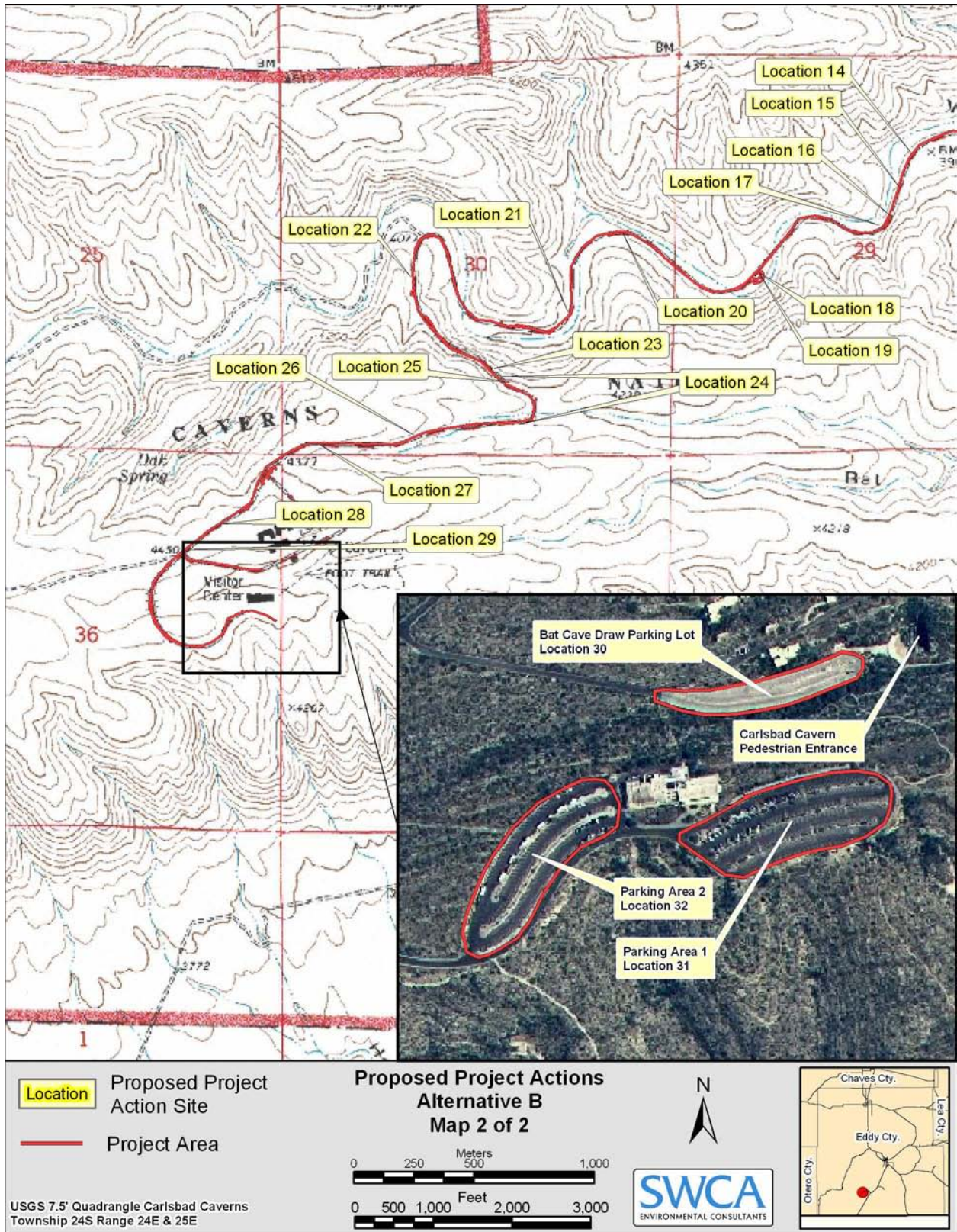


Figure 1. Project location map.



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Figure 2. Project area map 1 of 2, west half of project area.



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Figure 3. Project area map 2 of 2, east half of project area.

of failure and requires frequent repairs. To prevent impacts to Park operations and the visitor experience, the deteriorating pavement would be replaced, social pullouts would be paved or closed, and existing subgrade materials, culverts, masonry walls, and erosion control structures would be replaced or repaired as necessary.

In summary, the proposed project is needed to accomplish the following objectives:

- Reduce or eliminate contamination of Carlsbad Cavern and its associated groundwater
- Replace the old, deteriorating pavement on Walnut Canyon Road, the entrance to the Park
- Update the design of the public parking areas
- Formalize the road pullouts along Walnut Canyon Road

FEDERAL LANDS HIGHWAY PROGRAM

The project that is the subject of this environmental assessment (EA), Reconstruction of Visitor Center Parking Areas and Rehabilitation of Walnut Canyon Entrance Road, Carlsbad Caverns National Park, would be funded through the Federal Lands Highway Program. The FHWA/Central Federal Lands Highway Division is a cooperating agency on the design of the project.

Approximately 30 percent of the land in the United States is under the jurisdiction of the federal government. As such, the transportation needs of these lands are not the responsibility of state or local governments. The primary purpose of the Federal Lands Highway Program, created by the 1982 Surface Transportation Assistance Act, is to provide funding for a coordinated program of public roads to serve the transportation needs of federal lands. These roads support recreational travel and tourism, protect and enhance natural resources, provide sustained economic development in rural areas, and provide needed transportation access for Native Americans.

The FHWA, through interagency agreements with federal land managing agencies such as the NPS, administers a coordinated federal lands program consisting of forest highways, public lands highways, park roads and parkways, refuge roads, and reservation roads. This program provides funding for more than 90,000 miles of federally owned and public-authority-owned roads that serve federal lands. Program funds allocated to the NPS may be used only on the approximately 8,000 miles of public park roads and parkways that are under NPS jurisdiction.

In accordance with interagency agreements, the NPS and the FHWA jointly administer the program. The NPS develops a priority program of projects within available funding. The FHWA undertakes a majority of the design and construction tasks, and the NPS is responsible for planning, environmental issues, and protection of park values.

ENVIRONMENTAL ASSESSMENT

An EA analyzes a project's preferred alternative and other alternatives and their impacts on the environment. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR] 1508.9); the NPS's Director's Order (DO)-12—Conservation Planning, Environmental Impact Analysis, and Decision-Making (National Park Service [NPS] 2001); and the National Historic Preservation Act (NHPA) of 1966 (as amended [16 United States Code (U.S.C) §470]).

PURPOSE AND SIGNIFICANCE OF THE PARK

An essential part of the planning process is to understand the purpose, significance, and mission of the park for which the EA is being prepared. In the case of Carlsbad Caverns National Park, this understanding will allow determination of the best alternative for the rehabilitation and resurfacing activities proposed in this EA.

PARK PURPOSE

Park purpose statements are based on national park legislative history and NPS policies. They reaffirm the reasons for which a national park was set aside as a unit of the national park system and provide the foundation for national park management and use.

The purpose of Carlsbad Caverns National Park, which includes 113 known caves, as stated in the Final General Management Plan/Environmental Impact Statement (General Management Plan) (NPS 1996:4), is to:

- preserve and protect cave resources, the Chihuahuan Desert ecosystem, and the Capitan Reef in the Park, as well as associated natural and cultural resources
- provide a range of opportunities for public use, enjoyment, and understanding, while minimizing impacts on Park resources and natural processes
- facilitate research to provide a continuum of information in support of Park interpretation and management decisions and to add to the general body of scientific knowledge

PARK SIGNIFICANCE

Park significance statements capture the essence of a national park's importance to the natural and cultural heritage of the United States. Significance statements do not inventory a park's resources; rather, they describe the park's distinctiveness and help place the park within its regional, national, and international context. Defining national park significance helps park managers make decisions that preserve the resources and values necessary to accomplish the purpose of a park. According to the Park's General Management Plan,

The significance of Carlsbad Caverns National Park explains why the Park is important to our natural and cultural heritage. Together with the purpose

statements, the significance statements establish the foundation for this general management plan's recommendations for how the Park should be managed and used [NPS 1996:4].

Carlsbad Caverns National Park, a designated World Heritage Site, contains the deepest limestone cave in the United States and one of the largest easily accessible cave rooms in the world. The Park also has other unique features:

- Carlsbad Cavern reveals surprisingly large chambers with formations unsurpassed in variety and beauty.
- Lechuguilla Cave contains some of the world's most spectacular speleothems (cave formations), including features found nowhere else in the world.
- The caves of the Park have been formed through sulfuric acid dissolution, a process distinctly different from that taking place in most caves in the world.
- The Park provides a sanctuary for an easily viewed, world-famous colony of Brazilian (Mexican) free-tailed bats, as well as other faunal species, some of which are rare and endangered.
- The Park preserves one of the best exposures of Permian-age fossil reefs in the world.
- Remarkable new species of microbes continue to be discovered in the caves of the Park, offering great potential for research and understanding.
- The nature and extent of cave speleothems provide opportunities to understand past and present climates in the southwestern area of the United States, including Pleistocene era and more recent environments.
- The Park protects a wide range of important fossil resources, including one of the continent's most diverse assemblages of Pleistocene faunal remains.
- The Park protects an intact portion of the Chihuahuan Desert ecosystem, the most biologically diverse desert ecosystem in North America.
- Over 71 percent of the Park is federally designated as Wilderness, where visitors can experience a natural sound environment, clear night skies, expansive vistas, and opportunities for solitude.
- The entire Park enjoys Class I air quality, the highest category recognized under the 1963 Clean Air Act.
- The cultural resources of the Park include two National Register of Historic Places (NRHP) historic districts (the Caverns Historic District [District] and Rattlesnake Springs cultural landscape), 30 historic structures, and nearly one million museum objects, reflecting enduring and diverse use of this desert landscape.
- The Park protects more than 250 archeological sites, including many surface pictograph sites and at least one example of cave dark zone rock art.
- Fourteen Native American tribes have longstanding and ongoing relationships with the landscape that is now Carlsbad Caverns National Park.

- Surrounded by desert, Rattlesnake Springs is an important riparian area and is populated by a rich diversity of birds and other fauna.

PROJECT BACKGROUND, PREVIOUS PLANNING, SCOPING, AND VALUE ANALYSIS

PREVIOUS PLANNING

Previous planning has been completed for the Park. The Carlsbad Caverns National Park Final General Management Plan (NPS 1996) gave rise to a study of the effects of development on groundwater infiltration and cave resources. In 2002, the Carlsbad Cavern Resource Protection Plan included two options for rehabilitating the road system (NPS 2002a). Natural Heritage New Mexico, a program of the University of New Mexico, was contracted to perform a rare plant survey of the Walnut Canyon entrance road (Tonne 2004). General maintenance and protection of public access roads, parking, and pullout areas is also a consideration in the current Fire Management Plan (NPS 2005).

SCOPING

Scoping is the effort to involve agencies and citizens in determining the nature and extent of issues to be addressed in an EA. Scoping determines important issues and eliminates issues that are not important; allocates assignments among the interdisciplinary team members and/or other participating agencies; identifies related projects and associated documents; identifies permits, surveys, consultations, and other requirements of oversight agencies; and creates a schedule that allows adequate time to prepare and distribute the EA for public review and comment before a final decision is made. Scoping provides an opportunity for early input from any interested agency, or any agency with project area jurisdiction by law or expertise. Internal scoping was completed for the proposed road and parking lot improvements during project planning meetings. The following planning and scoping meetings included personnel from the Park, the NPS Denver Service Center (DSC), and the FHWA Central Lands Federal Highway Office:

- December 12, 2002—Initial Project Scoping Trip and Signed Project Agreement
- March 19, 2003—Preliminary Site Review/Data Collection
- June 26, 2003—30% Design Review
- December 2, 2003—Intermittent Design Review
- May 3–4, 2004—Choosing by Advantages/Value Analysis
- October 26, 2004—Environmental Compliance Kick-Off Meeting and Site Visit

VALUE ANALYSIS

Value Analysis (VA) is a process of arriving at an optimal solution to a complex issue through a structured and reasoned analysis of the factors and functions related to the issue. On May 3–4, 2004, a Choosing By Advantages (CBA)/VA was conducted at the Park for the Visitor Center parking lot reconfiguration portion of the proposed action. Issues addressed during the CBA/VA

included capacity, accessibility, impacts to cave resources, traffic flow and circulation, and signage. Members of the CBA/VA team considered four alternatives to improve parking lot operational efficiency, reliability, and sustainability and to protect cave resources. From these four alternatives, the CBA/VA team selected one option that best met the team's goals and allowed for the greatest flexibility to achieve the goals in the most cost effective and sustainable manner. The alternative selected during the CBA/VA process is presented in this document as the preferred alternative and is compared to the no action alternative.

The proposed road rehabilitation is a rehabilitation project and was not subject to the CBA/VA process.

ISSUES AND IMPACT TOPICS

The NEPA, the national charter for the protection of the environment, calls for an examination of impacts on all components of affected ecosystems. NPS policy is to protect the natural abundance and diversity of all naturally occurring communities in national parks. The 2001 NPS Management Policies (NPS 2000a), NPS 77 (Natural Resources Management), and the Carlsbad Cavern Resource Protection Plan (NPS 2002a), among other NPS and Park policies, provide general direction for the protection of the natural and cultural resources, processes, systems, and values associated with the Park.

ISSUES AND DERIVATION OF IMPACT TOPICS

The principal issue affecting this proposal is the conformance of the project with the Carlsbad Caverns Final General Management Plan (NPS 1996) and the Carlsbad Cavern Resource Protection Plan (NPS 2002a). Other issues and concerns related to the proposed project were identified during resource management planning and through input from Park employees, Native American pueblos and tribes, and state and federal agencies. Specific impact topics were developed as a focus for discussions and to allow comparison of the environmental consequences of each alternative. Impact topics were preliminarily screened for potential effects from the proposed project, as shown in Table 1 and discussed in the following sections.

IMPACT TOPICS INCLUDED IN THIS DOCUMENT

Those impact topics with potential for significant direct, indirect, long-term, or short-term impacts from the project were carried forward. These impact topics were identified based on federal laws, regulations, Executive Orders, 2001 NPS Management Policies (NPS 2001), and NPS knowledge of limited or easily impacted resources. The list of potential resource effects to be considered for this project is taken from DO 12, Handbook 12 (as amended; NPS 2001), and the project assessment completed by NPS personnel prior to the initiation of the EA. The impact topics relating to potential project activities are cave resources and groundwater quality, special status species, visitor experience, park operations, historic structures, and cultural landscapes.

Table 1. Derivation of Impact Topics to be Included for Further Study

Impact Topic	Potential Concern for this Project	Considered in Environmental Consequences Analysis
Geohazards	No likely effects	No
Geological Resources	No likely effects	No
Soils	No likely effects	No
Cave Resources and Groundwater Quality	Both alternatives have the potential to affect water quality and sensitive cave resources in the project area.	Yes
Air Quality	No likely effects	No
Soundscapes	Temporary and negligible effects only	No
Visual Resources	May be minimally affected during construction phase	No
Surface Water Resources	Minimal effects with implementation of required Best Management Practices (BMPs)	No
Wetlands and Floodplains	None in project area	No
Habitats, Rare or Unusual Vegetation	Except for special status plants, rare or unusual vegetation is not likely to be affected.	No. However, special status plant species and their habitats are evaluated.
Wildlife	Except for special status species, terrestrial wildlife effects would likely remain the same with implementation of this project.	No. However, special status wildlife species and their habitats are evaluated.
Unique or Important Terrestrial Wildlife or Wildlife Habitat	No likely effects	No. However, special status wildlife species and their habitats are evaluated.
Wilderness Values	None present	No

Table 1. Derivation of Impact Topics to be Included for Further Study (continued)

Impact Topic	Potential Concern for this Project	Considered in Environmental Consequences Analysis
Vegetation	No likely effects	No. However, special status plant species and their habitats are evaluated.
Special Status Species	The project may affect special status species located in or near the project area.	Yes
Visitor Experience	Both alternatives may potentially affect aesthetics and visitor experience.	Yes
Park Operations	Park operations could be affected by either alternative.	Yes
Archeology	No likely effects	No
Ethnographic Resources	No likely effects	No
Museum Objects	No likely effects	No
Historic Structures	The proposed action could adversely affect historic structures.	Yes
Cultural Landscapes	The proposed action could adversely affect cultural landscapes.	Yes
Indian Trust Assets	None present	No
Socioeconomics	No likely effects	No
Environmental Justice	No likely effects	No

Cave Resources and Groundwater Quality

Both alternatives described in this document have the potential to affect water quality in the project area, and any contaminants that are generated at the surface and enter the groundwater will reach Carlsbad Cavern or other cave systems (known or unknown) and, eventually, the water table. For this reason, cave resources and groundwater quality are linked as a single Impact Topic within this EA. The 1972 Federal Water Pollution Control Act, as amended by the Clean Water Act (CWA) of 1977, is a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters, to enhance the quality of water resources, and to prevent, control, and abate water pollution. The 2001 NPS Management Policies provide direction for the preservation, use, and quality of water originating, flowing through, or adjacent to park boundaries. The NPS seeks to restore, maintain, and enhance the quality of all surface water and groundwater within the national parks, consistent with the 1972 Federal Water Pollution Control Act, as amended, and other applicable federal, state, and local laws and regulations.

Special Status Species

The Endangered Species Act (ESA) of 1973 (16 United States Code [U.S.C.] §§1531–1544) requires an examination of impacts on all federally listed threatened or endangered species. NPS policy also requires examining the impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species and local species of special concern identified by the Park. Because ground-disturbing activities and extremely loud noises during construction could cause impacts to local species of concern, all special status species are discussed as an impact topic, including birds protected by the Migratory Bird Treaty Act of 1913 (MBTA) (16 U.S.C. §§703–712).

Visitor Experience

According to the Organic Act, providing for visitor enjoyment is one of the basic purposes of the NPS. The Final General Management Plan/Environmental Impact Statement for Carlsbad Caverns National Park (NPS 1996) and other Park management documents reaffirm the importance and significance of recreational values and established provisions for recreational uses by providing quality facilities for a meaningful visitor experience. Both the no action alternative and the preferred alternative have the potential to variously affect the visitor experience at the Park. Therefore, visitor experience is addressed as an impact topic in this EA.

Park Operations

Park operations associated with maintaining Walnut Canyon Road, the Visitor Center parking area, and cave resources could be affected by either of the alternatives described in this document. Therefore, Park operations is addressed as an impact topic in this EA.

Historic Structures

Historic structures, including historic buildings and other engineered features, are protected by the NHPA of 1966 (16 U.S.C. §470, as amended), the NEPA (42 U.S.C. §§4321 et seq.), and the Archeological Resources Protection Act of 1979 (16 U.S.C. §§470aa–470mm). NPS policy

regarding cultural resources includes DO 12 (NPS 2001), DO 28—Cultural Resource Management (NPS 1998a), and the NPS Management Policies 2001 (NPS 2000a).

The Bat Cave Draw parking area is part of and located within the Caverns Historic District. The Bat Cave Draw parking area would be affected by the proposed project, and historic structures are therefore analyzed further in this document.

Cultural Landscapes

The District nomination identified various buildings, structures, and trails within the District as contributing. The 2006 Park-approved Cultural Landscape Inventory broadens the nominated area by taking a landscapes approach, adding a number of landscape elements as contributing, and proposing an expansion of District boundaries to include significant landscape areas. The preferred alternative would affect overall landscape character within the existing District and the proposed expansion. Contributing circulation patterns, spatial organization, vegetation patterns, and views would be affected in addition to specific historic structures. Therefore, cultural landscapes are discussed as an impact topic.

IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

Other resource categories were considered but were not carried through full analysis. These categories and the reasons for their exclusion are discussed in this section.

Geohazards

In accordance with NPS Management Policies 2001 (NPS 2000a), the NPS is charged with preserving unimpaired some naturally occurring geologic processes that have the potential to be hazardous to humans and park infrastructure. These processes include earthquakes, volcanic eruptions, mudflows, landslides, floods, shoreline processes, tsunamis, and avalanches. The NPS tries to avoid placing new visitor and other facilities in geologically hazardous areas. Superintendents have examined the feasibility of rehabilitating and resurfacing roads and parking lots subject to hazardous processes, consistent with other sections of these management policies. This project would take place in an area that does not exhibit geological hazards. Therefore, this impact topic was not further analyzed.

Geologic Resources

Both the no action alternative and the preferred alternative would take place within the constructed limits of existing features—the entrance road and parking lots—with the exception of small areas of cliff face that may be affected by activities along the entrance road. At these locations, the cliffs would be hand-scaled to remove loose rock, which is a hazard to construction crews and the traveling public. The scaling would take place within defined areas and be carried out by a worker in a cherry picker to minimize impacts to the cliff face during rock removal. Impacts from hand-scaling of cliffs would be adverse and long term, but negligible. Therefore, the topic of geologic resources is dismissed from further consideration.

Soils

The soils of the Park are predominantly limestone rock land soils, often the residuum from weathered limestone. They are very shallow, stony, and rocky, and occur on mesa tops, on side slopes, and as older, deeper deposits on bajadas and within canyon bottoms. Vegetation is sparse due to the shallow depth and rocky nature of the soil. If vegetation is removed, these soils are very erodible.

The no action alternative would leave the road and parking lots in their present condition and location. There would be no construction activity or removal of vegetation that could increase soil erosion, and there would be no impact to soils within the Park. Contaminants from parking lot runoff would continue to threaten the cave ecosystem and resources.

The preferred alternative would result in a minor, long-term increase in permeable vegetated soils. About 1.8 acres of existing paved and gravel parking lots and driving surfaces at the Bat Cave Draw parking lot, the two Visitor Center parking lots, and the 12 social pullouts along the entrance road would be reclaimed. Erosion or loss of soils within the reclaimed acreage would be prevented by scarifying the areas, as needed, and replanting with native species.

Under the preferred alternative, about 1 acre of soil would be temporarily disturbed by the clearing of sediment build-up from three arroyos, the placement of new entry signs and traffic signs, and minimal hand-scaling of roadside cliff faces. Additionally, the existing shoulder would be cleared of vegetation for an average distance of about 2 feet from the edge of the pavement. Soils in all of these areas have been disturbed by previous construction activities but have recovered and currently function as wildlife habitat. All of these activities but the hand-scaling would create a locally minor, adverse impact on soils for the short term; the hand-scaling would create a long-term impact. Overall, given the hand-removal techniques to be employed, the amount of rock and soil removed would be negligible. Other short-term impacts to soils might result from sheet flow across the construction areas, causing erosion that could have a minor, adverse effect. Sheet flow and associated impacts would be controlled and mitigated by the implementation of a Stormwater Pollution Prevention Plan (SWPPP) and associated BMPs.

Short-term impacts to soils would be adverse, localized, and minor and would consist of disturbance and reclamation of 1 acre of soil during sign placement and cleaning of three arroyos. Soils removed from arroyos would be stored and used for later reclamation, as detailed in the mitigation table (Soils). The project would not remove soil from the temporary disturbance locations, and soils disturbed by construction (digging holes) would remain and be spread in the immediate area.

In the long term, there would be a net reduction in impermeable (paved) or gravel surfaces at nine social pullouts, sidewalks, and parking lots. In these areas, surface soil resources would be restored to natural conditions, and impacts would be minor and beneficial over the long term and limited to the project area. Therefore, this impact topic was dismissed from further consideration.

Air Quality

The 1963 Clean Air Act, as amended (42 U.S.C. §§7401 et seq.), requires land managers to protect air quality. Section 118 of the Clean Air Act requires national parks to meet all federal,

state, and local air pollution standards. The Clean Air Act also states that the federal land manager has an affirmative responsibility to protect the park's air-quality-related values (including visibility, plants, animals, soils, water quality, cultural and historic resources and objects, and visitor health) from adverse air pollution impacts. The Park is classified as a Class I air quality area under the Clean Air Act, as amended, and the NPS Management Policies (2000a) address the need to analyze potential impacts to air quality during Park planning.

Should the preferred alternative be selected, local air quality would be temporarily affected by dust and vehicle emissions. Hauling material and operating equipment during the construction period would result in increased vehicle exhaust and emissions. However, hydrocarbon, NO₂, and SO₂ emissions would be rapidly dissipated by air drainage, since air stagnation is rare at the project site.

Fugitive dust plumes from construction equipment would intermittently increase airborne particulates in the area near the project site, but loading rates are not expected to be appreciable. To partially mitigate these effects, such activity would be coupled with water sprinkling to reduce dust.

There would be temporary increases in localized air pollution during construction of the project, primarily from operation of the construction equipment. To reduce construction equipment emissions, the Park would apply appropriate mitigation measures limiting idling of construction vehicles.

Overall, there would be a negligible, adverse, and short-term degradation of local air quality due to dust generated from construction activities and emissions from construction equipment. These effects would last only for the duration of the construction, and the Park's Class I air quality would not be expected to experience any long-term adverse effects from the proposed project. Therefore, air quality was dismissed as an impact topic in this document.

Soundscapes

In accordance with NPS Management Policies 2001 (NPS 2000a) and DO 47—Sound Preservation and Noise Management (NPS 2000b), an important part of the NPS mission is to preserve natural soundscapes associated with national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive, and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound that are considered acceptable vary among NPS units, as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas. Hauling material, operating equipment, and other construction activities could result in dissonant human-caused sounds.

Any impacts to the Park's soundscape would be temporary and would occur only during construction periods. Because any dissonant construction-related sounds would constitute short-term and negligible impacts on visitor enjoyment of the Park, soundscape management was dismissed as an impact topic.

Visual Resources

There would be negligible to minor impacts to visual resources, especially during construction within the District. Construction activities, equipment, and traffic control measures would impact visual resources in the short-term by obstructing roadside scenery and views of the historic stone masonry features along the entrance road. These impacts are addressed under Cultural Landscapes, and are short-term, localized, and negligible to minor, and visual resources is therefore dismissed as an impact topic.

Surface Water Resources

There are no perennial streams or marine or estuarine resources within the construction limits of the preferred alternative. The entrance road crosses 22 intermittent drainages. At each crossing, existing culverts allow water carried by the drainages to pass under the roadway. The drainages are jurisdictional waters of the United States, and any work conducted within the drainages would require compliance with the Federal Water Pollution Control Act (33 U.S.C.), known as the Clean Water Act (CWA), and State of New Mexico surface water quality certification.

Under both the no action alternative and the preferred alternative, proposed changes to current roads and parking lots would not alter erosion or percolation sufficiently to affect surface water resources within the boundaries of the Park. Implementation of required BMPs under a SWPPP would mitigate any impacts to surface water during construction. Impacts to surface water resources would be adverse, negligible, and temporary. Therefore, impacts to stream flow and other surface-water resources have been dismissed as an impact topic.

Wetlands and Floodplains

Executive Order 11990, Protection of Wetlands (Federal Register [FR] 1977a), and DO 77-1 (NPS 2002b) provide protection for wetlands. Floodplains are covered under Executive Order 11988 (Floodplain Management [FR 1977b]). Guidelines governing proposed actions in park floodplains are found in the NPS Management Policies 2001 (NPS 2000a); DO 2—Planning Guidelines (NPS 1998b); DO 12—Conservation Planning, Environmental Impact Analysis, and Decision-Making (NPS 2001); and DO 77-2—Floodplain Management (NPS 2003). There are no wetlands or 100-year floodplain areas within the proposed project area of the Park. Therefore, wetlands and floodplains has been dismissed as an impact topic.

Rare or Unusual Vegetation Habitats

Proposed construction activities would affect some landscaped vegetation communities around the Visitor Center parking lots. Rehabilitation of access roads would temporarily impact some habitat types along the right-of-way, but none of these habitats is rare or unusual. The NPS has a long-term strategic goal of protecting the condition of riparian resources, and desert riparian vegetation occurs where the road crosses Walnut Canyon. The described project would resurface the existing roadbed, avoiding any specific vegetation or habitats flagged by the Park biologist for avoidance. Therefore, impacts to riparian vegetation or other sensitive vegetation are not anticipated. Rocky outcrops and cliff faces are also identified as subject to disturbance during the proposed project. These areas provide unique and specialized habitats for special status plants that have been identified in the project area. However, these plants and their habitats are

considered under the impact topic of special status species. Therefore, rare or unusual vegetation habitats were dismissed as a separate impact topic.

Wildlife

Loss of wildlife would be proportional to the amount of habitat lost. Although wildlife inhabiting the areas of the existing road corridor, pullouts, parking areas, and nearby areas has existed in close association with vehicles and attendant human activity for years, these wild species remain vulnerable to vehicle traffic. Furthermore, traffic delays due to construction events would result in vehicles idling in long lines, then traveling from the construction site in dense, staggered groups, resulting in a change in normal traffic flow during the construction period.

Overall, populations of affected species might be slightly and temporarily lowered during construction, but no permanent negative effects on wildlife would be anticipated. Long-term habitat reclamation (converting previously paved or gravel areas to vegetated areas) would yield a net increase in wildlife habitat. The preferred alternative would result in short-term, negligible, adverse effects to wildlife during construction and long-term, negligible benefits. Because the adverse and beneficial impacts would be negligible, wildlife is dismissed as an impact topic.

Unique or Important Terrestrial Wildlife or Wildlife Habitat

The Park exhibits a diversity of vegetation and habitat types, which in turn support a diversity of wildlife and a species composition peculiar to those habitats, including habitats found in the project area. There are no designated critical wildlife habitat areas within the construction limits of the proposed project. Therefore, at this broader scale, unique or important terrestrial wildlife or wildlife habitat has been dismissed as an impact topic. Several wildlife species are listed as threatened, endangered, or special status species. These species and their specialized habitats are considered under the impact topic of special status species. Therefore, unique or important terrestrial wildlife or wildlife habitats is dismissed as a separate impact topic.

Wilderness Values

The Wilderness Act of 1964 (16 U.S.C. §§1131–1136) “established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as ‘wilderness areas,’ [to] be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness.” Wilderness has been designated in about 71 percent (33,125 acres) of the Park’s 47,000 acres. All proposed activities would occur within the high public use areas of roads and parking lots, and construction and rehabilitation activities would not directly impact any of the designated wilderness areas. There could be impacts to users of the wilderness areas nearest to the entrance roads and parking lots from construction noise and from construction activities visible from high points. These impacts would be temporary and negligible, and wilderness values is therefore dismissed as an impact topic.

Vegetation

Vegetation associations form the basis for the existence of both terrestrial and aquatic wildlife species. The principal vegetation regimes at the Park range from Chihuahuan Desert Scrub and Mixed Arroyo Shrubland to Pinchot Juniper Shrubland, grading in and out of Curlyleaf Muhly

Grassland. Rock outcrops and cliffs with regional endemics are also present along Walnut Canyon Road (Tonne 2004).

Under the no action alternative, no impacts to vegetation would occur. Under the preferred alternative, short-term, negligible impacts could result from construction activity, but minor, beneficial impacts are expected in the long term from the decrease in paved areas and increase in 1.76 acres of native vegetation. Except for special status plants, vegetation is dismissed as an impact topic.

Archeology

Significant archeological sites are found throughout the Park. However, a survey of the project area for archeological sites found no new sites within the area of potential effect. Two previously recorded sites, located near Parking Area 1 (east Visitor Center parking area) and the Bat Cave Draw parking lot, would be fenced for protection during the construction period. Therefore, no impacts to archeological resources are anticipated from the proposed project, and archeology was dismissed as an impact topic. If additional archeological resources are inadvertently discovered during construction, specific mitigation measures that would reduce or eliminate the adverse effects would be developed.

Ethnographic Resources

Ethnographic resources are defined by the NPS as any “site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it” (DO 28; NPS 1998a). There are no known ethnographic resources in either the project area or its general vicinity. The Park contacted Native American groups traditionally associated with the Park’s lands, pursuant to Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (FR 2000). The tribes were apprised of the proposed action, by letter, on May 24, 2005. In March 2006, Mescalero Apache Elders visited the Park and identified several locales of significance to them. However, the Project would not adversely impact any ethnographic resources identified during their visit.

Copies of the EA will be forwarded to each associated tribe for review and comment. If any of the tribes should subsequently identify ethnographic resources with the proposed project area, appropriate mitigation measures would be undertaken in consultation with the tribe(s). The location of such ethnographic sites would not be made public. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, all items would be left in situ, and the provisions of the Native American Graves Protection and Repatriation Act of 1990 (43 CFR 10) would be followed.

Museum Objects

The no action alternative and the preferred alternative would not affect the museum collections of the Park. Therefore, the impact topic of museum objects was dismissed from further consideration.

Indian Trust Assets

Secretarial Order 3175 (U.S. Department of the Interior 1993) requires that any anticipated impacts to Indian Trust resources from a proposed project or action by a Department of the Interior agency be explicitly addressed in environmental documents. The federal Indian Trust responsibility is a legally enforceable obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to Native American and Alaska Native tribes. No Indian Trust resources are involved in the rehabilitation and resurfacing activities proposed in this EA; that is, none of the lands comprising the Park are held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, Indian Trust assets was dismissed as an impact topic.

Socioeconomics

The preferred alternative would neither change local and regional land use nor appreciably impact local businesses or other agencies. Implementing the preferred alternative could provide a negligible, short-term, beneficial impact to the economy of Eddy County (e.g., minimal increases in employment opportunities for the construction workforce and in revenues for local businesses and government, generated by construction activities and workers). Any increase, however, would be temporary and negligible, lasting only as long as the duration of construction. Therefore, socioeconomics was dismissed as an impact topic.

Environmental Justice

Presidential Executive Order 12898, “General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” (FR 1994), requires all federal agencies to incorporate environmental justice concerns into their missions by identifying and addressing disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The preferred alternative would not have health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency’s Environmental Justice Implementation Plan (Environmental Protection Agency 1996). Therefore, environmental justice was dismissed as an impact topic.

ALTERNATIVES

INTRODUCTION

This section describes the no action alternative and the preferred alternative for road and parking lot improvements at the Park.

THE NO ACTION ALTERNATIVE (ALTERNATIVE A)

The no action alternative describes the action of continuing the present management operation and condition. It does not imply or direct discontinuation of the present action or removal of existing uses, developments, or facilities. The no action alternative provides a basis for comparing the management direction and environmental consequences of the preferred alternative. Should the no action alternative be selected, the NPS would respond to future needs and conditions associated with the Park's Visitor Center without major actions or changes in the present course.

The no action alternative would leave the roads and parking lots as they are. The main Park entrance road would not be resurfaced and would continue to develop cracks and potholes due to its age and lack of flexibility and resilience, damage that Park maintenance staff would continue to have to repair. The three parking lots would not be resized and updated. Parking lot runoff would not be treated with oil and grit separators, and drainage of automobile byproducts would continue to infiltrate and negatively impact Carlsbad Cavern and its associated groundwater. Pullouts along Walnut Canyon Road would not be formalized, and visitors would continue to pull off the road, impacting park resources such as soils and vegetation. Any improvements to the roads and the parking facilities would be made incrementally, as funds become available.

THE PREFERRED ALTERNATIVE (ALTERNATIVE B)

The preferred alternative presents the NPS proposed action and defines the rationale for the action in terms of resource protection and management, visitor and operational use, costs, and other applicable factors.

The NPS has adopted the concept of sustainable design as a guiding principle of facility planning and development. Essentially, sustainability is living within the environment with the least impact on the environment. The objectives of sustainability are to design park facilities to minimize adverse effects on natural and cultural values to reflect their environmental setting, to maintain and encourage biodiversity, to construct and retrofit facilities using energy-efficient materials and building techniques, to operate and maintain facilities to promote their sustainability, and to illustrate and promote conservation principles and practices through sustainable design and ecologically sensitive use. The preferred alternative subscribes to and supports the practice of sustainable planning, design, and use of the entrance road and parking facilities.

This description of the preferred alternative is based on the drawings, typical sections, and summary tables from the design work for the project (FHWA 2003). The preferred alternative consists of multiple specific actions that would take place over a large project area that includes all of the 7.5-mile-long Walnut Canyon Road from the Park entrance to the Visitor Center parking areas. Also included in the project area are both Visitor Center parking areas and the Bat Cave Draw parking area. The specific actions described here are identified in Table 2, along with the proposed disturbance area for each and any reclamation indicated. The locations of all proposed actions are shown in Figures 2 and 3.

Under the preferred alternative, the Park entrance pullout would be improved with a new sidewalk and retaining wall, and the 7.5-mile-long entrance road would be rehabilitated with a new asphalt overlay. The typical roadway section is 24 feet wide, consisting of two 10-foot-wide driving lanes and a 2-foot-wide shoulder on either side of the roadway. Ditches and cut slopes of varying widths complete the existing road prism. New roadway signs would be installed in 62 locations to raise the safety standards of the roadway.

Eleven existing paved or gravel pullouts along Walnut Canyon Road would be repaved. An additional 13 gravel pullouts would be obliterated and revegetated. The end result would be that all pullouts and parking areas immediately associated with the roadway would be rehabilitated with new surfacing materials. The parking lot at the Rock Shelter Exhibit would be redesigned to have only one access; the asphalt and all base materials from the existing second access would be removed, and the soil would be scarified and revegetated.

The NPS would resurface and reconfigure Parking Areas 1 and 2 (East and West Visitor Center parking lots) and the Bat Cave Draw parking lot; all three are within 200 m (220 yards) of the main cavern entrance, as shown in Figure 2. The paved area within Parking Areas 1 and 2 would be slightly reduced, and traffic flow within the lots would be reconfigured. Oil and grit separators would be installed to remove petroleum byproducts from parking lot runoff before it is released into the environment. The Bat Cave Draw parking lot would be reduced in size and reconfigured to accept handicapped parking only. The reduced parking area at Bat Cave would be farther from the Carlsbad Cavern pedestrian entrance than it is at present. The existing asphalt and all base materials would be removed from the abandoned portions of the lot, and those areas would be scarified and seeded with native grasses and plants. New drainage structures would be placed under the reconfigured parking lot, with oil and grit separators to remove petroleum byproducts before runoff is released to the environment.

Some reconstruction of stone-masonry structures built during the early part of the twentieth century could be necessary during the proposed road and parking lot modifications. Other construction would occur as well. Some drainage features would be regraded to clear sediments that have accumulated over the years. The road cuts at the entrance to the maintenance facility, staff offices, and housing area would be scaled using mechanical excavators to remove loose material and improve safety for pedestrians and vehicles.

For safety purposes, cliffs along the main entrance road would be minimally scaled by hand to remove and stabilize loose rock. The cliff faces with loose rock have been identified and total about 1,500 linear feet (455 m). The scaling would take place within defined areas and be carried

out by a worker in a cherry picker so that most of the cliff face would not be directly impacted during rock removal.

For a more detailed description of the existing environment, please see the specific impact topics described in the Affected Environment section of this document. For a more detailed analysis of the proposed project's impact to the Park's resources, please see the Environmental Consequences section of this document.

Table 2. Construction Summary

Proposed Action Element	Description	Purpose	Side of Road	Map Location Code	Acres	Disturbance Type	Long Term Habitat Gain (Acres)
Construction materials storage, equipment staging, and refueling area	Clearing and grubbing of private land for access and materials storage for the duration of the project.	Isolate construction impacts from sensitive resources	NA	NA	TBD	Temporary new disturbance, followed by reclamation	0.00
Walnut Canyon Rd.	Rehabilitate existing road surface and add a new asphalt overlay; rehabilitate 2-foot gravel shoulder.	Visitor safety, improved visitor experience	NA	Figure 1, entire length of Walnut Canyon Road	22.31	Continued constructed roadway and disturbed shoulder	0.00
Walnut Canyon Rd.	Addition or replacement of 62 traffic signs along Walnut Canyon Road.	Visitor safety	Both	Figure 1, variable locations on Walnut Canyon Road	0.14	Temporary, with reclamation	0.00
Pullout3	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Right	Location 1	0.11	Continued disturbance without reclamation	0.00
Entry Sign Rehabilitation	Rehabilitation of Park entrance sign area with a replacement sidewalk and a new stone wall.	Improved visitor experience	Right	Location 2	0.10	Temporary disturbance, followed by reclamation	0.00
Pullout	Removal of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Right	Location 3	0.04	Existing disturbance removed and reclaimed	0.04
Pullout	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 4	0.09	Continued disturbance without reclamation	0.00

Table 2. Construction Summary (continued)

Proposed Action Element	Description	Purpose	Side of Road	Map Location Code	Acres	Disturbance Type	Long Term Habitat Gain (Acres)
Pullout	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 5	0.00	Continued disturbance without reclamation	0.00
Pullout	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Right	Location 6	0.02	Continued disturbance without reclamation	0.00
Pullout	Removal of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Right	Location 7	0.02	Existing disturbance removed and reclaimed	0.02
Pullout	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 8	0.02	Continued disturbance without reclamation	0.00
Pullout	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 9	0.02	Continued disturbance without reclamation	0.00
Ditch Grading	Recontouring of unpaved shoulder and nearby land.	Improved road drainage, visitor safety	Left	Location 10	0.02	Temporary disturbance, followed by reclamation	0.00
Pullout	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Right	Location 11	0.06	Continued disturbance without reclamation	0.00
Rock Scaling	Removal of loose rock and gravel from cliffs with hand tools.	Visitor, construction, and staff safety	Right	Location 12	TBD	New disturbance, reclamation TBD	0.00
Ditch Grading	Recontouring of unpaved shoulder and nearby land.	Improved road drainage, visitor safety	Right	Location 13	0.13	Temporary disturbance, followed by reclamation	0.00
Pullout	Removal of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Right	Location 14	0.01	Existing disturbance removed and reclaimed	0.01
Rock Scaling	Removal of loose rock and gravel from road cut face with hand tools.	Visitor, construction, and staff safety	Left	Location 15	TBD	New disturbance, reclamation TBD	0.00

Table 2. Construction Summary (continued)

Proposed Action Element	Description	Purpose	Side of Road	Map Location Code	Acres	Disturbance Type	Long Term Habitat Gain (Acres)
Pullout	Removal of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 16	0.03	Existing disturbance removed and reclaimed	0.03
Ditch Grading	Recontouring of unpaved shoulder and nearby land.	Improved road drainage, visitor safety	Right	Location 17	0.02	Temporary disturbance, followed by reclamation	0.00
Rock Shelter Exhibit Parking Lot	Removal and reclamation of asphalt and base materials, scarification of soil, and revegetation at one of two entrances.	Traffic flow, visitor experience	Left	Location 18	0.04	Existing disturbance removed and reclaimed	0.04
Rock Shelter Exhibit Parking	Rehabilitate parking lot surface and add a new asphalt overlay.	Traffic flow, visitor experience	Left	Location 19	0.09	Continued disturbance without reclamation	0.00
Pullout	Removal of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 20	0.03	Existing disturbance removed and reclaimed	0.03
Pullout	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Right	Location 21	0.06	Continued disturbance without reclamation	0.00
Pullout	Removal of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Right	Location 22	0.01	Existing disturbance removed and reclaimed	0.01
Pullout	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 23	0.08	Continued disturbance without reclamation	0.00
Scaling Areas	Removal of loose rock and gravel [with hand tools or mechanical excavator].	Visitor safety	Right	Location 24	TBD	New disturbance, reclamation TBD	0.00

Table 2. Construction Summary (continued)

Proposed Action Element	Description	Purpose	Side of Road	Map Location Code	Acres	Disturbance Type	Long Term Habitat Gain (Acres)
Pullout	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 25	0.05	Continued disturbance without reclamation	0.00
Pullout	Resurfacing of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Right	Location 26	0.11	Continuing disturbance without reclamation	0.00
Pullout	Removal of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 27	0.01	Existing disturbance removed and reclaimed	0.01
Pullout	Removal of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 28	0.04	Existing disturbance removed and reclaimed	0.04
Pullout	Removal of existing paved or gravel pullout.	Visitor safety, improved visitor experience	Left	Location 29	0.02	Existing disturbance removed and reclaimed	0.02
Bat Cave Draw Parking Area	Removal of portion of existing paved parking lot.	Reduce runoff from impervious cover	NA	Location 30	1.14	Existing disturbance removed and reclaimed	1.14
Bat Cave Draw Pedestrian Access	Removal of existing sidewalk adjacent to parking lot.	Reduce runoff from impervious cover	NA	Location 30	0.01	Existing disturbance removed and reclaimed	0.01
Bat Cave Draw Parking Area	Reconfiguration and reduction in size of portion of existing paved parking lot, addition of runoff collection system with oil and grit removal, resurfacing.	Reduced runoff from impervious cover, elimination of contaminated runoff to Carlsbad Cavern	NA	Location 30	0.44	Continued disturbance without reclamation	0.00
Bat Cave Draw Parking Area	Addition of 26 permanent signs within the parking area.	Improved traffic flow and handicapped visitor access and experience	NA	Location 30	0.24	Temporary disturbance, followed by reclamation	0.00

Table 2. Construction Summary (continued)

Proposed Action Element	Description	Purpose	Side of Road	Map Location Code	Acres	Disturbance Type	Long Term Habitat Gain (Acres)
Visitor Center Parking Areas 1 & 2 (East and West Lots)	Removal of existing asphalt and gravel base, recontouring, addition of runoff collection system with oil and grit removal, resurfacing.	Elimination of contaminated runoff to Carlsbad Cavern, protection of Cave resources	NA	Location 31 and Location 32	6.71	Continued disturbance without reclamation	0.00
Visitor Center Parking Area 1 (East Lot)	Installation of 30 permanent signs.	Traffic flow, visitor experience	NA	Location 31	0.28	Temporary disturbance, followed by reclamation	0.00
Visitor Center Parking Area 2 (West Lot)	Installation of 10 permanent signs.	Traffic flow, visitor experience	NA	Location 32	0.09	Temporary disturbance, followed by reclamation	0.00
Visitor Center Parking Lot Area 1 (East Lot)	Removal of portion of existing asphalt and all base materials, soil scarification, revegetation.	Elimination of contaminated runoff to Carlsbad Cavern, protection of Cave resources	NA	Location 31	0.35	Existing disturbance removed and reclaimed	0.35

Total Project Area, in Acres: 32.96
 Total Change (Gain) in Habitat, in Acres: 1.76

1 All data from FHWA 2003.

2 Stationing is an engineering term. Numbers are read as distance from the beginning of survey in hundreds of feet. For this project, the beginning of survey is at the intersection of Walnut Canyon Road with U.S. Hwy 62, and station numbers increase as you move along the road toward the Visitor Center. The beginning of the rehabilitation project is at Sta. 28+72, that is, 2872 feet from the intersection with U.S. 62. The designations right and left indicate the right and left sides of the road when looking upstation.

3 Paved and gravel pullouts are disturbed non-habitat areas in their current condition. Obliterating pullouts increases habitat; (re)paving existing pullouts does not increase or decrease habitat.

THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with DO 12 (NPS 2001), the NPS is required to identify the “environmentally preferred alternative” in all environmental documents, including EAs. According to CEQ guidelines for NEPA implementation (40 CFR §§1500–1508), the environmentally preferred alternative is the alternative that would best promote national environmental policy criteria as set forth in Section 101 of NEPA (42 U.S.C. §§4321 et seq.):

1. Fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations
2. Assuring for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings

3. Attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences
4. Preserving important historic, cultural, and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice
5. Achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities
6. Enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources

Generally, these criteria mean that the environmentally preferred alternative is the alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural, and natural resources. In this case, the preferred alternative is also the environmentally preferred alternative.

For NEPA criteria 2, 4, 5, and 6, there is not a discernible difference between the alternatives.

The no action alternative is not the environmentally preferred alternative because it does not:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations (NEPA criterion 1)
- Attain the widest range of beneficial uses of the environment without degradation (NEPA criterion 3)

The existing road and parking lot system that provides access to the Park is failing due to the age of the component structures. In addition, contaminated runoff from the road and parking lots from automobile fluid leakage, including oil, gas, and anti-freeze, is infiltrating the cavern system and its associated groundwater. Continuing under present policy would not address these deficiencies.

The preferred alternative is the environmentally preferred alternative because it:

- Fulfills the responsibilities of each generation as trustee of the environment for succeeding generations (NEPA criterion 1) by protecting the caverns from impacts
- Attains the widest range of beneficial uses of the environment without degradation (NEPA criterion 3) in that it allows continued use of the resource while limiting destructive contamination

Thus, not only does the preferred alternative best meet the purpose and need of this project, it also best fulfills the criteria established by the CEQ. In addition, the preferred alternative would promote and support environmentally sound management of the Park's resources, as outlined in existing NPS Resource Management Plans.

STAGING AREAS

All contractor-related staging for construction supplies and equipment would occur in previously disturbed areas negotiated and approved by the FHWA, Contractor, Park, and other affected parties. Large staging areas would be located outside the Park. Mitigation measures identified in the following section will apply to all construction-related activities, regardless of location. Smaller staging areas would be within the Project's construction limits at the Visitor Center parking areas and along the roadway in designated turnouts. No driving or storage of equipment or supplies would be allowed outside the construction limits. Batch plants, where asphalt and concrete would be prepared for use in construction, would be located outside the Park.

All contractor-selected, noncommercial areas outside of the project limits (including, but not limited to, material sources, disposal sites, waste areas, haul roads, and staging areas) would comply with provisions of the ESA of 1973, the NHPA, and the CWA. Written proof of compliance with these resource protection laws must be satisfactory to the NPS and include: (1) (a) a current U.S. Fish and Wildlife Service (USFWS) list of all threatened or endangered species in the area and (b) a "no effect" determination by a biological specialist, according to Section 7 of the ESA; (2) a historic resources inventory report prepared by a qualified archaeologist (and historic architect, if needed); and (3) a letter report by a specialist qualified to delineate jurisdictional waters.

MITIGATION MEASURES FOR THE PREFERRED ALTERNATIVE

The mitigation measures described below and summarized in Table 3 have been developed as part of the preferred alternative. These measures have been developed in response to adverse impacts identified for specific impact topics in order to lessen the overall impact of the preferred alternative on Park resources. In addition to decreasing adverse effects on impact topics, the mitigation measures may also provide benefits to other resources. Mitigation measures will be incorporated into the contractual documents and construction specifications.

GENERAL CONSTRUCTION SCHEDULE AND COSTS

Repair and rehabilitation work for the Park entrance road and parking lots is currently programmed for fiscal year 2009. Specifics of the project schedule have not been developed, but construction is expected to take less than one year. The construction costs are estimated at approximately \$6,380,000 in fiscal year 2009 dollars.

Table 3. Mitigation Measures Included with the Preferred Alternative

Resource Area	Impact Topics Addressed	Mitigation Measures
General Considerations	<p>Impact Topics: Cave Resources and Groundwater Quality, Special Status Species, Historic Structures, Cultural Landscapes</p> <p>Other resources protected by measure: Wildlife, Vegetation, Geologic Resources, Soils, Archeology</p>	<p>Before construction begins, construction limits would be surveyed and staked and may be marked with construction fencing, tape, flagging, snow fencing, or some similar material, as necessary. The construction limits identify and limit the area of construction activity. The Contractor is responsible for ensuring that all work and all contract employees stay inside the construction limits. All protection measures would be clearly stated in the construction specifications, and workers would be instructed to avoid conducting activities beyond the construction limits.</p> <p>All construction personnel must at all times avoid all caves and archeological sites, and similar park resources outside of the construction limits as well. Temporary structures such as erosion control fencing could be placed outside the area of potential effect (50 feet from the edge of the road on both sides) only after an NPS archeologist has surveyed the area for archeological resources.</p>
		<p>The FHWA's project engineer would ensure that the project remains confined within the parameters established in the compliance documents and that mitigation measures are properly implemented.</p>
		<p>Construction equipment staging would occur within the roadway or parking lots for active work areas or at designated turnouts. Construction-related offices or laboratories would be located outside Park boundaries. Fueling and daily maintenance of all machinery and vehicles would be conducted only in equipment staging or other approved areas. Any spill of hazardous materials, fuel, etc., would be cleaned up immediately. Hazardous materials clean-up kits would be available at the staging area and on any fuel and oil trucks. Equipment would be checked daily to identify and repair any leaks.</p>
	<p>Impact Topics: Special Status Species</p>	<p>If the wind is blowing significant amounts of dust into the Bat Cave Entrance, construction would be stopped until the wind either subsides or changes direction.</p>
	<p>Impact Topics: Special Status Species</p> <p>Other resources protected by measure: Wildlife</p>	<p>Any trenching required during the project would be covered and would have one end sloped to prevent trapping of wildlife. The Contractor would inspect trenches before refilling to ensure that no wildlife would be buried. If any wildlife (lizards, rodents, snakes, etc.) or insects are found, the Contractor would contact a Park biologist and ask for guidance or assistance in removing the wildlife.</p>
		<p>The Contractor would be required to maintain strict trash control so that wildlife is not attracted to the project area. No food scraps would be discarded or fed to wildlife.</p>

Table 3. Mitigation Measures Included with the Preferred Alternative (continued)

Resource Area	Impact Topics Addressed	Mitigation Measures
General Considerations (continued)	Impact Topics: Visitor Experience, Park Operations Other resources protected by measure: Visual Resources	All demolition debris, including visible concrete and metal pieces, would be immediately hauled from the Park to an appropriate disposal location. All tools, equipment, barricades, signs, surplus materials, and rubbish would be removed from the project work limits upon project completion. Any asphalt surfaces or concrete surfaces damaged due to work on the project would be repaired.
	Impact Topics: Cave Resources and Groundwater Quality, Special Status Species Other resources protected by measure: Wildlife, Vegetation, Soils, Surface Water Resources, Wetlands and Floodplains	BMPs for drainage and sediment control would be implemented to prevent or reduce non-point-source pollution and minimize soil loss and sedimentation in drainage areas.
Special Status Species	Impact Topics: Special Status Species	To avoid direct impacts to migratory birds protected by the MBTA, construction and clearing of any vegetation would be scheduled between September 1 and April 1 during the year of construction. If it is not possible to avoid vegetation removal during the breeding season, pre-construction bird surveys up to 100 feet on both sides of the construction limits would be conducted by NPS staff to assure that no breeding birds would be affected. Any positive survey results or observation of affected species would be discussed with the USFWS and the New Mexico Department of Game and Fish (NMDGF) to coordinate nesting area avoidance.
		Before ground-disturbing activities begin, construction workers would be educated about sensitive animals, such as the rock rattlesnake and the gray-banded kingsnake that may be found on the road or adjacent escarpments, so that harm to such species is avoided.
		A Park biologist would be on-site during any scaling activities. As a contract specification, sensitive resource areas would be identified by station marker to station marker, for avoidance or special considerations during construction. Construction workers would be made aware of any sensitive plant populations between the stations along the road corridor so that the plants would be avoided.
		Where there would be ground disturbance, the Contractor would search the area for breeding mammals. If evidence of active breeding is found, the Contractor would contact a Park biologist and ask for guidance or assistance before continuing to work in the area.
		Contractor-selected, noncommercial areas outside of the project limits (including but not limited to material sources, disposal sites, waste areas, haul roads, and staging areas) would not encroach upon any species protected under the ESA of 1973.
		Between March and November in the Bat Cave Draw parking area there would be no loud noises or heavy pounding from construction equipment or demolition activities.
		To avoid disturbance of bats, nighttime construction would not be permitted.

Table 3. Mitigation Measures Included with the Preferred Alternative (continued)

Resource Area	Impact Topics Addressed	Mitigation Measures
<p>Visitor Experience</p>	<p>Impact Topics: Visitor Experience, Park Operations</p>	<p>Total construction-related traffic delays would be limited to 30 minutes in each direction when there are fewer than 10 vehicles per hour. Delays would be limited to a maximum of 20 minutes in each direction when there are more than 10 vehicles per hour. Flaggers would record delay times at stopping points, and the results would be reported to the FHWA's project engineer. Immediate access would be provided to any emergency vehicles. The Contractor would be required to submit a traffic management plan for review and approval by the Park and the FHWA.</p>
		<p>Flaggers, pilot cars, signing, variable message signs, and/or the newest technology, as appropriate, would be used to manage traffic.</p>
		<p>No holiday or weekend (Saturday and Sunday) work would be permitted without specific written authorization of the Park Superintendent.</p>
		<p>During times that the road is open to the public, construction operations would occur on only part of the road width so that one traffic lane would be open at all times for the total length of the road, under alternate one-way traffic control.</p> <p>Limited occasions, such as replacement of deep culverts or unforeseen problems, may require temporary short-term full closure of the road. Such full closures would be for the minimal time required to complete the work activity or correct the problem. No more than two sections of road would be under alternate one-way traffic control at any one time.</p>
		<p>A traffic management plan would be required from the Contractor for review and approval by the FHWA and the Park. This plan would include: proposed areas of construction and anticipated delays; safety considerations; estimated lengths of delay; and estimated number of vehicles stopped at any one point, as applicable to the construction. The 30-minute delay in each direction would be considered maximum, and the plans would include proposals for less than 30-minute delays for the total length of the road. The plan would also include, as necessary, a limit on the number of vehicles that could be stopped at any one point to avoid backup into critical areas such as intersections.</p>
		<p>The Contractor would provide a weekly delay schedule with daily updates to the FHWA's project engineer for management of visitation and Park operations.</p>
		<p>Announcement through public release to radio stations, press, publications, other public information outlets, and Web sites, as appropriate, would be used as needed. The Contractor would also provide daily delay schedules, variable message boards coordinated with the FHWA's project engineer, and temporary construction signs inside and outside the Park.</p>
		<p>Walnut Canyon Road (the Park entrance road) would be closed to bicycle traffic during the construction period because of safety concerns.</p>

Table 3. Mitigation Measures Included with the Preferred Alternative (continued)

Resource Area	Impact Topics Addressed	Mitigation Measures
Cultural Resources	Impact Topics: Historic Structures	The Bat Cave Draw parking lot retaining wall and other structures in the District have been recorded in detail (NPS 1986). Mitigation of impacts to the wall would include dismantling, recovery, and reuse of the masonry elements for any new wall construction within the parking lot, in accordance with Department of the Interior Standards for Treatment of Historic Properties and Cultural Landscapes, Standard 5, for rehabilitation: "distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property would be preserved." Any damage to the stone or mortar during construction would be repaired or replaced with the original stone when possible, or with similar material that matches the color and texture of the existing wall, from a source approved by the Park.
	Other resources protected by measure: Archeology	Construction workers would be educated regarding the possibility and recognition of previously unidentified archeological resources. If archeological resources are inadvertently discovered during the project, all work would cease in the immediate vicinity and the NPS would initiate consultation with the NM State Historic Preservation Officer (SHPO) regarding significance and proper treatment to reduce or avoid adverse effects.
		In areas near known archeological sites, NPS archeologists meeting the Professional Qualifications Standards of the Secretary of Interior Standards and Guidelines would initiate consultation with the SHPO under 36 CFR 800.13.
	Impact Topics: Historic Structures, Cultural Landscapes Other resources protected by measure: Archeology, Indian Trust Assets, Ethnographic Resources	Contractor-selected, noncommercial areas outside of the project limits (including, but not limited to, material sources, disposal sites, waste areas, haul roads, and staging areas) would not have long-term adverse impacts to the integrity of sites listed in or eligible for inclusion in the NRHP. Written proof satisfactory to the NPS and the SHPO would document, for compliance with Section 106 of the NHPA, that no historic properties would be affected (1) because there are no historic resources present or (2) there is no adverse effect on historic properties that are present.
Vegetation		Adverse impacts to rare plants would be mitigated by flagging individuals or groups of specimens for avoidance during construction.
		The contractor would implement the previously approved revegetation plan to restore disturbed areas using native plants.
	Impact Topics: Cave Resources and Groundwater Quality, Special Status Species, Visitor Experience	Ground surface treatment would include grading to natural contours, topsoil replacement, seeding, and planting. This work would occur as soon after the completion of construction as possible.
	Other resources protected by measure: Wildlife, Vegetation, Soils, Surface Water Resources, Visual Resources	As part of the revegetation plan, the FHWA would pay for a contractor to monitor reclaimed areas after construction to determine if reclamation efforts have been successful or if additional remedial actions are necessary. Remedial actions could include installing erosion control structures, reseeding and/or replanting the area, and controlling non-native plant species.
		In an effort to avoid introducing non-native/noxious plant species, no imported hay bales would be used during revegetation. On a case-by-case basis, the materials may be used for erosion control dams that may be necessary, as approved by the Park. Examples of materials include: certified weed-free rice straw, cereal grain straw that has been fumigated to kill weed seed, and wood fiber products.

Table 3. Mitigation Measures Included with the Preferred Alternative (continued)

Resource Area	Impact Topics Addressed	Mitigation Measures
Vegetation, continued	Other resources protected by measure: Wildlife, Vegetation	<p>Non-native and invasive plant species would be monitored by a contractor funded by the FHWA and controlled in all affected areas, as necessary. To prevent the introduction of and minimize the spread of non-native vegetation, especially noxious weeds, the following measures would be implemented during construction:</p> <ul style="list-style-type: none"> ▪ Minimize soil disturbance. ▪ Pressure wash and/or steam clean all construction equipment, before entering the Park to ensure that all equipment, machinery, rocks, gravel, or other materials are clean and weed free before entering the Park. ▪ Cover all haul trucks bringing fill materials from outside the Park to prevent seed transport. ▪ Limit vehicle and equipment parking to within construction limits, existing roadways, and parking lots. ▪ Limit disturbance to roadsides, culvert areas, and other areas inside the designated construction limits. Limit movement of machinery and equipment to areas within the construction limits. ▪ Obtain all fill, rock, or additional topsoil from the project area, if possible. If not possible, then obtain weed-free fill, rock, or additional topsoil from sources outside the Park. The weed-free condition of the material from sources outside the Park would need to be approved by the Park. If material from an outside source is not weed free, then the Park may either reject use of material from that source or approve use if appropriate measures are taken to treat the material. ▪ Initiate revegetation of a disturbed area as soon as possible following completion of work in the area, based on suitable weather conditions for plants to become established. ▪ Monitor disturbed areas for up to 3 years following construction, by a contract provided by the FHWA to identify growth of noxious weeds or other non-native vegetation. Treatment of non-native vegetation would be completed in accordance with NPS-13, Integrated Pest Management Guidelines.
	Impact Topics: Cave Resources and Groundwater Quality, Special Status Species, Visitor Experience Other resources protected by measure: Wildlife, Vegetation, Soils, Surface Water Resources, Visual Resources	<p>To maximize vegetation restoration efforts after completing construction activities, the following measures would be implemented:</p> <ul style="list-style-type: none"> ▪ Salvage topsoil, as well as existing native vegetation (as feasible), from construction areas for reuse during restoration on disturbed areas. ▪ Monitor revegetation success for up to 3 years following construction, by a contractor funded by the FHWA, implementing remedial and control measures as needed.

Table 3. Mitigation Measures Included with the Preferred Alternative (continued)

Resource Area	Impact Topics Addressed	Mitigation Measures
Soils	Impact Topics: Cave Resources and Groundwater Quality Other resources protected by measure: Soils, Surface Water Resources	During periods of heavy rainfall, the Project Engineer would issue a temporary stop work order and work would be halted. During these work stoppage periods, project personnel would continue to check the silt fences and check dams, maintain the silt fences in effective condition, and remove accumulated sediment, as necessary, to ensure that stabilization is maintained.
		Erosion control and sediment control would be required consistent with BMPs for compliance with the CWA and with approval of the NPS Project Engineer.
		Topsoil would be windrowed on the sides of the roads and pulled back into place following construction, or would be removed from areas of construction and stored at Park-approved locations for later reclamation use. Erosion control would be required. The topsoil would be spread as near the original location as possible and supplemented with scarification, mulching, seeding, and/or planting with species native to the immediate area.
Air Quality	Other resources protected by measure: Air Quality	Fugitive dust would be controlled by periodic water sprinkling and other BMPs as appropriate.
		The Contractor would be responsible for assuring that construction vehicle engines would not be allowed to idle when the equipment is not actively being used. Visitors stopped due to construction delays would be encouraged to turn off their engines.

ALTERNATIVE CONSIDERED BUT DISMISSED

FACILITY REDUCTION AND LAND USE MODIFICATION

One alternative was considered and dismissed: the use of mass transit to reduce the number of vehicles using the parking areas above the caverns. This alternative, evaluated in the Carlsbad Cavern Resource Protection Plan (NPS 2002a), would use the west parking lot as a turnaround and staging area for shuttling visitors from an off-escarpment parking facility to the Visitor Center area. This alternative also would remove most of the non-historic structures in the Park and the east parking lot near the Visitor Center. The reasons for rejecting this alternative are described in the Carlsbad Cavern Resource Protection Plan:

This alternative was rejected because a transportation engineering analysis indicated that a transit system was not practical for the Park at this time. A shuttle system could also negatively impact visitor experience, by forcing visitors to stage their cars and visit the Park on the shuttles' schedule. The costs of developing a transit system and constructing new facilities off the escarpment would be substantial and would offer only slightly more resource protection than the preferred alternative (NPS 2002a).

ALTERNATIVES COMPARISON TABLE

Table 4 provides a comparative summary of alternatives and extent to which each alternative meets the project purpose and need.

Table 4. Summary of Alternatives

Alternative A: No Action	Alternative B: Preferred Alternative— Resurfacing and Rehabilitation
<p>Action: No action would leave the entrance road, parking lots, and pullouts as they are: asphalt would continue to fail and parking lots would continue to produce petroleum-contaminated runoff, risking contamination of Carlsbad Cavern and the associated groundwater. Traffic accidents could increase due to failing asphalt. Use of gravel social pullouts would continue to introduce dust into the atmosphere.</p> <p>The no action alternative does not meet the purpose and need of the project because it does not stop the continuing contamination of Carlsbad Cavern and the associated groundwater by parking lot runoff; does not replace the old, inflexible, cracked pavement on the Park entrance road; and does not provide more adequate public parking spaces at the Visitor Center.</p>	<p>Action: The preferred alternative would rehabilitate the entrance road, parking lots, and pullouts. Oil and grit separators would be installed at the Visitor Center and Bat Cave Draw parking lots to capture and filter runoff prior to infiltration. There would be a net decrease in paved area (increase in reclaimed and revegetated area) of about 1.8 acres. Gravel social pullouts would be improved and paved or obliterated (reclaimed) for better control of dust and sediment-laden runoff.</p> <p>The preferred alternative meets the project purpose and need by removing the chronic contamination of Carlsbad Cavern and its associated groundwater by parking lot runoff, replacing the old, inflexible, cracked pavement on the Park entrance road, and providing an updated design of the public parking areas at the Visitor Center.</p>

SUMMARY OF ENVIRONMENTAL CONSEQUENCES/IMPACT COMPARISON TABLE

Table 5 provides a comparative summary of the environmental consequences/impacts of the no action alternative and the preferred alternative.

Table 5. Summary of Potential Environmental Impacts

Impact Topic	Alternative A: No Action	Alternative B: Preferred Alternative— Resurfacing and Rehabilitation
Cave Resources and Groundwater Quality	There would be continued groundwater contamination from parking lot and road surface runoff. Impacts would be moderate, adverse, and long term. Cumulative impacts under the no action alternative would yield short-term, minor, adverse impacts but would reduce the long-term impacts by removing one source of the groundwater contamination—sewer leakage—which is to be addressed by a planned sewer rehabilitation project. No impairment of Park resources or values related to groundwater quality or cave resources would occur under this alternative.	Groundwater contamination from parking lot and road surface runoff would be mitigated by reducing the total area of impermeable surface and by cleaning parking lot runoff of contaminants before releasing it to the environment. Cumulatively, the road rehabilitation, Visitor Center rehabilitation, and sewer line replacement would reduce the contaminants entering Carlsbad Cavern. No impairment of Park resources or values related to groundwater quality or cave resources would occur under this alternative.
Special Status Species	There would be no discernible short- or long-term impacts to special status species. The no action alternative would not contribute to cumulative impacts to special status species. No impairment of Park resources or values related to special status species would occur under this alternative.	Impacts to special status species would be mitigated as described in Table 3, reducing most adverse impacts to special status species. Over the long term, all resources would be restored to natural conditions with a net increase of 1.76 acres of native vegetation. After mitigation, short-term construction impacts would be negligible to minor. Long-term, negligible impacts may occur to special status plants that colonize cliff faces since they may not be able to re-establish on newly exposed rock faces for more than a year. Cumulative impacts would be short term, localized, and minor. There would be no impairment of Park resources or values related to threatened, endangered, or other special status species in the Park.
Visitor Experience	The current condition of the roads, pullouts, and parking lots constitutes long-term, moderate, adverse impacts to the visitor experience. Cumulative impacts to visitor experience from other projects in the Park would be short term and negligible, but the no action alternative could create a long-term, moderate, adverse impact.	Adverse effects would be short-term, localized, and minor, lasting for the duration of construction activities. Over the long term, the effects would be beneficial. Cumulative impacts would create additional short-term, localized, minor adverse effects by lengthening time of construction or increasing the visitors' exposure to road construction. However, the long-term effects would be beneficial to visitor experience.

Table 5. Summary of Potential Environmental Impacts (continued)

Impact Topic	Alternative A: No Action	Alternative B: Preferred Alternative — Resurfacing and Rehabilitation
Park Operations	The current condition of the roads, pullouts, and parking lots constitutes long-term, moderate, adverse impacts to Park operations. Cumulative impacts to Park operations from other projects in the Park would be short term and negligible, but the no action alternative could create a long-term, moderate, adverse impact.	Short-term, localized, minor, adverse effects would last for the duration of construction activities. Over the long term, the effects would be beneficial. Cumulative impacts would create additional short-term, localized, minor adverse effects by lengthening time of construction or increasing Park staff duties to mitigate construction impacts. However, the long-term effects would be beneficial to Park operations.
Historic Structures	There would be no discernible short- or long-term impacts to historic structures. The no action alternative would not contribute to cumulative impacts to historic structures. There would be no impairment of Park resources or values, and the impacts to historic structures would result in no adverse effect under Section 106.	Rehabilitation of the Park's entrance road would have no impact under NEPA and no adverse effect under Section 106. Reconstruction of the Bat Cave Draw parking lot would have a moderate adverse impact under NEPA and an adverse effect under Section 106; the adverse effect would be mitigated in accordance with a Memorandum of Agreement (MOA) executed between the NPS and the SHPO. The preferred alternative would not result in impairment of Park resources or values.
Cultural Landscapes	There would be no discernible short- or long-term impacts to cultural landscapes. The no action alternative would not contribute to cumulative impacts to cultural landscapes. There would be no impairment of Park resources or values, and the impacts to cultural landscapes would result in no adverse effect under Section 106.	Rehabilitation of the Park's entrance road would have no impact under NEPA and no adverse effect under Section 106. Reconstruction of the Bat Cave Draw parking lot would have a moderate adverse impact under NEPA and an adverse effect under Section 106; the adverse effect would be mitigated in accordance with an MOA executed between the NPS and the SHPO. The preferred alternative would not result in impairment of Park resources or values.

AFFECTED ENVIRONMENT

OVERVIEW

This section describes the current condition of resources in the study area that may be affected by the no action alternative and the preferred alternative. The NPS has adopted the concept of sustainable design as a guiding principle of facility planning and development. Essentially, sustainability is living within the environment with the least impact on the environment. The objectives of sustainability are to design park facilities to minimize adverse effects on natural and cultural values to reflect their environmental setting, to maintain and encourage biodiversity, to construct and retrofit facilities using energy-efficient materials and building techniques, to operate and maintain facilities to promote their sustainability, and to illustrate and promote conservation principles and practices through sustainable design and ecologically sensitive use. The preferred alternative subscribes to and supports the practice of sustainable planning, design, and use of the entrance road and parking facilities.

Detailed information on resources in the Park may be found in the Carlsbad Cavern Resource Protection Plan: Implementation Plan and Environmental Assessment (NPS 2002a); the Final General Management Plan/Environmental Impact Statement for Carlsbad Caverns National Park (NPS 1996); the Caverns Historic District Cultural Landscape Inventory (NPS 2006a); the Caverns Historic District National Register Nomination (NPS 1986); Two Cultural Landscapes at Carlsbad Caverns National Park: Rattlesnake Springs and Caverns Historic District (Colby 1993); and the Fire Management Plan Environmental Assessment (NPS 2005). A summary of the resources associated with this project follows.

IMPACT TOPICS

CAVE RESOURCES AND GROUNDWATER QUALITY

Under natural conditions, most precipitation at the Park percolates into the soil, where it is taken up by plants or evaporates. Any water not evaporated or used by plants becomes a part of the groundwater system. During intense thunderstorms, surface water flows into Bat Cave Draw (NPS 2002a).

The water moves downward, primarily through fractures in the limestone underlying Bat Cave Draw and the developed areas. This water eventually appears in the caverns as seeps or drips, which are responsible for the pools and cave formations found throughout the cave system. Over time, the water continues downward through fractures in the cave passages to the water table, approximately 200 feet below the deepest known point in the caves.

Park development has disrupted the natural drainage and infiltration patterns above Carlsbad Cavern. Paved areas and buildings are impervious to water and thus focus drainage into culverts and drains, from which the water eventually enters Bat Cave Draw. Any contaminants generated

at the surface are carried by groundwater into the cave and eventually into the water table. The contaminated water poses a threat to cave ecosystems (NPS 2002a).

The Park does not conduct regular water quality sampling, but has baseline chemistry data from multiple studies. These data will be compared with the results of future chemical studies to determine changes in water chemistry once parking lot runoff has been eliminated/mitigated. The Park does not currently mitigate runoff from the parking lots, though to reduce impacts parking is allowed in the Bat Cave Draw parking lot only during peak visitation weekends.

The absence of a continuous soil zone at the Park and the presence of highly permeable fracture zones and of well-developed karst contribute to relatively high vulnerability of the caves. A major concern is that most Park facilities are located directly above Carlsbad Cavern. There are no indications that any massive contamination is occurring, but incidences have been detected, primarily related to chronic, low-level releases from parking lot runoff and sewer line leakage (van der Heijde et.al. 1997). Van der Heijde et al. (1997) also noted that “it is very conceivable that in the future, a major contamination incident may take place if no preventative measures are taken.”

Some invertebrates such as flatworms and crickets have been found in Carlsbad Cavern, but no federal- or state-listed threatened or endangered species have been identified in the Park's caves. Several species of bacteria have been found in Lechuguilla and Spider Caves that rely on cave environments similar to that of Carlsbad Cavern, suggesting that these types of bacteria may be present here also (NPS 2002a).

SPECIAL STATUS SPECIES CONFIRMED IN THE GENERAL PROJECT AREA

Protection of outstanding natural resource values is one of the missions of the NPS. The Park contains one of the few protected portions of the northern Chihuahuan Desert ecosystem, with high diversity and abundance of wildlife and plants. This EA considers those special status species that have been identified as present in the Park and may be found in the project area (NPS 2006b).

The agencies that have primary responsibility for the conservation of plant and animal species in New Mexico are the USFWS, under authority of the ESA (16 U.S.C. §§1531–1544); the NMDGF, under authority of the New Mexico Wildlife Conservation Act of 1978 [New Mexico Statutes Annotated (NMSA) 1978a]; and the New Mexico Energy, Minerals and Natural Resources Department (EMNRD), under authority of the New Mexico Endangered Plant Species Act of 1978 (NMSA 1978b). These agencies maintain lists of plant and animal species that have been classified, or are potential candidates for classification, as threatened or endangered. In addition, the Park identifies and takes measures to protect species of local concern, and all nesting birds considered native to North America are protected from harm and harassment under the MBTA (16 U.S.C. §§703–712).

Although no federally listed endangered species are known to occur in the project area, as shown in Appendix A, four animal species that are listed by the NMDGF as threatened or endangered may occur in the project area, and twenty more may occur in the project area that are identified by federal or state agencies, or the Park itself, as sensitive species or species of concern

(EMNRD 2006; NMDGF 2006; NPS 2006b; USFWS 2006). Six plant species have also been identified in the project area (Tonne 2004) that are Park species of concern. The project area does not contain appropriate habitat for any of the special status invertebrates or fish listed in Eddy County (Appendix A). Special status species are listed according to phylogenetic groups and alphabetically by scientific name.

Reptiles

Reptiles may be diurnal or nocturnal, are most active during the warmer months, and, as ectotherms, bask on warm rocks or pavement surfaces. They are susceptible to mortality through direct construction impacts: movement of heavy equipment, ground surface treatments, or installation of erosion control structures can result in road-kill incidents. Reptiles also may become entrapped in open trenches or injured during deposition of fill materials. Four of the eight special status reptile species in Eddy County are found in the project area (see Appendix A). These species are described below.

Desert Kingsnake (*Lampropeltis getula splendida*)

The Park considers the desert kingsnake a species of concern. In New Mexico, the desert kingsnake occurs throughout the state, most frequently along the middle and lower Rio Grande and the Pecos River, and in the southwestern corner of the state. The desert kingsnake prefers riparian and grassland habitats in New Mexico, but is also found in piñon-juniper and low desert areas (Degenhardt et al. 1996).

Gray-banded Kingsnake (*Lampropeltis alterna*)

The gray-banded kingsnake is protected by the NMDGF as a state endangered species. The gray-banded kingsnake is extremely rare in New Mexico, with the only two documented sightings having taken place within the Park, in the project area. The Park therefore plays a critical role in the gray-banded kingsnake's conservation and protection. Rocky areas with Chihuahuan Desert vegetation are primary habitat for this animal, which feeds primarily on lizards (Degenhardt et al. 1996).

Rock Rattlesnake (mottled) (*Crotalus lepidus lepidus*)

The rare mottled rock rattlesnake is state-listed as threatened and is found only in New Mexico, Texas, and Chihuahua, Mexico. In New Mexico, the rattlesnake is limited to the southern Guadalupe Mountains. Its key habitat exists within all canyons of the Park and it is in fact the most frequently encountered rattlesnake in the Park. This snake favors the Park's rocky canyons, where it feeds on lizards, snakes, and small mammals. In spite of its rare occurrence throughout its limited range, it has been documented multiple times within the Park (Degenhardt et al. 1996).

Texas Horned Lizard (*Phrynosoma cornutum*)

The Texas horned lizard is considered a species of concern by the Park and a sensitive species by other federal agencies due to declines over its range in Oklahoma and Texas, as well as other factors. The Texas horned lizard is most commonly found on sandy to gravelly soils in grasslands and open deserts throughout eastern and southwestern New Mexico (Degenhardt et al. 1996).

Birds

Of the 331 bird species confirmed in the Park, six have some form of agency listing or special status (see Appendix A). In addition to the legal protection of special status birds, all birds in the project area are protected under the MBTA while nesting, including protection of the active nests. As highly mobile species, adult birds are able to avoid direct construction impacts, but may be disrupted during breeding by human-caused noise or clearing of vegetation. Park areas of desert scrub, grasses, and piñon-juniper provide forage, protection from predation, and nesting sites. Immature birds and eggs are highly vulnerable to human-caused mortality. Vegetation damage can also result in the death of smaller prey species required to feed nestlings. Bird nests are likely to be present in woody vegetation or even in rocky cliffs, grass, or bare ground from April 1 to September 1. Special status birds are described here.

Cave swallow (*Petrochelidon fulva*)

A Park species of concern, the cave swallow is a permanent resident of Mexico that is currently experiencing an expansion in its range northward into the United States. The primary nesting sites chosen by the birds are caves; however, they sometimes occupy bridges and similar structures. The cave swallow arrives in the Park in early February, nests by April, and remains until late October or early November. These birds nest just inside the cavern entrance (R. West, CAVE Biologist, NEPA review comments, personal communication October 2006). Unlike the cliff swallow, the cave swallow's nest is not fully enclosed but is shaped like a small half-cup. It is constructed of mud and plant fibers and lined with feathers (West 1995). The colonies of cave swallows at the Park are probably among the northernmost of the species in the United States. The main threat to the Park's cave swallows is predation by great horned owls, and it is known that cold and rainy weather limits access to food, of greatest importance when feeding nestlings (West 1995).

Gray Catbird (*Dumetella carolinensis ruficrissa*)

The gray catbird is a Park species of concern that breeds in low numbers throughout most of New Mexico (NMDGF 2006a). This secretive bird is primarily associated with dense thickets along streams and marshes, though it is occasionally found in drier environments. Suitable habitat for this bird exists along riparian areas and in woodlands. The gray catbird forages in a variety of locations, ranging from ground to treetops, and consumes a variety of insects, mainly ants, and numerous small fruits. This catbird is one of only about a dozen species known to recognize cowbird eggs and eject them from its nest—an ability that is learned, not innate. An Ohio study found that predation accounts for 40 percent of egg losses and that the brown thrasher occasionally appropriates gray catbird nests shortly after construction (Cimprich and Moore 1995).

Gray Vireo (*Vireo vicinior*)

The gray vireo is a New Mexico threatened species that is found in the desert Southwest, ranging from Utah and Colorado south through New Mexico and Arizona and west to southern Nevada and California. In New Mexico, this bird is found sporadically throughout the state, where it is considered uncommon (NMDGF 2006a). Gray vireos inhabit grassy, open juniper woodlands in arid foothills, on mesas, and in rocky canyon bottoms. They nest in the summer in low scrub in juniper woodlands, including within the Park in canyon bottoms. A 2003 study in selected Park

areas found “much larger numbers than expected” (West 2003). The gray vireo’s diet consists almost exclusively of insects. Threats to this species include destruction of habitat and activities that increase the density of cowbirds (genus *Molothrus*), which parasitize vireo nests (NMDGF 2006b).

Loggerhead Shrike (*Lanius ludovicianus*)

The loggerhead shrike is listed as a Park species of concern. It has an extensive, but shrinking, range throughout the North American continent. Though these birds are migratory, a few sedentary populations generally remain on breeding territories throughout the winter. Loggerhead shrikes are rare and local in the Southwest, but are fairly common year-round residents throughout Eddy County (NMDGF 2006a). Like other shrikes, this bird utilizes a variety of habitats, including desert scrub and open grasslands, though it prefers to nest in trees of medium to tall height. The loggerhead shrike feeds on a variety of invertebrate and vertebrate prey (Yosef 1996). Primary threats include predation, and vehicle collisions because their preferred nesting sites are in low bushes along road corridors. They are also illegally shot and trapped (Yosef 1996).

Varied Bunting (*Passerina versicolor*)

The varied bunting is listed as threatened by the state of New Mexico. Though it breeds primarily in shrublands of Mexico, it does cross into lower parts of the U.S. In New Mexico (particularly the Park and the Guadalupe Mountains), the bunting prefers nesting in mesquite bushes found in Chihuahuan Desert scrub. The first state sighting of a varied bunting was in the Park, in the project area. Varied buntings nest very near the project area, and a 2003 study in selected park areas found “much larger numbers than expected” (West 2003). Loss of habitat, in particular the loss of dense shrubby riparian habitat required by this species, is a principal threat in New Mexico. Cowbird parasitism may also threaten New Mexico’s small breeding populations (NMDGF 2006b)

Yellow-billed Cuckoo (*Coccyzus americanus*)

The yellow-billed cuckoo is a species of concern for both the USFWS and the Park. It occurs locally along waterways in lowland deciduous woods and thickets throughout New Mexico (NMDGF 2006a). Yellow-billed cuckoos breed along major river valleys in southern and western New Mexico (the Rio Grande and the San Juan, Pecos, Canadian, San Francisco, and Gila Rivers; Howe 1986). This species does occasionally use dry canyons for nesting, and in the summer of 2003 was found nesting in three park canyons, including within the project area (West 2003). Yellow-billed cuckoos prefer open woodlands with clearings and low, dense, scrubby vegetation often associated with watercourses. Little information is available about threats to the yellow-billed cuckoo. However, it is known that predation may account for failure to fledge young from 80 percent of nests in some regions, while raptors may be an important cause of mortality in adults on migration routes or upon arrival in wintering grounds following migration (Hughes 1999).

Mammals

The diversity of habitat types in the Park supports six special status terrestrial mammal species as well as eight species of bats, described below and in Appendix A. Primarily nocturnal, bats can

be negatively impacted by human activities such as habitat destruction or disturbance of hibernacula and maternity colonies, while reptiles and small mammals may be unable to vacate dens and crevices in rocks in advance of construction equipment.

Ringtail (*Bassariscus astutus*)

The ringtail is a state sensitive species in New Mexico that, although seldom seen, is fairly common throughout most of New Mexico, particularly in the southern half of the state (Findley 1987). These nocturnal, raccoon-like carnivores inhabit a variety of rocky, broken, and shrubby terrains at low to mid elevations throughout the state. Ringtails are common in the Park, and are most often found in the rocky areas of the higher-elevation reef (Geluso and Geluso 2004). This secretive species may utilize denning and foraging sites within the proposed project area.

Nelson's Pocket Mouse (*Chaetodipus nelsoni canescens*)

A state sensitive species in New Mexico, the Nelson's pocket mouse has a limited distribution that extends from southeastern New Mexico into western Texas and north-central Mexico. The southeastern corner of New Mexico is its northernmost limit, and the only records of this pocket mouse's presence in the New Mexico (thus far) are in the Park (Geluso and Geluso 2004). The pocket mouse occurs in small burrows on steep rocky slopes (to about 30%), but also on sandy flats in and around rock piles and in desert shrub vegetation along riparian corridors in the Chihuahuan desert ecosystem. Its home range is less than 0.5 ha, with multiple overlapping territories in an area. Within its range, it is usually the most common mouse. Its burrows are usually found at the base of desert shrubs, and it forages nocturnally for seeds and small insects.

Pale Townsend's Big-Eared Bat (*Corynorhinus townsendii pallescens*)

The Pale Townsend's big-eared bat is a federal species of concern and a state sensitive species in New Mexico. A year-round resident of the state and the Park, it occurs in habitats ranging from desert scrub to montane forests. The species' distribution is correlated with cave availability for roosts and hibernacula, but for foraging the bats prefer semi-desert shrublands, piñon-juniper woodlands, and open montane forests (Harvey et al. 1999). In the Park, Townsend's big-eared bat use caves for shelter in the warm months and as hibernacula during cold months (Geluso and Geluso 2004).

Common hog-nosed skunk (*Conepatus leuconotus mearnsi*)

The common (white-backed) hog-nosed skunk is a state sensitive species in New Mexico. These animals are most common in the southern portion of the state, in deserts, grasslands, and woodlands (Geluso and Geluso 2004). Hog-nosed skunks are distinguished from striped skunks primarily by the pelage, with a characteristic broad white marking beginning at the top of the head and extending down the back and tail. Hog-nosed skunks live primarily in rocky areas in foothills and in grasslands. They are active most of the year and are mostly nocturnal. They actively root out insects, grubs, snails, and earthworms from the ground with a distinctive nose pad. During cold weather they are less active and remain in underground dens (Findley et al. 1975).

Mountain lion (*Felis concolor*)

The mountain lion is a Park species of concern. Mountain lions, or cougars, are in the cat family, Felidae. They are large, unspotted cats with a long, heavy tail. With the exception of the eastern plains, they appear throughout New Mexico, especially in mountainous areas. The Guadalupe Mountains appear to be one of the state's strongholds for this species. Sightings have become somewhat regular in the Park in the past decade (Geluso and Geluso 2004). In the Chihuahuan Desert, adult males average 125 to 160 pounds and adult females 90 to 110 pounds (Burgess et al. 1997).

Eastern Red Bat (*Lasiurus borealis*)

The eastern red bat is a state sensitive species and a Park species of concern. These bats are common throughout their range, which extends southwest into southeastern New Mexico (Harvey et al. 1999). In New Mexico they are known only from three localities, one of which is Carlsbad Caverns. Except for individuals reported in Park caves, all state captures were in areas of large deciduous trees (Geluso and Geluso 2004), where they spend daylight hours hanging in the foliage. Although these bats seldom enter caves for any distance, they often swarm about cave entrances in the fall. In colder parts of their range, they may migrate south in the winter or hibernate in hollow trees or leaf litter. Eastern red bats consume moths, crickets, flies, mosquitoes, beetles, cicadas, and other insects. This species mates in flight during August and September; sperm is stored over the winter, and females give birth to one to four babies during late spring or early summer.

Western Small-footed Myotis Bat (*Myotis ciliolabrum melanorhinus*)

The western small-footed myotis is state-listed by New Mexico as a sensitive species. More common at higher elevations, its center of distribution appears to be ponderosa pine forests. In New Mexico, this small bat is commonly associated with caves and mines, and prefers to use rock crevices, caves, and other isolated and protected areas for day roosts, maternity colonies, and hibernacula. Numerous skulls of unknown age discovered in Lechuguilla Cave suggest that the western small-footed myotis may have been more abundant in the Park in past years. All recent captures at the Park were during July and August (Geluso and Geluso 2004).

Fringed Myotis Bat (*Myotis thysanodes thysanodes*)

The fringed myotis is state-listed by New Mexico as a sensitive species. Its distribution includes southwestern Canada and the western United States. In New Mexico, this species is most commonly associated with mid-elevation evergreen woodlands throughout the state. The fringed myotis is found at both low and high elevations, occupying a variety of cave, mine, and other structural habitats within a large range of ecosystems, including deserts, grasslands, woodlands, and forests (Geluso and Geluso 2004). The fringed myotis is known to migrate, but little is known about its movements (Harvey et al. 1999). A small colony of about 100 fringed myotis bats lives in Carlsbad Cavern over a mile from the nearest entrance. This colony is rare and the subject of scientific investigations into these bats' behavior (Burgess et al. 1997).

Cave Myotis Bat (*Myotis velifer*)

The cave myotis is a state sensitive species in New Mexico. A common inhabitant of New Mexico deserts and grasslands, the cave myotis is especially prevalent in areas containing open

bodies of water (Geluso and Geluso 2004). This bat occupies caves and other isolated and protected areas for day roosts, maternity colonies, and hibernacula (Harvey et al. 1999). The species numbers from 100 to 1000 within the Park and has a maternity colony in Carlsbad Cavern. These bats are also reported to occupy buildings at the Park and in other areas. All records from the Park are between early March and late October, and it is suspected that some cave myotis hibernate east of the park in gypsum caves (Geluso and Geluso 2004).

Long-legged Myotis Bat (*Myotis volans interior*)

The long-legged myotis bat is a state-listed New Mexico sensitive species. Based on the more than 700 specimens collected in New Mexico, it is typically found in ponderosa pine or higher montane habitats. This bat emerges in the twilight of early evening and is a rapid, direct flyer that pursues its prey over relatively long distances through, around, and over the forest canopy (Harvey et al. 1999). The long-legged myotis bat has been documented very rarely in the Park. Though this bat is a hibernating species, nothing is known of its wintering habits in New Mexico. The only two captures of long-legged myotis in the Park were in June and August (Geluso and Geluso 2004).

White-throated Wood Rat (*Neotoma albigula melas*)

The white-throated wood rat is a Park species of concern. It is found in the southern and western United States in Texas, New Mexico, Arizona, and California. In New Mexico, the white-throated wood rat lives in a variety of habitats ranging from desert lowlands to mixed conifer forests. Three species of wood rat are found at the Park, but the white-throated has the widest distribution (Geluso and Geluso 2004). This large rat is often called a packrat because of the large nest of sticks and other material that it incorporates into nests. These animals live in a wide range of habitats, but especially below rocky ledges or brushy areas in the desert grasslands with dense stands of cacti such as cholla and prickly pear cactus. This nocturnal rat feeds on a wide variety of plants.

Big Free-tailed Bat (*Nyctinomops macrotis*)

The big free-tailed bat is regarded as sensitive by the NMDGF. This species is uncommon throughout most of its range (Harvey et al. 1999). Most captures are in Texas, but two occurred in the Guadalupe Mountains of New Mexico, within the Park (Geluso and Geluso 2004). This bat inhabits rocky country, where it roosts in crevices high up on cliff faces, but it has been known to roost in buildings. It leaves its roost late, when it is quite dark. The diet consists primarily of large moths but may include crickets, flying ants, stinkbugs, and leafhoppers. Females form maternal colonies where they give birth in June or July.

Western Spotted Skunk (*Spilogale gracilis*)

The western spotted skunk is a state sensitive species in New Mexico, where it is most commonly found in the western portion of the state. It occurs in many habitat types, including lower montane, mixed shrub, sagebrush, piñon-juniper, wetland, and riparian areas. This skunk is most often associated with rocky and brushy areas, especially in deserts, grasslands, and woodlands (Geluso and Geluso 2004). This species generally uses rocky areas for denning sites, but has also been reported to den in hollow logs (NMDGF 2002).

Brazilian (Mexican) Free-tailed Bat (*Tadarida brasiliensis mexicana*)

The Brazilian free-tailed bat is a species of concern for the Park. It has a distribution in the southern United States and southward through Mexico and Central America into northern South America and the Caribbean (Harvey et al. 1999). In New Mexico, Brazilian free-tailed bats are most common in lowland habitats of deserts, grasslands, and piñon-juniper woodland and occur statewide. The population that occurs at the Park is the best known, and perhaps most studied, of this species (Geluso and Geluso 2004). The subspecies inhabiting the Park is referred to as the Mexican free-tailed bat and was involved in the discovery of Carlsbad Cavern. They are present in very large numbers at the Park and have become a major visitor attraction (Geluso and Geluso 2004). The population inhabiting the Park is migratory. The bats travel long distances into Mexico to winter, and the Park therefore provides an important migratory stopover, in addition to being a maternity roost/resident colony in the summer. This is a colonial species that feeds entirely on insects, especially small moths and beetles (Burgess et al. 1997).

Plants

Chihuahuan Fishhook Cactus (*Sclerocactus uncinatus* ssp. *wrightii*)

The Chihuahuan fishhook cactus is a Park species of concern and is designated by the New Mexico Natural Heritage Program (NMNH) as critically-imperiled – rare. It occurs in southeastern New Mexico and is also scattered throughout Trans-Pecos Texas and northern Mexico, generally in low abundance (Tonne 2004). However, the species was relatively abundant in the Park during the 2004 survey, when Tonne identified six plants within the project area, growing as single plants and in extended clusters of plants within and along the entrance road. This species is quite cryptic, as it is often obscured by overlying shrubs (Tonne 2004).

Cliff Nama (*Nama xylopodum*)

A Park species of concern, the cliff nama is a rare plant being tracked in surveys in the Park (Tonne 2004). It has a limited distribution between the Guadalupe Mountains of New Mexico and the Franklin Mountains in Texas. However, it is abundant within the Park, where it grows on rocks and boulders along the entrance road. Tonne (2004) observed 34 occurrences with a total of 826 plants within the project area. It is unclear how long it might take this species to recolonize areas disturbed by construction activities (Tonne 2004).

Five-Flowered Rock Daisy (*Perityle quinqueflora*)

The five-flowered rock daisy is a Park species of concern that is endemic to the Guadalupe Mountains Trans-Pecos Texas region. This daisy grows on cliffs, large boulders, and rock outcrops. Tonne (2004) noted 15 sites with 907 plants in the Walnut Canyon Road rehabilitation project area. Though cliff-dwelling plants are better protected from damage by construction vehicles than those in open settings, mechanical disturbance of cliff faces would be detrimental, and the five-flowered rock daisy would likely be slow to, or incapable of, recolonizing (Tonne 2004).

Few-flowered (Guadalupe) Jewelflower (*Streptanthus sparsiflorus*)

The few-flowered (Guadalupe) jewelflower is a species of concern for both the USFWS and the Park. Endemic to the Guadalupe Mountains, it can be locally abundant, but little is known of its

distribution and habitat requirements. However, most known habitats for this plant are very rugged and remote, occurring in limestone canyon bottoms and montane scrub at 5,000–7,000 feet (1,525–2,150 m) (New Mexico Rare Plant Technical Council 1999). The few-flowered Guadalupe jewelflower was recorded at 15 locations with 106 plants within the Walnut Canyon project area (Tonne 2004). It does appear within and along roadways in the Park and may therefore be difficult to avoid during project activities (Tonne 2004).

Guadalupe Penstemon (*Penstemon cardinalis* ssp. *regalis*)

The Guadalupe penstemon is a species of concern for the Park and is listed as critically imperiled – rare by the NMNH. This penstemon subspecies is endemic to the Guadalupe Mountains and Trans-Pecos Texas area. It grows on intact bedrock, particularly in dry washes and on solid cliff bases. Tonne (2004) encountered 15 individual plants in three occurrences, including one growing on a cement and rock embankment below the highway.

Supreme Sage (*Salvia summa*)

Supreme sage penstemon is a species of concern for the Park and is deemed rare by the NMNH. Though occurring primarily on cliffs, it is also found in arroyo bottoms. Tonne (2004) noted seven occurrences (126 plants) growing on cliffs and steep rocky slopes. A portion of the population may be dependent on water from culverts. Damage to the supreme sage penstemon can be minimized by avoiding impacts to cliffs and cliff bases (Tonne 2004).

VISITOR EXPERIENCE

The Park receives approximately 500,000 visitors annually, with highest visitation occurring on weekends and holidays and in June, July, and August. Visitation from 1991 to 2004 ranged from a high of 688,742 (1992) to a low of 416,815 (2004). The main and most accessible cave, Carlsbad Cavern, attracts visitors from throughout the world. Most visitors walk the popular self-guided Carlsbad Cavern tour. Others venture on guided tours to off-trail areas of Carlsbad Cavern, Slaughter Canyon Cave, and Spider Cave. Seventy-one percent of the Park is wilderness, providing visitors not only with the clear air found throughout the Park but with spectacular vistas, natural sound, and solitude. Many people visit the Park to experience the dusk exodus of Mexican free-tailed bats and their pre-dawn return.

The Park entrance road and visitor parking lots are in degraded condition, with pavement that has lost its resiliency and flexibility and exhibits varying degrees of failure, requiring the maintenance staff to seal cracks and potholes on a regular basis. Social pullouts are rough gravel and are in need of removal or improvement to better accommodate visitors and to better protect natural areas found along the roadway.

PARK OPERATIONS

Park operations for Walnut Canyon Road, and to a certain extent the Visitor Center parking areas, include general maintenance such as culvert and ditch maintenance, patching, striping, and shoulder work (e.g., vegetation and rock clearing). Occasional plowing in the winter and pavement repair in landslide areas also take place. Walnut Canyon Road is also used by many Park staff traveling to and from work and for law enforcement and patrol, emergency responses,

and supply deliveries to Park offices. Members of the cooperating association and concession employees travel the road daily as well.

HISTORIC STRUCTURES

The Caverns Historic District was listed on the National Register in 1986. The District includes a collection of buildings and features located around the Visitor Center and the natural entrance to Carlsbad Cavern, with a primary period of significance of 1926–1942. The original context of the District was diluted during the 1956–1966 period, when some of the original buildings were removed, new residences were constructed, and the new Visitor Center was built.

The District is considered eligible for inclusion in the NRHP under Criteria A, B, and C. Contributing elements are the structures built from 1926 to 1942, the roads, and the Bat Cave Draw parking lot, with their historic stone walls, historic walkways and footpaths, and associated walls and abutments (NPS 2006a). These features are within the proposed project area.

Along the Walnut Canyon entrance road, there are numerous retaining walls, low-water crossings, drop inlets, and culvert headwalls of stone masonry built between 1927 and 1936. These features are integral to the roadway and the associated drainage and parking. Although not included in the District, these elements are also excellent examples of stone masonry construction and should be considered eligible for the NRHP under Criteria A and C.

The NPS is currently writing an addendum to the District NRHP listing with inventories, condition assessments, and treatment recommendations for all the stone masonry features built between 1926 and 1942 along Walnut Canyon Road and the Bat Cave Draw parking area.

CULTURAL LANDSCAPES

The District recognizes specific historic structural features. To provide a more inclusive recognition of cultural resources within the area, a Cultural Landscape Inventory (CLI) has been prepared. The 2006 CLI proposes an expansion of District boundaries to include significant landscape elements associated with early development and the Carlsbad Cavern entrance area, and identifies a number of landscape elements that contribute to the existing District and its proposed expansion. These landscape elements include: roads and the lower (Bat Cave Draw) parking terraces, with historic walls; auto and pedestrian circulation patterns including the presence of parking in Bat Cave Draw; historic walkways; native plants, and the designed cactus garden; views into and from the District, especially the view between the two ridges; and spatial organization of buildings, parking, and pedestrian areas. The size and scale of parking lots at the Visitor Center are noncontributing. Walnut Canyon Road has been identified as a potentially eligible historic designed landscape; to date a CLI has not been completed for this area.

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter examines the environmental consequences or impacts of the no action alternative and the preferred alternative for the Park. The organization of the chapter follows NPS EA organization and terminology, as provided in DO 12 (NPS 2001). The Methodology section defines NPS terminology as it is generally applied. The Impacts section addresses the impact topics described in the Affected Environment chapter. Under each impact topic, potential impacts are described and assessed in terms of the defined terminology and in relation to the no action alternative (Alternative A) and the preferred alternative (Alternative B).

METHODOLOGY

ANALYSIS TERMINOLOGY AND DEFINITIONS

This EA determines the environmental consequences of the no action alternative and the preferred alternative pursuant to NEPA requirements. The impact analyses and conclusions that follow are based on a review of existing literature, Park studies, information provided by experts at the Park and at other agencies, professional judgments and Park staff insights, public input, and surveys conducted by SWCA Environmental Consultants (SWCA). Impact analysis was based on *context, intensity, type, and duration* of an impact, *cumulative impacts*, and the potential for *impairment of Park resources or values* by an impact.

Context is the area an impact would affect and the scale of the effect: local, park-wide, regional, national, global.

Intensity of an impact is defined as negligible, minor, moderate, major, or impairment. The measure of intensity varies by topic (groundwater quality and cave resources, special status species, etc.) and is thus defined separately for each impact topic.

Type of impact is the nature of the effect that the project has on a resource, that is, whether it is beneficial or adverse, and provides a relative measure of these effects on biological or physical systems, cultural resources, or the social environment. For example, adverse impacts on ecosystems might degrade the size, integrity, or connectivity of a specific habitat. Conversely, beneficial impacts might enhance ecosystem processes or increase native species richness. The formal definitions of the impact types are:

- **Beneficial** — a positive change in the condition or appearance of a resource or a change that moves the resource toward a desired condition (addressed for Historic Structures only in this document)
- **Adverse** — a change that detracts from the condition or appearance of a resource or that moves the resource away from a desired condition

Duration is the length of time that an impact will last. Duration can be short term, for example during construction or for a single growing season; long term, spanning a number of years; or permanent, in which the impact or effect will never end.

Cumulative effects are the effects on the environment that result from incremental impacts of the action and other possible actions. The CEQ regulations, which implement NEPA, require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impact is 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). Cumulative effects can result from individually minor, but collectively major, actions taking place over a period of time.

Projects that Make Up the Cumulative Impact Scenario

To determine potential cumulative impacts, projects in the area surrounding the Park, including Eddy County, were identified. Projects were identified through phone calls to the Eddy County and City of Carlsbad governments and to the New Mexico Department of Transportation (NMDOT). Potential projects identified as cumulative actions included any planning or development activity that was currently being implemented or that would be implemented in the reasonably foreseeable future.

These cumulative actions are evaluated in the cumulative impact analysis in conjunction with the impacts of each alternative to determine if they would have any additive effects on a particular natural resource or on visitor use, historic structures, or Park operations. Because some of these cumulative actions are in the early planning stages, the evaluation of cumulative effects was based on a general description of the project.

Past Actions

The following past actions could contribute to cumulative effects:

- Historic trends of groundwater contamination by visitors and staff. The underground concessions in Carlsbad Cavern have changed the products they sell to reduce impacts to the cavern. The Bat Cave Draw parking area is currently used only for handicapped access to the entrance to Carlsbad Cavern and for tour-group loading and unloading.
- The Park completed a waterline replacement project in 2000. The buried waterline that had served since the 1930s was replaced by a new waterline to Rattlesnake Springs.

Current and Future Actions

Current actions and those projected for the future also could contribute to cumulative effects:

- The Park's Fire Management Plan guides the detection and control of wild fires and the management of prescribed fires (NPS 2005).
- Proposed Visitor Center rehabilitation, scheduled to begin around November 2006.
- Proposed replacement of the sewer line from the Visitor Center parking lot. Scheduled for fiscal year 2008, this project will replace the leaking sewer line with a new pipeline.

The sewer is located above parts of Carlsbad Cavern and contributes to contamination of cave resources and associated groundwater (van der Heijde et.al. 1997).

- NMDOT construction projects
 - During the next four years, U.S. Highway 62/180 between Carlsbad and the Texas state line will be rehabilitated and widened to four lanes. The project is divided into seven construction sections.
 - A section of U.S. Highway 62/180 east of Carlsbad will undergo maintenance in the next two years.
 - NM 18 is scheduled for a rebuild, including realignment of some sections from the junction with NM 31 (just east of Carlsbad) to the Texas state line.

IMPAIRMENT OF PARK RESOURCES OR VALUES

In addition to determining the environmental consequences of the no action alternative and the preferred alternative, the 2001 NPS Management Policies and DO 12 require that analysis of potential effects must also determine whether preferred alternatives would impair Park resources and values.

The fundamental purpose of the National Park System, as established by the National Park Service Organic Act (16 U.S.C. §§1–4) and reaffirmed by the General Authorities Act (NPS 1970), as amended, is a mandate to conserve park resources and values. NPS managers must always seek ways to avoid or minimize to the greatest degree practicable adverse impacts to these resources and values. However, the laws do give NPS management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, “as long as the impact does not constitute impairment of the affected resources and values.” Thus, although Congress has given NPS management some latitude in allowing certain impacts within parks, that latitude is limited by the statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute impairment. However, an impact would be more likely to result in resource impairment when the conservation of the resource value is:

- necessary to fulfill specific purposes identified in 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 Master Plan or General Management Plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing a park, from visitor activities, or from activities undertaken by concessionaires, contractors, and others operating within a park. In this Environmental Consequences section, each impact topic for the no action alternative and the preferred alternative includes, in the conclusion, a determination on impairment. Relevant studies

and the professional judgment of Park staff and environmental consultants are the basis for these determinations. The NPS does not analyze recreational values/visitor experience (unless impacts are resource-based), socioeconomic values, or park operations for impairment.

CAVE RESOURCES AND GROUNDWATER QUALITY

METHODOLOGY

Groundwater quality and cave resources are functionally linked at Carlsbad Cavern. Information for determining the impacts of the no action alternative and the preferred alternative was gathered by reviewing the Carlsbad Caverns Final General Management Plan (NPS 1996) and the Carlsbad Cavern Resource Protection Plan (NPS 2002a).

Impact Intensity, Type, and Duration

For this impact topic, levels of impact intensity are defined as follows:

Impact Intensity	Description
Negligible	Groundwater quality or quantity could be modified, but the impact would be so small that it would not have any measurable or perceivable consequences.
Minor	Groundwater quality or quantity could be modified to the extent that impacts might be visible, but would be slight and localized with few measurable consequences.
Moderate	A proposed action would result in evident impacts both to groundwater quality or quantity and to the cave ecosystems. Consequences may be perceived over a large area, but could be successfully mitigated to ensure short-term impacts.
Major	A proposed action would result in substantial impacts to groundwater resources and the unique cave ecosystems throughout Carlsbad Cavern and other known or unknown cave systems; extensive mitigation measures would be required, and their success could not be guaranteed.

The types of impacts that might occur are assessed under each action alternative. Temporary contamination of groundwater during and for a period of one year following construction, with no effect on cave ecosystems, is considered here to be a short-term impact. Long-term impacts would include contamination of the groundwater for more than one year or that results in impacts to cave ecosystems.

NO ACTION ALTERNATIVE

Impact Analysis

Under the no action alternative, there would be no new impacts. Existing impacts would continue, such as runoff contaminated by automobile byproducts originating along the entrance road and pullouts and then flowing down Walnut Canyon to the east.

Parking lots would continue to present a more serious source of groundwater contamination, as contaminants that collect on parking surfaces would continue to be washed into Bat Cave Draw and ultimately into the cave resources found within Carlsbad Cavern. Once contaminants

infiltrate into the subsurface, they have a long-term adverse impact on a considerably larger area, including the unique caverns that the Park is charged to protect.

The no action alternative would leave the entrance road and parking lots in their present condition and location, continuing the chronic contamination of cave resources and the associated groundwater by parking lot runoff. In addition, without the proposed changes in parking lot configurations and the addition of the oil and grit separators, a catastrophic event would have the potential to elevate any impacts to a higher level than would be sustained if the preferred alternative is selected. The impact of the no action alternative on cave resources and associated groundwater would be moderate, adverse, and long term.

Cumulative Impacts

Historically, trends in staff and visitor activities around developed areas have produced on-going contamination of cave resources and related impacts to groundwater. Vehicle maintenance activities introduce solvents and other byproducts. The parking lots not only alter natural infiltration patterns, they collect and concentrate hazardous materials generated by automobiles, maintenance operations, and residential activities that accumulate on the pavement surface. These materials include fuel, oil, and antifreeze, which are carried off the pavement during rainstorms and enter the fractured limestone above Carlsbad Cavern. The 458,000 square feet (10.5 acres) of parking surface produce 143,000 gallons of potentially contaminated runoff during every half-inch rainstorm. In combination, these activities create a moderate, long-term adverse impact on cave resources and associated groundwater.

The goal of the proposed Visitor Center rehabilitation and the proposed sewer line reconstruction projects, all in the developed area above Carlsbad Cavern, is to reduce contamination of cave resources and related impacts to groundwater. These projects, along with the waterline project completed in 2000, would have possible short-term minor adverse impacts during construction and long-term moderate beneficial impacts.

The roads projects planned by NMDOT have the goal of increasing the safety, comfort, and capacity of the area highways. Because they are located away from the Park's groundwater and cave systems, they are not expected to have any cumulative impacts to those resources.

The no action alternative represents a future of continuing, long-term adverse moderate impacts on the Park's cave resources and associated groundwater, with a higher potential for a major contamination incident.

Conclusion

Under the no action alternative, there would be no new impacts. There would be continued contamination of cave resources and associated groundwater from parking lot and road surface runoff. Impacts would be moderate, adverse, and long term. Cumulative impacts under the no action alternative would yield short-term minor adverse impacts but would reduce the long-term impacts by removing one source of the groundwater contamination—sewer leakage that is to be addressed by a planned sewer rehabilitation project. No impairment of Park resources or values related to cave resources or groundwater quality would occur under this alternative.

PREFERRED ALTERNATIVE

Impact Analysis

Under the preferred alternative, the entrance road and parking lots would be repaved and rehabilitated. Reclamation of 1.76 acres of the parking lots and social pullouts, including revegetation with native plants, would provide a corresponding reduction in contaminated parking lot runoff. Rehabilitation of the remaining parking lot areas would include installing oil and grit separators to remove contaminants from parking lot runoff before it is released to the environment. These improvements would lead to long-term moderate benefits to the cave resources and associated groundwater.

Once the parking lots have been reconfigured and partially removed and remaining runoff has been mitigated, the Park would work with interested researchers to conduct water-quality sampling to monitor for water-quality changes.

In the short term, implementing BMPs for controlling stormwater pollution would mitigate construction impacts to water quality. Short-term impacts would be negligible and adverse.

Cumulative Impacts

Historically, trends in staff and visitor activities around developed areas have produced on-going contamination of cave resources and associated groundwater. Vehicle maintenance activities introduce solvents and other byproducts. The parking lots not only alter natural infiltration patterns, they collect and concentrate hazardous materials generated by automobiles, maintenance operations, and residential activities that accumulate on the pavement surface. These materials include fuel, oil, and antifreeze, which are carried off the pavement during rainstorms and enter the fractured limestone above Carlsbad Cavern. The 458,000 square feet (10.5 acres) of parking surface produce 143,000 gallons of potentially contaminated runoff during every half-inch rainstorm. In combination, these activities create a moderate, long-term adverse impact on cave resources and groundwater quality.

The goal of the proposed Visitor Center rehabilitation and the proposed sewer line reconstruction projects, all in the developed area above Carlsbad Cavern, is to reduce contamination of cave resources and related impacts to groundwater. These projects, along with the waterline project completed in 2000, would have possible short-term minor adverse impacts during construction and long-term moderate beneficial impacts.

The roads projects planned by NMDOT have the goal of increasing the safety, comfort, and capacity of the area highways. Because they are located away from the Park's groundwater and cave systems, they are not expected to have any cumulative impacts to those resources.

In combination with the preferred alternative, these projects would have short-term negligible adverse impacts during construction, mitigated by use of BMPs. Long-term impacts would be moderate and beneficial.

Conclusion

Under the preferred alternative, groundwater contamination from parking lot and road surface runoff would be mitigated by reducing the total area of impermeable surface and by reducing or eliminating contaminants in parking lot runoff before releasing the water to the environment. Cumulatively, the Walnut Canyon Road rehabilitation, including the reconfiguring and partial removal of parking lots, the Visitor Center rehabilitation, and the sewer line replacement would reduce the contaminants entering Carlsbad Cavern. No impairment of Park resources or values related to cave resources or groundwater quality would occur under this alternative.

SPECIAL STATUS SPECIES

METHODOLOGY

Information on special status species of wildlife within the Park was collected by reviewing Park surveys and literature, USFWS species lists, and NMDGF data (NMDGF 2006; USFWS 2006). Information on rare plant species in the Park was obtained from Park surveys and literature and from species accounts obtained from the New Mexico EMNRD (EMNRD 2006; NPS 2006b), as well as other original sources. Potential project impacts to special status species vary by species, and by the intensity, type, and duration of the project activity affecting the species.

Impact Intensity, Type, and Duration

The levels of intensity for this impact topic are defined as follows:

Impact Intensity	Description
Negligible	The action could affect individuals of a species, but the effect would be so small that it would not create any measurable or perceptible change in populations of sensitive species.
Minor	The action could change a population, but would be small and localized to a small area of the Park, with few measurable consequences.
Moderate	Evident modifications to a sensitive species population would occur, with a decrease or increase of the species within the Park. However, the change would be localized and not considered to have a long-term impact on the species' survivability.
Major	A substantial decrease in a population or in species diversity would occur that could be considered a threat to the long-term survivability of, and/or eliminate, an endemic or keystone species within the Park; or species diversity or the long-term survival of sensitive populations within the Park would be increased.

The type of impact is assessed for each action alternative. Impacts would be considered short term if affected species could recover in less than one year. Impacts would be considered long term if recovery would require more than one year. Impacts would be considered permanent if any special status population was extirpated from the Park, causing impairment of the resource.

NO ACTION ALTERNATIVE

Impact Analysis

The no action alternative would leave the road, pullouts, and parking lots in their present condition and location. Existing conditions of noise and routine hazards from motorized traffic and visitor disturbance would continue for the foreseeable future. No additional disturbance of special status species would occur with the no action alternative because no construction, ground or vegetation removal, or construction noise and activity would occur. The no action alternative would have no discernible impacts to special status species.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions that could have an effect on special status species within the Park include the waterline project completed in 2000, the proposed Visitor Center rehabilitation, and the proposed sewer line reconstruction. The effects of these projects could result in minor, long-term, localized, adverse cumulative impacts if not properly mitigated (may affect, not likely to adversely affect). Similarly, the roads projects planned by NMDOT could result in minor adverse impacts if not mitigated. However, both the NPS and NMDOT are expected to follow their normal environmental protection procedures and mitigate any possible impacts to special status species during these projects.

The no action alternative for the road, parking lots, and pullouts rehabilitation would not contribute to these cumulative adverse impacts.

Conclusion

Under the no action alternative, there would be no discernible short- or long-term impacts to special status species. The no action alternative would not contribute to cumulative impacts to special status species. No impairment of Park resources or values related to special status species would occur under this alternative.

PREFERRED ALTERNATIVE

Impact Analysis

Under the preferred alternative, potential impacts to special status species, shown in Table 3, would result from increased human presence, generation of construction noise, and mechanical or manual destruction of suitable or occupied habitats along the margins of Walnut Canyon Road and its associated pullouts, cliff faces, access roads, and parking lots.

Suitable and occupied habitats for special status animal species occur along the road and parking lot rehabilitation area, including several desert riparian crossings, rock outcrop areas, cliff faces, and road cuts with exposed rock, grasslands, and woody vegetation. The project has a 2-foot construction limit clearing of the 2-foot shoulder. New disturbances would destroy a very small amount of habitat that would otherwise provide protective cover, food base, and breeding habitat for one or more of the special status animal species confirmed in the project area. Some of the construction disturbance would potentially harm or destroy the specialized habitats of special

status plants and animals, resulting in a long-term decrease in the amount of available suitable habitat for several years.

Impacts to special status animals and plants are related to a project's direct impacts from construction activities and long-term reduction in specialized habitats. For this project, these impacts would be localized along the approximately 7.5 miles of entrance road right-of-way, at the road pullouts, and within the existing visitor parking lots, but would be more intense in the riparian area of Walnut Canyon (Figures 2 and 3, Locations 2–21) and at the cliff faces along the road (Figures 2 and 3, Locations 12, 15, and 24).

After required revegetation of disturbed areas, the project would result in a net increase of 1.76 acres of native vegetation, and potentially provide colonization for special status plants. Cliffs would be scaled by hand to remove loose rock. Scaled areas would lose pockets of vegetation and the soils upon which future vegetation depends. The cliff faces with loose rock have been identified and total about 1,500 linear feet (455 m). The scaling would take place within defined areas and be carried out by a worker in a cherry picker so that most of the cliff face would not be directly impacted during rock removal.

Reptiles

Disturbance of the cliff faces may have a disproportionate effect on the local populations of the mottled rock rattlesnake and gray-banded kingsnake known to occupy the unique habitats provided by these rocky outcrops. If construction activities take place during cold weather months, special status reptiles may be hibernating within the construction limits. The mitigation measure of educating the construction workers, especially those assigned to hand-scale the cliff faces, would partially offset these potential direct impacts. The level of impact to these species would thus be small and localized, short term, and of minor intensity. Loss of weathered rock surfaces and pockets of soil in the cliff face would likely result in a long-term impact, the very slow recovery of special status plants in those areas.

Birds

Special status birds are present throughout the project area during the breeding season (April 1 until September 1). Although adult birds are able to vacate areas of construction activity, noise and vegetation removal during the breeding season would potentially disrupt birds protected by the MBTA and produce short-term effects on the special status birds in the project area. Mitigation measures specify that construction would occur before April 1 or after September 1 in order to avoid impacts to breeding birds, or that surveys for active nests would be conducted by a Park biologist and identified nests avoided if vegetation removal must occur during the nesting season. With these mitigation measures, the impacts to special status birds and birds protected by the MBTA would be negligible and short-term.

Mammals

The project area provides habitat for eight special status bats (see Appendix A, Table A). All special status bats in the Park are susceptible to habitat destruction or disturbance of hibernacula and maternity colonies. Most bats breed in the autumn, and baby bats are born in May or June. Baby bats may be dropped to their deaths or abandoned by panicked parents if disturbance occurs during the maternity season (Harvey et al. 1999). Mitigation specifies that construction

activities close to the cavern entrance, in or near the lower Visitor Center parking lot and Bat Cave Draw, would occur only between September 1 and April 1 to avoid impacts to bats. With this measure, impacts would be negligible and short-term.

Most of the Park's terrestrial mammals are able to vacate areas when noise from heavy equipment alerts them to potential risk. Direct impacts may occur from grading activities and fill materials that may bury or damage den and burrow entrances. Removal of vegetation (either temporary or permanent) can reduce both available forage and seclusion from predators. Direct vehicular mortality may temporarily decrease, since the presence of special status species in the project area may be reduced. Feeding and foraging activities would also be reduced in the project area during construction as a result of these indirect effects.

The indirect consequences of rehabilitation of the old roadway and parking areas include added noise and disruption from increased human activities over a relatively short period. These effects would temporarily disturb normal feeding and other behaviors, as mobile species would leave or avoid the project area. Impacts to special status terrestrial mammals would therefore have a short-term negligible effect.

Plants

Plants could be destroyed by any construction activities that remove or deposit topsoils and water, or that directly uproot, bury, or crush existing plants. Hand-scaling on the escarpments that may dislodge delicate root systems, ground surface treatments, construction of erosion-control devices, acquisition or deposition of fill materials, and direct crushing by equipment at staging areas and construction sites are all project activities that may damage special status plants.

Intensity of impacts to special status plants would depend on the number of individual plants destroyed during construction. Eighty occurrences of special status plants were identified within approximately 3 feet of the margins of the construction area, and these plants would therefore have the potential for direct impacts during construction (Tonne 2004). Mitigation measures listed in Table 3 specify that the project construction limits would be limited to within 2 feet of the road or parking area edges and that occurrences and individual specimens of special status plants would be flagged by a Park biologist and avoided during construction.

The long-term net gain of 1.76 acres of natural vegetation that would result from reclaimed asphalt or gravel parking areas and roadside pullouts would not be of the same functional quality as the specific habitats that currently support special status plant species

Cumulative Impacts

Special status species may be affected by other projects in the past, the present, and the reasonably foreseeable future. A waterline project was completed in 2000, and planned future projects include rehabilitation of the Visitor Center and reconstruction of the sewer line.

If these future projects are constructed in conjunction with or in close proximity to the road and parking lot rehabilitation project, sheet flow across the construction areas may increase, causing erosion and adversely affecting rare plants and wildlife habitat. Incorporating storm-water flow

controls as a mitigation measure would reduce these impacts. Other construction impacts such as noise may increase cumulatively, adversely impacting nesting migratory birds, and the more secretive special status species in the area, such as varied bunting, gray vireo, and mountain lion. Thus, cumulative impacts to special status species would be short-term, localized, and negligible if protective mitigation measures are in place.

Conclusion

Impacts to special status species would be mitigated. Recommended mitigation measures include:

- Specifying avoidance of harm and injury to gray-banded kingsnake, rock rattlesnake, and other special status reptiles by having a Park biologist provide educational material to construction personnel to avoid impacts to reptiles in the area, and be available to identify and relocate reptiles from the construction areas if they are spotted
- Conducting construction activities only during daytime to avoid impacts to special status bat species caused by noise
- Conducting construction outside of the bird breeding season and bat maternity period (April 1 through September 1), or, if construction becomes necessary during the nesting season, conducting nest surveys and avoiding active nests
- Avoiding construction activities in the area of Bat Cave Draw and the lower Visitor Center parking lot from April 1 to September 1 to avoid noise impacts to bats
- Flagging all specimens of special status plants in the areas that will be subject to direct ground disturbance by the project and avoiding those areas during construction to avoid impacts
- Flagging and avoiding riparian areas with dense woody vegetation to mitigate impacts to many of the special status species by providing areas of refuge during construction

Over the short term, impacts to special status species would be negligible to minor in intensity. Over the long term, all resources would be restored to natural conditions, and impacts would be negligible. Cumulative impacts to special status species would be short term, localized, and negligible. There would be no impairment of Park resources or values related to threatened, endangered, or other special status species in the Park under the preferred alternative.

VISITOR EXPERIENCE

METHODOLOGY

Information about visitor experience was gathered from the Park staff. Photographs of the road and parking lot rehabilitation areas were taken during field visits to ascertain potential impacts.

Impact Intensity, Type, and Duration

Levels of intensity for this impact topic are defined as follows:

Impact Intensity	Description
Negligible	Visitors would not be affected, or modifications in visitor experience would be at or below any or perceivable consequences.
Minor	There may be detectable modifications in visitor experience, but they would be slight and localized with few perceivable consequences.
Moderate	Modifications to visitor experience would be readily apparent to visitors, to the extent that visitors might voice an opinion about the modifications.
Major	Modifications to visitor experience could be substantial and either adverse or beneficial. Visitors would be aware of the effects and would likely express strong opinions about the changes.

The type of impact is discussed under each of the alternatives. Visitor experience impacts would be considered short term if the effects last only during construction. If effects last longer than the project's duration, impacts would be considered long term.

NO ACTION ALTERNATIVE

Impact Analysis

There would be no road, parking lot, or pullout improvements under the no action alternative. Without replacement, the asphalt surfaces would continue to decay. Over time, the reduction in serviceability of the roads and parking lots would lead to more difficulty in driving, parking, and Visitor Center access, reducing the quality of the visitor experience. This general decay of roadways and parking lots would have a long-term, minor, adverse impact on the visitor experience of the Park.

Cumulative Impacts

Past, present, and future projects to improve the infrastructure of the Park would impact visitor experience in the short term, but would be beneficial in the long term. The no action alternative would have a long-term, localized, moderate, adverse impact from potential deterioration of paved and packed-gravel driving and parking surfaces. Cumulative impacts from other projects would be short term, adverse, and negligible. The no action alternative would increase the moderate, adverse, long-term impacts.

The roads projects planned by NMDOT have the goal of increasing the safety, comfort, and capacity of the area highways. These projects would result in short-term minor adverse impacts for any visitors traveling those routes to the Park during construction and long-term, moderate, beneficial impacts once the roads are improved.

Conclusion

The current condition of the roads, pullouts, and parking lots constitutes long-term, moderate, adverse impacts to the visitor experience. Cumulative impacts to visitor experience from other

projects in the Park would be short term and negligible, but the no action alternative could create a long-term, moderate, adverse impact.

PREFERRED ALTERNATIVE

Impact Analysis

This alternative would not add to traffic volume or visitor use in this area of the Park. Over the short term, visitor experience would be adversely affected by noise, dust, fumes, delays, increased congestion, and construction while entering and leaving the Park along Walnut Canyon Road for the duration of road reconstruction activities. Some visitors would be dissatisfied because they would be unable to visit a particular feature or features due to work on the road, parking lots, and turnout closures. These activities would result in a short-term, negligible to minor, adverse impact. Also, speeds would be reduced in construction zones during the road and parking lot rehabilitation, increasing the time it would take for visitors to reach their destinations and resulting in short-term, negligible to minor adverse impacts to visitor use.

The reconstructed road would provide a smoother ride. Additional signage and any appropriate guardrail installation would also improve the driving experience. These changes would result in a long-term, negligible to minor beneficial effect.

Cumulative Impacts

Impacts associated with past, present, and future projects would prolong the period of construction, increasing noise, dust, and fumes, adding construction vehicle traffic, construction fences, traffic delays, and congestion, and decreasing parking. The impacts would be short term, localized, minor, and adverse. These effects could be mitigated by timing construction to off-season and off-peak hours. All projects, past, present, or future, have been designed with the ultimate goal of improving and protecting the visitor experience. Therefore, long-term cumulative impacts should be moderate and beneficial.

The roads projects planned by NMDOT have the goal of increasing the safety, comfort, and capacity of the area highways. These projects would contribute short-term minor adverse impacts for any visitors that travel those routes to the Park during construction, and long-term, moderate, beneficial impacts once the roads are improved.

Conclusion

The preferred alternative would have short-term, localized, minor, adverse effects lasting for the duration of construction activities. Over the long term, the effects would be beneficial. Cumulative impacts would create additional short-term, localized, minor adverse effects by lengthening time of construction or increasing the visitors' exposure to road construction. However, the long-term effects would be beneficial to visitor experience.

PARK OPERATIONS

METHODOLOGY

Information about Park operations was gathered from DSC staff.

Impact Intensity, Type, and Duration

Levels of intensity for this impact topic are defined as follows:

Impact Intensity	Description
Negligible	Park operations would not be affected, or modifications in Park operations would be at or below any perceivable consequences.
Minor	There may be detectable modifications in Park operations, but they would be slight and localized, with few perceivable consequences.
Moderate	Modifications to Park operations would be readily apparent, to the extent that visitors might voice an opinion about the modifications.
Major	Modifications to Park operations could be substantial and either adverse or beneficial. Visitors and staff would be aware of the effects and would likely express strong opinions about the changes.

The type of impact is discussed under each of the alternatives. Park operations impacts would be considered short term if the effects last only during construction. If effects last longer than the project's duration, impacts would be considered long term.

NO ACTION ALTERNATIVE

Impact Analysis

There would be no changes in Park operations related to the entrance road and parking lots under the no action alternative. Inevitably, continued road deterioration would increase the need for maintenance, the frequency of road repairs, and costs, with associated traffic delays. Failure to take action now could eventually result in closing the Walnut Canyon Road for extended periods for repairs and, thus, some portions of the Park. As a result, visitors would be inconvenienced, and Park operations would be disrupted.

Over time, the reduction in serviceability of the roads and parking lots would lead to more difficulty in staff and delivery access. This general decay of roadways and parking lots would have a long-term, minor, adverse impact on the operations of the Park.

Cumulative Impacts

Past, present, and future projects to improve the infrastructure of the Park would impact Park operations in the short term but would be beneficial in the long term. The no action alternative would have a long-term, localized, moderate, adverse impact from potential deterioration of paved and packed-gravel driving and parking surfaces. Cumulative impacts from other projects would be short term, adverse, and negligible. The no action alternative would increase the moderate, adverse, long-term impacts.

The roads projects planned by NMDOT have the goal of increasing the safety, comfort, and capacity of the area highways. These projects would not contribute impacts to Park operations.

Conclusion

The current condition of the roads, pullouts, and parking lots constitutes long-term, moderate, adverse impacts to Park operations. Cumulative impacts to Park operations from other projects in the Park would be short term and negligible, but the no action alternative could create a long-term, moderate, adverse impact.

PREFERRED ALTERNATIVE

Impact Analysis

Over the short term, Park operations would be adversely affected by delays, increased congestion, and construction vehicle traffic along Walnut Canyon Road for the duration of road reconstruction activities. Park staff would have the added burden of addressing visitor concerns during construction to make the visitor experience as enjoyable as possible. These activities would result in a short-term, negligible to minor, adverse impact to Park operations. Also, speeds would be reduced in construction zones during the road and parking lot rehabilitation, increasing the time it would take for staff to reach their destinations, resulting in short-term, negligible to minor, adverse impacts.

The reconstructed road would provide a smoother ride and reduced maintenance needs. These changes would result in a long-term, negligible to minor, beneficial effect.

Cumulative Impacts

Impacts associated with past, present, and future projects would prolong the period of construction, increasing noise, dust, and fumes, adding construction vehicle traffic, construction fences, traffic delays, and congestion, and decreasing parking. The impacts would be short term, localized, minor, and adverse. These effects could be mitigated by timing construction to off-season and off-peak hours. All projects, past, present, or future, were designed with the ultimate goal of improving and protecting the visitor experience. Therefore, long-term cumulative impacts should be moderate and beneficial.

The roads projects planned by NMDOT have the goal of increasing the safety, comfort, and capacity of the area highways. These projects would not contribute impacts to Park operations.

Conclusion

The preferred alternative would have short-term, localized, minor, adverse effects lasting for the duration of construction activities. Over the long term, the effects would be beneficial. Cumulative impacts would create additional short-term, localized, minor adverse effects by lengthening time of construction or increasing Park staff duties to mitigate construction impacts. However, the long-term effects would be beneficial to Park operations.

HISTORIC STRUCTURES

In this EA, analysis of impacts to historic structures is intended to comply with the requirements of both NEPA and Section 106 of the NHPA (16 U.S.C. §470). Thus, in addition to analysis in terms of context, intensity, type, and duration of impact and cumulative impacts, and in accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 (36 CFR 800, Protection of Historic Properties), impacts to historic structures were also identified and evaluated by (1) determining the areas of potential effect; (2) identifying historic structures present in the areas of potential effect that are either listed on or eligible to be listed on the NRHP; (3) applying the criteria of adverse effect to affected NRHP-listed or eligible historic structures; and (4) 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 be made for affected NRHP-listed or eligible historic structures. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion on the NRHP, for example, diminishing the integrity of its location, design, setting, materials, workmanship, feeling, or association (that is, the extent to which a resource retains its original historic condition). Adverse effects also include reasonably foreseeable effects of the alternatives that would occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5, Assessment of Adverse Effects). A determination of no adverse effect means there is an effect, but the effect would not diminish the characteristics of the cultural resource that qualify it for inclusion on the National Register.

CEQ regulations and the NPS's guidelines on Conservation Planning, Environmental Impact Analysis and Decision Making (DO 12; NPS 2001) also call for a discussion of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, for example, reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Historic structures are non-renewable resources, and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss in the integrity of the resource that can never be recovered. Therefore, although actions determined to have an adverse effect under Section 106 may be mitigated, the effect remains adverse.

This analysis of impacts to historic structures in the Park includes a Section 106 summary assessing the effect of the undertaking (implementation of each alternative) on NRHP-listed or eligible historic structures, based on the criteria of effect and criteria of adverse effect set forth in the Advisory Council's regulations.

METHODOLOGY

Information on historic structures in the Park was gathered from the existing Caverns Historic District Cultural Landscapes Inventory (NPS 2006a).

Impact Intensity, Type, and Duration

Levels of intensity for historic structures are defined as follows:

Impact Intensity	Description
Negligible	Impact is at the lowest levels of detection, with neither adverse nor beneficial consequences. The determination of effect for §106 would be <i>no adverse effect</i> .
Minor	Alteration of a feature would not diminish the overall integrity of the resource. The determination of effect for §106 would be <i>no adverse effect</i> .
Moderate	Alteration of a feature would diminish the overall integrity of the resource. The determination of effect for §106 would be <i>adverse effect</i> . An MOA is executed between the NPS and applicable state or tribal historic preservation officers and, if necessary, the Advisory Council on Historic Preservation in accordance with 36 CFR 800.6(b). Measures identified in the MOA to minimize or mitigate adverse impacts reduce the intensity of impact under NEPA from major to moderate.
Major	Alteration of a feature would diminish the overall integrity of the resource. The determination of effect for §106 would be <i>adverse effect</i> . Measures to minimize or mitigate adverse impacts cannot be agreed upon, and the NPS and applicable state or tribal historic preservation officers and/or Advisory Council are unable to negotiate and execute an MOA in accordance with 36 CFR 800.6(b).

The type of impact is discussed under each alternative. Visual and sound impacts from the presence and operation of equipment would occur only during construction and would be considered short term. All physical impacts to the historic structures would be considered long term.

NO ACTION ALTERNATIVE

Impact Analysis

The no action alternative would leave the road, pullouts, and parking lots in their present condition and location. There would be continued routine maintenance, with no change in management planning or decisions. The existing condition continues to impact the historic structures because they are part of an actively used resource within the parking lot and along the road. There would be no disturbance to historic structures because under the no action alternative no construction or associated ground disturbance would occur. The no action alternative would create no discernible impacts to historic structures. For purposes of Section 106, the determination of effect would be no adverse effect.

Cumulative Effects

Future actions that could have an effect on historic structures within the Park include rehabilitation of the Visitor Center and the proposed sewer line reconstruction. These projects could create negligible adverse, long-term cumulative impacts to the District that would be mitigated through appropriate measures in consultation with the SHPO. The no action alternative would not contribute additional cumulative impacts to historic structures; therefore, the no action alternative would have no effect in the cumulative impacts scenario.

Conclusion

Under the no action alternative, there would be no discernible long-term impacts to historic structures. Also, the no action alternative would not contribute to cumulative impacts to historic structures. Under the no action alternative, there would be no impairment of Park resources or values, and the impacts to historic structures would result in no adverse effect under Section 106.

PREFERRED ALTERNATIVE

Impact Analysis

The District is considered eligible for inclusion in the NRHP under Criteria A, B, and C. Contributing elements are the structures and features built from 1926 to 1942, the roads, and the Bat Cave Draw parking lot, with their historic stone walls, historic walkways and footpaths, and associated walls and abutments (NPS 2006a). These features are within the proposed project area.

Implementation of the preferred alternative would alter the retaining wall that divides the upper and lower levels of the Bat Cave Draw parking lot, which is a contributing element of the District. The impacts would include removing up to 295 feet of stone masonry wall to modify traffic circulation. Where feasible, the wall would be buried in place. Some materials would be salvaged from the wall to construct 115 feet of new wall at the east end of the new parking lot access road. The impacts from removing the wall would be moderate, adverse, and long term.

In addition to the archeological survey, an assessment was conducted along Walnut Canyon Road from November 28 to December 31, 2005, to identify and record retaining walls, low-water crossings, drop inlets, and culvert headwalls constructed of stone masonry. Sixty-three historic stone masonry features were surveyed and identified as contributing to the NRHP eligibility of the District. These features are integral to the roadway and the associated drainage and parking. An addendum to include these features in the District is being prepared by the NPS and will be submitted to the keeper of the National Register for consideration of its addition to the nomination.

Implementation of the preferred alternative would not alter the stone masonry features associated with the Walnut Canyon entrance road. Plans include provisions to avoid disturbance to existing features and to match pavement elevations with existing pavement where it abuts the masonry features. Care would be taken to minimize the amount of asphalt that comes in direct contact with any historic feature, and any damage to the stone or mortar during construction would be repaired or replaced with the original stone when possible or with similar material that matches the original color and texture. Salvaged masonry elements from the Bat Cave Draw parking area would be available for this purpose. Under the preferred alternative, there would be no long-term, adverse impacts to the historic features associated with the Walnut Canyon entrance road. Rehabilitation of the entrance road would have no adverse effect under Section 106 of the NHPA.

At the Bat Cave Draw parking area, up to 295 linear feet of masonry wall would be removed and salvaged. These alterations to the masonry wall at the Bat Cave Draw parking area would result in an adverse effect under Section 106 of the NHPA.

Under the preferred alternative, the NPS would execute an MOA with the SHPO and, if necessary, the Advisory Council on Historic Preservation, in accordance with 36 CFR 800.6(b). Measures identified in the MOA to minimize or mitigate adverse impacts to the District would reduce the intensity of impact under NEPA from major to moderate.

Cumulative Effects

Proposed future actions that could have an effect on historic structures within the Park include rehabilitation of the Visitor Center and sewer line reconstruction. These projects could create adverse, long-term, cumulative impacts to the District that would be mitigated through appropriate measures in consultation with the SHPO. The contribution of the preferred alternative to these cumulative impacts would be noticeable.

Conclusion

Rehabilitation of the Park's entrance road would have no impact under NEPA and no adverse effect under Section 106. Reconstruction of the Bat Cave Draw parking lot would have a moderate, adverse impact under NEPA and an adverse effect under Section 106. The adverse effect would be mitigated in accordance with an MOA executed between the NPS and the SHPO. The preferred alternative would not result in impairment of Park resources or values.

CULTURAL LANDSCAPES

In this EA, analysis of impacts to cultural landscapes is intended to comply with the requirements of both NEPA and Section 106 of the NHPA (16 U.S.C. §470). Thus, in addition to analysis in terms of context, intensity, type, and duration of impact and cumulative impacts, and in accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 (36 CFR 800, Protection of Historic Properties), impacts to cultural landscapes were also identified and evaluated by (1) determining the areas of potential effect; (2) identifying cultural landscapes present in the areas of potential effect that are either listed on or eligible to be listed on the NRHP; (3) applying the criteria of adverse effect to affected NRHP-listed or eligible cultural landscapes; and (4) 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 be made for affected NRHP-listed or eligible cultural landscapes. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion on the NRHP, for example, diminishing the integrity of its location, design, setting, materials, workmanship, feeling, or association (that is, the extent to which a resource retains its original historic condition). Adverse effects also include reasonably foreseeable effects of the alternatives that would occur later in time, be farther removed in distance, or be cumulative (36 CFR 800.5, Assessment of Adverse Effects). A determination of no adverse effect means there is an effect, but the effect would not diminish the characteristics of the cultural resource that qualify it for inclusion on the National Register.

CEQ regulations and the NPS's guidelines on Conservation Planning, Environmental Impact Analysis and Decision Making (DO 12; NPS 2001) also call for a discussion of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a

potential impact, for example, reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Cultural landscapes are non-renewable resources, and adverse effects generally consume, diminish, or destroy the original landscape or its form, resulting in a loss in the integrity of the resource that can never be recovered. Therefore, although actions determined to have an adverse effect under Section 106 may be mitigated, the effect remains adverse.

This analysis of impacts to cultural landscapes in the Park includes a Section 106 summary assessing the effect of the undertaking (implementation of each alternative) on NRHP-listed or eligible cultural landscapes, based on the criteria of effect and criteria of adverse effect set forth in the Advisory Council’s regulations.

METHODOLOGY

Information on cultural landscapes in the Park was collected by reviewing the existing Caverns Historic District Cultural Landscapes Inventory (NPS 2006a).

Impact Intensity, Type, and Duration

Levels of intensity for cultural landscapes are defined as follows:

Impact Intensity	Description
Negligible	Impact(s) at the lowest levels of detection with neither adverse nor beneficial consequences. The determination of effect for §106 would be <i>no adverse effect</i> .
Minor	Alteration of pattern(s) or feature(s) of the landscape would not diminish the overall integrity of the landscape. The determination of effect for §106 would be <i>no adverse effect</i> .
Moderate	Alteration of pattern(s) or feature(s) of the landscape would diminish the overall integrity of the landscape. The determination of effect for §106 would be <i>adverse effect</i> . An MOA is executed between the NPS and applicable state or tribal historic preservation officer(s) and, if necessary, the Advisory Council on Historic Preservation, in accordance with 36 CFR 800.6(b). Measures are identified in the MOA to minimize or mitigate adverse impacts and reduce the intensity of impact under NEPA from major to moderate.
Major	Alteration of pattern(s) or feature(s) of the landscape would diminish the overall integrity of the landscape. The determination of effect for §106 would be <i>adverse effect</i> . Measures to minimize or mitigate adverse impacts cannot be agreed upon, and the NPS and applicable state or tribal historic preservation officer(s) and/or the Advisory Council are unable to negotiate and execute an MOA in accordance with 36 CFR 800.6(b).

The type of impact is discussed under each alternative. Visual and sound impacts from the presence and operation of equipment would occur only during construction and would be considered short term. All physical impacts to the cultural landscapes would be considered long term.

NO ACTION ALTERNATIVE

Impact Analysis

The no action alternative would leave the District in its present condition and location. There would be continued routine maintenance and no change in management planning or decisions.

The existing condition continues to impact the cultural landscape because it is part of an actively used resource within the parking lot and along the road. There would be no disturbance to cultural landscapes because under the no action alternative no construction or associated ground disturbance would occur. The no action alternative would create no discernible impacts to cultural landscapes. For purposes of Section 106, the determination of effect would be no adverse effect.

Cumulative Effects

Future actions that could have an effect on cultural landscapes within the Park include rehabilitation of the Visitor Center and proposed sewer line reconstruction. These projects could create negligible adverse, long-term cumulative impacts to the District that would be mitigated through appropriate measures in consultation with the SHPO. The no action alternative would not contribute to these cumulative impacts; therefore, the no action alternative would have no effect in the cumulative impacts scenario.

Conclusion

Under the no action alternative, there would be no discernible long-term impacts to cultural landscapes. Also, the no action alternative would not contribute to cumulative impacts to cultural landscapes. Under the no action alternative, there would be no impairment of Park resources or values, and the impacts to cultural landscapes would result in no adverse effect under Section 106.

PREFERRED ALTERNATIVE

Impact Analysis

The District is considered eligible for inclusion in the NRHP under Criteria A, B, and C. Contributing elements are the structures and features built from 1926 to 1942, the roads, and the Bat Cave Draw parking lot, with their historic stone walls, historic walkways and footpaths, and associated walls and abutments (NPS 2006a). Some of these features are within the proposed project area and others are adjacent.

Implementation of the preferred alternative would substantially alter historic circulation systems, spatial arrangement, and historic views within the Carlsbad Caverns cultural landscape, as described in the 2006 CLI. Historic integrity of the cultural landscape, and of the existing District, would be substantially reduced. Reconfiguring the Bat Cave Draw parking lot to change its location and layout, and the changes proposed in the cave entrance area (including a new accessible walkway, new wheelchair ramp, new shade structure, and changing pedestrian access route from the Visitor Center) would significantly alter the character of this landscape, specifically circulation patterns, spatial relationships, and views. Revegetating a substantial portion of the historic parking area would change historic vegetation patterns. The preferred alternative would have a moderate long-term adverse impact (NEPA) and an adverse effect (Section 106) on cultural landscape resources.

The preferred alternative may negatively alter the historic integrity of the Walnut Canyon Road cultural landscape. However, insufficient information is available at this time to make a determination.

Cumulative Effects

Proposed future actions that could have an effect on cultural landscapes within the Park include rehabilitation of the Visitor Center and sewer line reconstruction. These projects could create adverse, long-term, cumulative impacts to the District that would be mitigated through appropriate measures in consultation with the SHPO. The preferred alternative would noticeably contribute to these cumulative impacts.

Conclusion

Rehabilitation of the Park's entrance road may affect the historic integrity of the potentially eligible Walnut Canyon Road cultural landscape. Reconstruction of the Bat Cave Draw parking lot and modifications to the cave entrance area would result in a moderate, long-term, adverse impact, and an adverse effect under NHPA Section 106.

CONSULTATION AND COORDINATION

Agencies and organizations that were contacted for information or that assisted in identifying important issues or selecting alternatives were given an opportunity to review and comment on this EA. These agencies are:

Federal Agencies

- U.S. Fish and Wildlife Service
- Federal Highway Administration

State and Local Agencies

- New Mexico Department of Game and Fish
- New Mexico State Historic Preservation Officer

Native American Tribes

The Park contacted 14 Native American groups traditionally associated with the Park's lands. They were apprised of the preferred alternative, by letter, on May 24, 2005; no comments have been received to date. The groups contacted are:

- Apache Tribe of Oklahoma
- Comanche Nation, Oklahoma
- Fort Sill Apache Tribe of Oklahoma
- Hopi Tribe of Arizona
- Jicarilla Apache Nation, New Mexico
- Kiowa Indian Tribe of Oklahoma
- Mescalero Apache Tribe of the Mescalero Reservation, New Mexico
- Pawnee Nation of Oklahoma
- Pueblo of Isleta, New Mexico
- Pueblo of Zia, New Mexico
- San Carlos Apache Tribe of the San Carlos Reservation, Arizona
- White Mountain Apache Tribe of the Fort Apache Reservation, Arizona
- Pueblo of Zuni, New Mexico
- Ysleta del Sur Pueblo of Texas

SCOPING

Internal scoping has been completed for the proposed road and parking lot improvements. The scoping meetings included personnel from the Park, DSC, NPS Intermountain Support Office (ISO), Central Federal Lands Highway Division (CFLHD), and the NEPA Contractor (SWCA) and were held on the following dates:

Date	Meeting	Attendees
December 12, 2002	Initial Project Scoping Trip and Signed Project Agreement	Park, DSC, CFLHD
March 19, 2003	Preliminary Site Review/ Data Collection	Park, DSC, CFLHD
June 26, 2003	30% Design Review	Park, DSC, CFLHD
December 2, 2003	Intermittent Design Review	Park, DSC, CFLHD
May 3–4, 2004	CBA/VA	Park, DSC, CFLHD
October 26, 2004	Environmental Compliance Kick-Off Meeting and Site Visit	Park, DSC, ISO, SWCA

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The following personnel provided invaluable assistance in the planning, resource assessment, development, and technical review for this EA:

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- 36 CFR 800, §106. Protection of Historic Properties
 - 36 CFR 800.5. Assessment of Adverse Effects
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ACRONYMS AND SHORT FORMS

BMP	Best Management Practices
CBA	Choosing by Advantages
CEQ	Council on Environmental Quality
CFLHD	Central Federal Lands Highway Division
CFR	Code of Federal Regulations
CLI	Cultural Landscape Inventory
CWA	Clean Water Act
District	Caverns Historic District
DO	Director's Objectives
DSC	NPS Denver Service Center
EA	Environmental Assessment
EMNRD	Energy, Minerals, and Natural Resources Department
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FR	Federal Register
ISO	NPS Intermountain Support Office
m	meter(s)
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMDGF	New Mexico Department of Game and Fish
NMDOT	New Mexico Department of Transportation
NMNH	New Mexico Natural Heritage Program
NMRPTC	New Mexico Rare Plant Technical Council
NMSA	New Mexico Statutes Annotated
NPS	National Park Service
NRHP	National Register of Historic Places
Park	Carlsbad Caverns National Park
SHPO	State Historic Preservation Officer
ssp.	indicates a subspecies within a species
SWCA	SWCA Environmental Consultants
SWPPP	Stormwater Pollution Prevention Plan
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
VA	Value Analysis

APPENDIX A

U.S. FISH AND WILDLIFE SERVICE SPECIES LIST

Appendix A

LIST OF SPECIAL STATUS SPECIES IN EDDY COUNTY, NEW MEXICO

REVISED OCTOBER 2006

This list (Table A) provides pre-project planning information. Under the Endangered Species Act (ESA), as amended, it is the responsibility of the federal action agency or its designated representative to determine whether a proposed action “may affect” any listed or proposed species. In addition, state agencies provide additional species that are of particular concern at the state level. The New Mexico Department of Game and Fish (NMDGF) focuses the listing status on state populations, including subspecies. The NMDGF may designate as endangered, threatened, or sensitive any native (terrestrial or aquatic) vertebrate, mollusk, or crustacean, but only species designated by the NMDGF as endangered receive full protection under Title 19 (19 NMAC 33.2). The New Mexico Energy, Minerals, and Natural Resources Department (EMNRD) is responsible for determining state-listed endangered plants. These plants receive full protection under Title 19 (19 NMAC 21.2.8).

NPS policy also requires examination of potential impacts on all special status species described above. For additional planning purposes, the expertise of staff biologists at Carlsbad Caverns National Park allows inclusion of local species of special concern, regardless of their status according to pertinent listing agencies.

The special status species from other federal land management agencies are not included because recent data do not exist and status can therefore not be verified.

Table A. Threatened (T), Endangered (E), Candidate (C), Species of Concern (SC), and Sensitive (S) Wildlife and Plant Species Known to Occur in Eddy County, New Mexico, and Their Potential for Occurrence in the Project Area

(Species that may be affected by project activities appear in boldface type.)

INVERTEBRATES

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Cicindela politula petrophila</i> Guadalupe Mountains tiger beetle	SC	-	SC	Limestone or calcareous clay; endemic to the Guadalupe Mountains	Documented in Park; possible habitat in project area
<i>Popenaias popeii</i> Texas hornshell (mussel)	C	E	-	Larger streams with variable substrates; in NM, restricted to Pecos River	Not found in Park; no suitable habitat in project area
<i>Pyrgulopsis pecosensis</i> Pecos pyrg (springsnail)	SC	T	-	Mud and pebble substrate in spring habitat, mainly along the edges of the water; endemic to Blue Spring (tributary of the Black River)	Not found in Park; no suitable habitat in project area
<i>Vertigo ovata</i> Ovate vertigo (snail)	SC	T	SC	Marshy spring-brook areas with damp soil	No suitable habitat in project area

AMPHIBIANS and REPTILES

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Crotalus lepidus lepidus</i> Mottled rock rattlesnake	-	T	SC	Rocky canyons or hillsides; reef escarpment habitats	Suitable habitat exists and species is confirmed in project area
<i>Lampropeltis alterna</i> Gray-banded kingsnake	-	E	SC	Rocky, dry limestone hills and mountain slopes vegetated with succulents and shrubs	Suitable habitat exists and species is confirmed in project area
<i>Lampropeltis getula splendida</i> Desert kingsnake	-	-	SC	In New Mexico, preferred habitat is riparian or grassland, some in piñon-juniper or low-elevation desert areas.	Suitable habitat exists, species is possible in project area
<i>Nerodia erythrogaster transversa</i> Plainbelly water snake	-	E	SC	Requires permanent water	No suitable habitat in project area

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Phrynosoma cornutum</i> Texas horned lizard	-	-	SC	Open desert grasslands on sandy to gravelly soils and sand dunes; common around yucca and ephedra and associated with playas, bajadas, and mountain foothills	Suitable habitat exists and species is confirmed in project area
<i>Pseudmys gorzugi</i> Western river cooter	-	T	SC	River systems with deep pools	No suitable habitat in project area
<i>Sceloporus arenicolus</i> Sand dune lizard	C	E	-	Sand dune habitat with shinnery oak, most abundant in Mescalero sand dunes	Not found in Park; no suitable habitat in project area
<i>Thamnophis proximus diabolicus</i> Western ribbon snake	-	T	SC	Found at edges of water bodies; prefers areas that are open and sandy, associated more with brush than forest	Possible in Park; no suitable habitat in project area

FISH

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Astyanax mexicanus</i> Mexican tetra	-	T	-	Prefers low-velocity pool habitats in small streams and spring systems	Not found in Park; no suitable habitat in project area
<i>Cycleptus elongates</i> Blue sucker	SC	E	-	Deep river channels, pools with moderate currents, and deep lakes; limited to the Pecos River drainage below Brantley Reservoir to the NM/TX state line	Not found in Park; no suitable habitat in project area
<i>Cyprinodon pecosensis</i> Pecos pupfish	SC	T	-	Saline springs and gypsum sinkholes to desert streams with highly fluctuating conditions; backwaters and side pools of the Pecos River	Not found in Park; no suitable habitat in project area
<i>Etheostoma lepidum</i> Greenthroat darter	SC	T	SC	Vegetated riffles with gravel and cobble bottoms; swift-flowing streams and springs; clear ponded-water habitats, including sinkholes and littoral areas	Not found in Park; no suitable habitat in project area
<i>Gambusia nobilis</i> Pecos gambusia	E	E	-	Heads and runs of springs with aquatic vegetation	Not found in Park; no suitable habitat in project area
<i>Gila pandora</i> Rio Grande chub	-	S	-	Able to inhabit both riverine and lacustrine habitats and usually found in pools with overhanging banks and brush	Not found in Park; no suitable habitat in project area

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Ictalurus lupus</i> Headwater catfish	SC	S	–	Clear, temperate waters, generally with a moderate gradient	Not found in Park; no suitable habitat in project area
<i>Moxostoma congestum</i> Gray redhorse	SC	T	–	Clear to moderately turbid, warm, low-gradient streams in medium to large pools, with cobble, gravel, silt, or sand bottoms	Not found in Park; no suitable habitat in project area
<i>Notropis jemezanus</i> Rio Grande shiner	SC	S	–	Large, open rivers with laminar flows and a minimum of aquatic vegetation; larger streams with gravel, sand, or rubble bottoms, sometimes overlain with silt	Not found in Park; no suitable habitat in project area
<i>Notropis simus pecosensis</i> Pecos bluntnose shiner	T	E	–	Main channel areas, with low-velocity water, depths of 17–31 cm, and a sandy substrate	Not found in Park; no suitable habitat in project area
<i>Percina macrolepida</i> Bigscale logperch [native population]	–	T	–	Most commonly found in fast-flowing, non-turbulent, moderately-deep water with large cobble substrate	Not found in Park; no suitable habitat in project area

BIRDS

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Accipiter gentilis</i> Northern goshawk	SC	S	SC	Dense coniferous and mixed-woodland areas	Irregular to rare in late fall and winter; no suitable nesting habitat in project area
<i>Ammodramus bairdii</i> Baird's sparrow	SC	T	SC	Winters in short and mixed grass upland prairies	Possible spring and fall migrant visitor; no suitable nesting habitat in project area
<i>Athene cunicularia hypugea</i> Western burrowing owl	SC	–	SC	Semi-arid grasslands and prairies, often associated with prairie dog towns	Possibly nests in flats below escarpment; species is possible in project area
<i>Buteo gallus anthracinus</i> Common black-hawk	–	T	SC	Requires mature, well-developed riparian forest stands located near permanent streams where principal prey of fish, amphibians, and reptiles is available	Increasing visitor to Park, but only at Rattlesnake Springs; not in project area

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Calothorax lucifer</i> Lucifer hummingbird	–	T	SC	Prefers rugged canyons and slopes in dry mountain ranges, especially rocky hillsides, talus slopes, and dry washes vegetated with desert scrub	Accidental to rare in Park; only seen at Rattlesnake Springs; not in project area
<i>Camptostoma imberbe ridgwayi</i> Northern beardless tyrannulet	–	E	–	A low-elevation riparian species that prefers dense thickets of mesquite, acacia, hackberry, and similar vegetation, typically along stream courses	Accidental (one record for Park); not in project area
<i>Charadrius melodus circumcinctus</i> Piping plover	–	T	–	A wetland obligate, this species substantially depends upon availability of mudflat and sandbar habitats	Not found in Park; no suitable habitat in project area
<i>Charadrius montanus</i> Mountain plover	–	S	–	This wading bird is found in semi-arid plains, grasslands, and plateaus	Not found in Park; no suitable habitat in project area
<i>Chlidonias niger surinamensis</i> Black tern	SC	–	SC	Vegetated marshes and prairie wetlands	Extremely rare; seen at sewage pond in past; no suitable nesting habitat in project area
<i>Coccyzus americanus occidentalis</i> Yellow-billed cuckoo	SC	S	SC	Prefers riparian habitat with dense willow, cottonwood, salt cedar and/or mesquite	Species nests in Park and in project area
<i>Columbina passerine pallescens</i> Common ground-dove	–	E	SC	Prefers low-elevation, brushy, well-watered valleys, frequenting riparian woodlands and shrublands, especially mesquite thickets along streams and canyon bottoms.	Very rare Park visitor (formerly regular); not in project area
<i>Cynanthus latirostris magicus</i> Broad-billed hummingbird	–	T	SC	Low- to middle-elevation riparian woodlands; nests in hackberry thickets and similar vegetation	Uncommon to rare vagrant; not likely in project area
<i>Dumetella carolinensis ruficrissa</i> Gray catbird	–	–	SC	dense thickets along streams and marshes, occasionally found in drier environments and anywhere in native brush or trees during migration and occasionally in winter	Suitable habitat exists, and species is possible in project area
<i>Empidonax traillii extimus</i> Southwestern willow flycatcher	–	E	SC	Thick streamside vegetation	Uncommon in spring and fall in Park; no suitable nesting habitat in project area

Common Name (Scientific Name)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Falco femoralis septentrionalis</i> Northern aplomado falcon	E	E	–	Grassy plains interspersed with mesquite, cactus, and yucca	Not found in Park; no suitable nesting habitat in project area
<i>Falco peregrinus anatum</i> American peregrine falcon	SC	T	SC	Montane species; prefers to perch in open areas, often near water	No suitable nesting habitat in project area.
<i>F.p. tundrius</i> Arctic peregrine falcon; listed for “similar appearance”	SC	–	–	Montane species; prefers to perch in open areas, often near water	May visit as a migrant; not likely in project area
<i>Haliaeetus leucocephalus alascanus</i> Bald eagle	T	T	SC	Winters along shores of rivers and lakes	Accidental winter visitor; no suitable nesting habitat in project area
<i>Lanius ludovicianus</i> Loggerhead shrike	–	S	SC	Semi-open areas in desert scrub and grasslands with lookout posts, wires, scrub; prefers trees of medium to tall height for nesting	Nests in Park; suitable habitat exists and species occurs in project area
<i>Passerina versicolor</i> Varied bunting	–	T	SC	Summers in New Mexico; dense, shrubby vegetation in arid canyons	Suitable habitat exists and species nests in project area
<i>Pelecanus occidentalis carolinensis</i> Brown pelican	–	E	–	Most frequent during summer-fall at large lakes or along major rivers	Not found in Park
<i>Petrochelidon fulva</i> Cave swallow	–	–	SC	Primary colonial nesting sites are in limestone caves	Suitable habitat exists, and species is confirmed in project area
<i>Phalacrocorax brasilianus</i> Neotropical cormorant	–	T	–	Nesting cormorants require stands of trees or shrubs, in or near water, that are free from human disturbance	Not found in Park, possible accidental visitor
<i>Sterna antillarum athalassos</i> Interior least tern	E	E	–	Sand bars and sandy shorelines	No Park records; no suitable habitat in project area

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Strix occidentalis lucida</i> Mexican spotted owl	T	S	SC	Mature mixed-conifer and pine-oak forests	May nest in isolated canyons of Park; species is possible but unlikely in project area
<i>Tympanuchus pallidicinctus</i> Lesser prairie chicken	C	S	SC	Short-, mid-, and tall-grass prairies and shrubsteppes	Rare visitor in Park; no suitable habitat in project area, not likely in project area
<i>Tyrannus crassirostris</i> Thick-billed kingbird	–	E	SC	Requires native broadleaf riparian habitats characterized by mature cottonwoods and sycamores	Rare in Park; not likely in project area
<i>Vireo bellii</i> Bell's vireo	–	T	SC	Dense, low, shrubby vegetation in riparian areas	Nests in native trees in Park, suitable habitat exists in project area
<i>Vireo vicinior</i> Gray vireo	–	T	SC	Grassy arid juniper woodlands; oak and piñon pines	Nests in Park; suitable habitat exists and species is possible in project area

MAMMALS

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Bassariscus astutus</i> Ringtail	–	S	SC	Rocky areas of cliffs, outcroppings, and rock piles; rarely found in lowlands	Suitable habitat exists and species is confirmed in project area
<i>Chaetodipus nelsoni canescens</i> Nelson's pocket mouse	–	S	SC	Inhabits slopes with many boulders and large slabs of flat rock with moderate grass densities	Suitable habitat exists and species is possible in project area
<i>Conepatus leuconotus</i> Common (white-backed) hog-nosed skunk	–	S	SC	Deserts, grasslands, and woodlands; has occurred along the base of the escarpment in the Park	Suitable habitat exists and species is confirmed in project area
<i>Cryptotis parva</i> Least shrew	–	T	–	In New Mexico, primary habitat is mesic areas with dense grass cover	Not found in Park

Common Name (Scientific Name)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Cynomys ludovicianus ludovicianus</i> Black-tailed prairie dog	SC	S	–	Short-grass prairies	Not found in Park; no suitable habitat in project area
<i>Lasiurus blossevillii</i> Western red bat	SC	S	–	Sycamore, cottonwood, and rabbitbrush riparian habitat	Not found in Park
<i>Lasiurus borealis</i> Eastern red bat	–	S	SC	Sycamore, cottonwood, and rabbitbrush riparian habitat; prefers areas with large deciduous trees	Suitable habitat exists and species is possible in area
<i>Mustela nigripes</i> Black-footed ferret	E	S	–	Prairies; associated with prairie dogs	Not found in Park; no suitable habitat in project area
<i>Myotis ciliolabrum melanorhinus</i> Western small-footed myotis (bat)	–	S	SC	Prefers conifer forests at higher elevations	Suitable habitat exists and species is possible in project area
<i>Myotis thysanodes thysanodes</i> Fringed myotis (bat)	–	S	SC	Lives in desert, grassland, woodland, and forests and found throughout the Park; roosts in buildings and caves	Suitable habitat exists and species is confirmed in project area
<i>Myotis velifer</i> Cave myotis (bat)	–	S	SC	Common in desert and grasslands of New Mexico, particularly near open bodies of water; may use caves for raising of young and roosting	Suitable habitat exists and species is confirmed in project area
<i>Myotis volans interior</i> Long-legged myotis (bat)	–	S	SC	Ponderosa pine forests at higher elevations, though a few are found in grassland habitats	Suitable habitat exists and species is possible in project area
<i>Myotis yumanensis yumanensis</i> Yuma myotis (bat)	–	S	SC	Primarily an inhabitant of desert regions, most commonly encountered in lowland habitats near open water, where it prefers to forage; roosts in caves, abandoned mine tunnels, and buildings	Known only from skeletal material in Park; species is possible in area
<i>Neotoma leucodon melas</i> Eastern White-throated woodrat	–	–	SC	Lives in a variety of habitats from desert lowlands to mixed coniferous forests; alluvial fans, rocky arroyos, and boulder-strewn ground	Suitable habitat exists and species is confirmed in project area

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Nyctinomops macrotis</i> Big free-tailed bat	-	S	SC	Typically inhabits rugged canyons with rocky outcrops and tall cliffs	Suitable habitat exists and species is confirmed in project area
<i>Ondatra zibethicus ripensis</i> Pecos River muskrat	SC	S	-	Riparian areas in Chihuahuan desert scrub and piñon-juniper woodlands	Not found in Park; no suitable habitat in project area
<i>Plecotus townsendii pallescens</i> Pale Townsend's big-eared bat	SC	S	SC	Caves and rocky outcroppings in scrub deserts and piñon-juniper woodlands	Suitable habitat exists and species is confirmed in project area
<i>Puma concolor</i> Mountain lion	-	-	SC	Range occurs throughout New Mexico (except eastern plains); prefers mountainous areas	Suitable habitat exists and species is confirmed in project area
<i>Spilogale gracilis</i> Western spotted skunk	-	S	SC	Most often associated with rocky and brushy areas, especially in desert, grasslands, and woodlands	Suitable habitat exists and species is confirmed in project area
<i>Tadarida brasiliensis mexicana</i> Brazilian (Mexican) free-tailed bat	-	-	SC	Lowland habitats of desert, grassland, and piñon-juniper woodland	Suitable habitat exists and species is confirmed in project area
<i>Thomomys bottae guadalupensis</i> Guadalupe pocket gopher	SC	S	-	Sycamore, cottonwood, and rabbitbrush in riparian areas; higher elevations of Guadalupe Mountains	Not found in Park; no suitable habitat in project area
<i>Vulpes vulpes</i> Red fox	-	S	-	Favored habitat is mixed woodland uplands interspersed with farms and pastures	Not found in Park
<i>Vulpes velox velox</i> Swift fox	SC	S	SC	Short- to mid-grasslands and pastures	Not found in Park

PLANTS

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Amsonia tharpii</i> Tharp's blue-star	SC	E	SC	Limestone and gypsum hills in Chihuahuan desert scrub	Species was not found during 2004 rare plant survey of project area

Common Name (Scientific Name)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Chaetopappa Hershey</i> Mat lestdaisy	SC	S	SC	Steep limestone cliffs in piñon-juniper woodland and Rocky mountain montane coniferous forest	Species was not found during 2004 rare plant survey of project area
<i>Chrysothamnus nauseosus</i> var. <i>texensis</i> Guadalupe rabbitbrush	SC	S	SC	Crevices on faces of limestone cliffs and huge boulders of canyon woodlands	Species was not found during 2004 rare plant survey of project area
<i>Coryphantha scheeri</i> var. <i>scheeri</i> Scheer's pincushion cactus	–	E	SC	Favors nearly level areas in desert grassland and Chihuahuan desert scrub, usually on gravelly or silty soils, occasionally on rocky benches or bajadas on limestone or gypsum	Species was not found during 2004 rare plant survey of project area
<i>Coryphantha sneedii</i> var. <i>leei</i> (<i>Escobaria sneedii</i> var. <i>leei</i>) Lee's pincushion cactus	T	E	SC	Cracks in limestone in areas of broken terrain and steep slopes of Chihuahuan desert scrub	Suitable habitat may exist, but species was not found during 2004 rare plant survey of project area
<i>Echinocereus fendleri</i> var. <i>kuenzleri</i> Kuenzler's hedgehog cactus	E	E	SC	Gentle, gravelly or rocky slopes and benches on limestone or limey sandstone in grassland, oak woodland, or piñon-juniper woodland	Species was not found during 2004 rare plant survey of project area
<i>Eriogonum gypsophilum</i> Gypsum wild-buckwheat	T	E	SC	Sparsely vegetated pure gypsum	Suitable habitat does not exist, and species was not found during 2004 rare plant survey of project area
<i>Hexalectris nitida</i> Shining coralroot	–	E	SC	Deep canyons in leaf litter under oaks	Species was not found during 2004 rare plant survey of project area
<i>Justicia wrightii</i> Wright's water-willow (Wright's justicia)	SC	S	SC	Limestone benches in Chihuahuan desert scrub	Species was not found during 2004 rare plant survey of project area
<i>Nama xylopodum</i> Cliff nama	–	–	SC	Abundant on exposed rocks and boulders on cliff surfaces and arroyo bedrock	Suitable habitat exists and species is confirmed in the project area

Common Name (<i>Scientific Name</i>)	STATUS			General Habitat	Occurrence in Project Area
	FWS ¹	STATE ²	NPS ³		
<i>Penstemon cardinalis</i> ssp. <i>Regalis</i> Guadalupe penstemon	–	S	SC	Limestone slopes and canyon bottoms in montane scrub, piñon-juniper woodland, and lower montane coniferous forest	Suitable habitat exists and species is confirmed in the project area
<i>Perityle quinqueflora</i> Five-flowered rock daisy	–	S	SC	Crevices of limestone bluffs; cliffs in high canyons and caprock	Suitable habitat exists and species is confirmed in the project area
<i>Salvia summa</i> Supreme Sage	–	–	SC	Typically occurs on cliffs and at cliff bases, but may also appear in arroyo bottoms	Suitable habitat exists and species is confirmed in the project area
<i>Sclerocactus uncinatus</i> ssp. <i>Wrightii</i> Chihuahuan fishhook cactus	–	–	SC	Dry, gravelly desert slopes, often under bushes below 4,500 feet	Suitable habitat exists and species is confirmed in the project area
<i>Streptanthus sparsiflorus</i> Few-flowered (Guadalupe) jewelflower	SC	S	SC	Limestone canyon bottoms and montane scrub	Suitable habitat exists and species is confirmed in the project area

Information taken from ¹USFWS 2006. ²State of New Mexico: BISON-M 2006; EMNRD 2006; NMDGF 2006. ³NPS: Tonne 2004; Renee West and Danielle West, Carlsbad Caverns, personal communication 2006. NMRPTC 1999 consulted for plant county of occurrence.

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19 NMAC 33.2-Natural Resources and Wildlife: Removal and Capture or Destruction of Endangered Species.



As the nation’s principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. Administration.

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