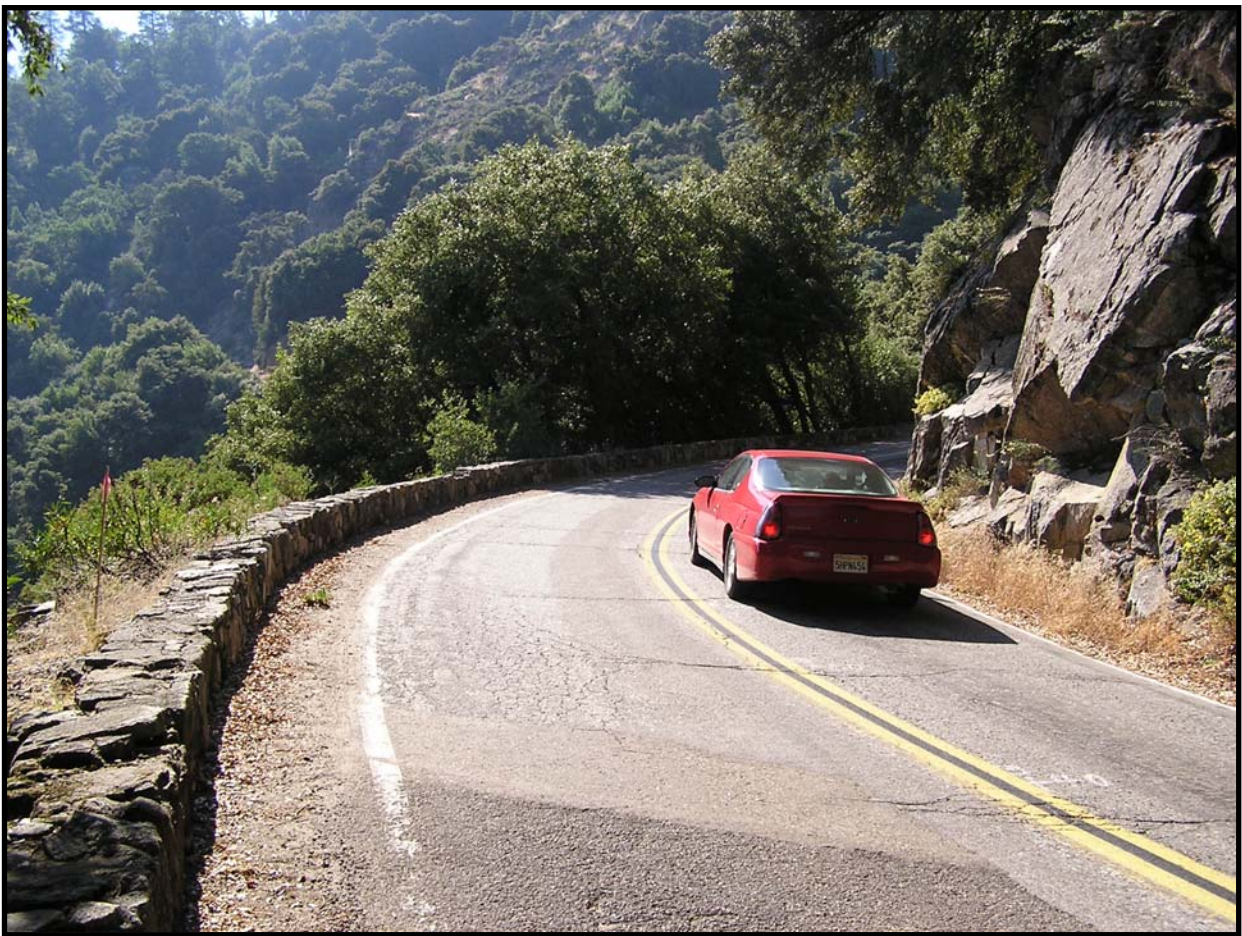




Environmental Assessment/Assessment of Effect

Rehabilitate Generals Highway from Amphitheater Point to Deer Ridge and Wolverton Road to Little Baldy Pullout

March 2008



ENVIRONMENTAL ASSESSMENT

Rehabilitate Generals Highway

Prepared For:
National Park Service



Prepared By:
Denver Service Center

Sequoia and Kings Canyon National Parks
California

**U.S. Department of the Interior
National Park Service
Environmental Assessment/Assessment of Effect
Rehabilitate Generals Highway
Sequoia and Kings Canyon National Parks
Tulare County, California**

Summary

The National Park Service in cooperation with the Federal Highway Administration/Central Federal Lands Highway Division is considering rehabilitating two sections of Generals Highway, the primary artery through Sequoia and Kings Canyon National Parks, Tulare County, California. One section proposed for work includes reconstructing the roadway for 1.5 miles from Amphitheater Point to Deer Ridge. Work would entail widening the existing travel lanes to a consistent 10-foot width and improving the turning radius of the switchbacks for a 22-foot vehicle. Shoulder stabilization, retaining walls, rock slope blasting, and cantilevered bridges would be necessary to construct this width.

The other section proposed for work would rehabilitate 8.5 miles of roadway from Wolverton Road north to the Little Baldy pullout. This element of the proposed project would recycle and overlay the existing pavement and rehabilitate the roadbed to a width of 22 feet while staying within the existing road bench. Culverts would be replaced or rehabilitated. Existing signs and interpretive pullouts and sidewalks would be upgraded or replaced as necessary. Existing curbs would be replaced and steel-backed timber guardrails or walls would replace existing metal guardrails in two locations. Existing pullouts would be reshaped to a consistent depth and layout throughout the project, while some unauthorized pullouts would be eliminated and revegetated. The existing roadway embankment bisects Halstead Meadow, creating a concentrated flow and deeply incised channel on the downstream side of the road culverts. The project would restore a more natural sheet flow condition under a proposed new bridge and provide long term road stability by removing the pipe culverts. A temporary one-lane detour would be built while the new bridge is under construction. Once the new bridge is fully operational the detour road would be removed and the meadow restored. Low spots in the meadow and the incised channel would be backfilled to restore the sheet flow conditions.

Notes to Reviewers and Respondents

If you wish to comment on the environmental assessment, you may mail comments to the name and address below or post comments online at <http://parkplanning.nps.gov/>. This environmental assessment would be on public review for 30 days. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we would be able to do so. We would make all submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

Please address comments to: Superintendent; Sequoia National Park; Attn: Rehabilitate Generals Highway Project; Sequoia and Kings Canyon National Parks Generals; 47050 Generals Highway, Three Rivers, CA 93271. E-mail: SEKI_superintendent@nps.gov

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ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
AoE	Assessment of Effect
CA SHPO	California State Historic Preservation Office
CCC	Civilian Conservation Corps
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
D.O.12	Director's Order 12
DSC	Denver Service Center
EA	Environmental Assessment
EA/AoE	Environmental Assessment/Assessment of Effect
ESF	Environmental Screening Form
GMP	General Management Plan
IO	Isolated Occurrence
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NPS	National Park Service
PA	Programmatic Agreement
SHPO	State Historic Preservation Office
USC	United States Code
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

INTRODUCTION

PURPOSE AND NEED FOR ACTION

The National Park Service (NPS) in cooperation with the Federal Highway Administration/Central Federal Lands Highway Division (FHWA) is considering rehabilitating two sections of Generals Highway, the primary artery through Sequoia and Kings Canyon National Parks (parks), Tulare County, California. The purpose of the proposed project is to maintain public access over Generals Highway. This would be accomplished by reconstructing and rehabilitating two sections of Generals Highway by improving the road geometry and structural instability; increasing the road width, where necessary, to two 10 foot travel lanes; formalizing and making uniform parking areas/pullouts or obliterating and revegetating social pullouts; and improving pavement surface and drainage.

One section proposed for work includes reconstructing the roadway for 1.5 miles from Amphitheater Point to Deer Ridge. Work would entail widening the existing travel lanes to a consistent 10-foot width with a one foot paved shoulder and improving the turning radius of the switchbacks for a 22-foot long vehicle. Shoulder stabilization, retaining walls, rock slope blasting, and cantilevered bridges would be necessary to construct this width.

The other section proposed for work would rehabilitate 8.5 miles of roadway from Wolverton Road north to the Little Baldy pullout. This section of the proposed project would use a 40-foot vehicle for its design requirements. The project would recycle and overlay the existing pavement and rebuild the roadbed within the existing road bench. Culverts would be replaced or rehabilitated. Existing signs and interpretive pullouts and sidewalks would be upgraded or replaced as necessary. Curbs would be replaced and steel-backed timber guardrails or walls would replace existing metal guardrails in two locations. Existing pullouts would be reshaped to a consistent depth and layout throughout the project, while some unauthorized pullouts would be eliminated and revegetated. The existing roadway embankment bisects Halstead Meadow, creating a deeply incised channel on the downstream side of the road culverts, eroding soils, and dewatering portions of the meadow. The project would restore a more natural sheet flow condition under a proposed new bridge and provide long term road stability by removing the pipe culverts. Low spots in the meadow and the incised channel would be backfilled to restore the sheet flow conditions.

Portions of the road have been in continuous use since 1926 and continue in service today as originally constructed. These actions are needed because:

1. The road geometry is inadequate in many areas. Retaining walls, cut walls, culverts, and support structures are unstable or failing (Amphitheater Point to Deer Ridge).
2. The pavement surface is deteriorated and of inconsistent width, varying from 18 to 22 feet (Amphitheater Point to Deer Ridge).
3. Parking areas and pullouts are often poorly designed and located (both sections).
4. Structural deficiencies and failures, including raveling edges, slumping of outside fills, and surface cracking, are occurring in the existing asphalt (both sections).
5. Drainage problems are present in some locations (both sections).

Continued deterioration of the road would result in damage to the adjacent natural environment, higher maintenance costs, loss of historic features, and hazardous driving conditions. Ultimately, the continued deterioration would threaten the ability of the visitors to see and enjoy the parks.

An environmental assessment/assessment of effect (EA/AoE) analyzes the preferred alternative and other alternatives and their impacts on the environment. This EA/AoE has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations (CFR) 1508.9); NPS Director's Order – 12: Conservation Planning, Environmental Impact Analysis, and Decision-making (D.O. 12); and the National Historic Preservation Act of 1966 (NHPA), as amended.

PARK PURPOSE, SIGNIFICANCE, AND MISSION

An essential part of the planning process is to understand the purpose, significance, and mission of the park for which this EA/AoE is being prepared.

Park Purpose

Sequoia National Park was established as the nation's second national park on September 25, 1890, with the purpose of preserving the giant sequoias (*Sequoiadendron giganteum*). General Grant National Park was established a week later, also with the purpose of preserving the giant sequoias. Kings Canyon National Park was established by Congress in 1940 and includes the area that was General Grant National Park. The purposes of the parks are the reasons why Congress established the area as part of the national park system. The purpose statements are basic to all other assumptions about the parks and the ways in which the parks should be used and managed. As defined by park managers, the following are the purposes of Sequoia and Kings Canyon National Parks, which incorporate the mission statement:

- Protect forever the greater Sierran ecosystem — including the sequoia groves and high Sierra regions of the park — and its natural evolution.
- Provide appropriate opportunities to present and future generations to experience and understand park resources and values.
- Protect and preserve significant cultural resources.
- Champion the values of national parks and wilderness.

Park Significance

Park significance statements capture the essence of the national park's importance to the natural and cultural heritage of the United States of America. Significance statements do not inventory park resources; rather, they describe the park's distinctiveness and help place the park within the regional, national, and international context. Defining park significance helps park managers make decisions that preserve the resources and values necessary to accomplish the purpose of the national park. Sequoia and Kings Canyon National Parks are special and unique places because they have:

- the largest giant sequoia trees and groves in the world, including the world's largest tree, the General Sherman Tree
- an extraordinary continuum of ecosystems arrayed along the greatest vertical relief (1,370 to 14,495 feet elevation) of any protected area in the lower 48 states

- the highest, most rugged portion of the high Sierra, which is part of the largest contiguous alpine environment in the lower 48 states
- magnificent, deep, glacially carved canyons, including Kings Canyon, Tehipite Valley, and Kern Canyon
- the core of the largest area of contiguous designated wilderness in California, the second largest in the lower 48 states
- the largest preserved southern Sierran foothills ecosystem
- almost 200 known marble caverns, many inhabited by cave wildlife that is found nowhere else
- a wide spectrum of prehistoric and historic sites documenting human adaptations in their historic settings throughout the Sierran environments

Sequoia and Kings Canyon National Parks have been designated as an international biosphere reserve, a program under the United Nations Educational, Scientific, and Cultural Organization that recognizes resources with worldwide importance. While this designation does not grant any form of control or ownership to the international body, it underscores the exceptional and singular qualities of the parks.

Park Mission

Park purpose describes the specific reason the park was established. Park significance is the distinctive features that make the park different from any other. Together, purpose and significance lead to a concise statement—the mission of the park. Park mission statements describe conditions that exist when the legislative intent for the park is being met.

The mission of Sequoia and Kings Canyon National Parks is based on the mission of the NPS, as defined by Congress in the 1916 Organic Act: to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations. The following mission statement for Sequoia and Kings Canyon National Parks articulates the broad ideals and vision that the NPS is striving to achieve: The mission of Sequoia and Kings Canyon Parks is to protect forever the greater Sierran ecosystem, including the sequoia groves and high Sierra regions of the parks and their natural evolution, and to provide appropriate opportunities to present and future generations to experience and understand park resources and values.

PROJECT BACKGROUND, PREVIOUS PLANNING, SCOPING, AND VALUE ANALYSIS

Reconstruction of Generals Highway began in fall 1993 at the south park boundary and has been completed to date to Big Fern Springs. The remainder of the road is in service today as originally constructed and receives periodic maintenance. The first phase of the Generals Highway reconstruction project began at the south entrance and continued 1.49 miles to Alder Creek. The second phase began where the first phase ended and continued for approximately 4.10 miles to Potwisha Campground. The next phase covered 2.39 miles from Potwisha Campground to Hospital Rock. Phase 4 covered the section of road from Hospital Rock to Big Fern Springs, approximately 3.29 miles. Phase 5 extends approximately 1.6 miles from Big Fern Springs to Amphitheater Point. Construction on this phase began in the summer of 2006 and was completed in late 2007.

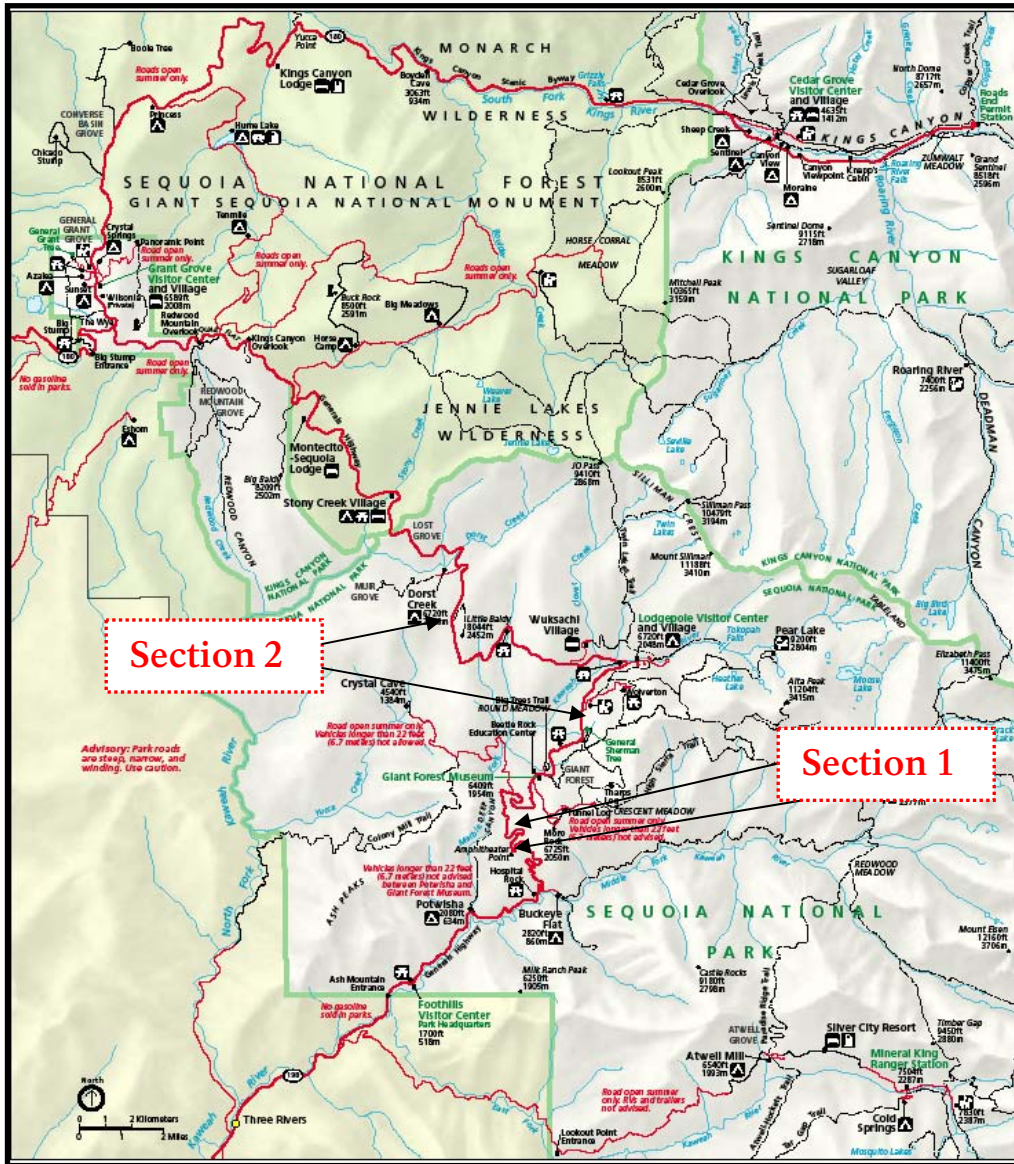


Figure 1: Project Location Map.

Previous Planning

Administratively, Sequoia and Kings Canyon National Parks are managed as one unit. They are currently operating under the direction of the General Management Plan (2006) (GMP), which states by 2010, the parks should see a 30% increase in traffic volume. According to their enabling legislations, both parks are managed as natural areas, with preservation of resources and wilderness character as their primary purposes. Roads and associated parking areas are all in lands classified as high density recreation, general outdoor recreation, or natural areas in which appropriate development is permitted. To protect resources, ease congestion, and to provide for a higher quality visitor experience, the GMP proposes a mass transportation system in the parks. To be consistent with the GMP, the proposed project would not impede any future implementation of a mass transportation system. However, vehicle size would need to be consistent with the design parameters used for road design.

A three year experimental shuttle system is currently being implemented with routes from Giant Forest to Crescent Meadow and Giant Forest to Wuksachi Lodge with stops at the General Sherman tree and Lodgepole Campgrounds.

The California Department of Transportation District 6 office in Fresno, California, was contacted as part of the *Road System Evaluation* (1988) planning process. An inquiry was made concerning future projects they may have planned that would influence traffic in Sequoia and Kings Canyon National Parks. The November 2002 *California State Transportation Improvement Plan* proposed widening Highway 180 to a four-lane road up to Minkler, which is located 20 miles east of Fresno. This could potentially increase the volume of drivers, thus influencing the number of visitors to the parks. The Transportation Improvement Plan did not provide estimated numbers of the forecasted increase in drivers. No capacity improvement projects are proposed for State Highway 198 for the next 20 years. Highway 198 will continue as a two-lane conventional highway, with only spot safety improvement projects (curve widening and intersection channelization) proposed. Highway 180, reconstructed in the vicinity of Fresno, and Highway 198, from State Highway 99 to Visalia, were recently finished as a continuous freeway, but the effect should not be felt in the parks. Some improvements will be made to Highway 198 in Three Rivers to better accommodate local traffic, but again there should be no effect on the parks.

Past planning efforts, including the *Road Inventory and Needs Study* (FHWA, 1982) and the abovementioned 1988 *Road System Evaluation*, have identified and analyzed Generals Highway for needed road work. Structural deficiencies and failures in the road were identified; these problems included raveling edges, slumping road shoulders, surface cracking, and poorly engineered and maintained drainages. Additionally, through years of filling potholes and other road maintenance actions (including burying a telephone cable in the road), the wearing surface is rough and uneven.

Before proposing to reconstruct all or part of Generals Highway, a number of natural, cultural, and visitor experience factors were analyzed. An EA was completed in 1988 which conceptually addressed improving the entire length of Generals Highway. The preferred alternative was selected at that time, and a *Finding of No Significant Impact* (FONSI) was signed. The preferred alternative was:

“Alternative 3 - Rehabilitate to a modified standard, which would provide a consistent 22-foot traveled way (11-foot-wide lanes) with a foreslope¹ that would be adjusted between 2:1 and 6:1² (1- to 3-feet wide). New cuts would be allowed only for safety reasons and grade/elevation changes are not deemed necessary.”

The intent of the 1988 EA was to determine a construction method and typical section which would maintain the appropriate historic and visitor experience characteristics of Generals Highway. The impact analysis was not based on a detailed design; it was meant to be used for comparison of alternatives. Some design criteria were established in general terms to further define appropriate character, such as no new cuts and no grade changes. These were stated prior to detailed design and were intended to define a low impact/modest change alternative that would retain the present historic and visitor experience characteristics of the highway.

¹Foreslope is that portion of the roadway that is contiguous with the traveled way and placed for lateral support of base and surface courses, but is not engineered to accommodate stopped vehicles or emergency use.

²2:1 = 2-foot horizontal to 1-foot vertical angle on foreslope, etc., through 6:1.

Modifications to the 1988 Preferred Alternative: During the design stage of Phase 1, it was determined that some modifications to the preferred alternative from the 1988 EA were warranted. A memorandum from the Park Superintendent to the Regional Director on December 21, 1990, clarified the evolution of thought and understanding about the reconstruction of Generals Highway, and the Regional Director concurred. The memorandum was not a NEPA or NHPA decision document. Instead, it outlined recommendations for future construction projects at Generals Highway. The recommendations included but were not limited to curve widening, treatment of historic rock work along the road, maintaining a slow vehicle speed, and the use of cutslopes to reduce resource impacts.

In order to implement these recommendations during the design for construction of Phase 1, it was determined that the use of a single specific vehicle length was the most efficient design consideration. Research has demonstrated that over 75 percent of the RVs in the parks were 24 feet or less in length (BRW, Inc., and Lee Engineering, 1999). All future road projects would use a 22-foot long design vehicle. The 22-foot long vehicle criteria provided the best balance between vehicle use and the curve widening needed to accommodate vehicle length. In addition to California Department of Transportation advisory signs posted on State Route 198 (the approach to the Ash Mountain entrance), the NPS has also posted signs advising that vehicles longer than 22 feet are not recommended from Potwisha to Giant Forest Village. The vehicle length advisory is posted in the parks at locations where larger vehicles can turn around before the curves at Alder Creek and at locations outside the parks at alternative routes. Buses and larger vehicles still have access to the Ash Mountain Visitor Center.

Scoping

Scoping is an effort to involve agencies and the general public in determining issues to be addressed in this EA/AoE. Scoping is used to determine important issues to be given detailed analysis in the EA/AoE and eliminate issues not requiring detailed analysis; allocates assignments among the interdisciplinary team members and/or other participating agencies; identifies related projects and associated documents; identifies permits, surveys, consultations, etc., required by other agencies; and creates a schedule that allows adequate time to prepare and distribute the EA/AoE for public review and comment before a final decision is made.

Scoping includes any interested agency or any agency with jurisdiction by law or expertise (including the State Historic Preservation Office (SHPO) and American Indian tribes) to obtain early input. In 1995 the NPS Western Regional Director, the California State Historic Preservation Officer (CA SHPO), and the Advisory Council on Historic Preservation (ACHP) signed the “Programmatic Agreement Regarding the Repair and Reconstruction of Roads, Appurtenant Structures, and Associated Utilities, Sequoia and Kings Canyon National Parks.” This Programmatic Agreement (PA) expired on September 30, 2000. The PA was updated in November 2006 and is currently being reviewed by tribes, the ACHP, and CA SHPO for approval and signature.

To begin the planning process, staff of Sequoia and Kings Canyon National Parks and resource professionals of the NPS Denver Service Center (DSC), conducted internal scoping. A Project Scoping Review was conducted by the DSC, Park/Regional staff, and the FHWA employees in August 2004. This meeting initiated the NEPA and NHPA Section 106 processes. To fulfill the requirements identified in NEPA and Section 106 the NPS has additional guidance in Director’s Order 12 (D.O. 12) that states each park unit would complete an Environmental Screening Form (ESF) when there is a federal undertaking at the park. D.O. 12 further states that an interdisciplinary team of park resource professionals would complete the ESF, provide

mitigation measures for the undertaking, and make recommendations to the Park Superintendent. The ESF also identified the appropriate NEPA pathway for analyzing resource impacts. In this case an EA was identified as the appropriate NEPA pathway. An AoE, which requires consultation with the CA SHPO, was identified as the appropriate pathway under Section 106.

A press release (Appendix A) initiating scoping and describing the proposed action was issued on July 28, 2006. The CA SHPO was sent a scoping letter on August 16, 2006, and American Indian groups traditionally associated with the parks were also sent scoping letters (Appendix B) on August 16, 2006. Comments were solicited until the scoping period ended in October 2006. No comments were received either on the internet or through the mail. The public and appropriate federal and state agencies will also have an opportunity to review and comment on this EA/AoE.

ISSUES AND IMPACT TOPICS

Issues

Issues are problems or concerns that initiated the need for federal action or may result from the action itself. Issues and concerns affecting this plan were identified from past NPS planning efforts; in meetings with Park managers, FHWA staff, interested citizens, and input from other state and federal agencies. The primary issues are:

- natural resources: the proposed action with its associated construction activities could have various effects on natural resources, such as soil, wildlife, vegetation, wetlands, and air quality;
- cultural resources: the proposed action with its associated construction activities could have various effects on known and unknown archeological and historic resources;
- visual and recreational values: the potential for impact to the expansive views, kinds and varieties of scenic resources, and recreational facilities or opportunities;
- safety concerns: particularly with buses and the larger RVs now common on Generals Highway, there are problems of inconsistent lane widths, and poorly designed parking areas and pullouts;
- visitor use and experience: the effects of a deteriorating road; and
- operations and maintenance: due to the effects of a deteriorating road system.

Derivation of Impact Topics

Specific impact topics were developed for discussion/analysis and to allow comparison of the environmental consequences of each alternative. These impact topics were identified based on federal laws, regulations, and Executive Orders; 2006 *NPS Management Policies*; and NPS knowledge of limited or easily impacted resources. A brief rationale for the selection of each impact topic is given below, as well as the rationale for dismissing specific topics from further consideration.

IMPACT TOPICS SELECTED FOR DETAILED ANALYSIS

Special Status Species

The Endangered Species Act (1973), as amended, requires an examination of impacts on all federally listed threatened or endangered species. NPS policy also requires examination of the impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species. In July 2006 the parks received the most current list of Federally and State Listed Endangered and Threatened Animals and Plants of California from the online database at: <http://www.dfg.ca.gov/hcpb/species/lists.shtml/>. By reviewing pertinent literature and through known occurrence of species in the project area, it was determined Special Status Species could be impacted by the proposed action through road construction and habitat removal; therefore, this impact topic is addressed in the EA/AoE.

Wetlands and Floodplains

Executive Order 11990 (*Protection of Wetlands*) requires an examination of impacts to wetlands, and the 2006 NPS Management Policies and Director's Order 77-1 provide guidelines for proposed actions within wetlands. There are jurisdictional or NPS-defined wetlands within the project area. A jurisdictional wetland is an area that meets the criteria established by the US Army Corps of Engineers for Wetlands (as set forth in their Wetlands Delineation Manual). In addition, the NPS classifies wetlands based on the U.S. Fish and Wildlife Service (USFWS) Classification of Wetlands and Deepwater Habitats of the United States, commonly referred to as the Cowardin classification system (Cowardin et al. 1979). Wetlands and floodplain at Halstead Meadow could be impacted by road construction; therefore, this impact topic is addressed in the EA/AoE.

Park Operations

Increased traffic delays during construction and road closures would have an adverse impact to the park staff's ability to respond to routine maintenance and getting to and from work. Paving pullouts and reducing the number of informal pullouts would reduce the amount of time maintenance workers require to maintain these pullouts. Therefore, the topic, park operations, has been retained as an impact topic.

Visitor Experience

Visitor experience would also be affected by the possible delay time required during construction, the closure of social pullouts, the formalization of pullouts, the removal of historic features along the road, and the consistent road width. Traffic delays would be limited to one hour during the peak season, Memorial Day to Labor Day. After the peak season, traffic delays would be increased to two hours, if needed. In addition to traffic issues, visitors also hike the Little Baldy Trail to access the wilderness that is 100 feet from the centerline of the road. Therefore, this topic is addressed in detail in the EA/AoE.

Cultural Landscapes

According to the NPS's *Cultural Resource Management Guideline* (Director's Order – 28), a cultural landscape is

“... a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined by both physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values.”

In 1998 the Cultural Landscapes Automated Inventory Management System database indicated that 10 parent landscapes and 13 component landscapes were identified in the parks. Generals Highway was one of the parent landscapes and is listed as a Level II documented landscape. The National Register nomination lists landscape architecture as an area of significance for Generals Highway. The stone masonry retaining wall, parapet walls, and culvert headwalls are all contributing features to the National Register nomination and the landscape architectural interpretation of the parent landscape. Therefore, cultural landscapes are retained for analysis.

Historic Structures

Generals Highway, Clover Creek Bridge, Marble Fork Bridge, Sillman Creek Culvert, and Suwanee Culvert are the structures within the project area that are listed on the parks' List of Classified Structures. Previous cultural resource inventories in and near the project area also identified the historic road alignment and stone masonry features such as retaining walls, culvert headwalls, and bridges for inclusion in the List of Classified Structures. A cultural resource inventory was completed in the area of potential effect in October 2005. The results of the survey and condition assessment are part of the National Register Nomination Addendum that will be submitted to the CA SHPO and National Register. Therefore, historic structures were retained for additional analysis in this EA/AoE.

IMPACTS DISMISSED FROM DETAILED ANALYSIS

Soils/Geologic Resources

Local igneous rocks of Cenozoic and Mesozoic origins (granite and its relatives) underlie the majority of the two parks, with extensive bands of Mesozoic metamorphic beds occurring as well. Within the latter, caves and beds of marble are common. Soils are derived from the two general igneous and metamorphic rock types, glacial debris, and alluvium. The weathered shallow soils are generally on steep south-facing slopes, especially in the canyon of the Middle Fork of the Kaweah River. Sierran soils tend to be shallow and young, showing little development. They also tend to have high infiltration rates due to high sand and rock content. Surface erosion is low because infiltration rates are greater than rainfall or snowmelt rates, and water is absorbed into the soil. Erosion is also limited and infiltration improved by plant distribution. About one mile north of Lodgepole, the highway breaches the terminal moraine left by the receding Tokopah Glacier. North of this, Generals Highway is built upon weathered granitic soils of variable depth or, at stream crossings, upon unconsolidated sand and gravel alluvium.

Between Giant Forest and Grant Grove, Generals Highway winds through batholithic granite domes, crossing exfoliating slopes and boulder strewn ridges. In the Tokopah Valley the highway descends across the south lateral moraine to Lodgepole where unsorted granitic boulders and gravel left by the edge of the melting glacier form a 400-foot wall on the canyon side.

Under the no action alternative, long term, minor, adverse impacts to soils would continue, resulting from erosion, incised channel flow destabilizing stream banks, unstable shoulders and rock slides.

The proposed action would impact approximately 13 acres of previously undisturbed soils and rock faces /overhangs. These areas would be down slope of the road where new walls are being constructed (Amphitheater Pt. to Deer Ridge project) and shoulder grading (Wolverton to

Little Baldy project). Approximately 31 acres of previously disturbed areas, primarily the existing roadway and pullouts, would be impacted.

Additional fill slopes, buttress walls, and cantilevered bridges would be built to stabilize soils and maintain a uniform road width. Short term, minor, adverse impacts to soils/geologic resources would occur due to construction of cut/fill slopes; construction of guardwalls, retaining walls, and bridges; and culvert rehabilitation. Impacts would be minimal and localized, and mitigation measures would be incorporated to reduce erosion potential during construction (see Mitigation table). Long term, negligible, adverse impacts would result from the blasting of rock in two to four locations and the paving of pullouts. Long term, beneficial impacts would be expected from stabilizing the eroded channel and building the bridge at Halstead Meadow, which would improve drainage and reduce erosion. The anchoring of rock slopes would reduce future rock slides. Because adverse impacts to soils/geologic resources would be minor or less, this impact topic was dismissed from further analysis.

Wildlife

Impacts to special status species will be analyzed under the Special Status Species impact topic, which was selected for detailed analysis.

Under the no action alternative, the existing roadway would continue to have long term, local, negligible, adverse effects to wildlife from collisions with automobiles, as well as disturbances associated with human activities (e.g. feeding, harassment, noise). Halstead Meadow would continue to degrade, altering habitat suitability for the fish, amphibians, and mammals that utilize the area.

Under the preferred alternative, increased noise from equipment and increased human activities during construction would cause short term, adverse impacts to wildlife species; however, these impacts would be temporary and wildlife usage would return once construction is complete. Noise disturbance resulting from the potential installation of pavement rumble strips in two locations would be noticeable to wildlife in these areas; however the impact would be localized and buffered by the dense vegetation lining the road corridor. Wildlife would likely acclimate to the new sound over time. During construction, some wildlife, particularly small mammals, could be temporarily displaced or destroyed. Larger animals, such as deer, would likely avoid the road corridor during construction. Black bear may be drawn to the area if food is not properly stored and removed. Mitigation measures, including education of construction workers to prevent feeding of wildlife and to properly store food in bear-proof containers would be implemented, as is currently enforced with park visitors.

Night work could be needed in areas requiring culvert replacements, primarily between Red Fir and the Little Baldy pullout and in areas requiring culvert replacement or cantilever bridge construction between Amphitheatre and Deer Ridge. The natural downtime usually experienced in the overnight hours provides a respite to wildlife within the vicinity of the road. Night work would introduce new short term disturbance to the environment, displacing some animals away from the corridor.

To accommodate the wider roadway and the meadow restoration work, some identified trees would be removed adjacent to the road corridor. This could impact wildlife by reducing the quality and availability of cover. To minimize wildlife impacts, when feasible all tree removal would occur between August 15 and March 1 to facilitate protection of nests and dens. If it would be necessary to remove trees during the breeding season, all trees would be identified

and examined before removal to ensure they are not being utilized for nesting. Animals that now utilize the artificial habitat and drier portions of the meadow could be displaced as the meadow is restored to a more natural condition. Amphibians located in the wet portions of the meadow may be temporarily displaced or their numbers may decline during the dewatering of the meadow for meadow restoration. Fish species found in the meadow are all non-native and their removal would be a benefit (Werner, pers. comm., July 12, 2006). As habitat is restored to a more natural condition, native animals would benefit.

Although the posted speed limit would not change, a smoother, wider road surface may increase the comfort level of drivers, increasing driving speeds, and potentially increasing the likelihood of wildlife-vehicle collisions. However, the winding nature of the Amphitheater Point to Deer Ridge portion of Generals Highway would be maintained, naturally limiting faster speeds. With these mitigations, the preferred alternative would be expected to have short term and long term, minor, adverse impacts on wildlife; therefore, wildlife was dismissed as an impact topic.

Vegetation

NEPA calls for an examination of the impacts on all components of affected ecosystems and is the charter for the protection of the environment. NEPA requires federal agencies to use all practicable means to restore and enhance the quality of the human environment and to avoid and minimize any possible adverse effects of their actions upon the environment. NPS policy is to protect the components and processes of naturally occurring biotic communities, including the natural abundance, diversity, and ecological integrity of plants and animals (*NPS Management Policies 2006*).

Native plant communities within the parks are comprised of over 1,200 vascular plant species. Extreme topographic differences create a variety of habitat types and conditions that range from xeric low-elevation oak woodlands to high-elevation alpine communities. Within elevation and precipitation bands, an additional complex of species and communities exist that are affected by relatively static physical influences, such as aspect, slope position, soils, and the effects of past glacial action. Dynamic processes, such as moisture and fire, also affect these species and communities.

The preferred alternative has high potential for introducing non-native plant species via equipment and imported earth materials. Ground disturbance would occur on approximately 44 acres, which includes approximately 13 acres of new disturbance, causing favorable conditions for the spread of invasive non-native plants already in the parks. Best management practices are listed in the mitigation table and would be incorporated as part of the project, reducing the level of impacts to native vegetation. Other plant species found within the project area are common to the parks, and impacts would be localized, impacting individual plants. Native plant populations would not be affected. Approximately 15 to 35 trees would be removed for the Halstead Meadow restoration project and for culvert replacement. Disturbed areas in the Amphitheater Point to Deer Ridge portion, which has the highest potential for invasive species problems, would be seeded with a native perennial grass mix, limiting the ability of non-native vegetation to become established. The area would be monitored following reseeding and non-native species would be treated with an herbicide, and the area again reseeded with the native seed mix. Disturbed areas in the Wolverton Road to the Little Baldy pullout section would have salvaged /conserved topsoil applied and would be mulched with native litter and duff, a treatment that has resulted in successful native plant establishment in other projects. With the implementation of mitigation measures, the preferred alternative

would result in short, and long term, negligible, adverse impacts to vegetation populations, therefore vegetation was dismissed from further analysis.

The Farnsworth jewelflower (*Streptanthus farnsworthianus*) is an annual herb that is on the parks' sensitive plant list along with the bigleaf maple (*Acer macrophyllum*), and California nutmeg (*Torreya californica*). These three plants are addressed under the impact topic "Special Status Species".

Air Quality

The 1977 amendment to the Clean Air Act, (42 U.S.C. 7401 *et seq.*), requires federal land managers to protect park air quality, while the 2006 NPS Management Policies address the need to analyze air quality during park planning. Sequoia and Kings Canyon National Parks were designated Class I under the 1963 Clean Air Act, as amended. A Class I area is subject to the most stringent regulations of any designation. Class I areas must not exceed the maximum allowable increment over baseline concentrations of sulfur dioxide and particulate matter as specified in Section 163 of the 1963 Clean Air Act. Further, the 1963 Clean Air Act provides that the federal land manager (the Assistant Secretary for Fish and Wildlife and Parks and the Park Superintendent) have an affirmative responsibility to protect the parks' 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. Section 118 of the 1963 Clean Air Act requires the parks to meet all federal, state, and local air pollution standards.

The proposed project falls within the San Joaquin Valley Air Pollution Control District (Ratliff, et al., 2005). The air district is currently *extreme* non-attainment for ozone (1 hour) and *serious* non-attainment for particulate matter (PM₁₀). This air district is susceptible to air pollution given its climate, topography, and human activities. Area (non-point) sources continue to be the major contributor of air pollutants in the district. Area sources include cars, trucks, farm equipment, and other agricultural activities. Most of the air pollution found in the parks originates outside park boundaries. However, emissions from construction equipment would produce particulate matter (PM), nitrogen oxides (NO_x), and hydrocarbons, precursors to the formation of ozone.

During construction the contractor would be required to implement dust control mitigation procedures to reduce the particulate matter. Additional mitigation measures that would be implemented include: allowing construction vehicles to idle up to but not exceeding 5 minutes when parked; when available park interpreters would be located at each delay station asking drivers to turn off their vehicles while waiting, reducing emissions from idling vehicles; and signs would be posted along the road before the delay stations, alerting visitors of the construction and the possibility of traffic delays. There would be no asphalt batch plant within the park boundaries.

Overall, there would be a slight and temporary degradation of local air quality due to dust generated from road reconstruction activities and emissions from construction equipment and visitor vehicles, resulting in negligible adverse impacts. These effects would last only as long as road reconstruction activities occurred, and the parks' Class I air quality would receive a negligible impact by the proposal. There would be no long term, adverse impacts to air quality from implementing the preferred alternative. Therefore, the impact topic of air quality was dismissed from further analysis.

Water Quality

The 1972 Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, is a national policy to restore and maintain the chemical, physical, and biological integrity of the

Nation's waters and to enhance the quality of water resources and prevent, control, and abate water pollution. The 2006 NPS *Management Policies* provides 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 and ground waters within the parks consistent with the Federal Water Pollution Control Act (1972), as amended, and other applicable federal, state, and local laws and regulations. The Generals Highway between Amphitheater Point and Deer Ridge is in the Middle Fork Kaweah Watershed, and the Generals Highway between Wolverton Road and the Little Baldy Pullout is in the Marble Fork Kaweah and the North Fork Kaweah Watersheds and crosses numerous named and unnamed rivers and creeks. There is the potential for adverse impacts to the watersheds and the water quality. To mitigate the level of impact, sediment traps, erosion checks, and/or filters would be constructed above or below all culvert drains (if such drains are required) and in all other ditches before the water (runoff) leaves the project construction limits. The project would require some cut and fill actions, therefore, silt screens or other methods of erosion and sedimentation control would be implemented to reduce potential impacts to water quality. Surface restoration and revegetation of disturbed land would reduce soil erosion and minimize potential for long term impacts. No water would be removed from any drainage for this project. Water needed for construction and dust control would come from the existing water systems at Giant Forest and Potwisha developed area should construction occur during the winter months. Water would not be diverted from surface waters. Because mitigation measures described above would reduce the level of impact to negligible, water quality was dismissed as an impact topic.

Soundscapes

In accordance with *NPS Management Policies 2006* and Director's Order – 47: *Sound Preservation and Noise Management*, an important part of the NPS mission is preservation of 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 considered acceptable varies among NPS units, as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas. Noise associated with road improvements would be short term and localized, and construction activities would be scheduled so as to minimize effects on visitor experience. Natural quiet is a factor that contributes to the visitor's wilderness experience and is addressed in visitor experience. Designated wilderness is 100 feet from the centerline of the road for approximately 3 miles; short term construction noise, including blasting, would have a minor adverse impact to the soundscape. The impacts from potentially adding rumble strips at the Little Baldy pullout and Clover Creek Bridge are addressed in the Environmental Consequences section under the visitor experience impact topic, and consideration of noise impacts on wildlife was addressed above under the wildlife impact topic. Therefore, soundscapes were dismissed for further analysis.

Night Sky

Sequoia and Kings Canyon National Parks offer opportunities to experience the night sky free from artificial light, one of a number of dwindling places where this is possible. The GMP (2006) states, "Efforts should be undertaken to ensure that light pollution from inside the

parks does not erode this value.” Existing impacts to the night sky from the low number of vehicles traveling the corridor at night may degrade the night sky for visitors and residents in the parks after dusk. The impact of light pollution from headlights is limited by the tall vegetation that buffers the roadway and prevents light pollution from traveling much beyond the road corridor. This impact is localized and negligible, lasting as long as it takes the vehicle to pass. No new facilities that would require additional lighting, or that would increase nighttime visitors are proposed under the preferred alternative. Localized impacts from nighttime construction include additional lighting from vehicles and spot lights to illuminate working areas. These impacts would be short term, minor, and adverse. Therefore, night sky was dismissed as an impact topic.

Wild and Scenic Rivers, Other Unique Natural Areas

As identified by park staff, no areas within the project vicinity are designated as wild and scenic rivers. However, the Marble Fork of the Kaweah River was determined to have characteristics that qualify it for Wild and Scenic River consideration. The 2006 GMP states that any activity in the area of the Marble Fork Bridge consider impacts to the qualities of the river that qualify the Marble Fork for Wild and Scenic River designation. The proposed project at the Marble Fork Bridge does not change any characteristic of the bridge or the river. Therefore, this topic was dismissed from detailed analysis.

Prime and Unique Farmland

In 1980 the CEQ directed federal agencies to assess the effects of their actions on farmland soils classified as prime or unique by the United States Department of Agriculture, Natural Resources Conservation Service. Prime or unique farmland is defined as soil which produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. As identified by park staff, there are no prime or unique farmlands associated with the project area; therefore, this topic was dismissed from detailed analysis.

Environmental Justice

Executive Order 12898 (*General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, 1994), requires all agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations or communities. No alternative under consideration would have disproportionate impacts on the health or environment of minority or low-income populations or communities as defined in the Environmental Protection Agency’s *Draft Environmental Justice Implementation Plan* (1996). The alternatives would affect all populations equally. Environmental justice was, therefore, dismissed from detailed analysis.

Wilderness

On September 28, 1984, the Sequoia – Kings Canyon Wilderness was established as federally designated wilderness, encompassing approximately 723, 000 acres, or about 83.5% of the parks. The wilderness acreage within the parks, when combined with the adjacent wildernesses in the neighboring Inyo, Sequoia, and Sierra National Forests are the second largest wilderness in the lower 48 states totaling 1,661,785 acres. There are two additional areas within the parks that were recommended by the administration for wilderness designation but not approved by Congress. The parks have continued to manage these areas to preserve

wilderness characteristics per regulation and policy. The wilderness boundary is set at 100 feet from the Generals Highway centerline starting just west of the Red Fir maintenance facility and continuing beyond the Little Baldy pullout, equaling approximately 3 miles of continuous visible wilderness from the road corridor. All construction activity would occur within 100' from the road centerline, and the construction noise that could be heard beyond the 100' buffer is addressed under visitor experience. The noise impacts on wilderness from potentially adding rumble strips at the Little Baldy pullout and Clover Creek Bridge are also addressed under the visitor experience impact topic. The preferred alternative would not physically alter wilderness resources, therefore, wilderness was dismissed as an impact topic.

Socioeconomic/Gateway Communities

The community of Visalia has partnered with the parks and developed a shuttle system that brings park visitors staying in the valley up to the parks through the Ash Mountain Entrance where the shuttle users are transferred to an internal NPS shuttle system at Giant Forest. The majority of seasonal employment for projects, especially construction related projects in the parks also comes from the surrounding communities and the San Joaquin or Central Valley. The duration of construction activity for the preferred alternative is three – five years. Neither the no action nor the preferred alternative would have an impact greater than negligible on the local or regional employment levels or economy or the Visalia shuttle system. Proposed construction delays would impact the internal NPS shuttle system and the shuttle from Visalia to the parks. Any construction employment would be short term and beneficial during the construction periods. Since the socio-economic/gateway community impact is tied directly to employment and visitors spending time and money in these communities and the overall impacts are negligible or less, socioeconomic/gateway communities were dismissed as an impact topic.

Archeological Resources

In 1985 and 1986 the NPS conducted an archeological survey that covered the area of potential effect except for the area between Lodgepole and Little Baldy Pullout. The report, *"The 1985 and 1986 Generals Highway Archeological Survey, Sequoia National Park"* (1990), located one site, a bedrock milling site with a lithic scatter. This site would be fenced off to indicate that no ground disturbing activities are allowed outside of the already disturbed area, and an NPS archeologist would be on site during the entire ground disturbance near the site. If archeological material is inadvertently discovered during the project, all work within the immediate area would stop until the park archeologist was notified and appropriate consultation and a mitigation plan is implemented according to the NHPA of 1966 as amended.

An archeological survey covering the remaining portion of the area of potential effect was conducted in September 2006. One historic site was located and six Isolated Occurrences (IO's) were recorded. The historic site was a dumping station for refuse from the Lodgepole and Giant Forest development areas. This site would be flagged and avoided during construction as well as having the other cultural resource mitigations applied. The IO's were outside of the construction limits. Because the one historic site would be avoided and all the IO's are outside of the construction limits, there would be no impact to archeological resources, and under Section 106 no historic properties affected. Therefore, archeological resources were dismissed from further analysis.

Ethnographic Resources

Ethnographic resources are defined by the NPS as any “site, subsistence, or other significance in the cultural system of a group traditionally associated with it” (Director’s Order – 28). There are twelve affiliated American Indian tribes traditionally associated with Sequoia and Kings Canyon National Parks. The tribal contacts were sent an informational letter on August 16, 2006, describing the proposed project and the NPS desire to hear their comments. There were no comments received from the tribes consulted. This EA/AoE was also sent to each tribe for their review and comment. If subsequent issues or concerns are identified, appropriate consultations would be undertaken. According to NPS professional staff and the GMP there are no known ethnographic landscapes or resources within the parks eligible or listed in the National Register of Historic Places (NRHP). Consequently, no adverse impacts are anticipated and appropriate steps would be taken to protect any human remains, funerary objects, sacred objects, or objects of cultural patrimony inadvertently discovered during project construction. Therefore, ethnographic resources were dismissed from detailed analysis.

Museum Objects

Museum collections include historic artifacts, natural specimens, and archival and manuscript material. They may be threatened by fire, vandalism, natural disasters, and careless acts. The preservation of museum collections is an ongoing process of preventative conservation, supplemented by conservation treatment when necessary. The primary goal is preservation of artifacts in as stable condition as possible to prevent damage and minimize deterioration. Professional staff at the parks stated (Tom Burge, pers. comm., July 7, 2006) the proposed activities along Generals Highway would not require additional curatorial services or increase the number of museum objects at the parks; therefore, museum objects were dismissed as an impact topic.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary 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 American Indian and Alaska Native tribes. Professional staff at the parks stated (Tom Burge, pers. comm., August 8, 2006) there are no Indian trust resources at Sequoia and Kings Canyon National Parks. The lands comprising the parks are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, Indian trust resources were dismissed as an impact topic in this EA/AoE.

ALTERNATIVES

The alternatives section describes two management alternatives for Generals Highway from Amphitheater Point to Deer Ridge and from Wolverton Road intersection to the Little Baldy pullout. Alternatives for this project were developed to improve structural road deficiencies, improve natural and cultural resources protection, enhance visitor experience, and improve park operations.

The no action alternative describes the action of continuing the present management operation and condition. It does not imply or direct discontinuing the present action or removing 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 Generals Highway at Sequoia and Kings Canyon National Parks without major actions or changes in course.

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

Additional alternatives considered and dismissed from detailed analysis are also discussed in this section. An alternative comparison table (Table 1) is found at the end of this section. This table compares and contrasts each alternative, including the degree to which each alternative accomplishes the purpose and fulfills the needs identified in the Purpose and Need section. Table 2 presents impacts of each alternative for comparative purposes along with a concise summary of each alternative's potential environmental effects.

ALTERNATIVE 1: NO ACTION ALTERNATIVE

The no action alternative would be the continuation of existing conditions for Generals Highway from Amphitheater Point to Deer Ridge and Wolverton Road intersection to Little Baldy pullout. The existing condition at Halstead Meadow below the roadway would persist. Should the no action alternative be selected, the NPS would respond to future needs and conditions associated with Generals Highway in the parks without major actions or changes in the present course. The no action alternative does not preclude short term, minor repair or improvement activities for the road that would be a part of routine maintenance for continuing operation of the road.

ALTERNATIVE 2: PREFERRED ALTERNATIVE

The preferred alternative presents the proposed action and defines the rationale for the action in terms of resource protection and management, visitor experience, and park operations. The preferred alternative meets the Sequoia and Kings Canyon National Parks' planning objective of providing a safe and adequate transportation route through this portion of the parks and opportunities for visitors to stop and experience the parks along the route. The preferred alternative would be designed for a 20-year service life, meeting current and anticipated future needs during that period.

Roadway Facilities

The first section would reconstruct Generals Highway for 1.50 miles from Amphitheater Point to Deer Ridge. Work would entail constructing retaining walls, guardwalls, cantilever bridges,

drainage structures, base material, and asphalt. The existing grade and alignment would be maintained as much as possible. Revegetation would occur where areas adjoining the road are disturbed. Widening the existing travel lanes to a consistent 10-foot width and improving the turning radius of the switchbacks to accommodate a 22-foot long design vehicle is a design standard adopted for the section from Potwisha to Giant Forest, which includes the Amphitheater Point to Deer Ridge section. Shoulder stabilization and rock outcrop blasting would be necessary to establish the proposed width.

The second section would rehabilitate Generals Highway for 8.5 miles, from Wolverton Road north to the Little Baldy pullout. The project would recycle and overlay the existing pavement, including rebuilding the roadbed within the existing road bench. The typical section of two 10-foot travel lanes with 1-foot shoulders would be used, and curves would be widened to accommodate a 40-foot vehicle length. Existing curb would be eliminated on fills, and at Suwannee Creek the curb would be removed and replaced. Steel-backed timber guardrails or walls would replace metal guardrails in two locations between Wolverton Road and Little Baldy pullout. Any new wall construction or rehabilitation of existing walls would be in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties* (1992). Existing pullouts would be reshaped to a consistent depth and layout throughout the project.

At the Clover Creek Bridge, the pullout may be extended approximately 30 feet to allow for two additional parking spaces. Rumble strips may be added across both travel lanes to attract attention to the pedestrian traffic in the area. The roadway cross-slope would be corrected on curves.

Little Baldy Saddle trail crosses Generals Highway at the pullout at the northern terminus of this project. Existing pullouts on both sides of the roadway allow visitors to park and access the trail. However, sight distance is poor because the trail crossing and pullouts are located on the crest of a hill. Proposed improvements may include adding rumble strips across both lanes to attract attention to the pedestrian traffic in the area and improved signing. Other existing signs and interpretive waysides would be upgraded or replaced as necessary throughout both sections.

Existing underdrains south of the Lodgepole area would be replaced during construction. Utilities, including sewer, water, electrical and telephone, are buried beneath the current road facility from Wolverton Road intersection to the Red Fir Maintenance Facility. The utility access boxes located in the road at this location would be modified or replaced. The vegetation along the road would be cut throughout the project.

The projects would be constructed in multiple (3-4) phases due to high costs and complexity of the work. In accordance with previous Generals Highway road projects, daytime traffic delays through the project would be a maximum of one hour during peak visitation, from Memorial Day weekend to late September and a maximum of two hours during the shoulder construction season, from early October to Memorial Day. Construction would be limited to daylight hours in the Wolverton Road to Little Baldy pullout section. An exception to this limitation may be made to repair or replace deep culverts mainly in the area between Red Fir to Little Baldy pullout with appropriate mitigation measures for wildlife. The 1.5 mile road section from Amphitheater Point to Deer Ridge requires complicated construction, including the widening of existing travel lanes requiring the construction of cantilevered bridges and retaining walls, on switchbacks, several of which are within the ¼ - mile radius of a known

California spotted owl territory. The construction on this road section may take the entire construction season making it impossible to limit construction during the nesting season. Impacts to historical nest sites may be unavoidable. These impacts may include shifts in territory use away from construction noise, changes in feeding behavior, or changes in adult nesting behavior, e.g. increased flushing from the nest.

Drainage Improvements

Drainages with stone masonry culverts would not be disturbed. Some masonry headwalls would be replaced or rehabilitated. Generals Highway and some associated stone masonry features are listed on the NRHP. Any rehabilitation or new construction would be in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties* (1992). An erosion hole was found at the culvert 4.5 miles northeast of the Wolverton Road road intersection. The existing pipe would be replaced with a 36- or 48-inch pipe. The inlet would be raised and the existing hole filled.

There are several deep culverts that need to be repaired or replaced, mainly in the area from Red Fir to the Little Baldy pullout. The replacement of these culverts may require excavating material down several feet to reach the damaged culvert. This may require extended road closures which will only be possible at night.

Wuksachi Village Road Improvements

The Wuksachi Village Road (approximately 0.7 miles) would be rehabilitated under this project. The road was originally constructed to half the pavement depth recommended. Curb would be added minimally in select locations to aid in drainage. Previously constructed curb and ditch would not be disturbed. The existing acceleration and deceleration lanes on Generals Highway at the Wuksachi Village Road would be redesigned with the goal of staying within the existing footprint.

Halstead Meadow Restoration and Bridge Construction

Generals Highway crosses Halstead Meadow approximately 5.3 miles north of the Wolverton Road intersection. The road embankment bisects the meadow, altering the natural sheet flow of water and adversely impacting the meadow ecosystem. Most of the meadow's water is diverted into two 36-inch pipe culverts, resulting in incision of a channel that is greater than 20 feet deep in many areas that extends for nearly the entire length of the meadow. In *Analysis of Meadow Hydrology, Vegetation, and Soils and Suggestions for Restoration of Upper Halstead Meadow, Sequoia National Park, California* (Cooper and Wolf, 2006), the incision was determined to be actively widening the channel, eroding additional meadow area, lowering the water table, and altering the native wet meadow plant community both above and below the roadway. Approximately 1.6 acres in the Upper Halstead Meadow has been drained by the channel and an estimated 2 acres in the Lower Halstead Meadow. The restoration of the Upper Halstead Meadow was completed in September 2007. Environmental effects of the restoration were discussed in a separate NEPA document.

The Lower Meadow Restoration, which would start in 2010, would be achieved by using a combination of restoration measures, which may include the following:

- use fill produced as waste from other projects in the park to fill the gullies and restore level cross-meadow grades;
- import fill from outside the park to fully or partially fill the gullies;

- grade and compact surface channels and tunnels in the highly disturbed, dried part of the meadow to restore level cross-meadow grades and eliminate piping of water toward the gullies;
- use earthen berms to exclude water from sections of gullies that cannot be filled;
- use rocks, logs, earth, and geotextile fabric to build check dams within the gullies;
- use rocks, logs, and geotextile fabric to build a large, stepped-down grade transition where the filled section of the large gully transitions down to the bed of the incised channel;
- build a temporary road (10-20 years) from the Generals Highway down into the large gully so that fill can be placed as it is produced as waste from other projects; alternatively, this access may be made through the existing Halstead Meadow picnic area, requiring short (one to two month) closures of the picnic area.
- embed logs across the meadow, below the bridge to provide grade control that will prevent headcuts from continuing up the meadow, endangering the bridge and the upper meadow restoration;
- obtain material on site – under the road or other parts of the upper or lower meadow without causing adverse grades;
- divert water temporarily to allow gullies to be filled. Water would be collected near the bridge area and piped further downstream for discharge to minimize headcutting near the restoration site and allow gullies to be filled;
- remove upstream, depositional sediment caused by the road acting as a dam; and
- fell approximately 15 to 35 live and dead trees, some over 24 inches in diameter, across the meadow perpendicular to the water flow to dissipate flow energy, spread water evenly across the meadow, and prevent channelization.
- plant approximately 50,000 native wetland plants, propagated from seed collected from Halstead Meadow or, if necessary, from other meadows located within 10 miles and within an elevation of 500 feet of Halstead Meadow. Until plants are established, erosion control blanket would be used to provide surface complexity and prevent surface erosion.

According to Cooper and Wolf (2006), the Lower Meadow Restoration would require 15,000 cubic yards of fill. Because this quantity of fill may not be immediately available within a 10-mile radius, the lower meadow restoration may extend over a longer time period (approximately 10 years), utilizing fill dirt in phases as it is produced by other projects. Once the gully is filled, surface water would be allowed to flow across the meadow.

Because California spotted owl surveys conducted in 2006 and 2007 indicated an owl pair within the vicinity of Halstead Meadow, larger trees would be flagged by the parks and evaluated by the owl survey crew to determine if the trees are within 100 meters of the owl's core use area. To protect other sensitive bird species that may use smaller trees for nesting, trees would be cut down between August 15 and March 1, avoiding conflicts with the nesting season. If the contractor encounters a situation where tree removal is required during the nesting seasons, they would contact the project manager and the tree would be evaluated for nests and/or roosts. If a roost or nest is found, the tree would be left in place or removed outside of the breeding season.

The road rehabilitation and lower meadow restoration work would tie-in with the upper restoration work to allow for a stable transition across the meadow. The lower meadow work could begin in 2010 and is expected to last several years as fill becomes available. The bridging of the meadow to restore sheet flow will require the installation of a one lane temporary detour road on the north side of the roadway, which would allow for removal of the existing road embankment and installation of the bridge. Construction of the bridge abutments would require removal of existing trees that have grown up in the road embankment. Areas of the meadow that have been eroded may require minor filling or grading to reestablish the natural flow across the meadow. Once surface water is reestablished across the meadow, the temporary roadway would be removed, and plants grown from seed collected in Halstead Meadow would be replanted in the spring following implementation of the earthwork.

Staging Areas

Previously disturbed areas (larger NPS approved pullouts) along Generals Highway, Dorst Material Yard, and/or a parking area at Potwisha within Sequoia National Park would be used as contractor and equipment staging and stockpile areas. Excess topsoil would be stored at either Wolverton Quarry site or Dorst material yard, and excess blasted rock would be transported out of the parks, if not used for construction.

Sustainability

The NPS has adopted the concept of sustainable design as a guiding principle of facility planning and development. The objectives of sustainability are to design park facilities to minimize adverse effects on natural and cultural values, to reflect their environmental setting, and to maintain and encourage native 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. Essentially, sustainability is living within the environment with the least impact on the environment. The preferred alternative subscribes to and supports the practice of sustainable planning, design, and use of Generals Highway within Sequoia and Kings Canyon National Parks by limiting and mitigating resource impacts and promoting conservation principles by recycling pavement materials.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with D.O. 12, the NPS is required to identify the “environmentally preferred alternative” in all environmental documents, including EAs. The environmentally preferred alternative is determined by applying the criteria suggested in NEPA, which is guided by the CEQ. The CEQ provides direction that “[t]he environmentally preferred alternative is the alternative that will promote the national environmental policy as expressed in Section 101 of NEPA, which considers:

1. fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations
2. assuring for all generations safe, healthful, productive, and esthetically 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" (NEPA, section 101)"

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

- address the deteriorating road surface and poor visibility that creates safety hazards for employees and visitors (criteria 2, 3, and 5 not met as well as under the preferred alternative)
- reduce the need for road and culvert maintenance that consumes depletable resources (criteria 1 and 6 not met as well as under the preferred alternative)
- ensure safer access to park facilities (e.g., parking areas, trails, wayside exhibits) for all individuals (criteria 2, 3 and 4 not met as well as under the preferred alternative)
- correct conditions producing the erosion/degradation at Halstead Meadow and would not restore the wetlands (criteria 1, 2, and 4 not met as well as under the preferred alternative)

The environmentally preferred alternative in this EA/AoE is the NPS preferred alternative.

This alternative was selected based on the following criteria:

- protects public and employee health, safety, and welfare by addressing safety concerns associated with a deteriorated road surface and poor visibility (NEPA criteria 2, 3, and 5)
- prevents loss of cultural and natural resources by improving drainage and revegetating/restoring social pullouts (NEPA criteria 1, 2, 3, 4, and 5)
- improves operations efficiency and sustainability by reducing the need for ongoing road maintenance and the consumption of depletable resources associated with such maintenance (criteria 1 and 6)

MITIGATION MEASURES

Mitigation measures are presented as part of the preferred alternative. These actions have been developed to lessen the adverse effects of the preferred alternative.

General Measures

- The NPS project manager or project specialist and Park Superintendent would ensure that the project remains within the construction limits and parameters established in the compliance documents and that mitigation measures are properly implemented.
- Construction zones outside of the existing disturbed area would be identified and fenced with construction tape or some similar material prior to any construction activity. The fencing would define the construction limits and confine activity to the minimum area required for construction.
- All protection measures would be clearly stated in the construction specifications/special construction requirements, and workers would be instructed to avoid conducting activities beyond the construction limits as defined by the construction fencing or similar material. This does not exclude necessary temporary structures such as erosion control fencing.
- All tools, equipment, barricades, signs, surplus materials, and rubbish would be removed from the project work limits upon project completion. Any asphalt surfaces damaged due to work on the project would be repaired to original condition. All demolition debris would be removed from the project site, including all visible concrete and metal pieces.
- Contractors would be required to properly maintain construction equipment (i.e., mufflers) to minimize noise from use of the equipment.
- A hazardous spill plan would be in place, stating what actions would be taken in the case of a spill, notification measures, and preventive measures to be implemented, such as the placement of refueling facilities, storage, and handling of hazardous materials, etc.
- Where appropriate and available “environmentally friendly” grease, hydraulic oil, and bar and chain oil would be used. These lubricants are vegetable or mineral oil based, less toxic, and biodegradable.
- All equipment on the project would be maintained in a clean and well-functioning state to avoid or minimize contamination from automotive fluids. All equipment would be checked daily.
- Best management practices for drainage and sediment control, as identified and utilized by the FHWA’s and the NPS’ Stormwater Pollution Prevention Plan, would be implemented to prevent or reduce nonpoint source pollution and minimize soil loss and sedimentation in drainage areas. Use of Best Management Practices in the project area for drainage area protection would include all or some of the following actions, depending on site-specific requirements:
 - keeping disturbed areas as small as practical to minimize exposed soil and the potential for erosion;

- locating waste and excess excavated materials outside of drainages to avoid sedimentation;
 - installing silt fences, temporary earthen berms, temporary water bars, sediment traps, stone check dams, or other equivalent measures (including installing erosion-control measures around the perimeter of stockpiled fill material) prior to construction;
 - conducting regular site inspections during the construction period to ensure that erosion-control measures were properly installed and are functioning effectively; and
 - storing, using, and disposing of chemicals, fuels, and other toxic materials in a proper manner
- Delays for emergency response vehicles would be kept to a minimum by having the emergency responders notify the traffic monitors via park radio/frequency immediately when the vehicle is dispatched, thus allowing approximately 10 minutes to clear the road before the arrival of the emergency vehicle.

Wetlands/Floodplains

- Wetland Protection Best Management Practices outlined in Appendix C would be adhered to, thus limiting impacts to wetlands. Restoration measures for Halstead Meadow described in the above section would also help limit wetland impacts.

Vegetation

- A revegetation plan would be developed for disturbances outside of the existing road prism.
- Ground surface treatment would include grading to natural contours, replacing topsoil, and, where necessary, seeding, and planting. On the Wolverton Road to Little Baldy pullout section, topsoil placement and mulching with litter and duff would be the primary revegetation treatment. If insufficient litter and duff is salvaged from the project area, additional litter and duff would be gathered from adjacent areas to place as mulch over disturbed soil.
- Reclaimed areas would be monitored after construction to determine if reclamation efforts are successful or if additional remedial actions are necessary, as outlined in the revegetation plan developed by the NPS.
- Remedial actions would include installation of erosion-control structures, reseeding, topsoil placement, and/or replanting the area, and controlling non-native plant species with herbicide.
- In an effort to avoid introduction of non-native/noxious plant species, no hay bales would be used during revegetation or for temporary erosion control.
- Best Management Practices would include:
 - Minimize soil disturbance.

- Pressure wash and/or steam clean all construction equipment to ensure that all equipment, machinery, rocks, gravel, or other materials are cleaned and weed free before entering the parks. Construction equipment would be inspected by NPS staff prior to entering the parks to ensure compliance with cleanliness requirements and inadequately cleaned equipment would be rejected.
- Cover all haul trucks bringing fill materials (excluding asphalt) from outside the parks to prevent seed transport and dust deposition along the road corridor.
- Limit vehicle parking to existing roadways, parking lots, or access routes.
- Limit disturbance to roadsides and culvert areas, including limiting equipment to the roadbed area - no machinery or equipment should access areas outside the construction limits.
- Obtain all fill, rock, or additional topsoil from the project area, if possible. If not possible, obtain weed-free sources from NPS approved sources outside the parks.
- If weed-free quarry sources cannot be located, the contractor may be required to scrape away topsoil at the quarry and/or acquire freshly exposed material with minimal seed deposition and washing of course materials (rip rap).
- Initiate revegetation of disturbed sites immediately following construction activities.
- Monitor disturbed areas for up to three years following construction to identify growth of noxious weeds or non-native vegetation. Treatment of non-native vegetation would be completed in accordance with NPS-13, *Integrated Pest Management Guidelines*.
- To maximize vegetation restoration efforts after completion of construction activities, the following measures would be implemented:
 - Salvage topsoil from construction areas for reuse during restoration on disturbed areas. Additionally, the topsoil containing the seed bank from identified, main jewelflower populations would be removed, stored, and replaced after construction.
 - Incorporate native litter and duff layer in forested sites for replacement over salvaged topsoil.

Wildlife

- The clearing limits (construction limits) outside of the existing road prism would be clearly marked or flagged prior to construction. All construction activities, including staging areas, would be located within previously disturbed areas and fenced, if necessary.

Special Status Species

- Construction personnel would be informed of the occurrence and status of special status species and would be advised of the potential impacts to the species and potential penalties for taking or harming a special status species.
- Great grey (*Strix nebulosa*) and California spotted owl (*Strix occidentalis occidentalis*) surveys would be conducted to protocol and until the projects are complete, to locate use

areas that may be impacted. Construction activities would be adjusted as practicable, to avoid sensitive life stages of these species.

- A bat survey would be conducted prior to construction to identify any maternity or roost colonies that may be affected by the project. Construction activities would be adjusted as practicable, to avoid sensitive life stages of these species.
- Most construction activity would be limited to daylight hours for the Wolverton Road to the Little Baldy pullout section. Some night work and/or road closures may be necessary for culvert repair or replacement, mainly from Red Fir to the Little Baldy pullout.
- To reduce noise disturbance and limit impacts to breeding avian and mammalian species, all tree removal work would be conducted August 15 – March 1, where feasible. If larger trees, with a diameter at breast height of 24 inches or greater, need to be removed outside of this time frame, they would be identified for removal and evaluated for nesting or roosting use. If nesting or roosting is found, the tree would be left in place or removed outside of the breeding season.
- Feeding or approaching wildlife would be prohibited by construction personnel.
- Any wildlife collisions would be reported to park personnel.
- Park biologist or ranger would be notified if bears loiter in area or if fisher sightings occur.
- A litter control program would be implemented during construction to eliminate the accumulation of trash. All food would be stored in bear proof containers except when it is being consumed. Food stored in vehicles would be in bear proof containers. Spilled food would be cleaned up. Visitors in traffic delays would be educated by NPS staff, when available, to not approach or feed wildlife.

Air Quality

- Dust control would occur, as needed, on active work areas where dirt or fine particles are exposed.
- The contractor will not leave vehicles idling for more than five minutes when parked or not in use.
- Concrete and asphalt plants would be located outside Sequoia and Kings Canyon National Parks. No long term or overnight storage of these materials would be permitted within the parks. Small quantities of concrete and asphalt may be stored for a short term only at the designated staging areas.
- Construction debris would be hauled from the parks to an appropriate disposal location.
- Visitors would be asked to not idle their vehicles while waiting for the traffic delay to be re-opened.

Water Quality

- Sediment traps, erosion checks, and/or filters would be constructed above or below all culvert drains (if such drains are required) and in all other ditches before the water (runoff) leaves the project construction limits.
- At all cut and fill areas, erosion and sedimentation control would be implemented to

minimize impacts to water quality.

- Surface restoration and revegetation of disturbed soils would be implemented to minimize long term soil erosion.
- Water needed for construction and dust control would come from the existing developed water systems within the parks and would not be diverted from surface waters.

Soils/Geologic Resources

- Blasting would be allowed, in clearly identified areas, and an appropriate blasting plan would be established and strictly enforced.
- Where blasting occurs, soils would be reestablished in “pockets” so that vegetation can be planted.
- Erosion and sediment control would be required (see “General Measures”).
- Topsoil would be removed from areas of construction and stored for later reclamation use. The topsoil would be redistributed as near the original location as possible and supplemented with scarification, mulching, seeding, and/or planting with species native to the immediate area.

Park Operations

- As necessary, future park utilities conduit may be incorporated into the project to reduce damage and the removal of any new road surface.
- Only one of the major overlooks (Amphitheater Point or Deer Ridge) would be used for staging during different phases of the project, but the other would be clear and remain open for visitors.
- Once the winter season terminates construction, the turnouts should be cleared of all construction storage equipment and materials.
- Delays for emergency response vehicles would be kept to a minimum by having the emergency responders notify the traffic monitors via park radio/frequency immediately when the vehicle is dispatched, thus allowing approximately 10 minutes to clear the road before the arrival of the emergency vehicle.

Visitor Experience

- One lane of traffic would remain open during construction, when feasible, and access to Wolverton Road and to the Sherman Tree Parking Lot would remain open, although delays will occur during intersection reconstruction.
- From Amphitheatre to Deer Ridge, traffic delays through the project would be a maximum of one hour during the peak visitation season, from Memorial Day to late September and a maximum of two hours during the off-peak season, from early October to Memorial Day.
- From Wolverton to Little Baldy, traffic delays would be a maximum of one hour, year round. When delays are necessary, traffic will be released through the construction zone on the hour.
- To minimize delays, when possible slip lines would be installed in existing culverts and/or overflow culverts would be installed, which would reduce installation time.

- All closures would be limited to weekday closures from 6 a.m. Monday to 12 p.m. Friday with weekend closures limited to short delays to account for the possibility of single lane travel.
- The park will provide information, e.g. brochures, signs, telecommunication, and interpretative programs to inform visitors, concessions, USFS, and employees of alternative routes and project schedule.
- Visitors would be notified when road closures or traffic delays would occur and information would be posted in neighboring communities, on the park website, at visitor centers and entrance stations.
- At the traffic delay locations and if conditions warrant, an NPS interpreter would be present to answer questions from visitors and advise them of procedures and construction expectations.

Cultural Resources

- Should unknown archeological resources be uncovered during construction, work would be halted in the discovery area, the site secured, and the appropriate Sequoia and Kings Canyon National Parks staff would consult with the CA SHPO and affiliated tribes, if necessary, according to 36 CFR 800.13 and, as appropriate, provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA).
- In compliance with the NAGPRA, the NPS would also notify and consult concerned American Indian tribal representatives for the proper treatment of human remains, funerary, and sacred objects should these be discovered during the project.
- Archeological specimens found within the construction area would be removed only by the NPS or their designated representatives.
- When a historic stone masonry feature is to be rehabilitated, the rehabilitation would be in accordance with the Secretary of Interior Standards for the Treatment of Historic Properties (1992) and Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings (Weeks and Grimmer, 1995).
- Known historic sites and IO's would be flagged and avoided during construction, and an NPS archeologist would be on site during the entire ground disturbance near the site.
- The aforementioned bedrock milling site with a lithic scatter located during the "*1985 and 1986 Generals Highway Archeological Survey, Sequoia National Park*," (1990) would be fenced off to indicate that no ground disturbing activities are allowed outside of the already disturbed area.
- All new stone masonry features would be built in accordance with the Secretary of Interior Standards for the Treatment of Historic Properties (1992) and Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings (Weeks and Grimmer, 1995).

- 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 sites listed or eligible for listing in the NRHP. Written proof satisfactory to the NPS and the CA SHPO shall document, for compliance with Section 106, that no historic properties would be affected because:
 - there are no historic resources present or
 - there is no effect to historic properties present.

Health and Safety

- Traffic monitors would have park radios with the appropriate park frequency and appropriate safety clothing and reflective signs.
- Visitors and NPS staff would not be allowed to stop/park in a pullout or on the road in the construction zone. Emergency vehicles would be allowed on an as needed basis.

General Construction Schedule and Costs

Construction to rehabilitate Generals Highway would take place between March and November 2008 - 2011. Construction activities to restore the lower Halstead Meadow would take place between 2010 and 2020. Construction could begin or extend beyond the timeframe identified previously based on weather conditions, but only after the Superintendent receives a formal written request and grants permission. In 2007 the estimated value of the construction effort is \$25 - \$30 million.

ALTERNATIVES CONSIDERED BUT DISMISSED

One design option considered and dismissed allowed for maintaining the various road widths. This option was not carried forward because the NPS interdisciplinary team determined the impacts would be too great for visitor experience and health and safety, and this option does not meet the purpose and need for the project.

Another construction option considered and dismissed allowed for a full road closure during construction. This construction option was dismissed because the impact to the visitor experience, the gateway community, and park operations would be too great.

TABLE 1. COMPARATIVE SUMMARY OF NO ACTION AND PREFERRED ALTERNATIVES

No action Alternative	Preferred Alternative
<p>There would be no improvements to Generals Highway from Amphitheater Point to Deer Ridge and Wolverton Road intersection to Little Baldy pullout. Sequoia and Kings Canyon National Parks staff would respond to future needs and conditions associated with Generals Highway without major actions or changes in the present course. Raveling, cracking, and potholes in the road edge would continue and the road surface would continue to have areas of severe rutting and instability. Improvements to the intersections and pullouts would not occur. Existing stone masonry guardwalls and metal guardrails would not be replaced or upgraded to meet safety standards. Drainage structures would not be improved, and Halstead Meadow would continue to flow through the existing incised channels below the roadway. The visitor would continue to feel unsafe using the unpaved and inadequate sized pullouts and the variable road widths. Damaged guardwalls and guardrails would contribute to a less enjoyable driving experience.</p> <p><u>Meets project objectives?</u></p> <p>No. Continuing the existing roadway maintenance would neither improve road surface conditions for park employees and visitors nor improve the feeling of safety while driving the damaged and curvy road. Historic stone masonry features and natural resources would continue to be adversely impacted because of erosion and visitor impacts.</p>	<p>Work would entail constructing retaining walls, guardwalls, cantilever bridges, drainage structures, base material, and asphalt. The existing grade and alignment would be maintained as much as possible. Widening the existing travel lanes to a consistent 10-foot width, and improving the turning radius of the switchbacks to accommodate a 22-foot long vehicle is a design standard for the section between Amphitheater Point and Deer Ridge and a 40-foot design vehicle for Wolverton Road to the Little Baldy pullout. Shoulder stabilization, rock outcrop blasting, retaining walls, and cantilever bridges would be necessary to maintain the proposed width.</p> <p>Existing curbs would be replaced. Steel-backed timber guardrails or walls would replace metal guardrails in two locations. Any new wall construction or rehabilitation of existing walls or drainage features would be in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties. Existing pullouts would be reshaped to a consistent depth and layout throughout the project. At Clover Creek bridge the pullout may be extended to accommodate two additional vehicles, and rumble strips may be added in both lanes approaching the bridge.</p> <p>Rumble strips in both travel lanes also may be added at the Little Baldy trail crossing. Signing would also be improved.</p> <p>Construction of a bridge over Halstead Meadow is proposed for restoring the meadow to its natural sheet flow. Backfilling the incised channel and regrading of unnatural low/high spots in the meadow is also proposed. The lower meadow work would begin in 2010 and is expected to last several years as fill becomes available. A combination of measures described above would be used to achieve meadow restoration.</p> <p>Meets project objectives? Yes. The improvements would reduce maintenance activities to restore or stabilize the roadway, shoulders, and pullouts. Visitors would feel safer driving a road with uniform road widths, greater acceleration and deceleration lanes, wider lanes on curves, and stable guardwalls and guardrails. Natural resources would be restored and preserved at Halstead Meadow and other erosion channels along with the rehabilitation of historic features such as stone masonry drainage features and stone masonry walls.</p>

TABLE 2. IMPACTS OF EACH ALTERNATIVE

Potential Environmental Impacts		
Impact Topic	No action Alternative	Preferred Alternative
Special Status Species	Impacts to special status species from collisions with automobiles, as well as disturbances associated with human activities (e.g., feeding, harassment, noise), would have long term, local, minor, adverse effects.	<p>Local, short term, minor, adverse impacts to special status species' habitats and noise disturbance would occur due to construction activities such as cut and fill slopes, guard and retaining wall construction, culvert rehabilitation, lower meadow restoration, and paving of informal pullouts.</p> <p>Impacts associated with human activities would be similar to the no action alternative. Long term impacts would be local, minor and adverse due to the faster driving speed that accompanies new asphalt and a wider road.</p>
Wetlands and Floodplains	Long and short term, moderate, adverse impacts to Halstead Meadow would continue due to the continued degradation of the meadow resulting from the roadway: e.g. the roadway would continue to bisect the meadow and water would be channeled through 4 large culverts, disrupting the natural sheet flow condition; the channelized flow would continue to erode the meadow, causing soil loss and faster flows; and higher areas within the meadow would continue to be dewatered, altering the vegetation community and contributing to the loss of the meadow ecosystem.	<p>Short-term, minor to moderate adverse impacts would result from the restoration of Halstead Meadow due to grading of low/high spots in the meadow, diversion of water and the building of a by pass road.</p> <p>Long term impacts will be beneficial resulting from the restoration of the hydrology and wet meadow vegetation.</p>
Park Operations	Deferred maintenance costs would increase due to the additional time spent to maintain the road surface and associated road features.	<p>Local, short term, moderate, adverse impacts to park operations would occur due to traffic delays and the temporary closure of pullouts during construction.</p> <p>Long term impacts to park operations would be local and beneficial due to the removal of some social pullouts and paving of other pullouts, and the reduced maintenance of the damaged road surface.</p>

Potential Environmental Impacts		
Impact Topic	No action Alternative	Preferred Alternative
Visitor Experience	The deteriorating condition of Generals Highway, inappropriately built road features (e.g., parking areas, intersections), and the variable road widths, constitute local, short and long term, negligible to minor, adverse impacts to visitor experience.	<p>Local, short term, moderate, adverse impacts to visitor experience would occur due to construction delays and night time work at specific locations.</p> <p>Long term impacts to visitor experience would be local, beneficial, and adverse. The beneficial impact would be due to the improved driving experience because of the road width being uniform and the construction of paved pullouts, the improved visual experience from replacing metal guardrails with stone masonry simulated guardwalls, and the restoration at Halstead Meadows. The minor, adverse impacts to visitor experience would be due to removal of social pullouts and the reduction of historic character because the stone masonry features would not have an aged historic look, and the potential placement of rumble strips in two locations near wilderness areas and other areas where visitors go to experience quiet.</p>
Historic Structures	The continued deterioration of the stone masonry guardwalls drainage features would occur; therefore there would be local, long term, minor, adverse impacts to historic structures.	<p>No short term impacts are analyzed because once a historic resource is impacted it is permanent.</p> <p>Long term impacts to historic structures would be local, moderate, and adverse due to the significant amount of historic features removed from the National Register listed roadway. A small percentage of historic features would be rebuilt using similar stone for the visible portions of the features while the less visible would be built from a non-historic material.</p> <p>Section 106 impact analyses would be an adverse effect to historic structures, and a PA would be written between the NPS, the CA SHPO, and the ACHP. There is a draft PA between the parks, SHPO, and ACHP being reviewed and routed for signature.</p>

Potential Environmental Impacts		
Impact Topic	No action Alternative	Preferred Alternative
Cultural Landscapes	<p>The deteriorating condition of Generals Highway and non-contributing built road features (e.g., social pullouts, metal pipe guardrails), and the variable road widths, constitute local, short and long term, negligible to minor, adverse impacts to cultural landscapes.</p>	<p>The short term impact would be local, negligible, and adverse because of the temporary staging of construction equipment and debris within the road corridor. There would also be a temporary loss of contributing historic features and materials during the reconstruction of the same features.</p> <p>The long term impact would be local, moderate, adverse, and beneficial. Several historic stone features would be removed and in most cases rebuilt with stone, however some features would not be replaced. The beneficial impact is due to removal of non-contributing features, such as social pullouts and metal pipe guardrails. The guardrails would be replaced with stone masonry guardwalls, so the features would be considered supporting to the National Register nomination.</p> <p>Section 106 impact analysis would be an adverse effect to cultural landscapes, and a PA would be written between the NPS, the CA SHPO, and the ACHP. There is currently a PA between the parks, CA SHPO, and ACHP being reviewed and routed for signature.</p>

AFFECTED ENVIRONMENT

Detailed information on the natural, cultural, and human resources at Sequoia and Kings Canyon National Parks may be found in the final general management plan (NPS, 2006). A summary of the resources that may be impacted from the proposed project are described below.

LOCATION AND GENERAL DESCRIPTION OF THE PARK AND ITS ROAD SYSTEM

Sequoia and Kings Canyon National Parks are located in south-central California. Sequoia National Park was established by Congress on September 25, 1890, to preserve the natural resources of the area with special emphasis on the unique groves of giant sequoia that occur on the west slope of the Sierra Nevada mountains. General Grant National Park was established a week later, also with the purpose of preserving the giant sequoias. Kings Canyon National Park was established by Congress in 1940 and includes the area that was General Grant National Park. Sequoia and Kings Canyon National Parks contain the most notable and extensive giant sequoia groves in the world, as well as a very scenic part of the Sierra Nevada Mountains, including 14,495-foot Mount Whitney, the highest mountain in the contiguous United States.

The parks are within easy driving distance of two major metropolitan regions of California, approximately 240 miles north of Los Angeles and 240 miles southeast of San Francisco, as well as the major cities in the Central Valley. Fresno is about 55 miles west of the Big Stump entrance to Kings Canyon National Park on Highway 180, and Visalia is about 35 miles west of the Ash Mountain entrance to Sequoia NP on Highway 198. These cities are easily reached from Los Angeles and San Francisco by freeway and are connected to the parks' entrances by 2-lane paved state highways. As each highway approaches the parks they become more narrow and winding as an effective transition between the high speed roads in the Central Valley and the narrow, mountainous, low-speed roads in the parks. Yosemite National Park is due north of Sequoia and Kings Canyon National Parks, and Death Valley National Park is due east. No road crosses the Sierra Nevada Mountains within Sequoia and Kings Canyon National Parks.

Approximately 1.6 million people visited Sequoia and Kings Canyon National Parks in 2005. In the past 30 years annual visitation has fluctuated between a low of 1.4 million in 2000 to a high of 2.2 million in 1987 and 1991 (BRW, Inc., and Lee Engineering, 1999). Visitors to Sequoia and Kings Canyon National Parks come primarily from within a 200-300 mile radius of the parks; this includes both the San Francisco and Los Angeles metropolitan areas. The primary mode of transportation to the parks is the private automobile. As a result, visitation tends to be weekend oriented, peaking on extended weekends in the summer. Weather plays a major role in setting the seasonal visitation patterns. July and August are the peak months, with visitation dropping off dramatically during the winter months. About 80 percent of annual visitation occurs in the six-month period of May through October. Entrance to the parks is approximately equal at both the Ash Mountain entrance in Sequoia National Park and the Big Stump entrance in Kings Canyon National Park.

Generals Highway: This section provides a brief history of the Sequoia and Kings Canyon National Parks road system and puts the existing system into perspective by explaining how it developed over the years. Knowledge of the historic concepts, design criteria, and existing conditions help define why the road has the design constraints, structural deficiencies, and characteristics it has today.

Generals Highway (a continuation of State Route 198) was originally designed and constructed to be the main access road through the parks. It is important to remember, however, that the design criteria used were based on the types of vehicles and volume of traffic existing during the 1920s and 1930s. Generals Highway and virtually all other roads in these parks have been in continuous use on their present alignments for 70 or more years. The portion of State Highway 198 from Three Rivers to Ash Mountain (7 miles) was completed in 1922. In July 1926 the portion from Ash Mountain to Giant Forest (16 miles) was opened as a gravel road. The existing 18- to 20-foot-wide pavement was added in 1929. The final portion, which linked Giant Forest to Grant Grove, was completed in 1935, with a paved width of 18 to 22 feet.

It is estimated that 364,033 vehicles entered the parks through the Ash Mountain entrance for the years 2002 and 2003, inclusive. Of this total, there were about 15,908 RVs, 346,668 automobiles, and 1,456 motorcycles. All of these vehicles traveled on at least a portion of Generals Highway, and many traveled the 16 mile length between Ash Mountain and Giant Forest.

Portions of Generals Highway have been in use since 1926 as the principal auto route through Sequoia National Park and into Kings Canyon National Park. The road extends 32.5 miles from Sequoia National Park's southern entrance at Ash Mountain to the park's northern boundary and an additional 13.3 miles from the northern boundary through Giant Sequoia National Monument and into Kings Canyon National Park, ending at The Wye in Grant Grove, for a total of 45.8 miles.

Generals Highway is a steep, narrow, winding, uneven, mountain road and a well-known scenic road with high public visibility. On Generals Highway there are about 165 pullouts. This number includes only the formal, paved pullouts. There are also a large number of additional "informal," dirt surfaced pullouts. Some of the formal pullouts are planned facilities that provide interpretation, trailhead access, or other amenities, such as access to picnic sites. Many of the informal pullouts, however, have simply developed over the years because of continued use of wide spots in the road prism. Some of these wide spots over the years have been paved and are now included in the formal category.

With few exceptions, the road is still in service today as originally constructed. For the most part, only periodic maintenance, patching, and chip-sealing has been performed. No major realignment, widening, or resurfacing has occurred. In many places Civilian Conservation Corps (CCC) era stone walls serve as guardwalls; however, these walls are inadequate and unsafe because they do not meet Federal Highways safety standards or NPS Road Standards for crash worthiness or safety.

In the mid-1960s spot repairs were done on Generals Highway as a result of rain damage. Several areas experienced severe slumping and required the installation of metal bin walls to support the roadway. As part of that project, the NPS replaced all the original wooden crib walls. Some guardrails were installed, and the pavement was widened to 22 feet in the vicinity of the metal bin walls. Another project in 1970 replaced a structurally unsound bridge over the Marble Fork of the Kaweah River near Potwisha. The road was reconstructed about 1/8 mile east and 1/2 mile west of the new bridge with a 22-foot pavement width as part of that project.

Starting in the late 1980's and continuing into 2007 sections of Generals Highway have been rehabilitated between the Ash Mountain Entrance Station and Amphitheater Point. In sections where the 22-foot wide road width was not met, half bridges were constructed and numerous stone masonry guard walls were replaced with stone veneer guardwalls or stone simulated poured concrete guardwalls.

A major factor contributing to the character of the road is the fact that there has not been any significant roadside disturbance since the road was originally constructed more than 70 years ago. Although decades with no major road work have been beneficial in developing the character of the road and experience, time has taken its toll on the road itself.

Special Status Species (Threatened and Endangered Species and Species of Concern)

Section 7 of the Endangered Species Act (ESA) directs all federal agencies to use their existing authorities to conserve threatened and endangered species and, in consultation with the USFWS, to ensure that their actions do not jeopardize listed species or destroy or adversely modify critical habitat. Additionally, NPS Management Policies 2006 mandates that state and locally listed species would be managed in the same manner as federally listed species, where feasible. After review of USFWS (USFWS, 2007a) and California Department of Fish and Game (CADFG) (CADFG, 2007a) species lists along with available park data, it was determined that 33 species, which have been known to occur in or travel through the project area, have been determined to be sensitive (see Appendix D). These include one federally listed wildlife species, California condor (*Gymnogyps californianus*) and two candidates for federal listing Pacific fisher (*Martes pennanti*) and the Sierra Madre yellow-legged frog (formerly mountain yellow-legged frog) (*Rana muscosa*).

Both the California condor and the Sierra Madre yellow-legged frog appear to be extirpated from the project area (Werner, pers. comm., July 12, 2006).

The federal candidate species, the Pacific fisher, inhabits logs or tree cavities, and its highly variable diet includes mammals, birds, carrion and fruit. Fishers tend to be rather shy and solitary, generally avoiding large open areas. Radio-tagged individuals have been known to occupy a home range of up to 75 square kilometers. Due to these habitat specifications, the fisher is limited to extensive tracts of relatively undisturbed, late-successional forest (Lewis and Fisher, 1998). The Pacific fisher is known to occur in the project area and a road killed fisher has been found on Generals Highway in the vicinity of Amphitheater Point.

The California state species of concern include: 5 state endangered species (California condor, bald eagle, peregrine falcon great grey owl, and willow flycatcher), 3 state threatened species (Swainson's hawk, red fox and wolverine). 15 other species are listed as sensitive by either the state, the US Forest Service (USFS) or the Bureau of Land Management (BLM).

Though survey information is limited, it is believed that three of the state listed species, the willow flycatcher (*Empidonax traillii brewsteri*), wolverine (*Gulo gulo*), and the red fox (*Vulpes vulpes necatorare*) have been extirpated from the project area (Werner, pers. comm., July 12, 2006). Additionally, the peregrine falcon (*Falco peregrinus*), has not been recorded in the project area but lives nearby and may fly over the project area occasionally.

The bald eagle (*Haliaeetus leucocephalus*), recently delisted, is a transient in the park and is unlikely to be in the project area more than momentarily.

The Swainson's hawk, a state listed threatened species, golden eagle (*Aquila chrysaetos*), a state species of concern, and the short-eared owl (*Asio flammeus*), another state species of concern, are rare visitors, with the golden eagle being more common. The Coopers hawk (*Accipiter cooperii*), Northern goshawk (*Accipiter gentilis*), and sharp-shinned hawk (*Accipiter striatus*), all state species of concern, are known to be present in the project area.

The California spotted owl is another state species of concern. USFWS determined in a May 2006 decision that federal listing of the California spotted owl was not warranted (Federal Register notice 71:29886, May 24, 2006).

They are "perch and pounce" predators, hunting primarily by selecting an elevated perch, detecting prey by sight or sound, and swooping from the perch to capture the prey with their talons. They forage primarily at night, but have been observed hunting during the day, especially while raising young. California spotted owls prey mainly on northern flying squirrels and dusky-footed woodrats. Other prey species include gophers, mice, squirrels, shrews, moles, bats, birds, frogs, lizards and insects (USFWS, 2007b). Portions of the project area have been surveyed for California spotted owl in previous years. The entire project area was surveyed for California spotted owl in spring and summer 2006 and 2007. In 2006, 7 territories were located within the project area with two nests within a ¼ mile radius of the project area.

Within the project area, two of the seven territories in 2006 along Generals Highway had successful nests. In 2007, only one of the four active nests was successful. Much annual variation has been observed in the nesting success (proportion of pairs nesting that also fledge young) of spotted owls from year to year and from region to region, ranging from as low as 0 to as high as 100 percent (Forsman et al., 1984; Gutierrez et al., 1984; Thomas et al., 1990; Lutz, 1992; LaHaye et al., 1992). For many owl species, failure to breed in some years has been shown to result from low prey availability.

The dusky-footed woodrat is a primary prey species of the California spotted owl, so impacts to the woodrat population would logically affect the California spotted owl population. Drought has been observed to depress woodrat populations. According to the Natural Resources Conservation Service, southern California has been experiencing a drought for the last four years. This drought may be having a direct and indirect effect, e.g. declines in prey populations, on the California spotted owl.

A raptor's behavior during the nesting season is an important determinant of its ultimate nesting success or failure (Hohman, 1986). Raptors may be more susceptible to disturbance-caused nest abandonment early in the nesting season because parents have less time and energy invested in the nesting process (Knight and Temple, 1986). Some raptors appear reluctant to leave the nest later in the nesting season (Anderson et al., 1989; Ellis et al., 1991; Delaney et al., 1999). Although reactions of adult raptors at the nest can influence hatching rates and fledgling success (Windsor, 1977), flush behavior of adult raptors from the nest is poorly quantified (Fraser et al., 1985; Holthuijzen et al., 1990). In the few studies that have examined raptor responses to specific noise disturbance types (e.g., aircraft noise), flush rates were higher if raptors were naïve (i.e., not previously exposed) (Platt, 1977).

Five sightings of great grey owls, a state-listed endangered species, have been recorded within the parks and one apparent road killed great grey owl was found on Generals Highway north of the project area. Surveys conducted by the U.S. Forest Service (USFS) have located them both north and south of the parks but not within the project area (Werner, pers. comm. September 6, 2006). Great grey owls were not detected in 2007 surveys in the Wolverton Creek area and the Halstead Meadow area, and the project area contains little potential habitat.

Nine bat species are considered sensitive by either the state, USFS or BLM (See Appendix D). Most are likely to occur within the project area (Pierson, pers. comm. October 13, 2006). Bats

could use large culverts, bridges, crevices and cavities in trees and rocks for hibernation and roosting throughout the project area.

Of over 1,500 species of vascular plants in the parks, no species are listed as federally threatened or endangered. The Tompkins' sedge (*Carex tomkinsii*) is listed by the state as rare. Little is known about the status and habitat requirements of this species within the parks. This California endemic is found in the central and southern Sierra Nevada in Fresno, Mariposa, and Tuolumne counties in the drainages of the Merced and South and Middle Forks of the Kings River. It occurs in dry, sunny areas in chaparral, cismontane woodland, lower montane coniferous forest, and upper montane coniferous forest habitats. Although targeted surveys have not found Tompkins' sedge south of the Kings River Canyon, suitable habitat exists in the Kaweah River watershed and within the proposed construction project. Park staff, in 2004 and 2005, conducted surveys within the project area and found no populations of the plant.

Within the proposed construction limits, park staff have identified three plant species of concern for the park: bigleaf maple (*Acer macrophyllum*), California nutmeg (*Torreya californica*), and the Farnsworth jewelflower (*Streptanthus farnsworthianus*).

The big-leaf maple is widely distributed elsewhere in California and the Pacific Northwest, but it is not abundant in the southern Sierra Nevada. The deciduous tree is common on the western slopes of the Sierra Nevada north of the Yuba River and is present in less abundance as far south as Sequoia National Park, where it reaches its southern extent in the Sierra Nevada. Here it is usually restricted to canyons or riparian habitats where it forms small stands. There are scattered big-leaf maples along the Generals Highway above Amphitheater Point.

The California nutmeg is a locally rare, but widely distributed endemic found in the mountains of central and northern California. The eastern limit of its range is along the western slopes of the Sierra Nevada, where it mixes with other conifers and grows primarily along mountain streams and in shady canyons of the lower montane. It reaches its southern limit in Tulare County. Although not technically considered rare, the evergreen gymnosperm is never abundant. In Sequoia National Park, the California nutmeg is found in the following areas: the Crystal Cave area, in the vicinity of South Fork Campground on the Kaweah River, in the East Fork of the Kaweah River drainage, and other scattered locations on the western slope where it associates with canyon live oak (*Quercus chrysolepis*) and California bay (*Umbellularia californica*). A population of California nutmeg occurs along the Generals Highway in the vicinity of Amphitheater Point.

The Farnsworth jewelflower occurs in scattered populations in the southern Sierra Nevada. Six populations are documented in Sequoia National Park. The Deer Ridge population is located at an elevation of approximately 5,100 feet, making it the highest growing population in California. The existing roadway bisects the population in two areas. The Farnsworth jewelflower is found on schist, a metamorphic rock that is exposed throughout the foothills of the southern Sierra Mountains.

Wetlands and Floodplains

Generals Highway crosses Halstead Meadow, a wet meadow, approximately 5.3 miles north of the Wolverton Road intersection. Halstead Meadow encompasses a total of 17 acres and is bisected by the Generals Highway to form the Upper Halstead Meadow (5 acres) and the Lower Halstead Meadow (12 acres). The restoration of Upper Halstead Meadow was completed in September 2007. Environmental effects of the restoration were discussed in a

separate NEPA document. The restoration of Lower Halstead Meadow would be planned to begin in 2010.

Wet meadows are uncommon yet striking and ecologically important features in Sequoia National Park. They are the only ecosystem within the park not dominated by woody plants, and they have very high herbaceous plant production. In addition, they have seasonally or perennially saturated soils and provide critical habitat for many species of plants, amphibians, large and small mammals, and aquatic invertebrates (Cooper and Wolf, 2006).

Wet meadows in the Sierra Nevada have seasonal or perennial sheet flow of water, and channelized flows are either absent, seasonal, or small. In some meadows overuse, e.g. overgrazing and the presence of roads have led to increased channelization and downcutting through the meadow sediments (Cooper and Wolf, 2006). Deep incisions have been documented in several meadows in the Sierra Nevada (Wood, 1975), including Halstead Meadow, where the depth of incision is greater than 10 feet in many areas, and over 25 feet immediately below the roadway. The incised channel extends for nearly the entire length of the meadow. This incision is actively head cutting, widening the channel, threatening to erode additional meadow areas, lowering the water table in increasingly large areas, which is causing the death of native wet meadow plants, producing excessive sedimentation in the stream, and creating a greater eye-sore for visitors. Therefore, a critical need exists to restore the meadow.

Park Operations

In fiscal year 2001, full-time employees numbered about 262, up from 220 in 1999. Typically, during the summer there are an additional 250 to 300 seasonal employees and over 1,400 volunteers. There are 26 cooperating association employees, 45 interagency staff and researchers, and 250 concession employees. Administrative functions are located in various places throughout the park, including: Ash Mountain, Lodgepole, Wuksachi, Grant Grove, Cedar Grove, and Mineral King. Administrators rely on the Generals Highway corridor to access other areas of the park for administrative purposes, respond to emergencies, etc. Maintenance staff work out of the Red Fir Maintenance Facility, which is within the project area.

Also in the project boundaries is the visitor service area, Lodgepole, which has laundry facilities, snack bars, a general store, post office, a visitor center, a campground, and trailheads. Wuksachi Village has lodging, a restaurant, and a trailhead. Amphitheater Point is a designated interpretive wayside/pullout, and Deer Ridge is an existing paved pullout. There are numerous paved and unpaved authorized pullouts along Generals Highway and numerous unofficial pullouts. There are designated picnic sites at the Marble Fork Bridge and Halstead Meadow. The Little Baldy pullout is also a trailhead. The Wolverton Road continues onto the access road for the Sherman Tree parking lot, the Wolverton Boy Scout Camp, and a designated picnic site and trailhead used for hiking and cross-country skiing.

There are approximately 258 miles of paved two-lane roads in the parks and about 38 miles of unpaved roads, generally less than two-lane. Road Character Guidelines were written by the parks in 1990 to “establish a design style and theme for road related details based on the principles of rustic design.” In Sequoia National Park there are four distinct areas along the road, each with different character and operational needs. The three areas of concern for this EA/AoE are Switchback Area, Big Tree Area, and Ridgetop Area. The Switchback Area extends from Hospital Rock to Giant Forest and is approximately 10.5 miles long and gains 3,600 feet in elevation. Widths range from 17 to 20 feet. There are some 200 curves and 23 major

switchbacks. The serpentine character challenges motorists and park operations. The many examples of CCC stone masonry drainage structures require cleaning and maintenance. The Big Tree Area extends from Giant Forest to Lodgepole. The road in this section is slightly wider and the curves more gentle. Like the lower road sections, this upper section of road blends into the landscape. The Ridgetop area extends from Lodgepole to Grant Grove and follows the ridge along less severe terrain. The road has gentler curves, is wider, and easier to drive, except when there are winter conditions of ice and snow.

There are over 2,100 parking spaces within Sequoia National Park in addition to 291 spaces for lodging visitors only. Between Wolverton Road and the Little Baldy pullout there are 906 spaces for vehicles, 33 for handicap parking, and 22 for oversized vehicles. Along Generals Highway there are 60 designated pullouts, many with CCC stone masonry walls. There is also park housing at Lodgepole and Wuksachi, which also has other park operations facilities near by.

Visitor Experience

Visitor experiences in the parks include many different elements – the character of the parks, the visitation patterns, educational and recreational opportunities, and visitor services as well as affordability.

The park character is comprised of a combination of the setting, natural and built environments, and the human activities that are associated with it. At Sequoia and Kings Canyon National Parks there are three types of character – rustic, basic, and traditional. Rustic refers to the character and quality of the built environment. Visitors continue to enjoy park facilities and site elements evoking the CCC era. New public use facilities continue this rustic heritage that used natural materials such as wood and large rough stone work. The basic character of the parks includes the setting and customary or historical activities, such as hiking, camping, lodging, backcountry use, and scenic driving. Other established activities include cave tours, winter recreation, water play, and fishing. Backcountry use permits are required so that use can be dispersed and documented. Traditional patterns of use date from the 1890's through the 1960's. Hiking, stock animals, and driving are the three primary ways that visitors enjoy the parks.

Waits and delays of up to 20 minutes may occur at the Big Stump entrance station during peak summer visitation periods. Parking at Lodgepole is inadequate during summer. To protect resources, visitors are not permitted to park in sensitive areas such as meadows. There are still privately owned cabins within the parks, but they are subject to land protection plans and permit conditions.

Annual visitation has fluctuated over the last two decades, reaching a high of 2.2 million in 1987 and 1991. Visitation in 2000 was the lowest at approximately 1.4 million. Visitation is seasonal with most visits occurring in the summer months. Winter use depends on the weather and snow conditions with the lowest visitation in December, January, and February. Front country areas (about 2.5% of the parks total area) receive around 98% of visitor use, with the backcountry receiving the remaining 2%. A visitor survey was conducted in March and May 1998. The results indicated that 45% of the visitors were day use visitors staying on average 4.5 hours (BRW, Inc., and Lee Engineering, 1999). About 14.6% of the visitors stayed two days and 14% three days. About a quarter of all visitors stayed four days or longer.

Stock use has declined since 1955, although it is allowed in coordination with a meadow monitoring program, based on standards and indicators, which has allowed stock use to

continue at sustainable levels. Pack operations at Wolverton were suspended in 2002 due to safety concerns regarding the construction of new roads and trail access. The park is currently working on a plan to resolve these issues. About half of the stock users enter from adjacent USFS areas, so not all stock use may be reported. Facilities for stock use include hitching posts, drift fences, bridges, and oversized parking for trailers at trailheads.

Recreational fishing primarily takes place in the Marble and Middle Forks of the Kaweah River and the South Fork of the Kings River. Fishing is highly regulated, but it is not supported by any facilities.

There are over 110 miles of frontcountry trails, including about 16 miles of paved trails. There are about 842 miles of backcountry trails. There are 25 trailheads within the parks and 17 on adjacent USFS lands. The parks' elevation ranges from 1,300 feet to 14,495 feet. August is the most popular month for backcountry use.

There are seven front country campgrounds in Sequoia National Park that had a total of over 128,000 overnight stays in 2000. Backcountry sites are not assigned, but some high-use backcountry areas have designated campsites with bear-proof food storage boxes and toilets to protect resources and visitors.

Cross-country skiing, snow play, snowshoeing, and sledding are popular winter activities for regional visitors, especially at Wolverton and Grant Grove. Cross-country skis and snowshoes can be rented at Wuksachi and cross-country ski lessons are provided at Lodgepole. Snowmobiles are allowed on private roads for use by inholders to access their property and on some public roads during seasonal snow closures for permit holders attempting to access their recreational cabins.

Historic Structures

"Historic properties," as defined by the implementing regulations of the NHPA (36 CFR 800), are a prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. This term includes artifacts, records, and the remains that are related to and located within such properties, as well as traditional and culturally significant Native American sites and historic landscapes. The term "eligible for inclusion in the National Register" includes both properties formally determined eligible and all other properties that meet National Register listing criteria.

The significance of historic properties is generally judged against a property's ability to meet, at a minimum, one of the four criteria for inclusion on the NRHP (36 CFR 60):

- Association with events that have made a significant contribution to the broad patterns of our history; or
- Association with the lives of persons significant in our past; or
- Properties that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- Property that has yielded, or may be likely to yield, information important in prehistory or history.

Properties may be eligible for the National Register for contributions at the national, state, or local level. Ordinarily, properties achieving significance within the last 50 years are not considered eligible unless they are integral parts of historic districts or unless they are of exceptional importance. Additionally, in order for a structure or building to be listed in the National Register, it must possess historic integrity of those features necessary to convey its significance, i.e., location, design, setting, workmanship, materials, feeling, and association. See National Register Bulletin #15, *How to Apply the National Register Criteria for Evaluation* (NPS, 1990).

Authorized by the NHPA of 1966, the NRHP is the nation's official list of districts, sites, buildings, structures, and objects in both public and private ownership that are significant in American history, architecture, archeology, engineering, and culture. Sequoia and Kings Canyon National Parks have 18 historic structures and districts listed on the National Register, two of which are within the area of potential effect, the Clover Creek Bridge, and the Marble Fork Bridge. In 1992 the NPS determined that the Generals Highway was eligible for listing in the National Register. The listing identified the 92 contributing features, specifically identifying stone masonry headwalls, stone masonry drainage ditches, stone masonry retaining walls, stone curbing, stone masonry guardwalls, specific turnouts, stone masonry bridges, stone embankment walls, and signs. Twenty-three of these features are within the area of potential effect. In 2005 and 2006, an additional historic feature inventory and condition assessment was conducted by the NPS. The survey area was limited to the area of potential effect for Generals Highway from Amphitheater Point to Deer Ridge and from the Wolverton Road intersection to the Little Baldy Pullout. This survey located an additional 95 features that were predominantly stone masonry headwalls with some dry-laid masonry retaining walls, and there were two concrete dam features (managed as National Register eligible) in lower Halstead Meadows that would be avoided.



There are four historic districts under consideration by the NPS for nomination to the National Register; two districts are within the area of potential effect – Generals Highway and the Lodgepole Historic District.

There are currently 80 structures identified on the Parks' List of Classified Structures. This list is an inventory of all structures with historical, architectural, or engineering significance and in which the NPS has or plans to acquire a legal interest. Of those 98, three are within the area of potential effect – Generals Highway, Clover Creek Bridge and Marble Fork Creek Bridge.

Applicable laws and regulations include the NPS Organic Act (1916), the Antiquities Act of 1906, the NHPA of 1966 (1992, as amended), NEPA, the National Parks and Recreation Act of 1978, the Archaeological Resources Protection Act of 1979, the NAGPRA (1990), and the Curation of Federally Owned and Administered Archaeological Collections (1991). Applicable agency policies relevant to cultural resources include Chapter 5 of *NPS Management Policies*, and Director's Order – 28: *Cultural Resource Management*, as well as other related policy

directives such as the NPS *Museum Handbook* (2005), *Interpretation and Visitor Services Guidelines* (1986), and, *The Secretary of Interior's Standards for the Treatment of Historic Properties* (1996).

Cultural Landscapes

Cultural landscapes are the result of the interaction between people and their geographic surroundings and the influence of the individuals' beliefs and actions exhibited on their landscapes. The land may be shaped or modified because of land-use, politics, laws, technology, or economics. Cultural landscapes provide a living dynamic record of an area's past, a chronicle of its history. Because it is a living record, the long range preservation can be a land manager's challenge.

According to the NPS's *Cultural Resource Management Guideline* (Director's Order 28), a cultural landscape is

“... a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined by both physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values.”

In 1998 the Cultural Landscapes Automated Inventory Management System database indicated that 10 parent landscapes and 13 component landscapes were identified in the parks. Generals Highway was one of the parent landscapes and is listed as a fully documented Level II landscape. The National Register nomination lists landscape architecture as an area of significance for Generals Highway. The stone masonry retaining wall, parapet walls, and culvert headwalls are all contributing features to the National Register nomination and the landscape architectural interpretation of the parent landscape.

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This section describes the potential environmental consequences associated with the no action and preferred alternatives. The methodologies and assumptions for assessing environmental consequences are discussed, including consideration of context, intensity, and duration of impacts; cumulative impacts; and measures to mitigate impacts. As mandated by NPS policy, resource impairment is explained and then assessed for each impact topic and alternative. Subsequent subsections in this section are organized by impact topic, first for the no action alternative and then for the NPS preferred alternative.

METHODOLOGY

Overall, the NPS based these impact analyses and conclusions on the review of existing literature and Sequoia and Kings Canyon National Parks studies, information provided by experts at the parks and in other agencies, professional judgments and park staff insights, the CA SHPO, input from interested local tribes, and public input.

CONTEXT, DURATION AND INTENSITY, AND TYPE OF IMPACT

Potential impacts (direct, indirect, and cumulative effects) are described in terms of type (beneficial or adverse), context (site-specific, local, or even regional), duration (short term, long term, or permanent), and intensity (negligible, minor, moderate, or major). Because definitions of intensity and duration vary by impact topic, intensity definitions and duration are provided separately for each impact topic analyzed in this EA/AoE.

Context

Context is the setting within which an impact may occur, such as local, parkwide, or regional. The CEQ requires that impact analyses include discussions of context. For this EA/AoE, local impacts would occur within the general vicinity of Generals Highway between Amphitheater Point and the Little Baldy pullout, while parkwide impacts would affect a greater portion of the parks, and regional impacts would extend outside the boundaries of the parks.

Duration

The duration of an impact is the time period for which the impacts are evident and are expressed as short term or long term. A short term impact would be temporary in duration and would be associated with road construction activities, as well as the period of site restoration. Depending on the resource, impacts may last as long as construction takes place, or a single year or growing season, or longer. Impact duration for each resource is unique to that resource. Impact duration for each resource is presented in association with impact intensities in the following section.

Intensity

Impact intensity is the degree to which a resource would be beneficially or adversely affected. The criteria that were used to rate the intensity of the impacts for each resource topic is presented later in this section under each topic heading.

Type of Impact

Impacts can be beneficial or adverse. Beneficial impacts would improve resource conditions while adverse impacts would deplete or negatively alter resources.

Direct versus Indirect Impacts

Both direct and indirect impacts are analyzed, consistent with CEQ regulations (40 CFR 1502.16 and D.O. 12). The following definitions of direct and indirect impacts are used during analysis but not specifically identified in the environmental analysis:

Direct – an effect that is caused by an action and occurs at the same time and in the same place.

Indirect – an effect that is caused by an action that is later in time or farther removed in distance, but is still reasonably foreseeable.

CUMULATIVE EFFECTS

The CEQ regulations, which implement NEPA (1969) (42 USC 4321 *et seq.*), require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for all alternatives, including the no action alternative.

Cumulative impacts were determined by combining the impacts of the alternatives with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects at Sequoia and Kings Canyon National Parks and, if applicable, the surrounding region.

Projects that Make Up the Cumulative Impact Scenario

To determine potential cumulative impacts, projects in the area surrounding Sequoia and Kings Canyon National Parks were identified. The area included lands administered by the USFS, non-profit organization landowners, and private landowners. 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. Past actions were also included in the analysis.

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, cultural resource, visitor use, or the socioeconomic environment. 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:

- **Generals Highway Cut Slope Repair Route 10(7A).** The project removed unstable rock and stabilized the remaining portions of the cut slope above the roadway at mile 0.8 as measured from the southwest park boundary. Stabilization was accomplished by excavating and removing additional soil and rock so that the finished slope was less than the destabilized slope. The project was completed in 2006.
- **Generals Highway Halstead Meadow Erosion Repair.** The project stabilized a failing section of Generals Highway from hydrologic action caused from the outfall at

two 36" metal culverts in the Red Fir sub-district, specifically Halstead Meadow, of Sequoia National Park. Approximately 400 cubic yards of rock and earthen fill were placed in a 25' deep chasm formed from the culverts discharge. During the project the creek flow was diverted to existing culverts approximately 100-feet north of the chasm.

- **Generals Highway Rehabilitate Route 10(1 – 6).** The reconstruction of the historic Generals Highway has been going on since the 1980s, starting near Three Rivers. This project is being phased over many years. Work has been completed from Ash Mountain to Big Fern Springs. The section from Big Fern Springs to Amphitheater Point was recently completed in 2007. The section from Deer Ridge to Wolverton Road would be reconstructed as soon as funds become available.
- **Rehabilitation of the Lodgepole Campground.** Campgrounds are being gradually renovated throughout the parks. At Lodgepole campsites are being renovated in phases. Sites within the 100-year floodplain are being relocated out of the floodplain, and an internal circulation system is likely to be redesigned.
- **Giant Forest Development Area Removal.** A 1980 Development Concept Plan (NPS 1980) and the 1996 Interim Management Plan (NPS 1996) called for removing concession and NPS facilities from the Giant Forest and relocating them to Wuksachi, so the giant sequoia forest could be restored to more natural conditions. During 1998–99 hundreds of structures in two historic districts were removed in accordance with an agreement with the CA SHPO. The project has also included removal of hundreds of concession lodging buildings, roads, and 18 parking lots. Historic buildings that are being adaptively reused include the market, which is now the Giant Forest Museum (opened in 2002) and the Beetle Rock Assembly Hall, which is being reused as a community building and education center. Other historic buildings (ranger residence and restrooms) have been rehabilitated. Museum exhibits, waysides, and trail centers have been built. Area trails are being improved and comfort stations replaced. Replacement parking is located outside the Giant Forest, and visitation to the area would depend on a shuttle system to be developed over the next several years. Utility system replacements have occurred in Giant Forest to bring aging systems up to state standards.
- **Construction of the Wuksachi, Clover Creek, and Red Fir Development Areas.** Facilities were constructed in the 1980s and 1990s in a red fir forest to replace those removed from Giant Forest, based on the 1980 Development Concept Plan (NPS 1980). Recent NPS facilities include the Red Fir maintenance building, wastewater treatment plant, seasonal housing, bathhouse for concession use, road system, utilities, permanent staff housing, parking lots, propane fuel area / distribution system, and a firehouse. Concession facilities already built include three lodges with 102 rooms, a restaurant/store/administration building, a bathhouse, and staff cabins. Concession contracts call for 312 additional lodging units plus employee housing.
- **Reconstruction of the Crescent Meadow / Moro Rock Road.** This repaving project was recently completed.

Current and Future Actions

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

- **Rehabilitate 10.7 km of Generals Highway.** Rehabilitate 10.7 km of the historic Generals Highway between Deer Ridge Pullout and Wolverton Road intersection. Work would entail replacing guardrails, retaining walls, cut walls, drainage structures, base material, and asphalt. The existing grade and alignment would be retained as much as possible. Existing signing and interpretive waysides would be upgraded and replaced as necessary. Revegetation would occur where disturbed areas were adjacent to the road. This project would most likely be phased over several years with an unknown start year.
- **Replace Cedar Grove Bridge in the Cedar Grove District of Kings Canyon National Park.** This bridge leads from Kings Canyon Highway (180) to the Cedar Grove Village. The bridge is a two span 142' x 27' steel stringer structure with a laminated timber deck. The substructure consists of reinforced concrete walls on spread footings. This structure is in poor condition and must be replaced due to the deficient condition, volume of traffic, and reduced load capacity. The original design of the bridge had a Normal Traffic Rating of 15 tons; however due to degradation, a limit of 9 tons has been assigned. The railing does not meet safety and design standards. The estimated remaining life was determined to be 7 years in 1989.
- **Replace Wolverton Corrals.** The project would develop a plan to offer pack station facilities in the Wolverton area. The pack station would serve the needs of stock animals used by the NPS for trail maintenance, a concession packer, as well as private pack stock users.
- **Lodgepole and Grant Grove - Replace Water Distribution Systems.** The 2008 project consists of reconstructing major components of the water distribution systems in the Grant Grove and Lodgepole areas of the parks, which involves all work associated with removal and replacement of approximately 33,100 linear feet of water line ranging in size from ¾" to 10" in diameter. Work includes excavation, demolition and disposal of old piping and valves, installation of new piping, valves and appurtenances, backfill and compaction, and revegetation of areas disturbed by construction activities.
- **Replace Big Stump Entrance Station.** A new entrance station would be constructed to serve the Kings Canyon entry point into Sequoia/Kings Canyon National Parks and Giant Sequoia National Monument. The proposed facility would replace an antiquated station with numerous safety issues and minimal visitor services. It would feature kiosks, bulk storage space, administrative fee collection space, employee restroom, and emergency generator room. The site footprint would accommodate present and projected traffic volume with a three lane entry way and two lane exit way for traffic flow.
- **Restoration of Big Meadow.** A watershed improvement project on the Hume Lake District of Sequoia National Forest to restore 6,100 ft of degraded stream.

IMPAIRMENT OF SEQUOIA AND KINGS CANYON NATIONAL PARKS RESOURCES OR VALUES

In addition to determining the environmental consequences of the preferred and other alternatives, the 2006 *NPS Management Policies* and D.O. 12, require analysis of potential effects to determine if actions would impair Sequoia and Kings Canyon National Parks resources.

The fundamental purpose of the national park system, established by the 1916 Organic Act and reaffirmed by the 1970 General Authorities Act, as amended, begins with 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 on park and monument 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. That discretion is limited by statutory requirements that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited 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 more likely constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park
- identified as a goal in the Sequoia and Kings Canyon National Parks final general management plan or other relevant NPS planning documents

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. In this “Environmental Consequences” section, a determination on impairment is made in the conclusion statement of each impact topic under each alternative. The NPS does not analyze recreational values / visitor experience (unless impacts are resource based), socioeconomic values, health and safety, or park operations for impairment.

ENVIRONMENTAL ANALYSIS

Special Status Species (Threatened and Endangered Species and Species of Concern)

The Endangered Species Act of 1973 [16 United States Code (USC) 1531 *et seq.*], as amended, mandates that all federal agencies consider the potential effects of their actions on species listed as threatened or endangered. If the NPS determines that an action may adversely affect a federally listed species, consultation with the USFWS is required to ensure that the action would not jeopardize the species’ continued existence or result in the destruction or adverse modification of critical habitat. *NPS Management Policies 2006* states that potential effects of agency actions would also be considered for state or park species of concern.

The NPS is required to control access to critical habitat of such species and to perpetuate the natural distribution and abundance of these species and the ecosystems upon which they depend. The USFWS website (USFWS, 2007a) provided a list of federally-listed special status species and designated critical habitats that may be within the project area or affected by any of the alternatives. Information on possible threatened, endangered, and candidate species, as well as species of special concern, was gathered from NPS surveys, other state and federal agencies, websites and print sources. Map locations of habitat associated with possible threatened, endangered, and candidate species, as well as species of special concern, were compared with locations of proposed activities. Known impacts caused by development and human use were also considered.

The thresholds of change for the intensity of an impact are defined as follows:

- **Negligible:** Special status species, or their habitats would not be affected, or the effects would be so small that it would not be of any measurable or perceptible consequence.
- **Minor:** Impacts to special status species or their habitats would be perceptible or measurable, but the severity and timing of changes to parameter measurements are not expected to be outside natural variability and are not expected to have effects on populations of special status species. Impacts would occur outside critical lifecycle periods. The change would be measurable but small, localized, and of little consequence.
- **Moderate:** Impacts to special status species or their habitats would be perceptible and measurable, and the severity and timing of changes to parameter measurements are expected to be sometimes outside natural variability. The changes within natural variability might be long term. Populations of special status species might have small to moderate declines, but could be expected to rebound to pre-impact numbers. No species would be at risk of being extirpated from the parks. Some impacts might occur during key time periods and the change would be measurable and of consequence.
- **Major:** Impacts to special status species would be measurable, and the severity and timing of changes to parameter measurements are expected to be outside natural variability for long periods of time or even be permanent. The changes within natural variability might be long term or permanent. Populations of special status species might have large declines with population numbers depressed. A species might be at risk of being extirpated from the parks. Substantive impacts would occur during key time periods. The action would result in a noticeable change to a population or individuals of a species, resource, or designated critical habitat.

Short term – special status species would recover in less than one year.

Long term – special status species would take more than one year to recover.

ALTERNATIVE 1: NO ACTION

The no action alternative would maintain the project area in its current state and would continue to provide habitat in the project area for many wildlife species. Habitat quality in the immediate area would remain the same. Wildlife would be involved in collisions with automobiles, as well as disturbances associated with human activities. According to park historic records, one great grey owl and one fisher carcass have been found in the road corridor. Noise disturbance from vehicles and from people centering activities in the pullouts

along the roadway would continue to shift animal activity away from the road corridor (Ament and Clevenger, 2007). Garbage would continue to be left by visitors around pullouts and may attract animals to the food source and closer to traffic. Scavengers such as bears, ravens, and coyotes may be drawn to the area increasing the likelihood of predation on smaller bird and mammal species. Vegetation would continue to be trimmed back to preserve the road corridor and visibility for drivers. This would temporarily modify cover along the road and may result in some differences in species crossing the road, predation along the road, and wildlife collisions on the road.

For avian species, especially owls that use a swooping pattern of flight from perch to perch, closer perch sites result in higher flight patterns. These species may be more likely to be at car level as they drop across the roadway due to the trimming back of vegetation. Nocturnal species such as owls are known to “freeze” in front of car headlights and may be drawn to the corridor by insects attracted to the light sources. The lack of cover also increases the time smaller mammals and birds are exposed when crossing the roadway, increasing the potential for predation. The ongoing impacts would be expected to continue to have long term, localized, minor, adverse effects to special status species.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects with the potential to affect wildlife include other roadway and infrastructure related projects [e.g., the rehabilitation of Generals Highway Route 10(1 - 6), the Emergency Cut Slope Repair Route 10(7A), the Halstead Meadow Erosion Repair, the Rehabilitation of the Lodgepole Campground, Giant Forest Development Area Removal, Construction of the Wuksachi, Clover Creek, and Red Fir Development Areas, Replace Water Distribution Systems at Lodgepole and Grant Grove, Replacement of the Cedar Grove Bridge, Replacement of Wolverton Corrals, Replacement of the Big Stump Entrance Station, and Reconstruction of the Crescent Meadow/Moro Rock Road]. Ground disturbance, including habitat removal and noise disturbance associated with construction activities such as trenching, regrading and resurfacing roads, shoulder reconstruction, culvert replacements/extensions, pipeline installation, and facility improvement/construction, would have long term, minor to moderate, adverse impacts on special status species, depending on the timing of construction in regard to sensitive life stages. The no action alternative would contribute minor adverse impacts to these projects resulting in minor to moderate, adverse impacts to special status species in the long term.

Conclusion. Minor to moderate, long term, adverse impacts to special status species would continue from collisions with vehicles and human disturbance within the vicinity of the project area. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the no action alternative, would have long term minor to moderate, adverse impacts to special status species.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park’s establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park’s final general management plan or other relevant NPS planning documents, there would be no impairment of park resources and values.

ALTERNATIVE 2: NPS PREFERRED ALTERNATIVE

Short term, moderate, adverse impacts to special status species' habitats would occur due to cut and fill slopes and wall construction, culvert replacement and rehabilitation, and paving of informal pullouts. Approximately 13 acres of new habitat disturbance would occur under the preferred alternative. The majority of this disturbance would occur immediately adjacent to the existing roadway to allow for shoulder regrading. Herbaceous ground cover would be the primary vegetation impacted by this work. Approximately 15 - 35 large trees would be removed to access culverts, reconstruct stone guardwalls and retaining walls, divert water flow for the Halstead Meadow repair work, and to install the bridge at Halstead Meadow.

California spotted owl surveys conducted in 2007, located a territory adjacent to Halstead Meadow. Due to the known location of sensitive bird species in the vicinity of Halstead Meadow and the potential use of trees for den sites by the Pacific fisher, tree removal in the Halstead Meadow area would be conducted August 15 – March 1 to limit breeding season impacts. If a situation is encountered where tree removal is required during the breeding season, the tree would be evaluated for current den and/or roost use. If evidence of roosting or denning is found, the tree would be left in place or removed outside of the breeding season.

Because work in the section from Wolverton Road to the Little Baldy pullout, with the exception of Halstead Meadow, would occur outside of the ¼ mile buffers of known nest sites during sensitive life stages for the California spotted owl, they would either not be impacted or would be more able to shift use to areas away from the noise disturbance.

Increased noise disturbance from construction activities, the potential installation of rumble strips in two locations, and increased levels of disturbance within occupied habitats would be outside of the normal sound parameters, but would not be expected to be outside of natural variability because of the existing level of human activity within the road corridor.

Displacement of small mammals and birds may occur due to construction noise, but individuals would be expected to rebound after construction is complete. Animals would be expected to acclimate to new sound created by pavement rumble strips over time.

Within the two project areas, night work would be allowed for the cantilevered bridge construction and culvert replacement or repair if needed. California spotted owls forage at night and appear to hunt primarily by sound (Forsman et al. 1984). Surveys in 2007 located 4 California spotted owl territories within the vicinity of the project area. Night work within the territory could disrupt hunting success as owls try to locate prey through sound. The noise from the construction may interfere with an owl's ability to hunt successfully near the project. The area used for foraging may shift away from construction noise (Munton 2006). Additional lighting used during the construction in the area may make it easier for the owls to find prey by attracting some prey species or by making the prey more visible. Owls foraging in or near well-lit areas may be more visible and, therefore, more susceptible to predation by great horned owls (*Bubo virginianus*).

For avian species, especially owls that use a swooping pattern of flight from perch to perch, closer perch sites result in higher flight patterns. These species may be more likely to be at car level as they drop across the roadway due to the clearing back of vegetation. Nocturnal species such as owls are known to "freeze" in front of car headlights and may be drawn to the corridor by insects attracted to light sources. The lack of cover also increases the time smaller mammals and birds are exposed when crossing the roadway, increasing the potential for predation. The

ongoing impacts would be expected to continue to have long term, localized, minor, adverse effects to special status species.

To limit these impacts, most construction activity would be limited to daylight hours for the Wolverton Road to Little Baldy pullout section. Some night work and/or road closures may be necessary for culvert repair or replacement, mainly from Red Fir to the Little Baldy pullout. When and if this should be necessary, closures will occur for no more than one hour and traffic will be allowed to pass through on the hour.

In this section of the project, 2006 and 2007 surveys found one occupied nest in the vicinity of Halstead Meadow. In the last two years of observation, this pair has not successfully reproduced. It will be impossible to avoid doing work during the breeding season in the vicinity of this nest. The breeding season directly coincides with the only months of the year that may be snow free which is the only time that road work can be done. There may be adverse impacts to this local pair of nesting owls which may include: continued lack of nesting success, disruption of hunting patterns and a move away from the noise of construction. Impacts would be adverse, short-term, local, moderate.

The 1.5 mile road section from Amphitheater Point to Deer Ridge requires complicated construction on switchbacks, several of which are within the $\frac{1}{4}$ - mile radius of a known California spotted owl territory. The construction on this road section may take the entire construction season making it impossible to limit construction during the nesting season.

Surveys conducted since 1992 have recorded an active nest every year in the section from Amphitheater Point to Deer Ridge. 2006 found a California spotted owl territory within the vicinity of Amphitheater Point, and two young were successfully fledged from the nest. The nest was unsuccessful in 2007. Even though the owl pair in the section from Amphitheater Point to Deer Ridge has nested near Generals Highway several seasons and may be accustomed to highway noise, the unusually loud and disruptive noise from the construction equipment for an extended duration in the nesting season within a quarter mile of the owl nest would be outside natural variability and may adversely impact this pair of owls. The local population from Amphitheater Point to Deer Ridge, which includes a nesting pair and any transient birds potentially hunting in the area, would potentially be adversely impacted by the increased construction disturbance, but the regional California spotted owl population and the Sierra Nevada population would not be impacted. This would have a short term, moderate adverse impact on the local population of California spotted owls.

Owl surveys of the project sections would continue, and historic roost sites would be evaluated each year until the projects are completed.

The limited tree removal, the scaling back of rock faces, and work around larger culverts, may displace or kill individual bats listed as species of concern. However, an evaluation of bat use areas would be conducted before construction, and if colonies are found, construction would be timed outside of the breeding season to avoid adverse impacts to populations.

Although posted speed limits would not increase, long term impacts would be minor and adverse due to the potential of faster driving speeds that accompanies new asphalt and a wider road. The construction of walls along the outside edge of the roadway may limit escape opportunities from the roadway in certain areas that could contribute to an increase in road kill deaths. Wider openings within the forest canopy to accommodate a wider roadway in addition to the continued maintenance of brush removal could restrict movements of animals that may be unwilling to cross. As in the no action alternative, garbage would continue to be

left by visitors around pullouts and may attract animals to the food source and close to traffic. Vegetation removal would be mostly limited to herbaceous cover limiting this impact. Vegetation would be reestablished in areas disturbed by construction and beneficial improvements to meadow habitats would result from the Halstead Meadow restoration.

Three park plant species of concern, bigleaf maple, California nutmeg, and the Farnsworth jewelflower are found within the 1.5 mile section of Generals Highway from Amphitheater Point to Deer Ridge. Surveys identifying the locations of plants were completed in summer 2006. Construction to accommodate the wider road widths in this section would impact individuals of the bigleaf maple and the California nutmeg and result in some removal. Impacts to the populations as a whole are not expected because of the plant distribution outside of the project area. The Farnsworth jewelflower population within the project area, however, consists of approximately 20% of the known plants in this population and is one of only six populations documented in the parks. Where feasible, impacts would be shifted away from this species to avoid impacts during construction. Seeds of the jewelflower would be collected before impact and used to reestablish populations after construction. Additionally, the seed bank from identified, major jewelflower populations would be removed with the top soil, stored, and replaced after construction. Restoration success on the steep slopes is unknown, though some degree of natural regeneration is expected, especially as the plant seems to thrive in disturbed areas. Permanent loss of habitat would occur. The preferred alternative is expected to have short term and long term moderate adverse impacts to the local populations of these three plant species of concern.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects with the potential to impact special status species include other roadway-related projects [e.g., the rehabilitation of Generals Highway Route 10(1 - 6), the Emergency Cut Slope Repair Route 10(7A), the Halstead Meadow Erosion Repair, the Rehabilitation of the Lodgepole Campground, Giant Forest Development Area Removal, Construction of the Wuksachi, Clover Creek and Red Fir Development Areas, Replace Water Distribution Systems at Lodgepole and Grant Grove, Replacement of the Cedar Grove Bridge, Replacement of Wolverton Corrals, Replacement of the Big Stump Entrance Station, and Reconstruction of the Crescent Meadow/Moro Rock Road]. Ground disturbance, habitat removal, and noise disturbance associated with construction activities such as trenching, regrading and resurfacing roads, shoulder reconstruction, culvert replacements/extensions, pipeline installation, and facility improvement/construction, would have short and long term, moderate, adverse impacts on special status species depending on the timing of construction in regard to sensitive life stages.

The preferred alternative would add moderate, adverse contributions to the cumulative impacts on special status species in the short and long term. Beneficial impacts would occur in the long term from the Halstead Meadow restoration. The effects of the abovementioned past, present, and reasonably foreseeable future actions, in conjunction with the effects of the preferred alternative, would result in short and long term, minor to moderate, adverse cumulative impacts on special status species and beneficial impacts in the long term.

Conclusion. Moderate, short term, adverse impacts to special status species would result from increased human disturbance during construction of the preferred alternative. In the long term, minor, adverse impacts would result from the increased potential of wildlife-vehicle collisions from higher driving speeds, fewer escape areas from the roadway, and permanent loss of vegetation and habitat in the road corridor. Beneficial impacts in the long term would

occur through habitat improvements at Halstead Meadow. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the impacts of the preferred alternative, would result in local, short and long term, minor to moderate, adverse impacts to special status species and beneficial effects in the long term.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a special status species' resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's final general management plan or other relevant NPS planning documents, there would be no impairment of park resources and values.

Wetlands and Floodplains

Executive Order 11990 (*Protection of Wetlands*) requires an examination of impacts to wetlands, and the 2006 NPS Management Policies and Director's Order 77-1 provide guidelines for proposed actions within wetlands. There are jurisdictional or NPS-defined wetlands within the project area. A jurisdictional wetland is an area that meets the criteria established by the US Army Corps of Engineers for Wetlands (as set forth in their Wetlands Delineation Manual). In addition, the NPS classifies wetlands based on the U.S. Fish and Wildlife Service (USFWS) Classification of Wetlands and Deepwater Habitats of the United States, commonly referred to as the Cowardin classification system (Cowardin et al. 1979). The construction of a bridge over Halstead Meadow may have impacts on wetlands and floodplains.

The thresholds of change for the intensity of an impact are defined as follows:

- **Negligible:** The impact would be at the lower levels of detection or not measurable.
- **Minor:** The impact would be detectable, but it would be limited to a small area of the wetland and would not affect the viability of any local biotic population or overall community size, structure, or composition.
- **Moderate:** The impact would be clearly detectable and could have an appreciable effect on wetlands or their biota in a localized area. This would include impacts that affect the abundance or distribution of local populations, but it would not affect regional wetlands or the viability of regional biotic populations. Localized changes to community size, structure, or composition and ecological processes could occur.
- **Major:** The impact would be severely adverse or exceptionally beneficial. Impacts would have a substantial, highly noticeable, or widespread influence on multiple or extensive wetlands and affect the abundance or distribution of a local or regional population to the extent that the population would not be likely to recover (adverse) or would return to a sustainable level (beneficial). Community size, structure, or composition and ecological processes would be highly altered, and landscape level changes could be expected.

Short term – wetlands and floodplains would recover in less than two years.

Long term – wetlands and floodplains would take more than two years to recover.

ALTERNATIVE 1: NO ACTION

Short and long term, moderate, adverse impacts would result from the continued degradation of Halstead Meadow. The roadway would continue to bisect the meadow, and water would be channeled through 2 large culverts and 2 overflow culverts, disrupting the natural sheet flow condition. The channelized flow would continue to erode the meadow, causing soil loss and faster flows. Higher areas within the meadow would continue to be dewatered, altering the vegetation community, and contributing to the loss of the meadow ecosystem.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects with the potential to affect wetlands and the floodplain include other roadway and infrastructure related projects [e.g., the rehabilitation of Generals Highway Route 10(1 - 6), the Emergency Cut Slope Repair Route 10(7A), the Halstead Meadow Erosion Repair, the Rehabilitation of the Lodgepole Campground, Giant Forest Development Area Removal, Construction of the Wuksachi, Clover Creek, and Red Fir Development Areas, Replace Water Distribution Systems at Lodgepole and Grant Grove, Replacement of the Cedar Grove Bridge, Replacement of Wolverton Corrals, Replacement of the Big Stump Entrance Station, and Reconstruction of the Crescent Meadow/Moro Rock Road]. The no action alternative would contribute moderate, adverse impacts to these projects resulting in moderate, adverse impacts to wetlands and floodplains in the long term.

Conclusion. Short and long term, moderate, adverse impacts to wetlands and floodplains would continue from continued channelization of water and gully formation. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the no action alternative, would have short and long term, moderate, adverse impacts to wetlands and floodplains.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's final general management plan or other relevant NPS planning documents, there would be no impairment of park resources and values.

ALTERNATIVE 2: NPS PREFERRED ALTERNATIVE

Short term, minor to moderate, adverse impacts and long term, beneficial impacts would result from the restoration of Halstead Meadow. Under the preferred alternative, the existing road embankment would be removed and replaced with a bridge. Short term, minor to moderate, adverse impacts to the degraded meadow would result from vegetation removal and water diversion for construction of a bridge and the restoration of the meadow, including filling of the unnatural gullies and grading of the meadow.

A one lane by-pass would be constructed north of the existing roadway to accommodate traffic during construction. Trees along the roadway embankment would be removed to allow construction of the bridge. The channel created downstream of the road would be filled using heavy equipment to transport, compact, and grade the fill material approved by appropriate park staff. After construction, the meadow would be revegetated with local flora propagated from seed collected from the project area and the water returned to a sheet flow condition. The by-pass lane would be removed and the area rehabilitated. The road rehabilitation and

lower meadow restoration work would tie-in with the upper restoration work to allow for a stable transition across the meadow.

A Statement of Findings is required if the preferred alternative would result in adverse impacts from hydrologic or vegetation restoration in wetlands, unless the actions are exempted. Exemption 4.2.A.1.e, Actions Designed Specifically for the Purpose of Restoring Degraded or Lost Natural Wetlands, Stream, Riparian, or Other Aquatic Habitats or Ecological Processes (DO 77-1) applies for this action as long as Best Management Practices (Appendix C) are applied. These Best Management Practices are included in the action.

Executive Order 11988 (Floodplain Management) requires an examination of impacts to floodplains and the potential risk involved in placing facilities within floodplains. 2006 NPS Management Policies, and Director's Order – 77-2, provide guidelines for proposed actions in floodplains. It is NPS policy to preserve floodplain values and minimize potentially hazardous conditions associated with flooding. Improvements to drainage would occur as part of the preferred alternative, however no new structures would be placed within the floodplain that would increase flooding potential or change the natural function of the floodplain. Under the preferred alternative, impacts to the floodplain within Halstead Meadow would be beneficial as more natural flows would be restored. A Statement of Findings (Appendix E) is required to address impacts to floodplains. Adverse impacts to floodplains from the preferred alternative would be short term and minor.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects with the potential to impact wetlands and floodplains include other roadway-related projects [e.g., the rehabilitation of Generals Highway Route 10(1 - 6), the Emergency Cut Slope Repair Route 10(7A), the Halstead Meadow Erosion Repair, the Rehabilitation of the Lodgepole Campground, Giant Forest Development Area Removal, Construction of the Wuksachi, Clover Creek and Red Fir Development Areas, Replace Water Distribution Systems at Lodgepole and Grant Grove, Replacement of the Cedar Grove Bridge, Replacement of Wolverton Corrals, Replacement of the Big Stump Entrance Station, and Reconstruction of the Crescent Meadow/Moro Rock Road]. The restoration of Halstead Meadow would add short term, minor to moderate, adverse contributions to the cumulative impacts on wetlands and floodplains. Beneficial impacts would occur in the long term from the Halstead Meadow restoration. The effects of the abovementioned past, present, and reasonably foreseeable future actions, in conjunction with the effects of the preferred alternative, would result in short term, minor to moderate, adverse cumulative impacts and long term, beneficial cumulative impacts on wetlands and floodplains.

Conclusion. Moderate, short term, adverse impacts to wetlands and floodplains would result from soil and vegetation removal and disturbance and water diversion during construction of the preferred alternative. In the long term, beneficial impacts would occur from the restoration of the wetlands and natural flows. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the impacts of the preferred alternative, would result in short term, minor to moderate, adverse impacts and beneficial impacts to wetlands and floodplains in the long term.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a special status species' resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as

a goal in the park's final general management plan or other relevant NPS planning documents, there would be no impairment of park resources and values.

Park Operations

Park operations, for the purpose of this analysis, refers to the quality and effectiveness of the infrastructure, and the ability to maintain the infrastructure used in the operation of the parks in order to adequately protect and preserve vital resources and provide for a positive visitor experience. This includes an analysis of the condition and usefulness of the facilities and developed features used to support the operations of the parks. Facilities in the project area include: six formal pullouts, some with picnic tables, garbage cans, pit toilets, a wayside exhibit, or a trailhead. The formal pullouts can accommodate a range of vehicles and in most cases oversized vehicles such as recreational vehicles or tour buses. The formal and informal pullouts are often used by NPS protection rangers when administering traffic violations, by visitors and staff who have disabled vehicles, and by visitors in slow moving vehicles who pull over to allow vehicles to pass. In addition to the six formal pullouts, there are 15 – 20 informal pullouts that commonly developed over time and do not provide safe road visibility when re-entering the road. There are also over 120 drainage structures (culverts, bridges, drop inlets) that routinely need to be repaired, unplugged, or cleaned out.

Park staff knowledgeable of these issues were members of the planning team that evaluated the impacts of each alternative. Impact analysis is based on the current description of park operations presented in the Affected Environment section of this document.

- **Negligible:** Park operations would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on park operations.
- **Minor:** The effect would be detectable and would be of a magnitude that would not have an appreciable effect on park operations. If mitigation was needed to offset adverse effects, it would be simple and likely successful.
- **Moderate:** The effects would be readily apparent and result in a substantial change in park operations in a manner noticeable to staff and the public. Mitigation measures would be necessary to offset adverse effects and would likely be successful.
- **Major:** The effects would be readily apparent, result in a substantial change in park operation in a manner noticeable to staff and the public, and be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed, extensive, and success could not be guaranteed.

Short term – Effects lasting for the duration of the proposed action of two to three years.

Long term – Effects lasting beyond when the project is completed.

ALTERNATIVE 1: NO ACTION

Vehicle pullouts would continue to be undersized and in unsafe locations, thereby decreasing the ability of the NPS to perform their routine park operations in a safe and efficient manner. Currently the road width marginally accommodates heavy equipment used by the NPS for snow removal and routine maintenance. Culverts and underdrains would continue to require frequent maintenance such as spot repairs and cleaning plugged culverts.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects with the potential to affect park operations include other roadway-related projects [e.g., the

rehabilitation of Generals Highway Route 10(1 - 6), the Emergency Cut Slope Repair Route 10(7A), the Halstead Meadow Erosion Repair, the Rehabilitation of the Lodgepole Campground, Giant Forest Development Area Removal, Construction of the Wuksachi, Clover Creek and Red Fir Development Areas, Replace Water Distribution Systems at Lodgepole and Grant Grove, Replacement of the Cedar Grove Bridge, Replacement of Wolverton Corrals, Replacement of the Big Stump Entrance Station, and Reconstruction of the Crescent Meadow/Moro Rock Road]. Construction delays, the presence of construction equipment, and construction-related facility closures would have short term, negligible to minor, adverse impacts on park operations for the duration of the construction activities.

However, improvements associated with each of these projects (e.g., rehabilitated road surfaces, improved accessibility and parking, improved infrastructure) would have long term, beneficial effects on park operations. The no action alternative would have negligible to minor, adverse contributions to cumulative effects in the short and long term. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the no action alternative, would have short term, negligible to minor, adverse impacts on park operations, and long term, beneficial impacts.

Conclusion. The deteriorating condition of Generals Highway, poorly delineated road features (e.g., parking areas, intersections), and dysfunctional drainage structures constitute a short and long term, negligible to minor, adverse impact to park operations. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the no action alternative, would have short term, negligible to minor, adverse impacts on park operations, and long term, beneficial impacts.

ALTERNATIVE 2: NPS PREFERRED ALTERNATIVE

Short term, moderate, local, adverse impacts to park operations would occur due to traffic delays and the temporary closure of pullouts during construction. Local, long term impacts to park operations would be beneficial due to the removal of some social pullouts, the paving of other pullouts, and the reduced maintenance of the damaged road surface and cleaning of clogged undersized culverts.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects with the potential to affect park operations include other roadway-related projects [e.g., the rehabilitation of Generals Highway Route 10(1 - 6), the Emergency Cut Slope Repair Route 10(7A), the Halstead Meadow Erosion Repair, the Rehabilitation of the Lodgepole Campground, Giant Forest Development Area Removal, Construction of the Wuksachi, Clover Creek and Red Fir Development Areas, Replace Water Distribution Systems at Lodgepole and Grant Grove, Replacement of the Cedar Grove Bridge, Replacement of Wolverton Corrals, Replacement of the Big Stump Entrance Station, and Reconstruction of the Crescent Meadow/Moro Rock Road]. Construction delays, the presence of construction equipment, and construction-related facility closures would have short term, negligible to minor, adverse impacts on park operations for the duration of the construction activities.

However, improvements associated with each of these projects (e.g., rehabilitated road surfaces, improved accessibility and parking, improved infrastructure) would have long term, beneficial effects on park operations. The NPS preferred alternative would have negligible to minor, adverse contributions to cumulative effects in the short and long term. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with

the NPS preferred alternative, would have short term, negligible to minor, adverse impacts on park operations, and long term, beneficial impacts.

Conclusion. The preferred alternative would have short term, minor, adverse impacts. Upon completion of the preferred alternative, there would be long term, beneficial effects on park operations. The cumulative effects of the preferred alternative would be negligible to minor and adverse in the short term and negligible to minor and beneficial in the long term.

Visitor Experience

NPS Management Policies 2006 state that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all national parks and that the NPS is committed to providing appropriate, high-quality opportunities for people to enjoy the parks.

Part of the purpose of Sequoia and Kings Canyon National Parks is to offer opportunities for recreation, education, inspiration, and enjoyment. Consequently, one of the parks' management goals is to ensure that visitors safely enjoy, and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.

Scoping input and observation of visitation patterns, combined with an assessment of what is available to visitors under current management were used to estimate the effects of the actions in the various alternatives of this document. The impact on the ability of the visitor to experience a full range of park resources was analyzed by examining resources and objectives presented in the park significance statements. The potential for change in visitor use and experience proposed by the alternatives was evaluated by identifying projected increases or decreases in visitor use of the Generals Highway, and determining how these projected changes would affect the desired visitor experience, to what degree and for how long. The thresholds of change for the intensity of an impact to visitor experience are defined as follows:

- **Negligible:** Visitors would not be affected by the change, or the change might be slight enough that visitors would not likely be aware of the effects associated with the alternative.
- **Minor:** Changes in visitor use and/or experience would be detectable by some visitors although the changes would be slight. Those aware of the changes would not likely express an opinion about the change.
- **Moderate:** Changes in visitor use and/or experience would be readily apparent by many visitors, and some visitors would be likely to express an opinion about the changes.
- **Major:** Changes in visitor use and/or experience would be readily apparent by most visitors, severely adverse, or exceptionally beneficial, and have important consequences. Many visitors would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.

Short term – effects lasting for the duration of the proposed action (two to three years).

Long term – effects lasting beyond when the project is completed.

ALTERNATIVE 1: NO ACTION

The deteriorating condition of Generals Highway, inappropriately built road features, e.g., parking areas, intersections, and the variable road widths, constitute short and long term, moderate, adverse impacts to visitor experience. Raveling (loosening) of the road edge would continue, and the road surface would continue to have areas of rutting and cracking. Some pullouts would allow visitors to continue to impact park resources. Park visitors would continue to feel uncomfortable driving because of the various road widths, and w-beam guardrails would not provide the sense of safe driving on Generals Highway. Also, drainage would not be improved because additional culverts would not be placed, and culvert diameters would remain inadequate for the amount of water flow. Road surface slumping and shoulder raveling would continue to create an unsafe road surface, which increases the potential for vehicles to lose contact with the road surface. Under winter driving conditions with ice and snow the potential for loss of contact with the road surface is increased.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects with the potential to affect visitor experience include other roadway-related projects [e.g., the rehabilitation of Generals Highway Route 10(1 - 6), the Emergency Cut Slope Repair Route 10(7A), the Halstead Meadow Erosion Repair, the Rehabilitation of the Lodgepole Campground, Giant Forest Development Area Removal, Construction of the Wuksachi, Clover Creek and Red Fir Development Areas, Replace Water Distribution Systems at Lodgepole and Grant Grove, Replacement of the Cedar Grove Bridge, Replacement of Wolverton Corrals, Replacement of the Big Stump Entrance Station, and Reconstruction of the Crescent Meadow/Moro Rock Road]. Construction noise, the presence of construction equipment, and construction-related traffic delays or facility closures would have short term, negligible to minor, adverse impacts on visitor experience for the duration of the construction activities.

However, improvements associated with each of these projects (e.g., rehabilitated road surfaces, improved accessibility and parking, improved infrastructure) would have long term, beneficial effects on visitor experience. The no action alternative would have negligible to minor, adverse contributions to cumulative effects in the short and long term. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the no action alternative, would have short term, negligible to minor, adverse impacts on visitor experience, and long term, beneficial impacts.

Conclusion. The deteriorating condition of Generals Highway and poorly delineated road features (e.g., parking areas, intersections) constitutes a short and long term, moderate, adverse impact to visitor experience. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the no action alternative, would have short term, moderate, adverse impacts on visitor experience, and long term, beneficial impacts.

ALTERNATIVE 2: NPS PREFERRED ALTERNATIVE

There would be short term, local, moderate, adverse impacts to visitor experience during the construction phase due to the proposed one or two hour traffic delays, the possible need for night work or closures to replace or repair culverts, the increase in trucks hauling construction materials and waste materials on the roadway, and the temporary closure of pullouts during rehabilitation. Long term impacts to visitor experience would be local, beneficial and minor adverse. The beneficial impacts would be due to the uniform road width, stabilized shoulders and pullouts, construction of paved pullouts, the replacement of guardrails with guardwalls, and the restoration of a free flowing wetland at Halstead Meadows. The adverse impacts to visitor experience would be due to removal of social pullouts, the removal of 3 – 8 historic stone features that contribute to the roads rustic and historic character, and the potential one to two month closure of the Halstead Meadow picnic area to provide access to the Halstead Meadow restoration site.

During construction, visitors and employees may be impacted as a result of the lack of access to the adjoining park, restricted access to neighboring USFS permit holders, and reduced recreational access within the project area.

From Amphitheatre to Deer Ridge, daily road closures will be limited to one hour during the peak season from Memorial Day to the end of September. Traffic will pass through the construction zone at the top of every hour. During the off peak season, closures will still be limited to a maximum of two hours during the day. For the extent of the construction phase, night closures will remain a possibility, when necessary, with one traffic pass through at midnight.

From Wolverton to Little Baldy, all closures will be limited to one hour with traffic passing through at the top of the hour.

To mitigate for impacts during construction, all construction activities will be limited to weekdays, starting at 6 a.m. on Monday and ending at 12 p.m. on Friday. Construction will not occur on weekends or major holidays. There may be minor delays at these times in order to allow for one lane of traffic at a time to pass through certain areas.

The park will provide information, e.g. brochures, signs, telecommunication, and interpretative programs to inform visitors, concessions, USFS, and employees of alternative routes and project schedule.

Upon completion of the preferred alternative, the repaired road surface, wider travel lanes, better sight lines, and improved signage would improve driving conditions. Although it is not anticipated that the road condition would have any impact on visitation numbers, the driving experience would be improved, resulting in a beneficial effect.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects with the potential to affect visitor experience include other roadway-related projects [e.g., the rehabilitation of Generals Highway Route 10(1 - 6), the Emergency Cut Slope Repair Route 10(7A), the Halstead Meadow Erosion Repair, the Rehabilitation of the Lodgepole Campground, Giant Forest Development Area Removal, Construction of the Wuksachi, Clover Creek and Red Fir Development Areas, Replace Water Distribution Systems at Lodgepole and Grant Grove, Replacement of the Cedar Grove Bridge, Replacement of Wolverton Corrals, Replacement of the Big Stump Entrance Station, and Reconstruction of the Crescent Meadow/Moro Rock Road]. Construction noise, the presence of construction

equipment, and construction-related traffic delays or facility closures would have short term, negligible to minor, adverse impacts on visitor experience for the duration of the construction activities. However, improvements associated with each of these projects (e.g., rehabilitated road surfaces, improved accessibility and parking, improved infrastructure, and new or rehabilitated facilities) would have long term, beneficial effects on visitor experience.

The preferred alternative would involve short term, moderate, local, adverse effects and long term minor, adverse and beneficial impacts to visitor experience. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the preferred alternative, would have moderate adverse impacts on visitor experience in the short term and minor adverse and beneficial impacts in the long term.

Conclusion. The preferred alternative would have short term, moderate, local, adverse impacts. Upon completion of the preferred alternative, there would be long term, beneficial and minor adverse, local effects on visitor experience. The cumulative effects of the preferred alternative would be minor to moderate and adverse in the short term and beneficial and minor, adverse in the long term.

METHODOLOGY FOR ASSESSING IMPACTS TO CULTURAL RESOURCES

Potential impacts (direct, indirect, and cumulative effects) are described in terms of type (beneficial or adverse), context (site-specific, local, or even regional), duration (short term, long term, or permanent), and intensity (negligible, minor, moderate, or major). Because definitions of intensity and duration vary by impact topic, intensity definitions and duration are provided separately for each impact topic analyzed in this EA/AoE.

Cumulative Impacts: The CEQ regulations, which implement the NEPA of 1969 (42 USC 4321 *et seq.*), require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for all alternatives, including the no action alternative.

Cumulative impacts were determined by combining the impacts of the alternatives with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects at Sequoia and Kings Canyon National Parks and, if applicable, the surrounding region.

Impacts to Cultural Resources and Section 106 of the NHPA: In this EA/AoE impacts to cultural resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the CEQ that implement NEPA. These impact analyses are intended, however, to comply with the requirements of both NEPA and Section 106 of the NHPA. In accordance with the ACHP's regulations implementing Section 106 of the NHPA (36 CFR Part 800, *Protection of Historic Properties*), impacts to cultural resources were also identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the NRHP; (3) applying the criteria of adverse effect to affected, National Register eligible or listed cultural resources; and (4) considering ways to avoid, minimize or mitigate adverse effects.

Under the ACHP's regulations, a determination of either *adverse effect* or *no adverse effect* must also be made for affected National Register listed or eligible cultural resources. An *adverse effect* occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register, e.g. diminishing the integrity (or the extent to which a resource retains its historic appearance) of its location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by 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 in the National Register.

CEQ regulations and D.O. 12 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, e.g. reducing the intensity of an impact from major to moderate or minor. Any resulting 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 resources are nonrenewable 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 unless the mitigation prevents any impact.

A Section 106 summary is included in the impact analysis sections. The Section 106 summary is an assessment of the effect of the undertaking, implementation of the alternative, on National Register eligible or listed cultural resources only, based upon the criterion of effect and criteria of adverse effect found in the ACHP's regulations.

Historic Structures

In order for a structure or building to be listed in the NRHP, it must be associated with an important historic context, i.e, possess significance - the meaning or values ascribed to the structure or building and have integrity of those features necessary to convey its significance, i.e., location, design, setting, workmanship, materials, feeling, and association (see National Register Bulletin #15 *How to Apply the National Register Criteria for Evaluation*). For purposes of analyzing potential impacts to historic structures, the thresholds of change for the intensity of an impact are defined as follows:

- **Negligible:** Impact is at the lowest levels of detection with neither adverse nor beneficial consequences. The determination of effect for Section 106 would be *no adverse effect*.
- **Minor:** Adverse impact – alteration of a feature(s) would not diminish the overall integrity of the resource. The determination of effect for Section 106 would be *no adverse effect*.
- **Moderate:** Alteration of a feature(s) would diminish the overall integrity of the resource. The determination of effect for Section 106 would be *adverse effect*. A PA is executed among the NPS and applicable state or tribal historic preservation officer and, if necessary, the ACHP in accordance with 36 CFR 800.6(b). Measures identified in the PA to minimize or mitigate adverse impacts reduce the intensity of impact under NEPA.

- **Major:** Alteration of a feature(s) would diminish the overall integrity of the resource. The determination of effect for Section 106 would be *adverse effect*. Measures to minimize or mitigate adverse impacts cannot be agreed upon between the NPS and applicable state or tribal historic preservation officer and/or ACHP, and they are unable to negotiate and execute a PA in accordance with 36 CFR 800.6(b).

Short term – occurs only during the construction period.

Long term – occurs during and continues after the construction period.

ALTERNATIVE 1: NO ACTION

Under the no action alternative, the NPS would continue management actions that would include minor repairs of the stone masonry headwalls, endwalls, retaining walls, and any other historic stone feature within the project area. The stone masonry features would continue to be impacted from piecemeal road maintenance, vegetation, and erosion; therefore there would be local, short term and long term, minor, adverse impacts to historic structures.

Cumulative Impacts. Other past, present, or reasonably foreseeable future actions would have or had adverse impacts on the parks' historic structures. For instance, the rehabilitation of Generals Highway from the Ash Mountain entrance to Big Fern Springs rehabilitation removed some of the historic stone masonry structures when they lacked structural integrity or could not be incorporated into the required highway design. These features were replaced with either similar stone masonry structures or simulated stone (concrete form-liner) structures that received CA SHPO concurrence. There are no future actions that would add to cumulative impact scenario. The no action alternative would add a perceptible adverse increment to the cumulative effect for the reasons stated in the previous paragraph. Overall, the no action alternative when added to the other projects listed in the cumulative impact scenario would have a local, moderate, long term, adverse cumulative effect to historic structures.

Conclusion. Under the no action alternative, there would be local, long term, minor adverse impacts due to ongoing deterioration from erosion, piecemeal maintenance, and vegetation. The no action alternative would add a perceptible increment to the overall local, moderate, long term, adverse cumulative effect.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a historic structure's resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's final general management plan or other relevant NPS planning documents, there would be no impairment of park resources and values.

ALTERNATIVE 2: NPS PREFERRED ALTERNATIVE

Under the NPS preferred alternative, the NPS would rehabilitate, restore, and resurface two sections of Generals Highway. The first section proposed for work includes reconstructing the roadway for 1.5 miles, from Amphitheater Point to Deer Ridge. Work would entail reconstructing 35 – 40 stone masonry guardwalls using schist or granite, whichever was originally used, reconditioning 2 – 5 stone masonry culvert headwalls, reconstruction of 12 – 15 stone masonry culvert headwalls, removing 2 – 7 stone masonry culvert headwalls because they are not functioning, installing 2 – 5 drop inlets with stone masonry cap stones, and

cleaning 2 – 5 metal culverts, and replacing one stone masonry parapet wall with a stone veneer cantilevered bridge. At least two major stone masonry features will be retained and incorporated into the highway design, including a large granite wall and a car watering station.

The second section proposed for work would rehabilitate 8.53 miles of roadway from Wolverton Road north to the Little Baldy pullout. The project would recycle and overlay the existing pavement and rebuild the roadbed within the existing road bench. Two metal guardrails would be replaced with steel backed timber guardrails or walls. Work would also entail removing and replacing 10 -15 stone culvert headwalls with stone headwalls, reconditioning approximately 5 stone masonry headwalls, removing one culvert, installing up to five culverts with stone masonry headwalls, and cleaning out over 40 culverts. Between 12 and 15 culverts would not be disturbed. Existing signs and interpretive pullouts and sidewalks would be upgraded or replaced as necessary. Curb would be eliminated on fills. Existing pullouts would be reshaped to a consistent depth and layout throughout the project, while some unauthorized pullouts would be eliminated and revegetated. There would be no short term impact to historic structures. Long term impacts to historic structures would be local, moderate and adverse due to the substantial amount of historic features removed or reconstructed that are currently listed in or eligible for listing in the National Register.

Cumulative Impacts. Other past, present, or reasonably foreseeable future actions would have or had adverse impacts on the parks' historic structures. For instance, the rehabilitation of Generals Highway from the Ash Mountain entrance to Big Fern Springs rehabilitation removed some of the historic stone masonry structures when they lacked structural integrity or could not be incorporated into the required highway design. These features were replaced with either similar stone masonry structures or simulated stone (concrete form-liner) structures that received CA SHPO concurrence. There are no future actions that would add to the cumulative impact scenario. The NPS preferred alternative would add a noticeable adverse increment to the cumulative effect for the reasons stated in the previous paragraph. Overall, the NPS preferred alternative when added to the other projects listed in the cumulative impact scenario would have a local, moderate, long term, adverse cumulative effect to historic structures.

Conclusion. Under the NPS preferred alternative, there would be local, long term, moderate, adverse impacts due to the reconstruction, removal, and reconditioning of the various historic structures within the two sections of Generals Highway that would be rehabilitated. The NPS preferred alternative would add a detectable increment to the overall local, moderate, long term, adverse cumulative effect.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a historic structure's resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's final general management plan or other relevant NPS planning documents, there would be no impairment of park resources and values.

Section 106 Summary. After applying the ACHP's criteria of adverse effect (36 CFR 800.5), the NPS proposes that implementing the no action alternative would have an *adverse effect* on a property formally determined eligible for listing in the National Register. The NPS had a 1995 PA with the CA SHPO and the ACHP that expired on September 30, 2000. The NPS is in the final stages of revising the 1995 PA, which would be forwarded to the CA SHPO for their

review and concurrence in 2007. The new PA would retain all the existing stipulations in the 1995 PA and add new stipulations reflecting any design changes specific to the Generals Highway Rehabilitation on Route 10(8) and (9) in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties* (1996).

Cultural Landscapes

According to the NPS's *Cultural Resource Management Guideline* (Director's Order – 28), a cultural landscape is

“... a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined by both physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values.”

In 1998 the Cultural Landscapes Automated Inventory Management System database listed 10 parent landscapes and 13 component landscapes within the parks. Generals Highway was one of the parent landscapes and is listed as a fully documented Level II landscape. The National Register nomination for Generals Highway lists landscape architecture as an area of significance, along with the period of significance being 1922 – 1942. The period from 1922 – 1935 is the highway's construction period and the period from 1933 – 1942 is when the CCC added “the rustic elements” giving the highway its distinctive character, making it “more compatible with its natural surroundings, and lessen its impact on the landscape...” (Unrau, 1992)

A PA between the NPS Western Region, the CA SHPO, and the ACHP was signed in 1995. The PA specifically addressed “The Repair and Reconstruction of Roads, Appurtenant Structures, and Associated Utilities.” This PA expired in September 2000. A new PA was drafted in 2007 and is currently at the CA SHPO, the ACHP, and the tribes for comment and concurrence. Once these two offices sign the document it would be returned to the parks for final signature. The 2007 PA retained all the original stipulations and added new stipulations that address cantilever bridges and *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* (NPS, 1996). For purposes of analyzing potential impacts to cultural landscapes, the thresholds of change for the intensity of an impact are defined as follows:

- **Negligible:** Impact(s) is at the lowest levels of detection with neither adverse nor beneficial consequences. The determination of effect for Section 106 would be *no adverse effect*.
- **Minor:** Alteration of a pattern(s) or feature(s) of the landscape would not diminish the overall integrity of the landscape. The determination of effect for Section 106 would be *no adverse effect*.
- **Moderate:** Alteration of a pattern(s) or feature(s) of the landscape would diminish the overall integrity of the landscape. The determination of effect for Section 106 would be *adverse effect*. A PA is executed among the NPS and applicable state or tribal historic preservation officers and, if necessary, the ACHP in accordance with 36 CFR 800.6(b). Measures identified in the PA to minimize or mitigate adverse impacts reduce the intensity of impact under NEPA from major to moderate.

- **Major:** Alteration of a pattern(s) or feature(s) of the landscape would diminish the overall integrity of the landscape. The determination of effect for Section 106 would be *adverse effect*. Measures to minimize or mitigate adverse impacts cannot be agreed upon and the NPS and applicable state or tribal historic preservation officers and/or ACHP are unable to negotiate and execute a PA in accordance with 36 CFR 800.6(b).

Short term – occurs only during the construction period.

Long term – occurs during and continues after the construction period.

ALTERNATIVE 1: NO ACTION

Under the no action alternative, the NPS would continue management actions that would include minor repairs of the stone masonry headwalls, endwalls, retaining walls, and any other historic stone feature that contribute to the cultural landscape of Generals Highway. The non-supporting/non-contributing road features such as the unauthorized/social pullouts and the metal pipe guardrails would remain. The road width would remain inconsistent from 18 to 22 feet wide. The stone masonry features would continue to be impacted from piecemeal road maintenance, vegetation, and erosion; therefore there would be local, short term and long term, negligible to minor, adverse impacts to the Generals Highway cultural landscape.

Cumulative Impacts. Other past, present, or reasonably foreseeable future actions would have or had adverse impacts on the Generals Highway cultural landscape. For instance, the rehabilitation of Generals Highway from the Ash Mountain entrance to Big Fern Springs rehabilitation removed some of the historic stone masonry structures when they lacked structural integrity or could not be incorporated into the required highway design. These features were replaced with either similar stone masonry structures or simulated stone (concrete form-liner) structures. Some unauthorized/social pullouts were eliminated and revegetated providing a beneficial impact. There are no future actions that would add to cumulative impact scenario. The no action alternative would add a perceptible adverse increment to the cumulative effect for the reasons stated in the previous paragraph. Overall, the no action alternative when added to the other projects listed in the cumulative impact scenario would have a local, minor, long term, adverse cumulative effect to the cultural landscape.

Conclusion. Under the no action alternative, there would be local, short and long term, negligible to minor, adverse impacts due to ongoing deterioration from erosion, piecemeal maintenance, vegetation, and the non-supporting/non-contributing features along the road would remain. The no action alternative would add a perceptible adverse increment to the overall local, moderate, long term, adverse cumulative effect.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a cultural landscape's resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's final general management plan or other relevant NPS planning documents, there would be no impairment of park resources and values.

ALTERNATIVE 2: NPS PREFERRED ALTERNATIVE

Under the NPS preferred alternative, the NPS would eliminate National Register non-supporting unauthorized/social pullouts and replace non-supporting metal pipe guardrails

with stone masonry or simulated stone masonry guardwalls that would meet the *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*.

The short term impact would be localized, negligible, and adverse because of the temporary staging of construction equipment and debris within the road corridor.

The long term impact would be localized, moderate, and adverse and beneficial. Several historic stone features would be removed and in most cases rebuilt with stone, however up to eight (out of 137) stone masonry features would not be reconstructed. The beneficial impact is due to removal of non-contributing features, such as social pullouts and metal pipe guardrails. Two metal guardrails would be replaced with steel-backed timber guardrails or walls. All new stone masonry guardwalls and timber guardrails would be built in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. The new guardwalls and guardrails would be considered supporting the Generals Highway National Register listing as a cultural landscape.

Cumulative Impacts. Other past, present, or reasonably foreseeable future actions would have or had adverse impacts on the Generals Highway cultural landscape. For instance, the rehabilitation of Generals Highway from the Ash Mountain entrance (Station 0+0) to the end of Route 10(6) Rehabilitation (station 18+200) removed all the historic stone masonry structures and either replaced them with similar stone masonry structures or simulated stone (concrete form-liner) structures. Some unauthorized/social pullouts were eliminated and revegetated providing a beneficial impact. There are no future actions that would add to cumulative impact scenario. The NPS preferred alternative would add a perceptible adverse increment to the cumulative effect for the reasons stated in the previous paragraph. Overall, the NPS preferred alternative when added to the other projects listed in the cumulative impact scenario would have a local, moderate, long term, adverse cumulative effect and a beneficial impact to the Generals Highway cultural landscape.

Conclusion. Under the NPS preferred alternative there would be local, short term, negligible, adverse impacts due to the construction equipment staging and debris along the road, and long term, localized, moderate, and adverse as well as beneficial impacts due to National Register contributing stone masonry features being removed permanently and beneficial because non-supporting features would be removed permanently. Any new features would be built according to the Secretary of Interior's Standards for the Treatment of Cultural Landscapes, thus reducing the level of impact. The NPS preferred alternative would add a perceptible adverse increment to the overall local, moderate, long term, adverse cumulative effect and a beneficial impact to the Generals Highway cultural landscape.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a cultural landscape's resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's final general management plan or other relevant NPS planning documents, there would be no impairment of park resources and values.

Section 106 Summary. After applying the ACHP on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the NPS proposes that implementing the no action alternative would have an *adverse effect* on a property listed in the National Register. The NPS had a 1995 PA with the CA SHPO and the ACHP that expired on September 30, 2000. The NPS has

revised and updated the PA and forwarded it to the CA SHPO in 2007 for their review and concurrence. The new 2007 PA would retain all the existing stipulations of the 1995 PA and add new stipulations reflecting any design changes specific to the Generals Highway Rehabilitation on Route 10(8) and (9) in accordance with the *Secretary of Interior's Standards for the Treatment of Historic Properties, with Guidelines for the Treatment of Cultural Landscapes*.

CONSULTATION AND COORDINATION

SCOPING

Scoping is the effort to involve agencies and the general public in determining the scope of issues to be addressed in the environmental document. Among other tasks, scoping determines important issues and eliminates issues not important; allocates assignments among the interdisciplinary team members and/or other participating agencies; identifies related projects and associated documents; identifies other permits, surveys, consultations, etc. required by other agencies; and creates a schedule that allows adequate time to prepare and distribute the environmental document for public review and comment before a final decision is made.

Scoping includes any interested agency, or any agency with jurisdiction by law or expertise (including the ACHP, the CA SHPO, and American Indian tribes) to obtain early input.

Staff of Sequoia and Kings Canyon National Parks, FHWA, and resource professionals of the NPS, DSC, conducted internal scoping. This interdisciplinary process defined the purpose and need, identified potential actions to address the need, determined the likely issues and impact topics, and identified the relationship of the proposed action to other planning efforts at the parks.

A press release initiating public scoping and describing the proposed action was issued on August 4, 2006 (Appendix A). Comments were solicited during a public scoping period. No comments were received.

The undertakings described in this document are subject to Section 106, as amended in 1992 (16 USC 470 *et seq.*). A copy of this EA/AoE was sent to the CA SHPO in early 2007. Project scoping letters went out to the parks affiliated tribes on August 16, 2006 (See Appendix B - "Consultation and Coordination").

In accordance with section 7(c) of the Endangered Species Act of 1973, as amended (16 USC 1531 *et seq.*), it is the responsibility of the federal agency proposing the action (in this case the NPS) to determine whether the proposed action would adversely affect any listed species or designated critical habitat. After consulting internet sources and with species experts, it was determined that no listed species or their critical habitats would be adversely affected by either alternative.

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This EA/AoE was prepared by the NPS DSC. Sequoia and Kings Canyon National Parks staff provided invaluable assistance in the development and technical review of this EA/AoE. NPS staff that provided information include:

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 ▪ 36 CFR 800.5. Assessment of Adverse Effects
 ▪ 36 CFR 800.13 Post-review discoveries
 ▪ 36 CFR 800 Part 60 National Register of Historic Places
 ▪ 36 CFR 800 Part 79 Curation of Federally-owned and Administered Archaeological Collections.
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APPENDIX A

NATIONAL PARK SERVICE PRESS RELEASE

Sequoia and Kings Canyon National Parks News Release

July 6, 2006

For Immediate Release

Alexandra Picavet 559-565-3131

Public Comment Sought on Planning of the Reconstruction of Generals Highway

The National Park Service is proposing to continue the process of reconstructing and rehabilitating the Generals Highway in Sequoia and Kings Canyon National Parks. Plans for the next five years include two sections of Generals Highway in Sequoia National Park. Work on these two sections is not part of the contract recently awarded to Agee Construction Corp for the Big Fern to Amphitheater Point (Phase Six) project starting mid-July of 2006.

In the first section, the seventh phase of the over-all project, work would entail widening the existing travel lanes and improving the turning radius of the switchbacks. The project will start 10.8 miles from the Ash Mountain Entrance Station at Amphitheater Point and will continue for 1.5 miles to Deer Ridge. Shoulder stabilization, retaining walls, shoulder cuts, and half bridges may be necessary for this project. The second section will rehabilitate 8.5 miles of existing roadway, from the Wolverton Road north to the Little Baldy pullout, and will include the rehabilitation of Lower Halstead Meadow. The project may include recycling and overlaying the existing pavement, and rebuilding the roadbed within the existing road bench.

This project is expected to begin in 2008. The Park Service welcomes public input as it develops formal alternatives for this project, and prepares an EA for public review. Questions and/or comments must be submitted in writing to the Superintendent at Sequoia and Kings Canyon National Parks, 47050 Generals Highway, Three Rivers, CA 93271, or email your comments to: SEKI_Superintendent@nps.gov. Please include the phrase "Generals Highway Reconstruction" at the top of your comments or in your email subject line. Comments must be postmarked or transmitted no later than August 10, 2006 to be considered.

Please note that names and addresses of people who comment become part of the public record. If commenting individuals request that their name or address be withheld from public disclosure, it will be honored to the extent allowable by law. Such requests must be stated prominently in the beginning of the comments. There also may be circumstances wherein the NPS will withhold from the record a respondent's identity, as allowable by law. As always: the NPS will make available to public inspection all submissions from organizations or businesses and from persons identifying themselves as representatives or officials of organizations and businesses. Anonymous comments may not be considered.

NPS

APPENDIX B

CONSULTATION AND COORDINATION LETTERS



United States Department of the Interior

NATIONAL PARK SERVICE
Sequoia and Kings Canyon National Parks
47050 Generals Highway
Three Rivers, California 93271-9651
(559) 565-3341

Received

AUG 25 2006



IN REPLY REFER TO

H4217 (SEKI)

DSC - T

August 16, 2006

Milford W. Donaldson, State Historic Preservation Officer
Office of Historic Preservation, Department of Parks and Recreation
P.O. Box 942896
Sacramento, California 94296-0001

Dear Mr. Donaldson:

Under the terms of our 1995 Programmatic Agreement regarding the repair and reconstruction of roads, appurtenant structures, and associated utilities, please be advised that our office is now developing plans for the next two segments of proposed reconstruction for the Generals Highway, Sequoia and Kings Canyon National Parks, Tulare County:

- **Project 10(8): Rehabilitate Generals Highway from Amphitheatre Point to Deer Ridge**
- **Project 10(9): Rehabilitate Generals Highway from Wolverton Road to Little Baldy Pullout**

The proposed projects cover 1.5 and 9.3 lineal miles respectively.

The work for Project 10(8) will entail widening the existing travel lanes to consistent 10-foot widths and improving the turning radii of the switchbacks to accommodate a 22-foot design vehicle. To achieve the additional lane widths, retaining walls, buttress walls, blasting for road cuts, and cantilevered bridges will be constructed and/or replaced, and road shoulders will be stabilized. Loose rock above the roadway will be scaled by hand to reduce or prevent future rockfalls. The design fits into the existing mountainous nature of this historic, National Register-eligible road. The original archeological survey (Mundy 1990) included the acreage within this segment of the highway.

The work for Project 10(9) will entail recycling the failed road base and overlaying it with asphaltic concrete. Drainage structures (culverts) and drop-inlets will be rehabilitated/replaced or redesigned at locations where existing drainage is deemed inadequate. Curbs and guardwalls will be replaced as needed and road shoulders will be stabilized. Turnouts and scenic overlooks will be rehabilitated. Safety improvements at the Little Baldy Saddle Pullout on the highway may include adding a crosswalk or improving signage to alert drivers to the presence of pedestrians. The intersection of Wolverton Road and the Generals Highway will be redesigned and narrowed to accommodate a 40-foot-long bus. Acceleration and deceleration lanes on the highway at the Wuksachi Village Road will be redesigned, as needed, but will stay within the existing road footprint. Work to restore the upstream portion of the Halstead Meadow, currently bisected and dammed by the roadway, is on-going. A temporary 25-foot-wide bypass road will be built and used during construction of a new Halstead Meadow bridge. Culverts that create artificially incised channels within the meadow will be removed and low spots will be filled to restore the

TAKE PRIDE
IN AMERICA

APPENDIX B (continued)

CONSULTATION AND COORDINATION LETTERS

H4217 (SEKI)

August 16, 2006

Greg Shipman
Bishop Indian Tribal Council
50 Tu Su Lane
Bishop, CA 93514

Dear Mr. Shipman,

I am writing to seek your comments on two proposed projects within Sequoia and Kings Canyon National Parks. As part of the ongoing efforts to rehabilitate the Generals Highway, we are working with the Federal Highway Administration to undertake the environmental compliance. The two projects are:

1) Project 10(8): Rehabilitate Generals Highway from Amphitheatre Point to Deer Ridge: The proposed project covers 1.5 lineal miles and would be consistent with the previous phases of reconstruction. The work would entail widening the existing travel lanes to consistent 10-foot widths and improving the turning radii of the switchbacks to accommodate a 22-foot design vehicle. To achieve the additional lane widths, retaining walls, buttress walls, blasting for road cuts, and cantilevered bridges would be constructed and/or replaced, and road shoulders would be stabilized. Loose rock above the roadway would be scaled by hand to reduce or prevent future rockfalls. The design fits into the existing mountainous nature of this historic, National Register-eligible road. The original archeological survey (Mundy 1990) included the acreage within this segment of the highway. The project's contract requirements would include a provision for the immediate suspension of operations in an area if any archeological resources are uncovered. Monitoring and coordination would be conducted by the park's Cultural Resources Specialist Tom Burge. Construction is slated for 2008 and 2009.

2) Project 10(9): Rehabilitate Generals Highway from Wolverton Road to Little Baldy: The proposed project covers 8.2 miles of the Generals Highway from the Wolverton Road intersection to the Little Baldy Trail pullout. Along this segment we propose to recycle the failed road base and overlay it with asphaltic concrete. Drainage structures (culverts) and drop-inlets) would be rehabilitated/replaced or redesigned at locations where existing drainage is deemed inadequate. Curbs and guardwalls would be replaced as needed and road shoulders would be stabilized. Turnouts and scenic overlooks would be rehabilitated. Safety improvements at the Little Baldy Saddle Trail access point on the highway may include adding a crosswalk or improving signage to alert drivers to the presence of pedestrians. The intersection of Wolverton Road and the Generals Highway would be redesigned and narrowed to accommodate a 40-foot-long bus. Acceleration and deceleration lanes on the highway at the Wuksachi Village Road would be redesigned, as needed, but would stay within

the existing road footprint. Work to restore the upstream portion of the Halstead Meadow, currently bisected and dammed by the roadway, is on-going. A temporary 25-foot-wide bypass road would be built and used during construction of a new Halstead Meadow bridge. Culverts that create artificially incised channels within the meadow would be removed and low spots would be filled to restore the downstream portion of the meadow. Supplemental archeological survey would be undertaken from the Lodgepole area to Little Baldy. Construction is slated for 2010.

We have begun the National Environmental Policy Act (NEPA) compliance for both projects and anticipate preparing an Environmental Assessment in the coming months.

We look forward to working with you as we proceed with the environmental planning process for these projects. Please contact us with any initial comments or concerns you may have. Cultural Resources Specialist Tom Burge can be reached directly at 559-565-3139 if you have any questions regarding these proposed projects.

Sincerely,

/s/ J.D. Swed for

Craig C. Axtell
Superintendent

APPENDIX C

DO- 77-1 Wetland Protection Best Management Practices

Appendix 2: “Best Management Practices (BMPs) Conditions” to be Applied when Proposed Actions Have the Potential to Have Adverse Impacts on Wetlands

The following serve as BMPs for NPS actions that may have adverse impacts on wetlands. Additional BMPs may be appropriate depending on local conditions or special circumstances. These also serve as “conditions” that must be met for the actions listed in Section 4.2 A of these procedures to qualify as “excepted.”

1. **Effects on hydrology:** Action must have only negligible effects on site hydrology, including flow, circulation, velocities, hydroperiods, water level fluctuations, and so on.
2. **Water quality protection and certification:** Action is conducted so as to avoid degrading water quality to the maximum extent practicable. Measures must be employed to prevent or control spills of fuels, lubricants, or other contaminants from entering the waterway or wetlands. Action is consistent with state water quality standards and Clean Water Act Section 401 certification requirements (check with appropriate agency).
3. **Erosion and siltation controls:** Appropriate erosion and siltation controls must be maintained during construction, and all exposed soil or fill material must be permanently stabilized at the earliest practicable date.
4. **Effects on fauna:** Action must have only negligible effects on normal movement, migration, reproduction, or health of aquatic or terrestrial fauna, including at low flow conditions.
5. **Proper maintenance:** Structure or fill must be properly maintained so as to avoid adverse impacts on aquatic environments or public safety.
6. **Heavy equipment use:** Heavy equipment use in wetlands must be avoided if at all possible. Heavy equipment used in wetlands must be placed on mats, or other measures must be taken to minimize soil and plant root disturbance and to preserve preconstruction elevations.
7. **Stockpiling material:** Whenever possible, excavated material must be placed on an upland site. However, then this is not feasible, temporary stockpiling of excavated material in wetlands must be placed on filter cloth, mats, or some other semipermeable surface, or comparable measures must be taken to ensure that underlying wetland habitat is protected. The material must be stabilized with straw bales, filter cloth, or other appropriate means to prevent reentry into the waterway or wetland.

APPENDIX C (continued)

8. **Removal of stockpiles and other temporary disturbances during construction:** Temporary stockpiles in wetlands must be removed in their entirety as soon as practicable. Wetland areas temporarily disturbed by stockpiling or other activities during construction must be returned to their pre-existing elevations, and soil, hydrology, and native vegetation communities must be restored as soon as possible.
9. **Topsoil storage and reuse:** Revegetation of disturbed soil areas should be facilitated by salvaging and storing existing topsoil and reusing it in restoration efforts in accordance with NPS policies and guidance. Topsoil storage must be for as short a time as possible to prevent loss of seed and root stability, loss of organic matter, and degradation of the soil microbial community.
10. **Native plants:** Where plantings or seeding are required, native plant material must be obtained and used in accordance with NPS policies and guidance. Management techniques must be implemented to foster rapid development of target native plant communities and to eliminate invasion by exotic or other undesirable species.
11. **Boardwalk elevations:** Minimizing shade impacts, to the extent practicable, should be a consideration in designing boardwalks and similar structures. (Placing a boardwalk at an elevation above the vegetation surface at least equal to the width of the boardwalk is one way to minimize shading.)
12. **Wild and Scenic Rivers:** Action cannot be “excepted” (see Section 4.2 of these procedures) if proposed in a component of the National Wild and Scenic River System or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in official study status.
13. **Coastal zone management:** Action must be consistent, to the maximum extent practicable, with state coastal zone management programs.
14. **Endangered species:** Action must not jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, including degradation of critical habitat (See NPS *Management Policies* (1988) and guidance on threatened and endangered species).
15. **Historic properties:** Action must not have adverse effects on historic properties listed or eligible for listing in the National Register of Historic Places.

APPENDIX D Species List

Animal Species of Concern – Sequoia National Park

SPECIES	LISTING STATUS		STATUS
Animal species	California	Federal	Comment
California condor <i>Gymnogyps californianus</i>	CE	FE	formerly flew over this area and could do so again in the future
bald eagle <i>Haliaeetus leucocephalus</i>	CE	Delisted	low probability of presence but could fly over
Swainson's hawk <i>Buteo swainsonii</i>	CT		Forest Service Sensitive, No record of occurrence in project area
American peregrine falcon <i>Falco peregrinus anatum</i>	CE	Delisted	low probability of presence but could fly over
Cooper's hawk <i>Accipiter cooperii</i>			California special concern, present
northern goshawk <i>Accipiter gentilis</i>			California special concern, Forest Service and BLM Sensitive, present
sharp shinned hawk <i>Accipiter striatus</i>			California special concern, present
golden eagle <i>Aquila chrysaetos</i>			California special concern, could fly over
prairie falcon <i>Falco mexicanus</i>			California special concern, could fly over
short-eared owl <i>Asio flammeus</i>			California special concern, Not good habitat, a few records exist of observations nearby, low probability of presence
long-eared owl <i>Asio otus</i>			California special concern, Low probability of presense
great gray owl <i>Strix nebulo</i>	CE		Forest Service sensitive, not in project area and little future potential
California spotted owl <i>Strix occidentalis occidentalis</i>			California special concern, Forest Service and BLM Sensitive, Currently 2 nests within ¼ mile radius of project

APPENDIX D (continued)

SPECIES	LISTING STATUS		STATUS
	California	Federal	Comment
black swift <i>Cypseloides niger</i>			California special concern, could fly over
willow flycatcher <i>Empidonax traillii</i>	CE		Forest Service sensitive, not in project area but has future potential in Halstead Meadow. No historic records.
purple martin <i>Progne subis</i>			California special concern, 1 record nearby
yellow warbler <i>Dendroica petechia brewsteri</i>			California special concern, likely to be in area, not likely to be impacted by project
pallid Bat <i>Antrozous pallidus</i>			Forest Service and BLM sensitive, Known to occur in open conifer forests
Townsend's big-eared bat <i>Corynorhinus townsendii</i>			California special concern, Forest Service and BLM Sensitive, Most likely to occur in Amphitheatre area
spotted bat <i>Euderma maculatum</i>			BLM sensitive, likely to forage in meadows, avoids light
western red bat <i>Lasiurus blossevillii</i>			Forest Service sensitive, unlikely to be present
western small-footed myotis <i>Myotis ciliolabrum</i>			BLM sensitive, wide but scarce distribution
long-eared myotis <i>Myotis evotis</i>			BLM sensitive, likely present in forests
fringed myotis <i>Myotis thysanodes</i>			BLM sensitive, likely in area
Yuma myotis <i>Myotis yumanensis</i>			BLM sensitive, possibly present, likes open water
western mastiff bat <i>Eumops perotis</i>			California special concern, BLM sensitive, prefers cliffs
red fox <i>Vulpes vulpes</i>	CT		Forest Service sensitive, 1 record nearby
wolverine <i>Gulo gulo</i>	CT		Forest Service sensitive, extirpated from project area
American marten <i>Martes americana</i>			Forest Service sensitive, good habitat
Pacific fisher <i>Martes pennanti</i>		FCS	California special concern, Forest Service and BLM Sensitive, good habitat

APPENDIX D (continued)

SPECIES	LISTING STATUS	STATUS	
Animal species	California	Federal	Comment
American badger <i>Taxidea taxus</i>			California special concern, extirpated from project areas
coastal range newt (formerly California newt) <i>Taricha torosa torosa</i>			California special concern, could get to Amphitheatre Point but not likely, occurs in drainages to the south
Sierra Madre yellow-legged frog (formerly mountain yellow-legged frog) <i>Rana muscosa</i>		FCS	California special concern, Forest Service sensitive species, no longer present in project area, historic record in Halstead Meadow
Plant Species of Concern			
Hoover's spurge <i>Chamaesyce hooveri</i>		T	Critical habitat
Springville clarkia <i>Clarkia sprinwillensis</i>		T	
Orcutt grass <i>Orcuttia inaequalis</i>		T	Critical habitat, San Joaquin Valley
San Joaquin adobe sunburst <i>Pseudobahia peirsonii</i>		T	
Keck's checker-mallow <i>Sidalcea keckii</i>		E	Critical habitat
Ramshaw sand-verbena <i>Abronia alpina</i>		C	



APPENDIX E

DRAFT STATEMENT OF FINDINGS FOR EXECUTIVE ORDER 11988

(FLOODPLAIN MANAGEMENT)

REHABILITATE GENERALS HIGHWAY

SEQUOIA AND KINGS CANYON NATIONAL PARKS CALIFORNIA

Recommended:

Superintendent, Sequoia and Kings Canyon National Parks Date

Certified for Technical Adequacy and Servicewide Consistency:

Water Resources Division Date

Concurrence:

Regional Safety Officer Date

Approved:

Pacific West Regional Director Date

INTRODUCTION

The National Park Service (NPS) in cooperation with the Federal Highway Administration/Central Federal Lands Highway Division (FHWA) is proposing to rehabilitate two sections of Generals Highway, the primary artery through Sequoia and Kings Canyon National Parks, Tulare County, California. The NPS has evaluated the impacts to floodplains associated with the proposed improvements required for the rehabilitation of the Generals Highway from Amphitheater Point to Deer Ridge and Wolverton Road to Little Baldy Pullout. This evaluation is consistent with the following requirements and guidelines: Executive Order 11988 (“Floodplain Management”), NPS Director’s Order #77-2 Floodplain Management (NPS, 2003), and NPS Procedural Manual #77-2: Floodplain Management (NPS, 2002).

This Statement of Findings (SOF) summarizes the floodplain development associated with actions included in the preferred alternative as described and evaluated in the *Draft Environmental Assessment/Assessment of Effect to Rehabilitate Generals Highway from Amphitheater Point to Deer Ridge and Wolverton Road to Little Baldy Pullout* (EA/AoE) (NPS, 2007).

Purpose and Need

The purpose of the proposed project is to maintain public access over Generals Highway. This would be accomplished by reconstructing and rehabilitating two sections of Generals Highway to improve the road geometry and structural instability; increase the road width, where necessary, to two 10-foot travel lanes; formalize and make uniform parking areas/pullouts or eliminate and revegetate social pullouts; and improve pavement surface and drainage.

Portions of the road have been in continuous use since 1926 and continue in service today as originally constructed. These actions are needed because:

6. The road geometry is inadequate in many areas. Retaining walls, cut walls, culverts and support structures are unstable or failing (Amphitheater Point to Deer Ridge).
7. The pavement surface is deteriorated and of inconsistent width, varying from 18 to 22 feet (Amphitheater Point to Deer Ridge).
8. Parking areas and pullouts are often poorly designed and located (both projects).
9. Structural deficiencies and failures, including raveling edges, slumping of outside fills, and surface cracking, are occurring in the existing asphalt (both projects).
10. Drainage problems are present in some locations (both projects).

Continued deterioration of the road would result in damage to the adjacent natural environment, higher maintenance costs, loss of historic features, and hazardous driving conditions. Ultimately, the continued deterioration would threaten the ability of visitors to see and enjoy the park.

Description of Preferred Alternative

The first section proposed for work includes reconstructing the roadway for 1.5 miles from Amphitheater Point to Deer Ridge. Work would entail widening the existing travel lanes to a consistent 10-foot width with a one foot paved shoulder and improving the turning radius of the switchbacks for a 22-foot long vehicle. Shoulder stabilization, retaining walls, rock slope blasting, and cantilevered bridges would be necessary to construct this width.

The second section proposed for work would rehabilitate 8.5 miles of roadway from Wolverton Road north to the Little Baldy pullout. The project would recycle and overlay the existing pavement and rebuild the roadbed within the existing road bench. Culverts would be replaced or rehabilitated. Existing signs and interpretive pullouts and sidewalks would be upgraded or replaced as necessary. Curbs would be replaced and steel-backed timber guardrails or walls would replace existing metal guardrails in two locations. Existing pullouts would be reshaped to a consistent depth and layout throughout the project, while some unauthorized pullouts would be eliminated and revegetated.

The existing roadway embankment bisects Halstead Meadow, creating a deeply incised channel on the downstream side of the road culverts, eroding soils, and dewatering portions of the meadow. Under the preferred alternative, the existing road embankment would be removed, and a bridge would be constructed. The project would restore a more natural sheet flow condition under the proposed new bridge and provide long term road stability by removing the pipe culverts. Low spots in the meadow and the incised channel would be backfilled to restore the sheet flow conditions.

Floodplain Extent

Generals Highway crosses Halstead Meadow approximately 5.3 miles north of the Wolverton Road intersection (Figure 1). Halstead Meadow encompasses a total of 17 acres and is bisected by the Generals Highway to form the Upper Halstead Meadow (5 acres) and the Lower Halstead Meadow (12 acres). The restoration of Upper Halstead Meadow began in September 2007. Environmental effects of the restoration were discussed in a separate NEPA document. The restoration of Lower Halstead Meadow would be planned for 2010.

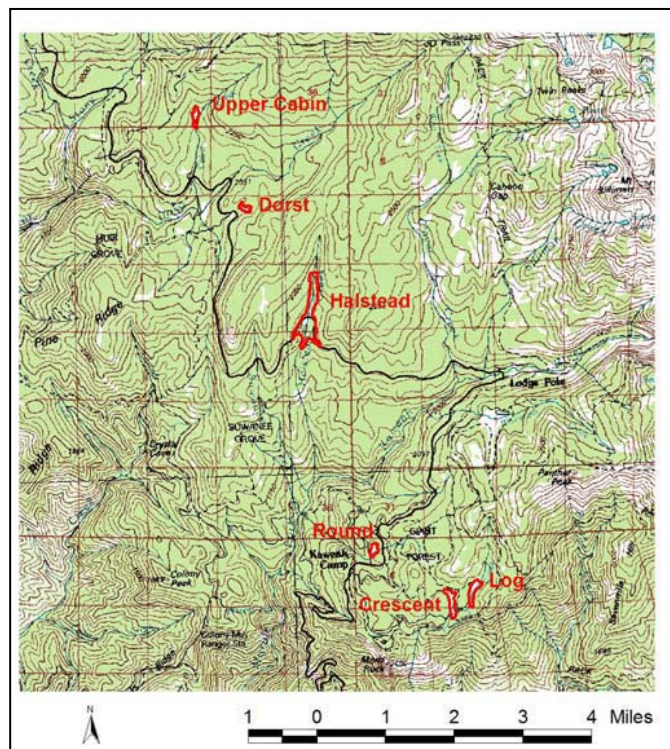


Figure 1. Upper Halstead Meadow restoration location.

General Characteristics of Flooding in the Area

Based on the analysis of water tables in six meadows, including intact portions of Halstead Meadow, in 2005, water moved as sheet flow across the meadows through most of the summer (Cooper and Wolf, 2006). Runoff resulting from snow melt and spring rain events contributed to the sheet flow. The water table in monitoring wells in Upper Halstead Meadow varied from less than one inch above the soil surface in spring and early summer to more than 20 inches below the soil surface later in the season in some monitoring wells in intact portions of the meadow in 2005. In areas affected by the formation of gullies, the water table was more than 60 inches below the soil surface in 2005 (Cooper and Wolf, 2006). The existing road embankment has served as a dam for sheet flow in the upper meadow, channeling most of the water into 2 large culverts, and a small amount into 2 overflow culverts early in the season. When the capacity of the culverts is exceeded, water levels rise and overtop the road embankment. A flood event on January 2, 1997 washed out about a 10 foot section of both lanes of the road at Halstead. There is visible evidence of other repairs made at Halstead from flooding. The channelization of the flow from Upper to Lower Halstead Meadow through 4 large culverts has eroded the meadow, causing soil loss and faster flows. Higher areas within the meadow are dewatered because of lower water tables due to gully formation, altering the vegetation community and contributing to the loss of the meadow ecosystem.

JUSTIFICATION FOR USE OF THE FLOODPLAIN

Improvements to drainage would occur as part of the preferred alternative, however no new structures would be placed within the floodplain that would increase flooding potential or change the natural function of the floodplain. Under the preferred alternative, the long term impacts to the floodplain within Halstead Meadow would be beneficial as a result of the removal of the road embankment, restoring natural flows from the upper to the lower meadow. Short term, moderate adverse impacts to floodplain soils and vegetation may result from the grading of the soil surface to restore the natural slope from the upper to the lower meadow and the filling in of gullies.

The proposed bridge would replace the existing road embankment, an already disturbed area of Halstead Meadow. Movement of the road to an alternative location would only result in increased disturbance to the meadow.

DESCRIPTION OF SITE-SPECIFIC FLOOD RISK

As described in Cooper and Wolf's (2006) study, snow melt, spring rain events and permanent groundwater (springs) contribute to the sheet flow, which usually has a depth of less than 1 inch. By removing the embankment and constructing the bridge, sheet flow would pass unimpeded from the Upper to the Lower Halstead Meadows. Potential flooding, resulting from the backing up of water behind the embankment, would no longer occur.

DESIGN OR MODIFICATIONS TO MINIMIZE HARM TO FLOODPLAIN VALUES

Natural floodplain values include attributes of floodplains that contribute to ecosystem quality such as soils, vegetation, wildlife habitat, dissipation of flood energy, sedimentation processes, and groundwater discharge. The proposed bridge would improve the hydrology of Halstead Meadow by filling in gullies, allowing sheet flow, and raising the water table, which would also aid in the restoration of wet meadow vegetation to the site. By improving vegetation, it would improve wildlife habitat for wet meadow species and help in the dissipation and dispersal of flood energy. Other benefits include increased water-storage capacity, allowing flow to be

maintained to downgradient streams longer into the dry season. Also carbon sequestration would be greatly improved (carbon decomposes in aerobic, dry soils and accumulated in anaerobic, saturated soils).

The Lower Halstead Meadow Restoration, which would start in 2010, would be achieved by using a combination of restoration measures, which may include the following:

- use fill produced as waste from other projects in the park to fill the gullies and restore level cross-meadow grades (Figure 2 and Table 1);
- import fill from outside the park to fully or partially fill the gullies (Figure 2 and Table 1);
- grade and compact surface channels and tunnels in the highly disturbed, dried areas of the meadow to restore level cross-meadow grades and eliminate piping of water toward the gullies;
- use earthen berms to exclude water from sections of gullies that cannot be filled;
- use rocks, logs, earth, and geotextile fabric to build check dams within the gullies;
- use rocks, logs, and geotextile fabric to build a large, stepped-down grade transition where the filled section of the large gully transitions down to the bed of the incised channel;

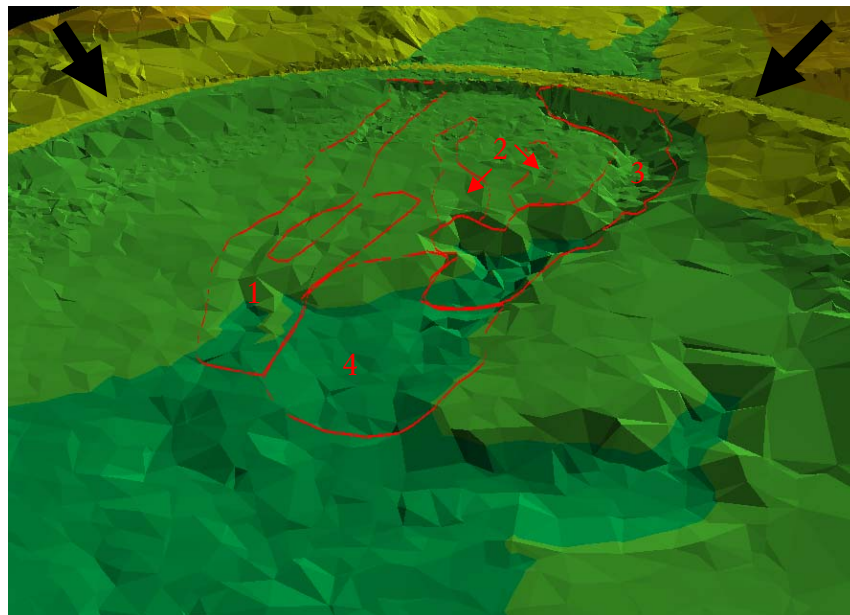


Figure 2. North-facing view of a 3D ground-surface model derived from Lidar and survey data (Wolf and Cooper, 2007). The General Highway crosses in the background, identified with black arrows. The gullies of Lower Halstead Meadow are outlined in red, with the main gully on the right. Fill volumes and restored surface area for zones 1, 2, 3, and 4 are given in Table 1.

Table 1. Volume and surface area of fill zones identified in Figure 1 (Wolf and Cooper, 2007). The main gully, on the east side of the meadow is fill zone 3.

Fill zone	Volume (yd ³)	Filled surface area (acres)
1	1,500	0.619
2	300	0.175
3	9,100	0.590
4	4,100	0.473
TOTAL	15,000	1.857

- build a temporary road (10-20 years) from the Generals Highway down into the large gully so that fill can be placed as it is produced as waste from other projects;
- embed logs across the meadow, below the bridge to provide grade control that will prevent headcuts from continuing up the meadow, endangering the bridge and the upper meadow restoration;
- obtain material on site – under the road or other parts of the upper or lower meadow without causing adverse grades;
- divert water temporarily to allow gullies to be filled. Water would be collected near the bridge area and piped further downstream for discharge to minimize headcutting near the restoration site and allow gullies to be filled;
- remove upstream, depositional sediment caused by the road acting as a dam; and
- fell approximately 15 to 35 live and dead trees, some over 24 inches in diameter, across the meadow perpendicular to the water flow to dissipate flow energy, spread water evenly across the meadow, and prevent channelization.
- plant approximately 50,000 native wetland plants, propagated from seed collected from Halstead Meadow or, if necessary, from other meadows located within 10 miles and within an elevation of 500 feet of Halstead Meadow. Until plants are established, erosion control blanket would be used to provide surface complexity and prevent surface erosion.

Conclusion

The preferred alternative would restore natural sheet flow in the meadow and eliminate flooding of the roadway by removing the road embankment and constructing a bridge within the floodplain of the Halstead Meadow. The bridge would allow sheet flow between the Upper and Lower Halstead Meadows. The filling of the gullies in the Upper and Lower Halstead Meadows would improve hydrology throughout the meadow, aiding in the restoration of wet meadow vegetation and wildlife habitat.

NPS has determined that the proposed actions associated with the preferred alternative as described in the Draft EA/AOE (NPS, 2007) would have no significant effect on human health or property or on natural or beneficial floodplain values. Mitigation and compliance with regulations and policies to prevent impacts to water quality, floodplain values, and loss of property or human life would be strictly adhered to during and after the construction.

Individual permits with other federal, state and local agencies would be obtained prior to construction activities. No long-term adverse impacts on floodplains would occur from the preferred alternative. Therefore, NPS finds the preferred alternative to be consistent with Executive Order 11988 for the protection of floodplains.

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Cooper, D.J. and E.C. Wolf

- 2006 Analysis of Meadow Hydrology, Vegetation, and Soils and Suggestions for Restoration of Upper Halstead Meadow, Sequoia National Park, California. Department of Forest, Rangeland, and Watershed Stewardship at Colorado State University, Fort Collins, Colorado. On file at Sequoia and Kings Canyon National Parks, Three Rivers, California.

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United States Department of the Interior ✧ National Park Service