

Sequoia and Kings Canyon National Parks

U.S. Department of the Interior
National Park Service



ENVIRONMENTAL ASSESSMENT CRYSTAL CAVE AREA REDEVELOPMENT AND REHABILITATION PLAN



Tulare County, California
November 2015

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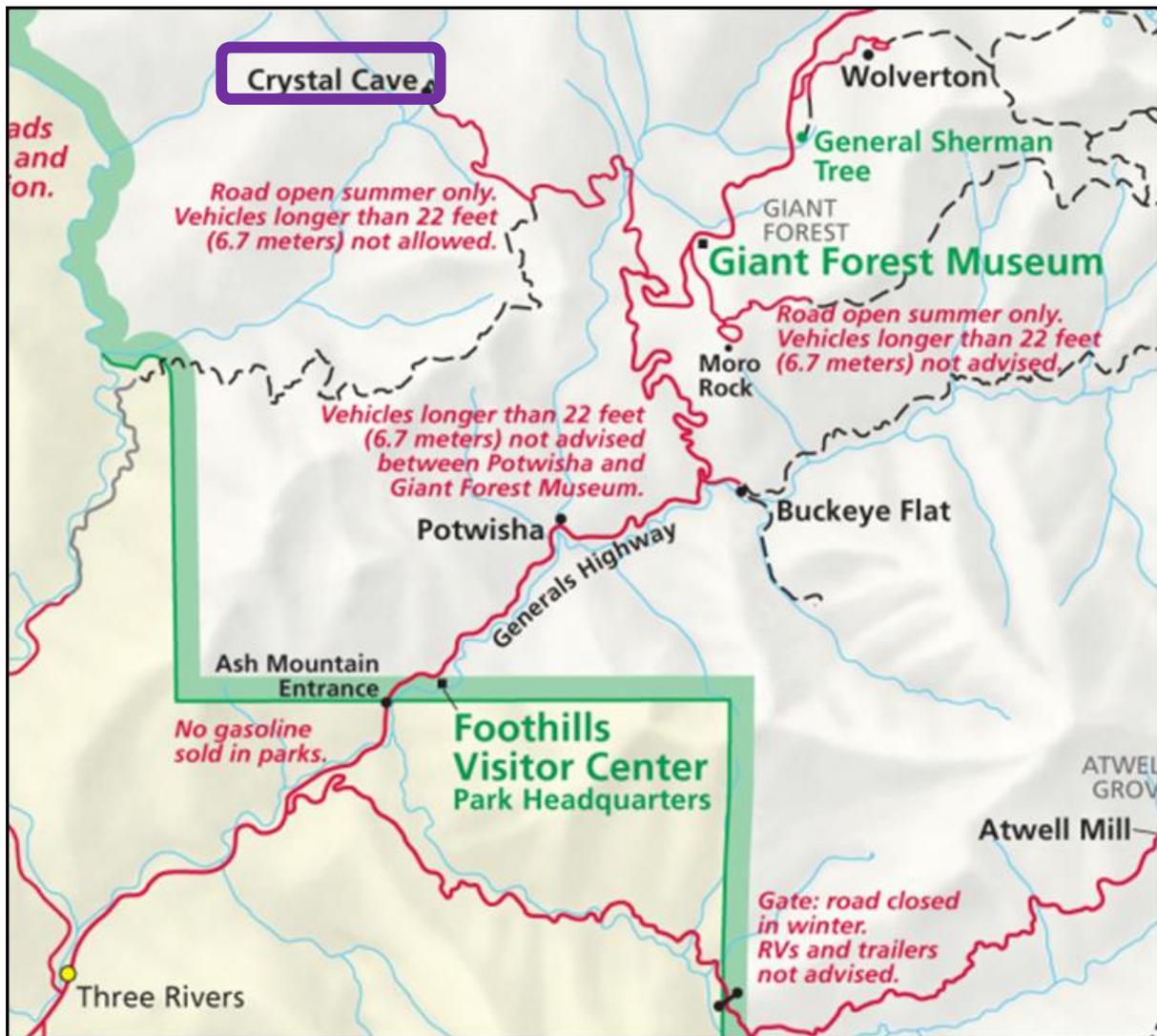
PURPOSE AND NEED

INTRODUCTION

BACKGROUND

Crystal Cave has been one of Sequoia National Park's primary visitor attractions since 1940 when the cave was officially opened to the public. It is the only cave open for guided public cave tours within Sequoia and Kings Canyon National Parks (SEKI or parks). The cave is generally open for cave tours from May through November, weather permitting. Crystal Cave is located on a secondary road approximately 7 miles off the Generals Highway in Sequoia National Park, between the Ash Mountain entrance and the Giant Forest Museum (Figure 1). Note that in October 2015, the Sequoia Natural History Association and the Sequoia Parks Foundation merged to form Sequoia Parks Conservancy (SPC). References in this document reflect the newly formed SPC non-profit organization.

Figure 1 General Location of Crystal Cave in Sequoia National Park



PROJECT PURPOSE AND NEED

The purpose of the project is to provide for an improved visitor experience at the Crystal Cave area in such a manner that reduces impacts, improves sustainability, meets legal requirements, and protects park natural and cultural resources. The following are overarching objectives for the proposed project.

Provide a long-term vision for the Crystal Cave area.

- There has not been a long-range plan for the development of facilities at the Crystal Cave area since the 1950s.
- The facilities in the Crystal Cave area have received piecemeal redevelopment. Many of the facilities were added to the area with no overall plan or concept.
- No major work to facilities has been accomplished in more than 30 years.
- Some of the existing facilities are old, decrepit, or unsightly.

Protect natural and cultural resources in the Crystal Cave area.

- Long-term options for human waste management need to be addressed in a manner that is sensitive to park resources.
- The proposed Crystal Cave Historic District has a number of National Register-eligible contributing resources (Figures 2 and 3) that need to be considered during project planning.
- The abandoned septic and water treatment systems at the cave are still in place and need to be evaluated to determine disposition.

Comply with laws, regulations, mandates, and other guidance.

- The existing comfort station is non-compliant with the Americans with Disabilities Act (ADA) guidelines (Figure 3).
- Human waste treatment and disposal does not meet current disposal requirements as per the Regional Water Quality Control Board (RWQCB).
- Area hazards are considered in this plan. NPS *Management Policies 2006* states that the NPS will allow natural geologic processes to proceed unimpeded except under certain circumstances; geologic processes will be addressed during planning and other management activities in an effort to reduce hazards that can threaten the safety of park visitors and staff and the long-term viability of the park infrastructure.



Figure 2. Trail to Crystal Cave



Figure 3. Existing Mission 66-era comfort station.

Provide a better ‘sense of arrival’ as visitors approach the Crystal Cave area and at the trailhead area.

- The existing parking lot design does not allow efficient use of space. The asphalt in the parking area has failed and continues to deteriorate.
- The existing picnic area near the Crystal Cave trailhead needs to be reconfigured and an ADA compliant picnic area provided.
- There are inadequate interpretive displays at the trailhead area.
- There is a need to provide information and a gathering area for those visitors who are unable to go on cave tours.
- There is a need to provide bilingual information.

Improve tour operations and the visitor experience by providing an adequate visitor services kiosk.

- The existing building (Figure 4) does not provide adequate space for sales, storage, and employees.
- The building is not secure from unauthorized entry by people and wildlife, and is prone to rodent infestation.
- There is little to no room for interpretive displays or information at the existing building.

Improve the visitor experience on the trail accessing the cave.

- The trail to the cave is deteriorated and in need of repairs.
- The trail needs to be rehabilitated in a manner that minimizes impacts to the park’s natural and cultural resources.
- Wayside exhibits and resting points/benches for visitors need to be provided.

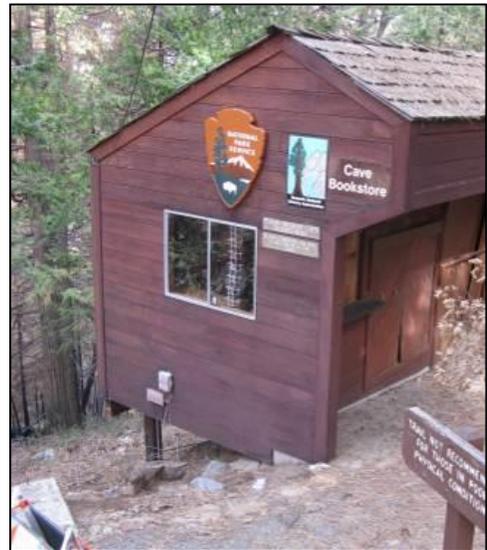


Figure 4. Existing Information Kiosk

Improve visitor flow at the cave entrance area.

- The existing surface of the cave entrance area is uneven and is a mix of asphalt and concrete.
- Visitor congestion occurs in the cave tour introduction area and entrance area trail.
- The cultural integrity of the cave entrance area needs to be protected and maintained.

This environmental assessment (EA) is being prepared by the NPS in accordance with the National Environmental Policy Act (NEPA, 1969, as amended), Department of the Interior (DOI) regulations, NPS guidance, and in accordance with the California Environmental Quality Act.

ISSUES AND IMPACT TOPICS

SCOPING

On August 24, 2009, SEKI issued a news release and letter to initiate 30-day public scoping for the Crystal Cave Redevelopment and Rehabilitation Plan/ EA. The news release was distributed to 56 local and regional media outlets. A letter was emailed or mailed to approximately 366 individuals, agencies, businesses, and interest groups, along with 24 tribal representatives or individuals affiliated with area tribes. Public scoping notices were published in several newspapers and internet sites, including the Orange Cove Area Chamber of Commerce website on August 26; the Visalia Times-Delta (website and newspaper) on August 26; the Kaweah Commonwealth Newspaper on August 28; the Fresno Bee website

and newspaper on August 27; and the Valley Voice on August 27. In addition, on September 5 there was a link to scoping information on the MSN website through the local news link.

During the public scoping period, the park hosted an informational meeting open to the public at Crystal Cave to discuss potential options and answer questions concerning the proposed project. The public was also provided with a flier and information on how to provide input on the proposed project. A news release announcing the meeting was sent on August 24 to the same media outlets as the scoping news release, and also was emailed to the original mailing list. A total of 29 members of the public attended the September 1, 2009 meeting at Crystal Cave.

Public scoping ended September 25, 2009. During that time, the parks received comments from seven different sources. Six of the comment letters received were from unaffiliated individuals, and one comment letter was submitted by the SPC. All commenters supported improvements to the Crystal Cave area and many provided recommendations for alternatives. Many of these recommendations have been incorporated into the alternatives section of this EA.

Internal scoping among NPS subject matter experts, SPC staff, and others has been ongoing since 2009. In November, 2013, an interdisciplinary team consisting of park and SPC staff participated in a Choosing by Advantages (CBA) process to consider a range of alternatives, determine which alternatives would be carried forward for more detailed analysis, and to identify the agency preferred alternative.

In 2014, park staff contacted the NPS Geologic Resources Division (GRD) and the Federal Highway Administration Central Federal Lands Highway Division (FHA) to assist with a risk assessment and explore possible engineered rockfall mitigation measures for the Crystal Cave entrance area. The FHA provided a draft Technical Memorandum (FHA 2014) outlining the project background and mitigation alternatives. The GRD provided recommendations in a Crystal Cave Entrance Rockfall Risk Assessment (NPS 2015). Higher risk rockfall zones in the lower Crystal Cave area were identified and were considered during design. Information from both the draft Technical Memorandum and Risk Assessment were referenced to inform tour operational changes and the alternatives being considered in this environmental document.

Based on the above considerations and subject matter expertise, the following issues will be further evaluated in the document: cultural resources (including historic structures and cultural landscapes); visitor use and experience; and, geology, soils, and vegetation. See Chapter 4: Environmental Consequences for detailed evaluation of potential impacts to these topics.

The following issues were initially considered because they are either in or near the project area, or could be potentially affected by project implementation. However, after additional analysis and consideration of mitigation measures, these issues were dismissed from detailed analysis for the subsequent reasons.

Special Status Species and Species of Management Concern

On July 24, 2015, the NPS accessed the U.S Fish and Wildlife Service (USFWS) website to obtain an official species list for endangered and threatened species that may be in the project area and could be affected by project activities (FWS 2015). NPS biologists reviewed the USFWS list and lists of state-listed species and species of concern to determine which species could potentially be affected by implementation of the proposed project. The NPS has determined that there would be no effect on threatened or endangered species from implementation of the preferred alternative.

Special Status Wildlife Species – The parks’ cave species are unusual and uncommon, however, there are no known federally listed species that would be affected by the project proposal. Proposed project work is

limited to the cave entrance area and visual surveys would be done prior to conducting work to protect any visible cave species.

The FWS is proposing to list, as threatened, the West Coast Distinct Population Segment of fisher under the ESA. The fisher has been documented within the parks and near Crystal Cave. Fishers are generally elusive and typically avoid people. While there are no anticipated impacts to fisher from implementation of any of the actions described in this environmental document, mitigation measures would be implemented to avoid impacting fisher. Mitigation would include measures such as: surveying trees that are scheduled for removal for cavities that may have become a shelter for fisher, attempting to schedule work outside of the breeding season which is from late February through April, and enforcing strict speed limits on the Crystal Cave access road.

There are no other federally listed species known to occur in the project area. Because there are no listed species in the project area, and the low probability that fishers occur in the project area and would be affected by the project, special status wildlife species will not be further evaluated.

Special Status Plant Species – A population of Call's Angelica (*Angelica callii*) occurs near the cave entrance area along Cascade Creek and within a small wetland area. This perennial herbaceous plant is endemic to Tulare and Kern counties. The California Native Plant Society (CNPS) has assigned it a rare plant rank of 4.3 (plants of limited distribution, not very endangered in California). Plants have been observed near the spring and along the creek adjacent to the lower portion of the unmaintained trail. It was determined that all alternatives would avoid work and ground disturbance near this plant, in wetland areas, and surrounding soils, resulting in no impact to this species. Therefore, this species of concern was eliminated from further analysis.

Wildlife

According to the NPS *Management Policies 2006*, the NPS strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of animals (NPS 2006). The project area is inhabited by a large variety of wildlife. The majority of the project work would occur within park developed areas where human noise and presence is common. Most of the project work would occur within previously disturbed areas, such as existing trail networks and the parking area. While there could be temporary displacement of wildlife during construction activities, the impacts would be localized, temporary, and not outside the natural range of variability for wildlife species, their habitats, or the natural processes sustaining them. Population numbers and structure would remain stable and viable. Occasional responses to disturbance by some individuals are expected, but without measurable interference with survival, reproduction, or other factors affecting population levels. Sufficient habitat remains to maintain viability of all species. Therefore, this topic has been dismissed from further evaluation.

Cave Resources

There are two caves in the vicinity of the project area. Work would occur within the entrance of Crystal Cave, but would be limited to the existing footprint of disturbance and would create no new impacts to cave habitat. Cave-dwelling species could be disturbed during project work. Most species are mobile and will quickly relocate to interstitial spaces or nearby areas where they will be protected. In addition, project work would be scheduled in time periods to avoid impacting species of interest such as bats and nesting canyon wrens.

A portion of the area referred to as the “upper Crystal Cave area” in this document is positioned above an existing cave. Site-specific design would be reviewed after geotechnical investigations to ensure that work would not affect the underlying cave resources.

This plan poses no change to visitation within the cave, and would result in no change from current conditions at Crystal Cave. For these reasons, within-cave resources have been dismissed from further evaluation.

Air Quality and Greenhouse Gas Emissions

During construction activities, fugitive dust would be emitted into the air by activities that disturb the soil, such as earthmoving and vehicular/equipment traffic on unpaved surfaces. Dust generated during construction activities can degrade visibility and affect sensitive biota near the project area. To mitigate these potential effects, dust control mitigation procedures would be implemented to reduce the potential for particulate matter. Vehicles and equipment would be allowed to idle up to, but not exceed, five minutes when parked to reduce emissions from idling vehicles. Overall, there would be a slight and temporary degradation of local air quality due to dust generated from earthmoving activities and emissions from construction equipment. Project components would be phased over a number of years and would be dependent on funding. Impacts to air quality and greenhouse gas emissions would last only as long as construction activities occurred, and would not exceed standards. For these reasons, air quality was dismissed from further analysis.

Water Resources, including Wetlands and Floodplains

No project activities would occur within wetlands. No structures would be placed within the floodplain and no proposed work would alter or impact the floodplain. Best Management Practices (BMPs) would be incorporated to reduce the potential for erosion or sedimentation of watercourses during construction activities. Minor repairs to the Cascade Creek Bridge abutment would occur, however, work would occur during low water periods and no instream work would occur. Best management practices (BMPs), such as using erosion control wattles and conducting project work during low water periods, would be implemented. Permitting through the Regional State Water Quality Control Board and/or U.S. Army Corps of Engineers may be required. Permits would be obtained prior to work. There is a low potential for impacts to water resources, and a high potential that best management practices would be successful based on past similar work, therefore, this topic has been dismissed from further analysis.

Soundscapes

There would be noise associated with construction activities and the presence of work crews. The noise would be slightly above normal background levels. Construction activities would be scheduled to minimize effects on visitors; the majority of work would occur during the off-season when visitors are not present in the area. Construction work would be limited to daylight hours, reducing the effects on wildlife in the area. BMPs would be required to properly maintain construction equipment (e.g., mufflers) to minimize noise from use of equipment. Impacts on the soundscape would be minimal and temporary; therefore, this impact topic has been dismissed from further analysis.

Archeological Resources

Archeological resources are the remains of past human activity and the records documenting the analysis of such remains (NPS 2002). Potential impacts on archeological resources are assessed based on the amount of disturbance to an archeological resource and the degree to which the integrity remains or is otherwise lost without recordation of the remains.

From the time of its modern discovery and development in the early 20th century, there has been limited documentation of historic or prehistoric use of Crystal Cave by American Indians. Archeological investigations throughout the surrounding areas of Sequoia National Park and adjacent Southern Sierran Foothills have been undertaken since the 1920s and, linked with available linguistic and ethnographic information, indicate that the general vicinity near Crystal Cave has been inhabited by native peoples for at least the past 2,500 years (Carpenter 1996). Historic and protohistoric groups who frequented the area that is now the southwestern portion of Sequoia National Park included the Yokuts groups (Wukchumni,

Gawia, Yokod, and Yawdanchi) as well as the Tubatulabal, Owens Valley Paiute (Eastern Mono) and the Monache (Western Mono) (Carpenter 1996). Subsistence was based primarily on hunting and temporary camps at higher elevations.

Numerous archeological sites have been recorded along the Kaweah River, along the corridor of the Generals Highway, and within Giant Forest (Carpenter 1996). There are two recorded archeological sites near Cascade Creek and Crystal Cave. Both of these sites were recorded with brief survey reconnaissance in 1961 and have not been further researched.

In 1986, an archeological survey was completed for the entire length of the Crystal Cave access road. No surface evidence of archeological resources was observed during the survey (Spude 1992). The project area was surveyed in 2014 for the presence of archeological resources; none were found. An archeological monitor would be on-site during ground-disturbing activities. If concealed archaeological resources are encountered during project activities, all necessary steps would be taken to protect them and the parks Cultural Resources Program Manager would be notified immediately upon their discovery. Further consultation with the California State Historic Preservation Office (CA SHPO), Advisory Council on Historic Preservation (ACHP), and American Indian tribes would follow, as appropriate. Based on recent surveys, there is no evidence that archeological resources exist in the project area. Therefore this topic is dismissed from further evaluation.

Socioeconomic Environment

Crystal Cave is one of the primary visitor attractions in SEKI. Visitation may be slightly affected in the short-term during construction, but in the long term, visitation may increase slightly as facilities are improved, providing a slight economic benefit to the gateway communities. Since the impact is slight and would not be measurable, this topic will not be further evaluated.

Compliance with Federal Accessibility Laws

Section 504 of the *Rehabilitation Act of 1973* (23 USC 794 PL 93-112) and the *Architectural Barriers Act of 1968* (42 USC 4151) require that programs be reviewed for accessibility for access and for federal services. Due to the rugged terrain and the steepness of the Crystal Cave trail, providing an accessible trail to Crystal Cave without causing unacceptable resource degradation would be extremely difficult and cost-prohibitive. Under the action alternatives, the trail would be rehabilitated, but the steps along sections of the trail and steep grade of the trail would remain, and would continue to be inaccessible to many visitors with disabilities. Accessibility of infrastructure in the upper Crystal Cave area (e.g. comfort stations, parking, and picnic area) would be improved and updated, and enhanced interpretive exhibits would provide an alternative way to experience the cave and park resources. Since the beneficial effects are slight and would not be measurable, this topic will not be further evaluated.

Other Issues Considered

There would be no effect from the project on Wild and Scenic Rivers, Indian Trust Resources, or Prime and Unique Farmland because there are none of these resources in the project area. The activities proposed in this environmental document would occur outside of proposed and designated wilderness and would have no impact on the wilderness resource. There would be no effect on health or environmental effects on minorities or low-income populations or communities as defined in the EPA's *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (EPA 1998). No areas within the project site are designated as critical habitat or ecologically critical areas. The alternatives being considered in this document would not affect the parks' status as an international biosphere reserve. In addition, there are no growth-inducing impacts related to the project. For these reasons, these topics are dismissed from further analysis.

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ALTERNATIVES

INTRODUCTION

This chapter describes the no action alternative, and two action alternatives that consider the future management and development of the Crystal Cave area within Sequoia National Park. During the scoping process, a full range of alternatives for meeting the project purpose, need, and objectives were developed. In November 2013, an interdisciplinary team went through a deliberative process to determine which alternatives would be carried forward for more detailed analysis and to identify the preferred alternative.

In October 2014, the NPS requested assistance from FHA geotechnical engineers to provide recommendations on rockfall mitigation alternatives near the Crystal Cave entrance area. In addition, the GRD prepared a risk assessment and provided recommendations for the parks' consideration. Recommendations from the FHW and GRD were considered in formulating alternatives.

Below are descriptions of the alternatives that were selected for detailed analysis followed by those alternatives considered but dismissed from further evaluation. The no-action alternative provides a baseline from which the action alternatives can be compared, magnitudes of proposed changes can be evaluated, and environmental impacts of those changes can be measured.

There are a number of constraints in the Crystal Cave area, such as topography and presence of cave resources, which result in limitations when considering options in development of the area. Consequently, there are many elements that are common to the action alternatives- alternatives B and C. These are described under "Elements Common to Action Alternatives." The key differences in alternatives B and C are in regard to the actions that would occur in the upper Crystal Cave area near the parking lot; restoration actions in the lower Crystal Cave area near the Crystal Cave entrance would be the same.

PLANNING CONTEXT: OVERVIEW OF EXISTING INFRASTRUCTURE AND DEFICIENCIES

This section provides background information to provide context in regards to this planning effort. For ease of discussion, summaries of the existing infrastructure and deficiencies are separated into the following two general areas of the Crystal Cave developed area: upper Crystal Cave area (parking area and related infrastructure) and lower Crystal Cave area (access trail, cave entrance area, and tour gathering areas).

Upper Crystal Cave area

Kiosk

A small visitor kiosk, approximately 250 square feet, is currently operated by SPC as part of the Crystal Cave tour operation. The kiosk includes a small bookshop and basic information about cave resources. The structural integrity of the building has some critical system components in poor condition and includes several life, health, and safety deficiencies. The building is not rodent proof and results in unhealthy working conditions for employees. In addition, the kiosk does not meet ADA and/or universal access for employees. Storage space for merchandise and emergency medical services (EMS) equipment is inadequate. The Crystal Cave access trail begins adjacent to the kiosk and is only open to those participating in a cave tour. There is a small undesignated picnic area and food storage lockers adjacent to the parking lot, near the kiosk.

Comfort Station

There is a 366 square foot comfort station adjacent to the Crystal Cave parking area. The Mission 66-era comfort station is a National Register-eligible contributing resource to the proposed Crystal Cave Historic District. Access to the facility is via a stairway; therefore, the building does not meet ADA guidelines. When water becomes unavailable, which typically happens every summer, there is no water for flush toilets and the comfort station is closed and portable toilets are provided in the parking area.

Water System

A non-potable seasonal water system primarily supplies a peak day demand of 3,000 gallons of water to the 366 square foot comfort station. Due to the classification of the water system as non-potable by the RWQCB in 2004, all hand washing sinks were removed from the comfort station and replaced with hand sanitizer dispensers.

Human Waste Disposal System

The treatment and disposal of human waste does not meet current disposal requirements as per the RWQCB. The comfort station wastewater gravity flows to a standard 5,000 gallon two chamber septic tank where liquid and solids separate. The liquids then gravity flow to a second tank (size unknown) that siphons doses via gravity to the existing sprayfield.

Photovoltaic System

A 6 kilowatt (kW) photovoltaic (PV)/ propane generator hybrid power system was installed in 2010 and supplies power to the visitor information services kiosk and cave lighting system. The power system consists of a ballasted 6 kW PV array, battery, and inverter building; and, a 15 kW propane generator with a 1,000 gallon propane tank.

Parking Lot

Traffic flow is generally one way around a central island through a tear-drop shaped parking area. The paved, approximately 60-foot wide parking area provides head-in parking along the island's perimeter. Southwest of the island is an ancillary parking area that provides nearly 40 parking spots. In total, the parking area provides about 107 parking spaces. The parking lot serves as a landing zone for emergency services and rescue operations.

Lower Crystal Cave Area

Crystal Cave Access Trail

The Crystal Cave access trail begins near the information kiosk and winds ½-mile to the Crystal Cave entrance area. It is a predominantly asphalt paved trail and has an approximate 325 feet elevation change. The trail does not meet ADA and/or universal access grades due to topographical constraints of the area. Several concrete stair structures along the trail have moderate deterioration due to freeze-thaw spalling.



Figure 5. Chain link fence along trail

The trail is cut into the slope of a steep drainage with historic Civilian Conservation Corps (CCC) era retaining walls and benches on the cut and fill slope sides of the trail. The trail has multiple asphalt overlays that now exceed the elevation of some of the historic stone wall structures. In 2008, a wildfire followed by heavy rains damaged many of the historic wall structures and destabilized sections of the trail. The trail has been stabilized to meet safety concerns,

but requires further work to return the trail to good condition. One free-span timber bridge provides access across Cascade Creek and is in good condition. There are handrails along sections of the trail. Several steep sections of the lower trail are bordered by a chain link fence (Figure 5).

Several wider areas along the trail provide informal rest areas or “pull-offs” where visitors can rest before continuing on the trail. These areas are inadequate in size to support moderate to peak visitation days. There is an opportunity to provide interpretive informational waysides in conjunction with formalizing the rest areas or “pull-offs” to provide a more meaningful experience for visitors.

Crystal Cave Entrance Area

The Crystal Cave entrance area (Figure 6) is defined as the area between the drip line of the cave and the historic Spider Web Gate. There is a circular concrete gathering area with a few wooden benches and an asphalt path that leads to the Spider Web Gate. Currently, this is the area where visitors receive the tour introduction.

Just outside of the cave entrance area, historic stone walls line the trail that connects the cave access trail with the cave entrance area. This area is inadequately sized to accommodate visitors during moderate and peak visitation. At any one time, there may be up to three tours with 150 individuals congregating in the lower Crystal Cave area. The trail is narrow and the current configuration does not support visitors waiting for a tour, nor does it support the ingress and egress of visitors through the area. When the area becomes crowded and congested, visitors sometimes move off the trail and trample adjacent vegetation. In addition, there is a water and sewer system near the cave entrance area that was abandoned when the restrooms were removed from the cave.



Figure 6. Crystal Cave entrance area

ALTERNATIVE A- NO ACTION

Under the no action alternative, the existing facilities would remain in place.

Upper Crystal Cave (Figure 7) - Facilities, utilities, and parking area

The existing historic comfort station would remain; however, it would be closed for public use during times of drought when water is scarce. During drought conditions, portable toilets would be placed in the upper Crystal Cave parking area. There would be no change to the existing human waste disposal system. The parking area would undergo cyclic chip/seal treatments; however, no substantial rehabilitation would occur and traffic circulation would not be improved. A small informal picnic area adjacent to the parking lot and the few picnic tables located on the parking lot island would continue to be available for use. The existing kiosk would be maintained and serve as the main visitor contact station. There would be no comprehensive improvements to educational or interpretive displays.

Crystal Cave access trail and cave entrance area (Figure 8)

There would be no substantial rehabilitation of the ½ mile Crystal Cave access trail. Cyclic maintenance that takes into account preservation of the historic features along its length would continue to the extent of maintaining access. Historic stone walls would be maintained to the greatest extent practicable and the non-uniform handrail system (i.e. chain link fencing) would remain along the trail.

There would be no change to existing conditions at the cave entrance area. The cave entrance area and the area near the Cascade Creek waterfall would continue to be the main gathering locations for visitors to congregate before and after a cave tour. There would be no physical improvements made to alleviate visitor conflict associated with ingress and egress in the lower Crystal Cave area. The concrete pad, benches, and asphalt path within the cave's entrance area would remain. The existing portable tent platform structure, approximately 200 square feet, would remain near the cave entrance to provide an area for staff breaks and storage.

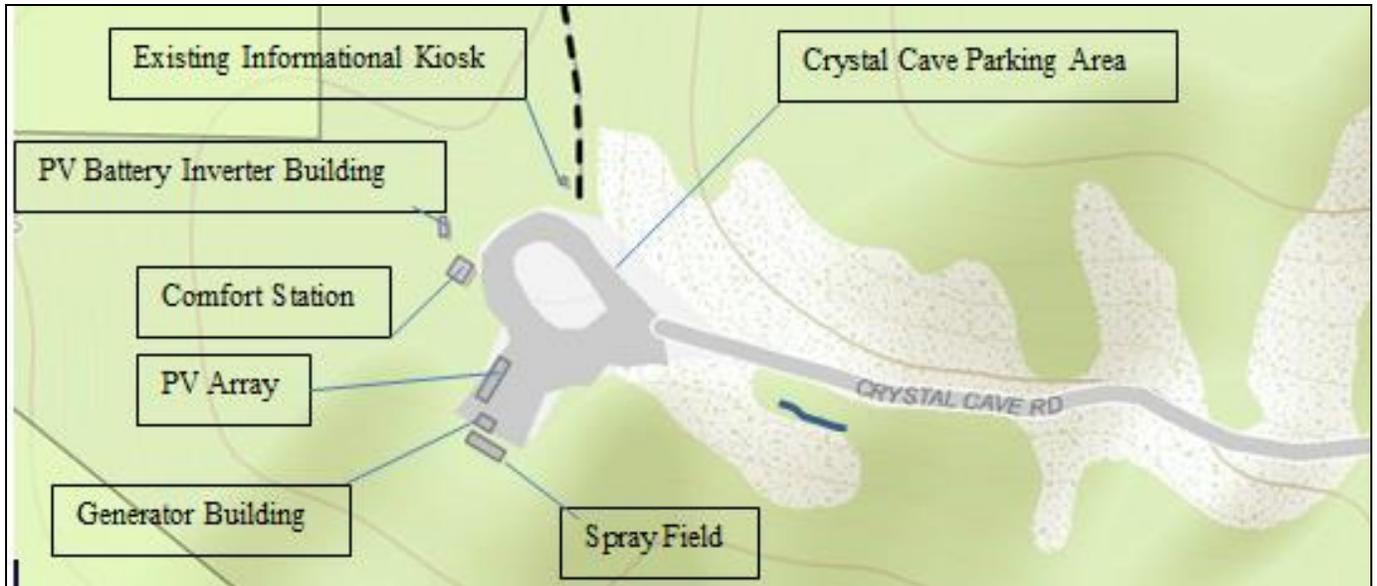


Figure 7. Upper Crystal Cave Area – Existing Conditions

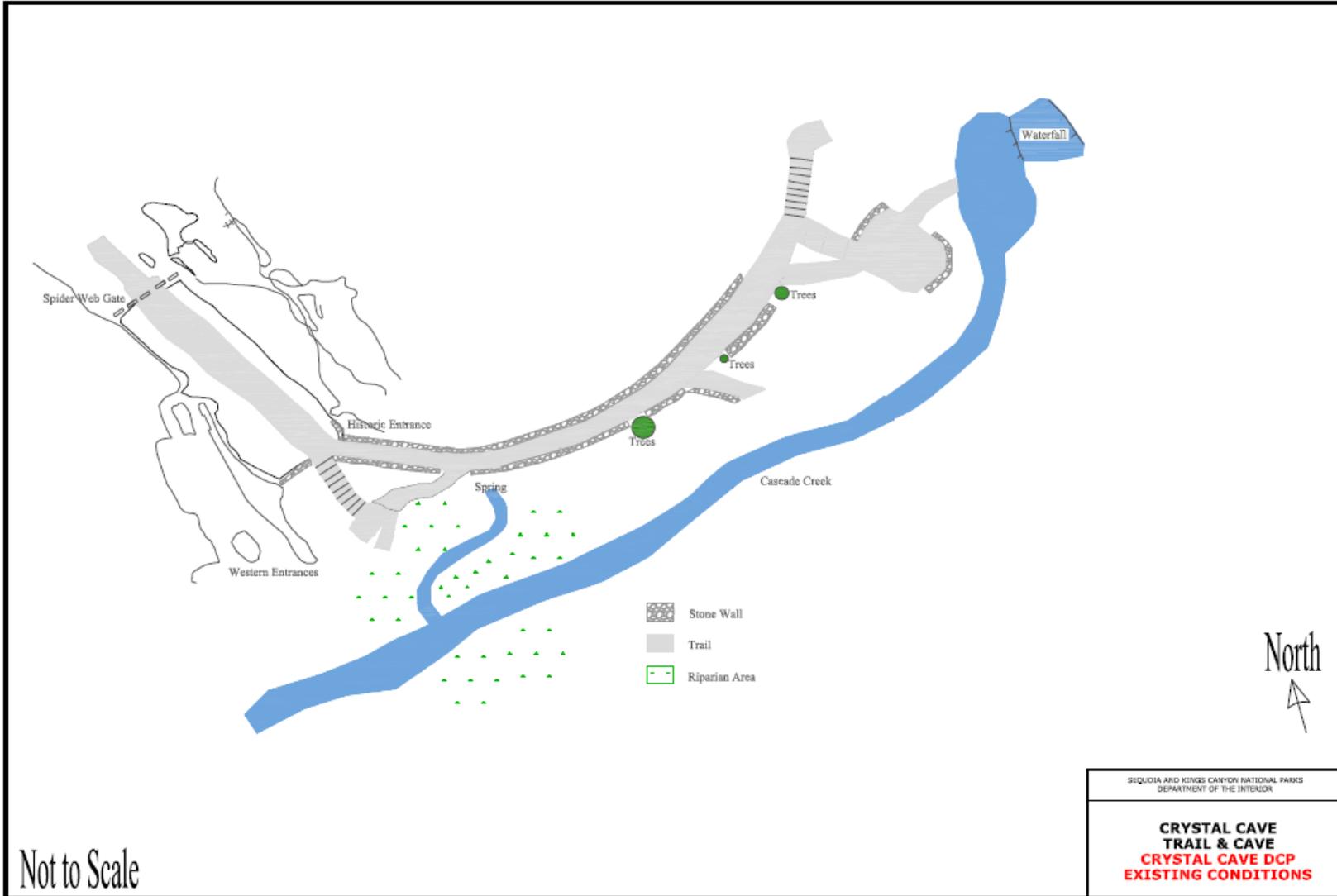


Figure 8. Lower Crystal Cave Area – Existing Conditions

ELEMENTS COMMON TO ACTION ALTERNATIVES

Both action alternatives address deficiencies in the upper and lower Crystal Cave areas and provide for enhancements to visitor services. The following elements are common to action alternatives B and C:

- Install vault toilet comfort stations.
- Stabilize the existing information kiosk to address life-health-safety deficiencies.
- Rehabilitate the picnic area near the trailhead for ADA compliance.
- Rehabilitate the parking area.
- Improve interpretive media.
- Rehabilitate the Crystal Cave access trail.
- Redesign the tour introduction area.
- Improve the existing staff tent site.
- Rehabilitate the cave entrance gathering area.

Install vault comfort stations

The existing treatment and disposal of human waste does not meet current disposal requirements as per the RWQCB. To remedy this, a new vault toilet comfort system would be installed. Two double occupancy pre-cast concrete vault comfort stations (Figure 9) would be installed at the southern end of the parking area near the existing photovoltaic system. The comfort stations and associated parking would meet the ADA standards for accessible design. In addition, the comfort stations would be designed to meet the parks' *Architectural Character Guidelines* (NPS 1998).

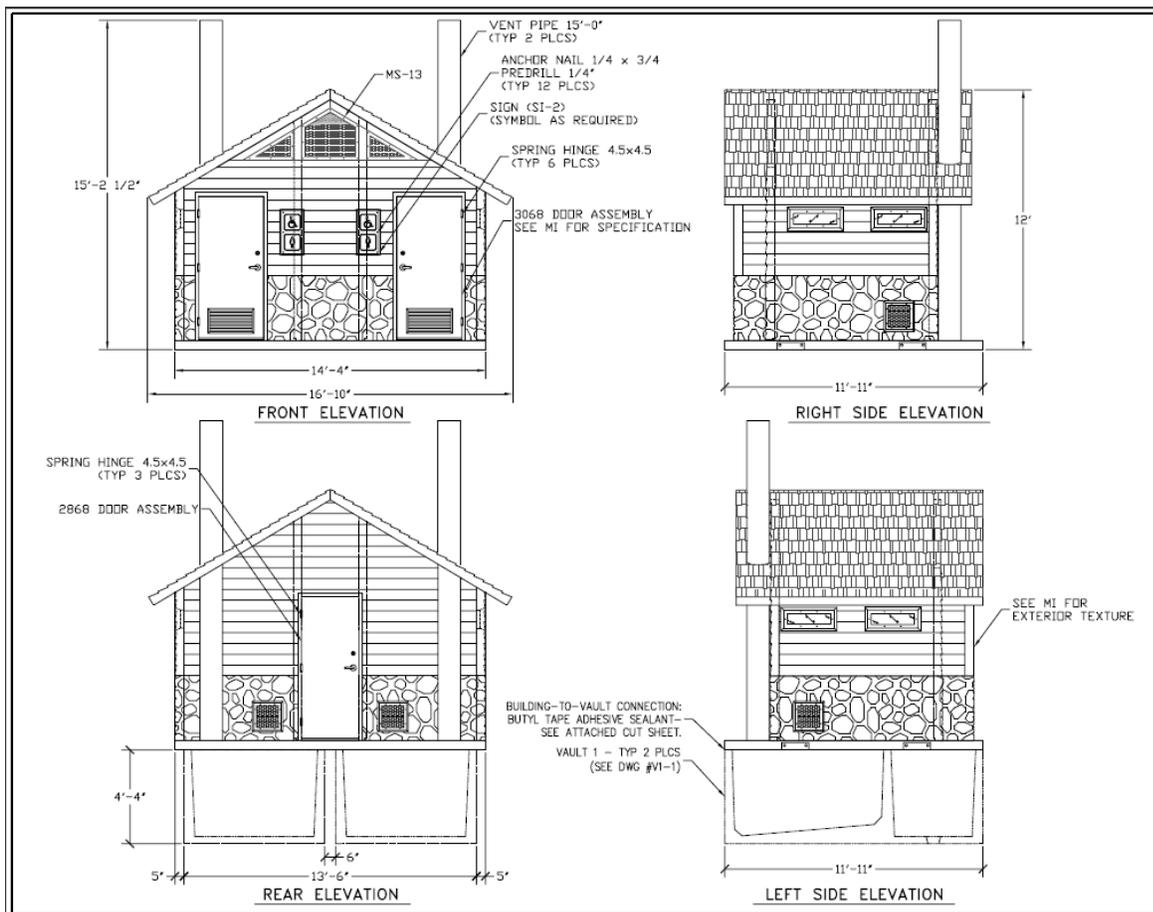


Figure 9. Typical comfort station

All above-ground human waste disposal infrastructure would be demolished and removed from the site. The existing dosing siphon and associated piping in the upper Crystal Cave area would be removed and disposed of properly, and rehabilitation of the area would occur. All below-ground infrastructure associated with the current and abandoned sewer systems would be abandoned in place utilizing best management practices.

Stabilize existing information kiosk

The existing 250 square foot building would be stabilized to correct life-health-safety deficiencies until such time as a new kiosk is constructed, then the existing building would be demolished and removed. The following stabilization actions would occur:

- Rodent-proof the building.
- Replace the flooring to include decking.
- Provide structural mechanical connections from the foundation system to the building.
- Rehabilitate the stairs.

Rehabilitate picnic area near trailhead

The existing picnic area near the Crystal Cave access trailhead would be reconfigured to provide a waiting/staging area with seating near the trailhead. There would also be an ADA compliant picnic area away from the trailhead to reduce congestion with traffic, parking, and groups preparing to hike to the cave. Food storage boxes and garbage cans would be provided.

Rehabilitate parking area

The existing Crystal Cave parking area would be rehabilitated to improve traffic circulation, ease confusion, minimize visitor and vehicle conflict, and optimize parking space. The parking lot would be redesigned within the current footprint to maximize individual spaces. The following actions would occur:

- Grind existing pavement and reuse as the structural base material.
- Grade and level parking area and apply base material.
- Install a new four inch asphalt surface.
- Restripe the parking lot.
- Optimize use of the central island in the parking lot to maximize parking spaces and to control traffic flow.
- Install signage to manage traffic circulation and flow.

Improve interpretive media

The following actions would be taken to enhance interpretive and educational opportunities in the Crystal Cave area:

- Install a sign at the entrance to the Crystal Cave parking lot to provide for a sense of arrival.
- Provide interpretive media at the trailhead.
- Provide for an educational experience on sustainable energy at the existing photovoltaic panel array. Reconfigure the barrier protecting the existing photovoltaic panel array to reduce visual intrusiveness.
- Design and install new interpretive exhibits to improve educational messaging of the Crystal Cave area and cave resources.
- Provide interpretive media at rest area “pull offs” along the Crystal Cave access trail, where appropriate, and at the tour introduction area.

Rehabilitate the Crystal Cave access trail

The existing ½ mile cave access trail would be rehabilitated with a goal of preserving the historic character of the trail. The following actions would occur.

- Grind and remove asphalt trail surface.
- Resurface trail using rough textured concrete
- Repair damaged historic stone edges along the trail.
- Repair and stabilize damaged walls using existing rock and mortar that matches historic construction standards.
- Install conduit down the length of the trail for future utility placement.
- Widen trail on the cut slope side in approximately 5-7 areas where historic stone structures would not be affected, to provide for visitor rest and interpretive opportunities along the trail.
- Rehabilitate trail drainage structures, stairs, and safety railings.
- Replace non-uniform handrail system and chain link fencing where appropriate with standardized handrail system that harmonizes with the natural landscape.
- Repair and stabilize the abutments at the Cascade Creek Bridge.
- Remove approximately 15 trees that are growing into the historic walls/trail or are a safety hazard to visitors and staff.
- Pitch the trail away from the slope above the trail to provide positive drainage.
- Stabilize about four upslope areas where erosion or trail damage is occurring.
- Install wayside exhibits and benches.

Redesign the tour introduction area

The tour introduction area for cave naturalists to begin their talk with park visitors would be established at a location near the waterfall and outside of the cave entrance area (Figure 10). The existing non historic pergola would be removed and the tour introduction area would be expanded and hardened with concrete. Existing stone walls/benches in this area would be reconfigured to widen the introduction area. New stone walls/benches may be constructed to add additional seating and would be designed to harmonize with the existing historic walls. A short, narrow trail to the waterfall, with vegetation planted on either side of the trail, may be delineated to provide visitors access to the waterfall.



Figure 10. Existing tour introduction area

Improve the existing staff tent site

An approximate 10' x 10' area southwest of the tour introduction area is the site of a staff staging area. This area would be leveled and hardened for the placement of a staff tent platform. None of the historic rock walls at this site would be modified.

Rehabilitate cave entrance area

The cave entrance area, from the entrance of the cave to the Spider Web Gate, would be rehabilitated to provide a level area for visitors to gather before embarking on the tour. The existing uneven concrete and asphalt surface of the cave entrance area would be removed and replaced with concrete within the existing footprint. Existing benches in the entrance area would be replaced with new benches and a storage area for visitor gear. The above-ground non historic infrastructure associated with the abandoned water and sewer system near the cave entrance would be removed and/or abandoned per best industry standards.

ALTERNATIVE B: IMPROVE THE LOWER CRYSTAL CAVE AREA, REPLACE EXISTING VISITOR KIOSK, AND ADAPTIVELY REUSE HISTORIC COMFORT STATION (NPS PREFERRED ALTERNATIVE AND PROPOSED ACTION)

The elements described under “Elements Common to Action Alternatives” would be implemented along with the following two project components:

- Replace existing visitor information kiosk
- Adaptively reuse the historic comfort station for storage

Replace existing visitor information kiosk

As an interim measure, the existing information kiosk would be stabilized until it can be replaced. The replacement kiosk would be constructed at a site located across from the existing kiosk near the trailhead and adjacent to the parking lot (Figure 11). The building would allow for more educational opportunities and interaction with staff, and would provide a safe and more efficient use of space. Sustainability and energy efficiency would be incorporated into facility design. The parks’ *Architectural Character Guidelines* would also be utilized in the design of the new structure. The new building would be approximately 486 square feet (Figures 12 and 13). Upon completion of the new kiosk, the existing kiosk would be demolished and removed, and the area restored.

Wayside exhibits, displays, and other informational media would be provided near the new kiosk and at strategic points along the cave access trail.

Utilize existing historic comfort station for storage

The existing historic comfort station would be converted for adaptive reuse for administrative storage. The building’s exterior appearance would be preserved and its structural and architectural components would be stabilized and rehabilitated to allow for storage of dry goods/merchandise and emergency medical equipment and supplies. All existing plumbing fixtures and partitions would be removed; and, the waterline currently servicing the building would be cut and capped. All above-ground waste disposal infrastructure would be removed and underground infrastructure would be abandon in place utilizing best industry practices. All rehabilitation and stabilization measures to the historic comfort station would adhere to the *Secretary of Interior’s Standards for Treatment of Historic Properties*.

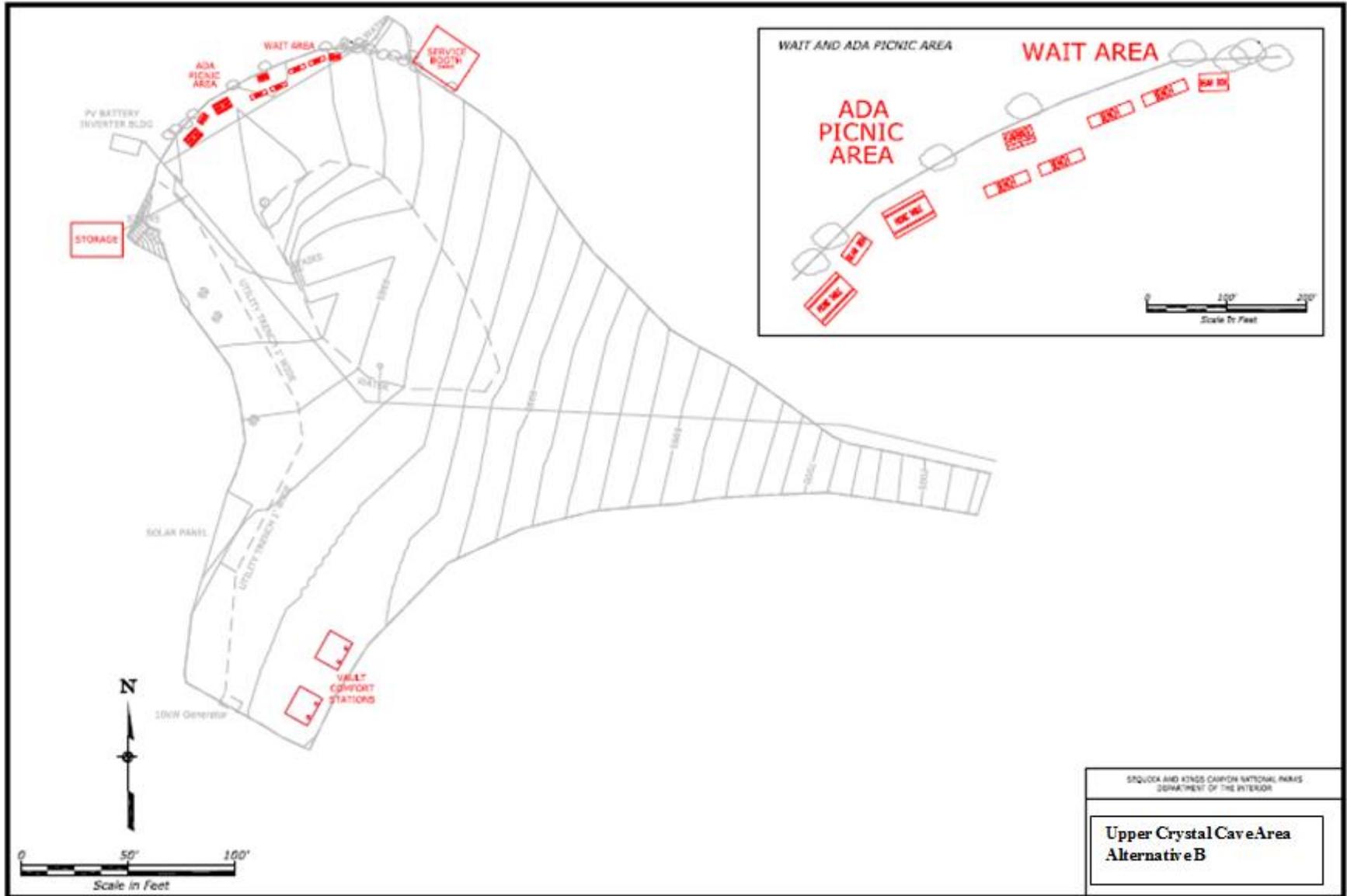


Figure 11. Layout of the Upper Crystal Cave Area under Alternative B.

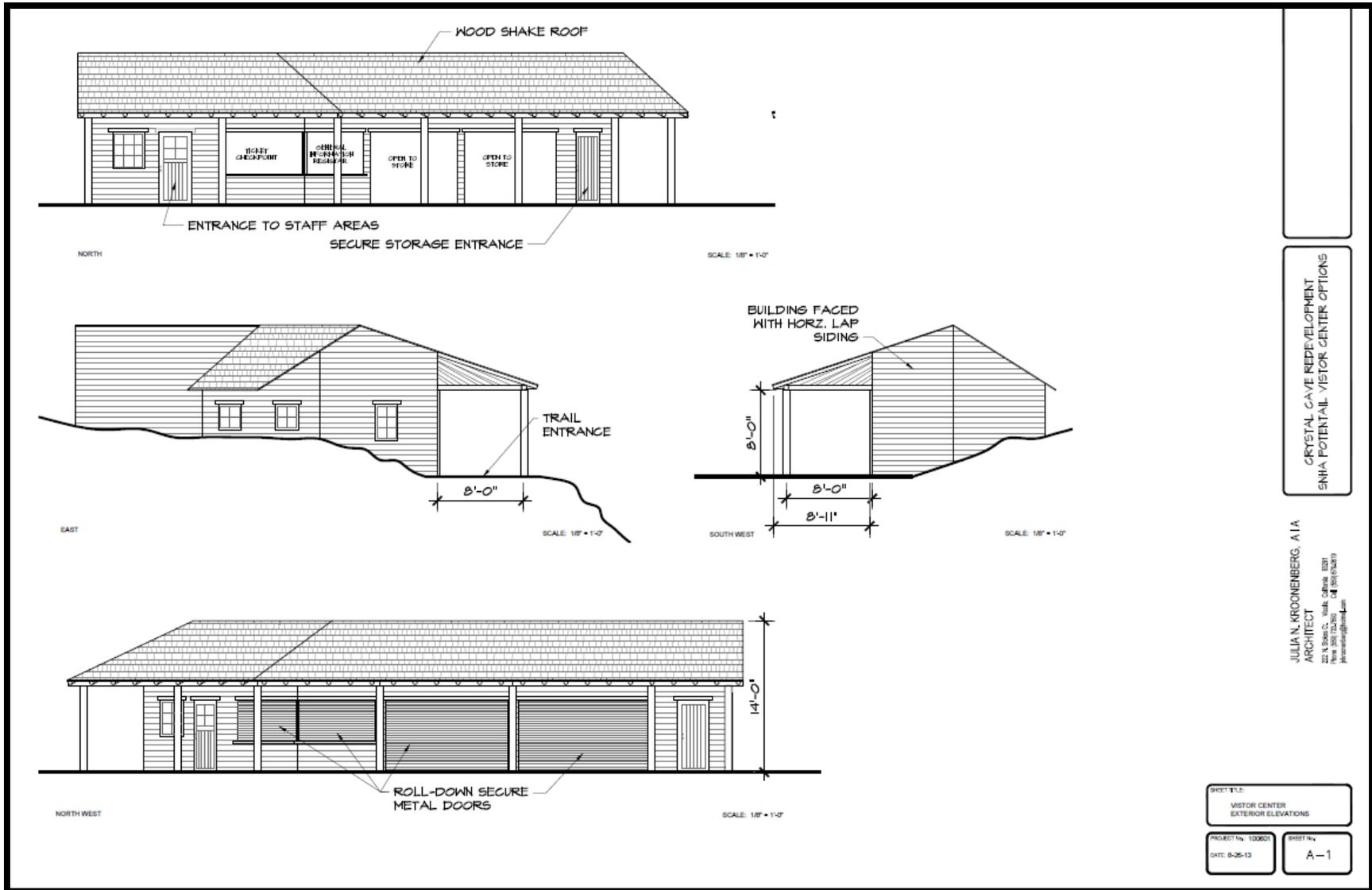


Figure 12. Information kiosk basic appearance (Kroonenberg 2013).

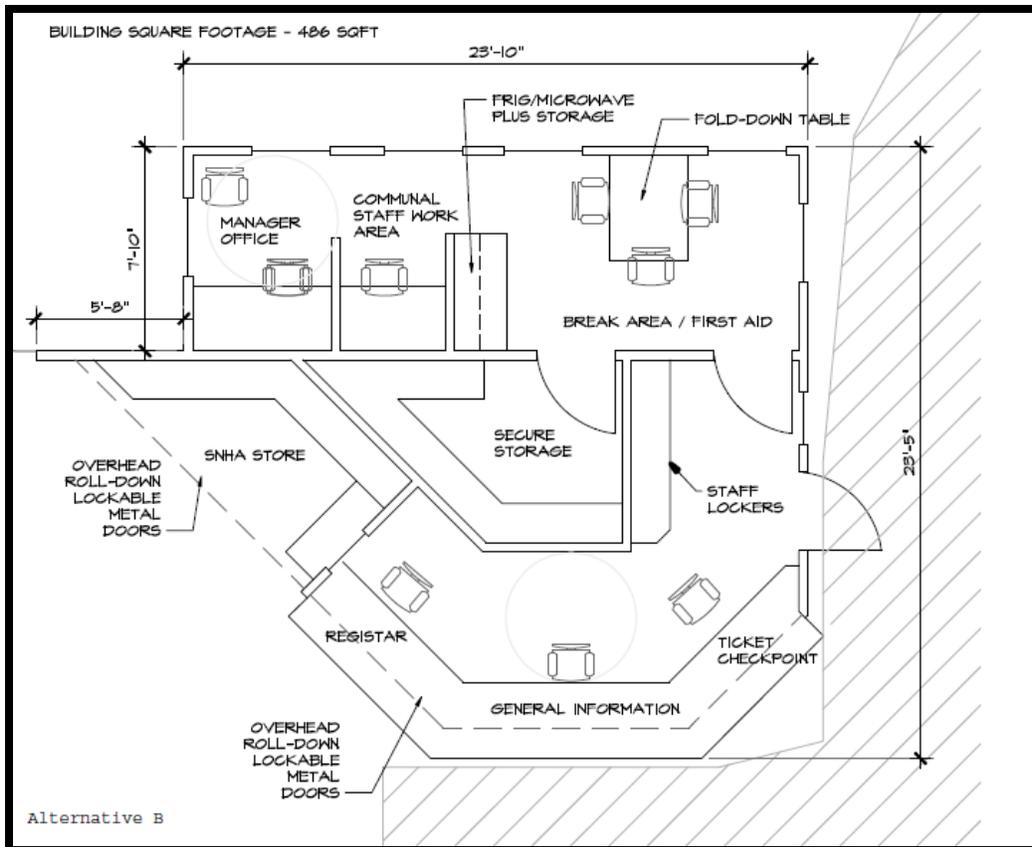


Figure 13. Layout of 486 square foot kiosk (Kroonenberg 2013)

ALTERNATIVE C: IMPROVE THE LOWER CRYSTAL CAVE AREA, REPLACE EXISTING VISITOR KIOSK, AND DEMOLISH HISTORIC COMFORT STATION

Alternative C differs from alternative B in the size of the new visitor kiosk and the disposition of the historic comfort station (Figure 14). Under alternative C, a new visitor information kiosk would be constructed but it would be larger to accommodate storage. The historic comfort station would be demolished and the area rehabilitated. The elements described under “Elements Common to Action Alternatives” would be implemented along with the following two components:

- Replace existing visitor information kiosk
- Demolish the historic comfort station and rehabilitate the area

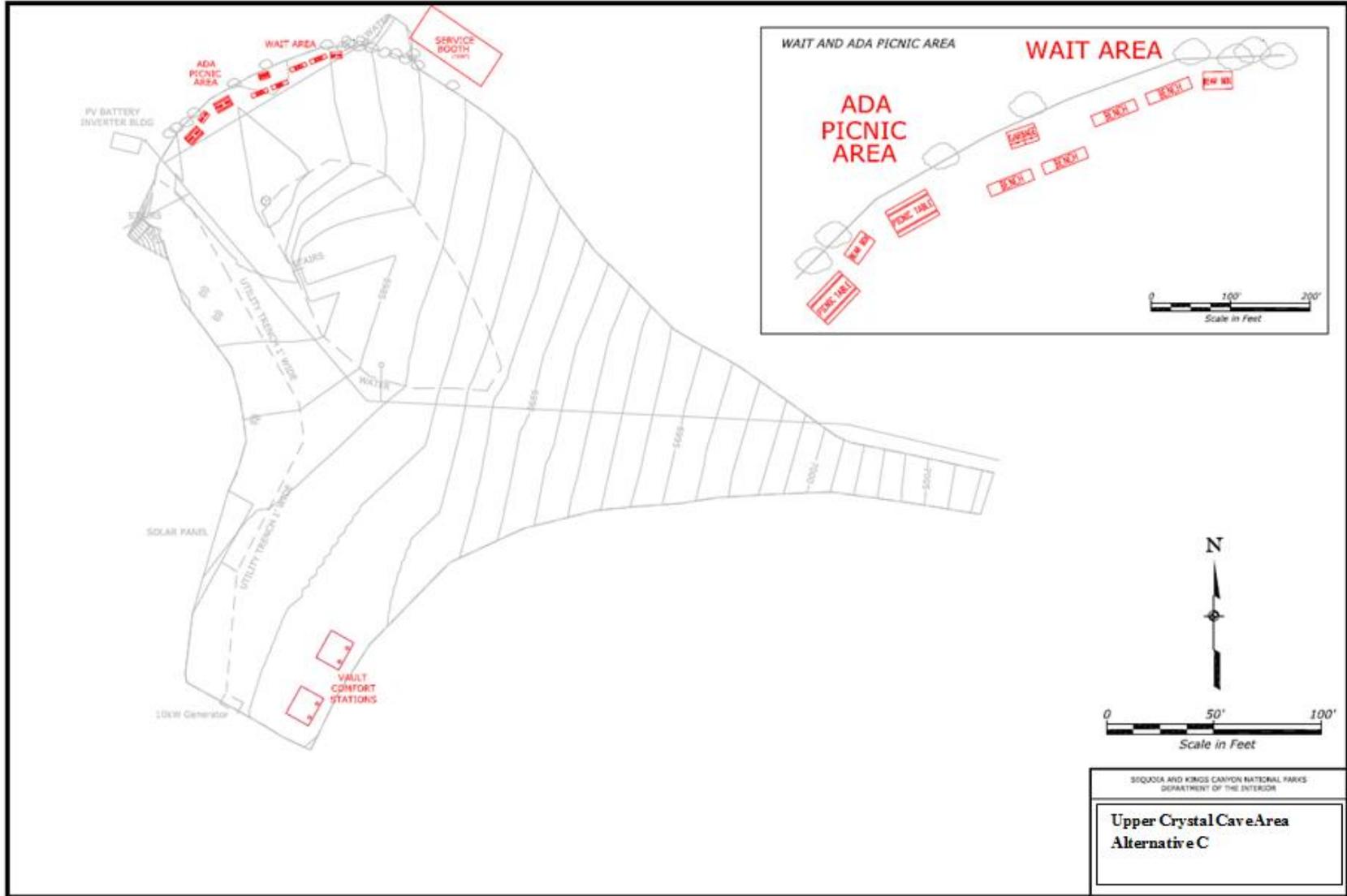


Figure 14. Layout of the Upper Crystal Cave Area under Alternative C.

Replace existing information kiosk

As an interim measure, the existing information kiosk would be stabilized until it can be replaced. The replacement kiosk would be constructed at a site located across from the existing kiosk near the trailhead and adjacent to the parking lot. The building would allow for more educational opportunities and interaction with staff, and would provide a safe and more efficient use of space for staff. Sustainability and energy efficiency would be incorporated into facility design. The parks' *Architectural Character Guidelines* would also be utilized in the design of the new structure. The new building would be approximately 720 square feet (Figure 15). This larger-sized building would provide more storage space for merchandise, supplies, and emergency medical equipment. The existing information services kiosk would be demolished and removed, and the area restored.

Wayside exhibits, displays, and other informational media would be provided near the new kiosk and at strategic points along the cave access trail.

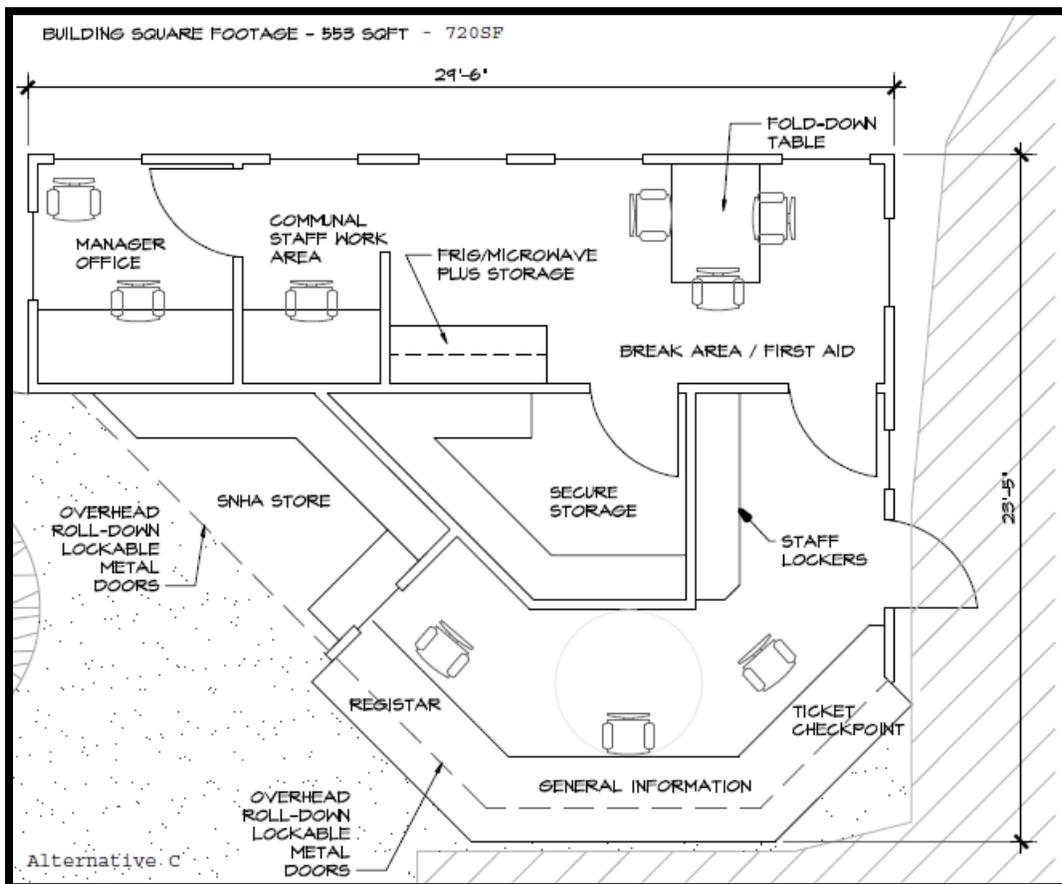


Figure 15. Layout of 720 square foot building (Kroonenberg 2013)

Demolish existing historic comfort station

The existing historic comfort station would be demolished and removed from the site. Demolition of the historic structure would engender an adverse effect determination under section 106 of the National Historic Preservation Act (NHPA) that would require development of a Programmatic Agreement (PA) with the ACHP and the CA SHPO to mitigate the loss of the historic structure. Underground water and wastewater lines would be abandoned in place. The historic stairs leading from the parking lot to the comfort station and concrete footings would also be removed (also an adverse effect to resources

determined to be contributors within the proposed historic district). Following removal activities, the area would be rehabilitated and restored to its original condition to the greatest extent practicable.

MITIGATION MEASURES

Mitigation measures are designed to prevent or minimize adverse impacts or to contain impacts within acceptable limits during and after project implementation. Mitigation measures and guidance has been included in each project alternative. The following are additional guidance and mitigation measures that would be incorporated into project implementation.

Protect Cultural Resources
<ul style="list-style-type: none"> • For alternatives B and C, prior to construction, shovel test units must be excavated in the footprints of the proposed new structures. • Before a structure eligible or listed on the National Register is removed, development of mitigation measures for the adverse effect will be required. Mitigation may include, but is not limited to, documentation that must be prepared in accordance with Section 110(b) of the NHPA that must be submitted to and accepted by the Chief, Historic American Buildings Survey/ Historic American Engineering Record (HABS/HAER) Program (NPS-28, Chapter 8). • Repairs made to existing historic features (e.g., historic rock walls, comfort station, Cascade Creek Bridge, etc.) will be made in accordance with the Secretary of the Interior’s Standards for the Treatment of Historic Properties under the Standards for Rehabilitation. • Should previously unknown historic or prehistoric resources be unearthed during project implementation, work will be halted in the discovery area, the site secured, and the parks’ Cultural Resources Program Manager notified. A qualified cultural resource management specialist will examine the area as soon as possible and will follow the procedures of 36 CFR Part 800.13[c]. • In the event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during project activities, the regulations implementing the <i>Native American Graves Protection and Repatriation Act</i> (43 CFR Part 10) shall be followed. • Should construction activities or project work inadvertently harm a cultural resource, work will stop in the area and the SEKI cultural resources program manager notified. Consultation with the CA SHPO, tribes, and/or other interested parties would be conducted, as necessary and appropriate.
Minimize Impacts to Visitor Use and Experience
<ul style="list-style-type: none"> • A communications plan would be developed by SEKI and SPC staff to ensure adequate time for public notification regarding any potential closures or delays in access or tours of the cave. • Construction activities would be planned to minimize any procedure that might displace normal visitor access or impact their experience. Work would be planned for the shoulder seasons, staff availability and weather permitting, to minimize impacts to visitors.
Protect Water Resources and Wetland Values
<ul style="list-style-type: none"> • During new construction, install silt protection devices to prevent excessive sediment flow into riparian wetlands or waterways. • Cease operations when weather conditions could cause erosion or sediment to enter any naturally-occurring water body. • All equipment that could come in contact with a naturally-occurring waterbody or potentially enter a storm drain system shall be: a) thoroughly cleaned of soil/mud and all organic matter by rinsing the equipment within a containment barrier constructed at least 100 feet of any waterbody;

<p>b) disinfected with a chlorine solution (one part bleach to 32 parts water or stronger) followed by a thorough rinse with clean water, and c) soil/mud, organic debris and cleaning solution collected and removed from the parks.</p> <ul style="list-style-type: none"> • Fuel and other hazardous materials will be accessed, applied, and stored within a containment barrier placed at least 100 feet from any waterbody or storm drain system. • Every day, prior to commencement of work, all machinery will be inspected for leaks, leaked material removed from the environment, and if a leak is found, the machinery will not be used until repaired. • Machinery maintenance involving potential contaminants will occur outside the parks or in a designated appropriate area. • 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. Hazardous spill clean-up materials will be on site at all times and spilled hazardous materials would be cleaned up immediately and would not be allowed to seep into the soil or reach open water sources. • Appropriate permits (section 404 permit and 401 notification or certification) would be acquired prior to work that could impact wetlands or waterways.
<p>Protect Cave Resources</p>
<ul style="list-style-type: none"> • Consideration must be made for karst hydrologic processes within construction areas. Staging and storage areas of hazardous materials should not be within the karst areas (as defined by the presence of marble or up watershed of marble areas). The parks' cave management program must be notified of spills or any hazardous materials within the karst areas. Runoff from rains on the newly laid parking lot and trail asphalt should be mitigated with hydrocarbon traps and filters.
<p>Protect Air Quality</p>
<ul style="list-style-type: none"> • Abide by California State vehicle idling regulations; 5 minute limit for heavy diesel equipment. • Do not permit any power tool or engine to idle for 5 or more minutes. • Use dust abatement measures, where and when appropriate. • Cover all haul trucks carrying construction materials or debris.
<p>Protect Night Sky Values</p>
<ul style="list-style-type: none"> • If night-time work is necessary and approved, project work lighting will be the minimum necessary to provide for visitor, employee, and worker safety. • Any outdoor lighting should be directed downwards and light fixtures should be the lowest brightness (lumens) adequate for safety and security.
<p>Protect Soundscapes</p>
<ul style="list-style-type: none"> • Use the quietest equipment to accomplish the task efficiently and safely. • Consider noise effects when scheduling project work. • Install and maintain mufflers and sound attenuation devices on all equipment and vehicles; use only well-maintained and properly functioning equipment and vehicles.
<p>Protect Native Wildlife</p>
<ul style="list-style-type: none"> • Comply with food-storage and garbage disposal requirements at all times. Implement a litter control program. • Prior to modifying any structure, park biologists would conduct surveys to determine if bats are present. Bats would be excluded from the structures prior to any project activities.

Prevent the Introduction and Spread of Non-Native Plants

- Pressure wash equipment to remove all dirt and plant parts before entering the park for the first time, paying special attention to undercarriage and grill/radiator; subsequent entries will not require pressure washing unless the vehicle shows signs of mud, plant material, or other substances. Project manager will inspect equipment for compliance prior to entry into the park and reject equipment that is not adequately clean.
- Before moving vehicles or equipment to a new job site, visually inspect and clean the vehicles or equipment (including the undercarriage) thoroughly to remove all mud, dirt, and plant parts.
- Inspect, remove, and properly dispose of invasive plant seed and plant parts found on clothing, boots, tools, and equipment. Disposal consists of removing the seed and plant parts from clothing and equipment at a spot near the infestation, or bagging the seeds and plant parts and disposing in bagged garbage.
- Use weed-free, locally-staged fill or on-site fill (mineral) materials when it can be extracted from the project site without causing adverse impacts to the native vegetation, soils, or hydrology.
- Do not import topsoil. Imported materials must come from an approved source. Consult with the senior invasive plant ecologist at least a month in advance of project work.
- Construction materials would be staged and sling-loaded from asphalt, rather than on vegetated edges of helispots, whenever possible.
- Construction materials would be inspected for soil and plant parts. Dirty materials would be cleaned by pressure washing or other means. Construction materials that could acquire seeds from surrounding areas would be covered.
- Ensure stockpiled fill or topsoil remains free of non-native plants at all times.
- Survey for and control invasive non-native vegetation in the project area and staging areas for one to three years after project activities are completed.

Protect Native Vegetation and Soils

- Call's Angelica is in the lower Crystal Cave area near the historic trail. Areas with known sensitive species will be flagged and construction crews would be directed to avoid these areas.
- Straw products (e.g., "certified weed-free straw" and other straw products) are not authorized on project work sites due to the high risk of importing non-native plants and seeds. Instead, use an excelsior (aspen fiber) or coir (coconut fiber) product for erosion control, sediment filtration, or other needs.
- All disturbed ground will be rehabilitated according to a SEKI approved rehab plan immediately after project completion.
- Minimize harm to native vegetation and soils by designing and sequencing project work to protect or salvage native vegetation and topsoil, as appropriate.
- Topsoil will be removed from areas of construction, stored, and replaced at the end of the project.
- Salvage native vegetation from project areas for reuse on disturbed areas.
- Use only approved travel routes and stay within construction limits to protect vegetation and soils.
- Plant or seed with native vegetation propagated from the local gene pool.
- Transplant plugs of native vegetation from adjacent areas, without harming adjacent areas.
- Install protective barriers around individual and groups of trees or other vegetation identified for protection at the canopy drip line or further away.
- Hand-dig around and under high value trees at the canopy drip line or further away.
- De-compact subsoil, without harming major tree roots, before placing topsoil.
- Grade to natural contours. Topsoil will be spread in as near the original location as possible.
- Litter and duff will be removed from project areas and stored for later replacement over topsoil.

- Mulch disturbed soils with wood chips, soil retention blankets, or native litter and duff.
- Monitor project affected areas for restoration success for up to 3 years.

Facility Design and Construction Considerations

- Where possible, building design would take advantage of naturally occurring site conditions, such as sunlight, shade, ventilation, views, drainage, and existing vegetation. Products used would not be rare or endangered. Where possible, recycled products would be used. Nontoxic products would be used and design would strive for a high level of energy efficiency.
- Sustainable design principles would be used that meet all applicable Uniform Building Codes, National Fire Protection Association codes, and Occupational Safety and Health Administration requirements.
- Construction of any new buildings will comply with the SEKI's Architectural Character Guidelines.
- Any appurtenances and buildings would be designed to ensure compatibility with the historic character of the proposed historic district and to soften their appearance and blend into the surrounding terrain. Areas disturbed by project activities would be revegetated and rehabilitated to pre-work conditions.
- All tools, equipment, barricades, signs, surplus materials and rubbish would be removed from the project work limits upon project completion. All demolition debris would be disposed of at appropriate areas outside the parks or stockpiled at approved locations within the parks to be used in future projects. When possible, debris would be disposed of at a materials recycling facility.

ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

Develop additional picnic areas

During the 2013 Choosing by Advantages process, park staff considered two different options for providing additional picnic sites in the Crystal Cave area. One option considered developing the south side of the existing vegetated island in the parking area to accommodate additional picnic facilities. This option considered an approximate 2,500 square foot area that would be ADA accessible and have picnic tables and shade structures. A second option considered developing a new non-ADA picnic area in the footprint of the existing comfort station (if the selected alternative called for the structure's removal). The picnic area would be approximately 1,000 square feet.

These options were ruled out because it was determined that: additional picnicking options would create an undesirable effect of decreasing the area's carrying capacity by increasing the length of time visitors may want to stay in the area. Also, additional picnic areas could create unintended pedestrian/vehicle conflicts by encouraging people to picnic and linger in a high use area that has steady traffic and limited space. For these reasons, the options to create additional picnic areas in the Crystal Cave area were considered but dismissed from further evaluation.

Upgrade trail to improve accessibility or provide additional nature trails

A commenter suggested that the steps along the trail be removed to improve accessibility to Crystal Cave. Because of the steep slope from the trailhead to the cave, the scale and scope of the trail necessary to meet accessibility requirements would create unacceptable resource impacts (natural, cultural, and wilderness impacts). In addition, it is not feasible or reasonable to develop the cave or internal cave trail to meet accessibility standards without the destruction of the cave resource. Consequently, this alternative would not meet project objectives and was dismissed from further evaluation.

Another commenter suggested providing additional trails, including an accessible nature trail, near the parking lot, and a shaded amphitheater. Park staff evaluated the area around the parking lot and found the slopes in the area too steep for the development of an accessible trail or amphitheater. Therefore this alternative was ruled out.

Re-establish historic trail outside cave entrance area

Park staff considered developing a loop trail outside the cave entrance area to alleviate visitor congestion and improve pedestrian circulation. The abandoned trail historically used to access the cave was considered. After biological surveys, it was determined that the abandoned trail was located in a wetland and riparian area. Rebuilding the trail would require the removal and destruction of Call's Angelica (*Angelica callii*). This species is endemic to Tulare and Kern counties, and it is considered a plant of limited distribution. Reestablishing the trail near the cave entrance adjacent to Cascade Creek could impact this sensitive plant species and the wetlands environment. Other options that meet project objectives are considered and evaluated in this document, therefore, the option to re-establish the historic trail was ruled out from further evaluation.

Improve the cave access road

Several commenters suggested improving the cave access road and adding a shuttle service from Lodgepole or Visalia to the cave area. This alternative will be considered in a future planning effort related to the road rehabilitation project, and is outside the scope of this project.

Restore the cave entrance area

A long standing objective of this proposal was to restore the cave entrance area to improve conditions and habitat for endemic cave-adapted species. An option to remove the existing hardened surface and install a boardwalk-type walkway was considered to allow for unimpeded movement of cave-adapted species inhabiting the entrance area. However, because the FHA and GRD recommended that the cave entrance area remain the primary gathering area for visitors to congregate before and after a cave tour due to rockfall concerns, this element was removed from consideration.

In addition, installing a boardwalk would require excavation of the cave entrance floor for support posts. The boardwalk would need to be composed of a material that is sustainable and resilient to weather and cave conditions, and that minimizes noise impacts on wildlife inhabiting the cave entrance (such as birds and bats). In addition, past restoration work located adjacent to the current entrance area provides habitat for cave-adapted animals. The advantages of constructing a boardwalk would not greatly benefit cave resources in the area. However, it is important to provide a gathering area for visitors on cave tours. For these reasons, the option to restore the cave entrance area and remove the gathering area from the cave was dismissed from further consideration.

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AFFECTED ENVIRONMENT

This section provides a summary of the resources associated with the alternatives and the environmental consequences of the alternatives. It is organized by impact and resource topics that were derived from internal park and external public scoping, and is limited to those topics that may be affected by the alternatives. More detailed information on resources in SEKI can be found in the GMP (NPS 2007).

LOCATION AND GENERAL PROJECT AREA DESCRIPTION

SEKI is located in the eastern part of central California. The combined acreage of the two parks is 865,964. Included in the parks' rugged landscape is the highest peak in the contiguous United States, Mount Whitney, which rises to about 14,497 feet above sea level. Both parks occupy the western slope of the Sierra Nevada Mountains. Access to the developed areas in the parks is from the historic Generals Highway; the main thoroughfare through Sequoia National Park.

Crystal Cave is located on a secondary road approximately 7 miles off the Generals Highway in Sequoia National Park between the Ash Mountain entrance and the Giant Forest. Crystal Cave constitutes one of SEKI's most outstanding natural features, and is also one of the most popular visitor destinations within the parks.

CULTURAL RESOURCES

Historic Resources

Though long known and used by American Indians, Crystal Cave was first "discovered" by Euro-Americans in 1918. The first tourists arrived shortly thereafter. Within the first few months of the cave discovery, damage to several cave resources occurred; a reinforced gate was constructed in 1921 barring public access. Pressure to open Crystal Cave to public tours continued to increase, and in 1938, funding was granted to the park for the development of Crystal Cave with the stipulation that the work be undertaken by Civilian Conservation Corps (CCC) members.

From 1938 to 1941, the CCC constructed the Crystal Cave access road, the parking area, and the existing cave access trail with its associated stonework. During this three-year period, the CCC also constructed restrooms at the mouth of the cave, and installed a sewage treatment system, electrical system, and a water system. Work improving access in the interior of the cave included trail improvements and installing a lighting system. In 1939, the Spiderweb Gate, designed by Landscape Architect Harold G. Fowler, was installed approximately 80 feet inside the cave.

In November 1949, approval was given to proceed with the expansion of the existing parking area to accommodate additional cars. With the advent of the NPS *Mission 66 Program*, a number of improvements to the parking area and trail system were proposed as part of the 1956 Master Plan for the Crystal Cave developed area. Between 1963 and 1965, as part of the Accelerated Public Works (APW) contracts, improvements to the access trail with their associated wet-rubble stone walls, concrete steps, Cascade Creek bridge, and asphalt pavement work; construction of stone walls to create a discontinuous oval seating area at the bottom of the access trail; and, the construction of the parking lot comfort station occurred. While these efforts were not funded directly as part of the agency's *Mission 66 Program*, they were clearly undertaken in an effort to complete additional portions of the 1956 Master Plan for Crystal Cave.

Other upgrades and improvements have occurred through the years in the Crystal Cave area, such as applying asphalt surface to the access trail in 1985, modifying the 1930s electrical system by most

recently installing a light emitting diode (LED) system, installing a kiosk near the oval-shaped seating area at the bottom of the trail, and installing a visitor information services kiosk near the parking area in 1985.

Proposed Crystal Cave Historic District Determination of Eligibility

In 2010-2011, a draft Determination of Eligibility (DOE) for the proposed *Crystal Cave Historic District* (NPS 2012) identified 12 contributing resources eligible for listing on the National Register of Historic Places (NRHP), and 10 non-contributing resources. The period of significance for the Crystal Cave area is identified as 1938 to 1941, with other significant dates of 1918 and 1963 to 1965. The National Register-contributing resources include one building (Mission 66-era comfort station), four sites (Crystal Cave Road, Crystal Cave parking area, Crystal Cave Access trail, and Crystal Cave interior trail), and seven structures (Cascade Creek bridge, oval-shaped seating area, dry-stacked stone walls, wet-rubble walls and curbs, access trail concrete staircases, mortared stone walls at cave's mouth, and the Spider Web Gate). The non-contributing resources include two buildings (concrete block powerhouse and ticket booth/bookstore), one site (a short, secondary trail in the lower Crystal Cave area), and seven structures (Marble Fork Bridge, solar panel array, generator shelter, chain-link fencing, information kiosk, and a former generator room and comfort station).

Cultural Landscape

Depending on the outcome of the draft DOE, the Crystal Cave Historic District may also be designated as a cultural landscape. The "Crystal Cave Developments" are inputted into the NPS online Cultural Landscape Inventory (CLI) database; CLI Number 725379.

According to NPS DO-28 (NPS 2002), 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 both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions.

The draft DOE describes the proposed *Crystal Cave Historic District* as locally significant under National Register Criterion A, "associated with events that have made a significant contribution to the broad patterns of our history," because it is associated with the broad pattern of the federal government's response to the Great Depression, during the Franklin Roosevelt Administration. The primary area of significance is the cave's association with the work of the CCC in Sequoia National Park. Crystal Cave is also significant under the category of Recreation, specifically, Tourism, because its development was undertaken solely to provide access to the cave for the general public. The proposed *Crystal Cave Historic District* is also significant in the area of Conservation because the NPS sought to provide accessibility to the cave while maintaining the integrity of the cave's associated natural resources.

VISITOR EXPERIENCE AND RECREATIONAL OPPORTUNITIES

The primary purpose that visitors travel to the Crystal Cave area is to tour Crystal Cave. Crystal Cave has been one of the park's primary visitor attractions since 1940, and is the only cave open for tours within the parks. The cave is generally open for a variety of cave tours from early May through the end of October. The tour operation at Crystal Cave has been managed and staffed by SPC since 1982. The cave is visited by an average of 51,000 people each summer season.

Aside from the tour operation at Crystal Cave, the area around Crystal Cave has few facilities or recreational opportunities. A visitor kiosk is operated by SPC as part of the tour operation, and includes a gift shop and basic information about cave resources. The cave access trail is open only to those

embarking on a cave tour. There is a small undesignated picnic area adjacent to the parking lot, and a restroom and several food storage boxes.

GEOLOGY, SOILS, AND VEGETATION

Crystal Cave has formed within the Sequoia pendant of the Kings Terrane. The Sequoia pendant is an approximately ten miles long and one mile wide northwest-southeast trending accretionary wedge of rocks that span the Middle Fork and Marble Fork of the Kaweah River in western SEKI. The Kings Terrane is made up primarily of metamorphic rocks including schist, quartzite and marble. These rocks were originally deposited in a shallow marine environment as their sedimentary equivalent shale, sandstone and limestone before being metamorphosed and lifted with the Sierra Nevada due to collision and subduction at the continental margin. The meager fossil evidence suggests the rocks were originally deposited in the Mesozoic and perhaps as early as the Paleozoic and uplifted by the early Jurassic.

The rocks of the Sequoia pendant are steeply dipping to near vertical. Calcite, the principal mineral in marble, is soluble in naturally slightly acidic rain and groundwater. Marble generally has low primary porosity and dissolution occurs at the margins of the rock; however, as a result of uplift and tilting, fractures formed along planes of weakness. These fractures created vertically oriented secondary porosity in the marble and allowed water to deeply penetrate the rock mass. As the fractures enlarged, subterranean passages capable of carrying an increasing volume of water formed, thus creating a positive-feedback mechanism. Once a sufficiently large passage intersected the land surface, the cave became accessible to humans. Evidence suggests that the highest, oldest surviving passages in Crystal Cave were formed more than one million years ago. The cave-forming processes continue today as new passages are being formed by the stream that flows in the lowest levels of the cave. Soils around the Crystal Cave area have not been previously mapped and are poorly understood. A soils mapping project of SEKI is currently underway, and more detailed information on soils is pending. In general, most soils in the Crystal Cave area are thin and contain copious rock. Creek bottoms, such as at the cave entrance, clearly have more varied soils including dark wetland soils in permanently moist areas and stream deposited sand, cobbles, and terraces.

The project area occurs at an elevation of approximately 5,000 feet at the Crystal Cave parking area/trailhead to approximately 4,400 feet in the canyon bottom along Cascade Creek. The site is notable for its marble parent materials and proximity to karst features. Vegetation in the Cascade Creek riparian corridor corresponds to the White Alder Temporarily Flooded Forest Alliance, while upland areas are largely Canyon Live Oak-California Laurel Forest Superassociation (NPS 2010). The site burned during the 2008 Hidden Fire and includes resprouting shrubs and trees, burned stumps, and the boles of trees killed or weakened by the fire (NPS 2010).

Call's Angelica (*Angelica calii*), a plant species of concern that is associated with riparian/spring vegetation, has been documented in the lower Crystal Cave area. Thirty three taxa have been observed within the area including: big-leaf maple (*Acer macrophyllum*), cow parsnip (*Heracleum lanatum*), California sweet-sicily (*Osmorhiza brachypoda*), white alder (*Alnus rhombifolia*), hazel nut (*Corylus cornuta mexicana* var. *californica*), spicebush (*Calycanthus occidentalis*), blue elderberry (*Sambucus Mexicana*), Florin incense cedar (*Calocedrus decurrens*), California wood fern (*Dryopteris arguta*), canyon live oak (*Quercus chrysolepis*), mountain pink currant (*Ribes nevadense*), sticky currant (*Ribes viscosissimum*), California bay (*Umbellularia californica*), and miner's lettuce (*Claytonia perfoliata* ssp. *perfoliata*) (NPS 2010). Two non-native species occur in the project area, both in the proposed cave tour staging area – annual bluegrass (*Poa annua*) and hedge parsley (*Torilis arvensis*). Neither is considered a priority species in terms of threats to park resources (NPS 2010).

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ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter analyzes both beneficial and adverse impacts that would result from implementing the alternatives considered in this EA. This chapter also includes methods used to analyze direct, indirect, and cumulative impacts. A summary of the environmental consequences for each alternative is provided in table 2, which can be found in “Chapter 2: Alternatives.” The resource topics presented in this chapter and the organization of the topics correspond to the resource discussions contained in “Chapter 3: Affected Environment.”

This EA assesses whether significant impacts would occur as a result from implementing any of the alternatives, resulting in the need to prepare an environmental impact statement (EIS); or, whether a finding of no significant impact (FONSI) is the appropriate decision document.

GENERAL METHODOLOGY

This section describes the environmental impacts, including direct and indirect effects, and their significance for each alternative. The analysis is based on the assumption that the mitigation measures identified in the “Mitigation and Best Management Practices” section of this EA would be implemented for the action alternatives. Overall, the NPS based the impact analyses and conclusions on the review of existing literature and park studies, information provided by experts within the park and other NPS personnel, other agencies, professional judgment and park staff insights, and public input.

In accordance with the CEQ regulations, direct, indirect, and cumulative impacts are described (40 CFR 1502.16) and the impacts are assessed in terms of context and intensity (40 CFR 1508.27). Where appropriate, mitigating measures of adverse impacts are also described and incorporated into the evaluation of impacts. The specific methods used to assess impacts for each resource may vary; therefore, these methodologies are described under each impact topic.

The geographic study area is generally defined as the upper and lower Crystal Cave areas. This includes the Crystal Cave parking area, cave access trail, and area near the cave entrance.

The following terms are used in the discussion of environmental consequences to assess the nature of impacts associated with each alternative and the impact intensity threshold (the terms “impact” and “effect” are used interchangeably throughout this document).

Type: Impacts can be beneficial or adverse. A beneficial impact is an impact that would result in a positive change in the condition or appearance of the resource. An adverse impact is an impact that causes an unfavorable result to the resource when compared with the existing conditions.

Duration: Duration of impact is analyzed independently for each resource because impact duration is dependent on the resource being analyzed. Depending on the resource, impacts may last for the implementation period, a single year or growing season, or longer. Impact duration is described as short-term or long-term for each resource. For the purposes of this analysis, short-term and long-term impacts are defined for each resource.

Direct and Indirect Impacts: Effects can be direct, indirect, or cumulative. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and

occur later or farther away, but are still reasonably foreseeable. Direct and indirect impacts are considered in this analysis. Cumulative effects are discussed in the next section.

Context: This means the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site specific action, significance would usually depend upon the effects in the locale rather than in the park as a whole. Both short- and long-term effects are relevant.

Intensity: This refers to the severity of impact. The following should be considered in evaluating intensity:

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect would be beneficial.
2. The degree to which the proposed action affects public health or safety.
3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, parklands, prime farmlands, wetland, wild and scenic rivers, or ecologically critical areas.
4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.
5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.
10. Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

For each impact topic analyzed, an assessment of the potential significance of the impacts according to context and intensity is provided in the “Conclusion” section that follows the discussion of the impacts. Context includes both overall context and resource-specific context. Overall context is presented here in the “General Methodology for Analyzing Impacts” section because it is based on the purpose and significance of the two national park units and applies across all resource topics. Resource-specific context is presented in the “Methodologies” section under each resource topic, as applicable, and applies across all alternatives. Intensity of the impacts is presented using the relevant factors from the list in (b) above. Intensity factors that do not apply to a given resource topic and/or alternative are not discussed.

CUMULATIVE EFFECTS ANALYSIS METHODOLOGY

A cumulative effect is defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions” (40 CFR 1508.7). As stated in the CEQ handbook entitled *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ handbook 1997), cumulative impacts need to be analyzed in terms of the

specific resource, ecosystem, and human community being affected and should focus on impacts that are truly meaningful. The California Environmental Quality Act (CEQA) also requires an assessment of cumulative impacts that could be associated with the proposed project when the project's incremental effect is "cumulatively considerable." "Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (as defined by Section 15130).

Cumulative effects are considered for all alternatives. Cumulative effects were determined for each affected resource by combining the impacts of the alternative being analyzed and other past, present, and reasonably foreseeable actions that would also result in beneficial or adverse impacts to that resource. Because some of these actions are in the early planning stages, the evaluation of the cumulative effect is based on a general description of projects. These actions were identified through the internal and external scoping processes. The geographic scope for this analysis includes actions occurring proximate to the Crystal Cave area and the Marble Fork drainage. The temporal scope includes actions that have occurred in the past that are still affecting resources, actions that are ongoing, or those expected to begin in the next 10 years based on current funding cycles.

PROJECTS OR ACTIONS MAKING UP THE CUMULATIVE EFFECTS SCENARIO

Past and Ongoing Crystal Cave Restoration Work and Maintenance – Cave Interior

Since 1992, restoration activities have occurred in Crystal Cave in order to improve and protect cave habitat, and improve the visitor experience in the cave. This work included removing bathrooms, workrooms, concrete plugs, and a metal ceiling. Other past restoration activities at Crystal Cave have included removing about 30 tons of blast rubble from the cave, reducing the size and width of the interior trails and platforms, cleaning cave formations and pools, painting and repairing the Spider Web Gate, and cleaning cave walls and floors. These activities are included because they removed what may have been contributing historic features to the National Register-eligible cave interior.

Ongoing activities in Crystal Cave include the maintenance and upkeep of lights and the paved trail within the cave. Maintenance on the existing lighting system in Crystal Cave occurs periodically along the paved cave trail and occasionally adjacent to the trail. Invasive, phototrophic algae are often found near high-intensity lights. Algae are periodically removed using mild bleach solution and stream water. Trail work is conducted per the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. Routine trail work includes: 1) moving rubble to maintain clear trail delineations and to reduce trip and fall hazards on the established trail; 2) maintaining and repairing established walkways that have moved or slumped; and, 3) maintaining and repairing existing handrails and stairways. These projects are included in the cumulative effects scenario because they have improved cave habitat and cave resources, and improved the experience of visitors on tours because they are able to view a more natural cave.

Generals Highway Road Maintenance and Rehabilitation

The rehabilitation of the 45.8 mile Generals Highway has been ongoing since the 1980s beginning at the southern portion of the parks' boundary near the community of Three Rivers and continuing north. The rehabilitation work complies with the Programmatic Agreement established with the CA SHPO for the protection of the historic road. Most of the work has occurred within the existing highway corridor, but there has been some removal of vegetation and soils/rock from along the road corridor where necessary to maintain a safe site distance and to prevent highway deterioration. Formal pullouts and curbing has been placed in several areas to protect native vegetation from visitor parking.

Two more phases are to be initiated in the next few years, depending on funding, including a section of the Generals Highway south of the Crystal Cave access road, and a section north of Lodgepole from Little

Baldy to near the intersection for Grant Grove. There could be short-term adverse effects from the removal of vegetation and soils/rock that is interfering with sight distance or causing road deterioration. This would be limited in scale, scope, and effect; therefore the cumulative effects on vegetation and soils from road work will not be included in the discussion. These projects could result in short-term adverse effects on visitors driving on the roadway as a result of delays, and long-term beneficial effects as the road surface is improved. The highway projects are considered in the cumulative effects scenario because of the potential effects on the visitor experience.

Crystal Cave Road Rehabilitation

Road rehabilitation is planned for the Crystal Cave access road and would occur when funding is obtained, likely in the next 3-5 years. This project would rehabilitate and resurface 6.46 miles of the Crystal Cave road (Route 100) including the cave parking lot. The project would entail grinding and recycling of existing road and parking surface, grading and leveling parking and road corridor, adding base material, installing a new 3" tread surface, as well as rehabilitating the road shoulder (15,800 linear feet), paved drainage ditches (5,500 linear feet), and striping of new surface. In addition the project includes the rehabilitation or replacement of culverts and drop inlets, rehabilitation of retaining wall (3,900 square feet), installation of signs/object markers, and rehabilitation of tread surface in turnouts and scenic overlooks. Road construction could result in short or long-term closures of the Crystal Cave Road, which would adversely affect park visitors. Vegetation and soils may be adversely affected as a result of project work. In addition, the Crystal Cave Road is likely a historic road, therefore, prior to work being conducted on the road, the park would determine its eligibility as a historic resource under the National Historic Preservation Act, and, if necessary develop an agreement with the CA SHPO to ensure for the preservation of this resource. The Crystal Cave Road rehabilitation project is included in the cumulative effects scenario because of the potential effects on the visitor experience, and vegetation and soils in the area.

Tree Hazard Mitigation

The parks tree hazard management program includes surveillance, mitigation/abatement, and cleanup. Identified hazards are mitigated (hazard removed) or abated (target removed). The Crystal Cave area is periodically surveyed for tree hazards. In 2014, three maple trees in the lower Crystal Cave area near the trail and one incense cedar near the parking area were identified for removal. The condition of a tree can change quickly due to weather events, rock slides, etc. and surveillance, mitigation/abatement, cleanup are ongoing activities. Due to past fire (detailed below) and the proposed project work, it is likely that more hazard trees will be identified, mitigated or abated. Therefore, because of the potential effects on vegetation, this project is included in the cumulative effects scenario.

Hidden Fire

The 2008 Hidden Fire burned most of the watershed area of Crystal Cave including the area directly above the cave. Fire suppression work included the construction of hand line, helispots, sling sites, and spike camps. During the early stages of the fire, retardant drops were used in the Yucca Creek watershed above the cave; approximately 20 drops were made in the area. Research within area karst aquifers was undertaken in 2008 and completed in 2010 with no indication that aquatic cave-adapted park endemic species were negatively affected by the fire or suppression efforts / retardant drops.

A Burned Area Rehabilitation plan provided recommendations for the rehabilitation of lands within the Hidden Fire perimeter. As a result of the plan, the survey and removal of invasive plant populations occurred, along with the replacement of a power cable damaged by the fire. Impact from the fire is still evident in the area, and has led to increased erosion and sloughing along the Crystal Cave access trail, temporary trail and cave closures, and an increased number of dead and dying trees. This project is included in the cumulative effects scenario because of the past and ongoing impacts to vegetation and soils in the area, and impacts to the visitors as a result of trail closures.

Cave Management Plan

The 1997 Cave Management Plan provides the guidance for administering and protecting cave resources in the parks, including the management of Crystal Cave. An updated Cave and Karst Management Plan is in preparation and would address the management of visitor use and restoration activities within Crystal Cave, excluding the entrance area up to the Spider Web Gate, which is included in this planning effort. This project is included in the cumulative effects scenario because the guidance established by the Cave Management Plan may modify the visitor experience in the Crystal Cave area.

Lodgepole, Wolverton, and Wuksachi Area Management Plan

A comprehensive visitor-service and facilities plan is being developed with the overall purpose of improving visitor and administrative services and functions at the Lodgepole, Wolverton, and Wuksachi areas within Sequoia National Park, while ensuring protection of natural and cultural resources. This project could result in increased opportunities for visitors, including the establishment of a shuttle service to Crystal Cave; therefore it is included as it may change the visitor's experience.

CULTURAL RESOURCES

METHODOLOGY FOR ANALYZING IMPACTS

The NPS will evaluate the effects on cultural resources in accordance with the determinations defined within the NHPA. Since the project occurs within a potentially eligible historic district, with contributing resources, and involves ground disturbance, the project is considered "an undertaking." The alternatives will result in either no adverse effect or adverse effect on the historic district as a whole, and/or effects on individual contributing elements.

Adverse effects on historic properties occur when irreparable alterations of features or patterns, including demolition, diminish the overall integrity of the resource so that it no longer qualifies for the NRHP. Adverse effects to built properties (e.g., buildings, walls, and trails) under NHPA section 106 can be addressed with a good-faith effort to consider whether and how to avoid, minimize, or mitigate the effect. This may involve modifying the undertaking, imposing certain mitigation conditions, or other measures negotiated in consultation with the CA SHPO, the ACHP, culturally associated American Indian tribes and groups, and the public.

Historic Structures

Of the 12 identified contributing resources eligible for listing on the National Register of Historic Places, the following will not be affected by any alternative and will not be further analyzed: the Crystal Cave Road, the Crystal Cave interior trail, and the Spider Web gate.

The National Register-contributing resources that have the potential to be affected include: the Mission 66-era comfort station, Crystal Cave parking area, Crystal Cave Access trail, Cascade Creek bridge, oval-shaped seating area, dry-stacked stone walls, wet-rubble walls and curbs, access trail concrete staircases, and the mortared stone walls at cave's mouth. Potential impacts to these contributing resources are evaluated based on changes to character-defining features of the resources and the ability of each alternative to maintain the integrity of the proposed *Crystal Cave Historic District*. This approach is derived from both the *Secretary of the Interior's Standards for Rehabilitation of Historic Buildings* as well as the regulations of the ACHP implementing the provisions of Section 106 of the *National Historic Preservation Act*.

Cultural Landscapes

For purposes of analyzing potential impacts to cultural landscapes, evaluations of how implementation of the alternatives may affect a character defining pattern or feature of the National Register-eligible cultural landscape are considered in the determination of effects.

IMPACTS OF ALTERNATIVE A: NO ACTION

Historic Resources

Ongoing and routine maintenance and stabilization work to historic resources in the Crystal Cave area has generally left the resources intact and exhibiting considerable integrity. The National Register-eligible contributing resources to the proposed Crystal Cave Historic District would be retained, with periodic maintenance occurring. The appearance of the contributing resources would remain similar to the existing appearance in the near term. Any modifications would be accomplished with a goal of retaining the resources' original appearance. Each modification would be reviewed in accordance with the NHPA Section 106 requirements to evaluate the effects to these resources. The NPS would work with the CA SHPO to ensure that work elements fall within the 2008 Nationwide Programmatic Agreement, or for "No Adverse Effect" determinations for any proposed stabilization and maintenance work. For contributing resources that are deemed critical to Crystal Cave operations (i.e. Crystal Cave access trail), every effort would be made to maintain these resources in good condition so that visitors can continue to access the cave.

It is likely, in the future, that with only basic maintenance and stabilization work, some of the National Register-eligible contributing resources would eventually deteriorate to a condition where they could no longer be maintained or they could pose a risk to employees and/or visitors. For any contributing resources that's condition would warrant removal, the NPS would collaborate with the CA SHPO, ACHP, American Indian tribes and other relevant parties to develop alternative preservation methods, or to implement mitigation measures for the adverse effect.

Cultural Landscapes

There would be no changes to the proposed Crystal Cave Historic District. Non-contributing structures, such as the kiosk, pergola, and chain-link fencing would remain. No new structures would be built. National Register-eligible contributing resources would continue to be maintained to the greatest extent possible, as funding and staffing allows. There would be no adverse effect on cultural landscapes.

Cumulative Effects of Alternative A

Past actions by the NPS have resulted in the removal of some infrastructure in the Crystal Cave area, such as the former bathrooms and workrooms from the westernmost entrance of the cave. This work was completed prior to the initiation of the determination of eligibility process, but if these resources remained in place it is likely that they would have been determined historic. Therefore a component of the Crystal Cave Historic District is no longer extant.

A project to rehabilitate the Crystal Cave Road, which is a contributing resource to the proposed Crystal Cave Historic District, may occur in the future as funding allows. The NPS would work with the CA SHPO as appropriate to ensure that rehabilitation work is compatible with the preservation of the historic character of the roadway.

Beneficial effects from ongoing maintenance and stabilization of National Register-contributing resources in the Crystal Cave area would continue. However, historic resources (e.g., trails, trail walls, stairs, etc.) could continue to deteriorate to a condition where they could no longer be maintained or they could pose a risk to employees and/or visitors, which may lead to removal. Removing additional historic structures

would result in an adverse cumulative effect on historic structures and the cultural landscape of the Crystal Cave area.

IMPACTS OF ALTERNATIVE B (NPS PREFERRED)

Historic Resources

Under alternative B, the following National Register-contributing resources would be affected: Crystal Cave parking area, Mission 66-era comfort station and stairs, Crystal Cave access trail (including retaining walls, staircases, and railings), Cascade Creek Bridge, oval-shaped seating area, and the mortared stone walls at the cave’s entrance.

All work activities on National Register-eligible contributing resources would conform to the *Secretary of the Interior’s Standards for the Treatment of Historic Properties* (the *Standards*). Some of the contributing resources are deteriorating and in poor condition; project work would generally result in long-term beneficial effects by rehabilitating the resources to good condition.

Table 1. Assessment of Effect for Cultural Resources

Contributing Resource	Work Item	Effect
Parking area	Grinding and recycling of existing 50,400 square feet of asphalt surface, grading and leveling the parking area, adding base material, installing a new tread surface, and striping the surface.	Because work would occur within the existing footprint and there would be no change to the configuration of the teardrop-shaped parking lot or the rocky vegetated outcrop in the middle of the parking area, there would be no adverse effect to this resource.
Mission 66-era comfort station	The historic comfort station would be adaptively reused for the storage of supplies, merchandise, and EMS equipment. Plumbing fixtures and partitions would be removed from the interior of the building, along with all above-ground waste disposal infrastructure.	Because the exterior appearance of the building would be preserved and structural and architectural components would be stabilized and rehabilitated per the <i>Standards</i> and in accordance with the <i>2008 Nationwide Programmatic Agreement</i> , there would be no adverse effect to this resource.
Comfort station staircase	The three short flights of contributing concrete steps to the comfort station would be rehabilitated per the Secretary of Interior’s Standards.	Because the appearance and function of the steps would be preserved per the <i>Standards</i> as well as the <i>2013 CA Historical Building Code</i> and in accordance with the <i>2008 Nationwide Programmatic Agreement</i> , there would be no adverse effects to this resource.
Access trail	Grinding and removing excess pavement and resurfacing the trail to the original elevation. Approximately 8,000 square feet of old asphalt and concrete mix tread surface would be removed and a new concrete surface would be installed.	Because the trail would remain in its current alignment, and rehabilitated in accordance with the <i>Standards</i> , there would be no adverse effect

Contributing Resource	Work Item	Effect
Access trail (con't)	The work would occur mostly within the existing footprint; wider areas would be used for interpretive opportunities (wayside exhibits) and benches.	
Retaining walls and curbs	Repoint mortar, regrout, and repair of over 2,000 square feet of the trail's historic retaining walls (dry-stacked stone walls, wet-rubble walls and curbs) with in-kind materials.	Walls would be restored to their original condition per guidance from <i>the Standards</i> ; therefore there would be no adverse effect.
Concrete staircases and safety railing	The existing staircases and safety railings would be rehabilitated and would remain in place.	The existing staircases and railings would be restored to their original condition per guidance from <i>the Standards</i> ; therefore there would be no adverse effect.
Cascade Creek bridge	The bridge abutments would be rehabilitated using in kind materials.	The bridge abutments would be restored to their original condition per guidance from <i>the Standards</i> ; therefore there would be no adverse effect.
Oval shaped seating area	This area would be hardened and expanded to accommodate more people. Existing contributing stone walls/benches would be rehabilitated and be reconfigured to widen the area. New stone walls/benches would be constructed to provide more seating and would utilize in-kind materials to resemble the existing historic walls.	The existing walls on a portion of the seating area would be rebuilt to reconfigure the area, and additional walls would be added to complement the existing historic walls. There would be a modification to this structure, but the appearance and the characteristics of this resource would remain similar to existing conditions, therefore there would be no adverse effect.
Cave entrance area (exterior)	The mortared stone walls outside the mouth of the Crystal Cave entrance area would be stabilized.	The appearance and characteristics of the walls would not change; therefore there is no adverse effect.
Cave entrance area (interior)	The concrete and asphalt surfaces would be removed and replaced with a concrete surface within the existing footprint.	The appearance and characteristics of the cave entrance area would not change; therefore there is no adverse effect.

Cultural Landscapes

Contributing resources associated with the proposed Crystal Cave Historic District would not be substantially altered. New elements to the Crystal Cave Historic District include a 428 square foot kiosk which would replace the existing (non-contributing) kiosk and new vault toilets in the upper Crystal Cave Area. New construction would be compatible with the parks' Architectural Review Guidelines. The non-contributing pergola in the lower Crystal Cave area and portions of the non-contributing chain-link fence along the trail would be removed, resulting in a beneficial effect on the cultural landscape by restoring conditions more similar to the period of significance. The existing footprint of the parking area and cave access trail would not change. The circulation patterns and overall design of the area would remain.

Because the changes to the overall historic district would be slight, and the overall character of the area would remain similar to current conditions, there would be no adverse effects on the cultural landscape.

Cumulative Effects of Alternative B

Past actions by the NPS have resulted in the removal of some infrastructure in the Crystal Cave area, such as the former bathrooms and workrooms from the westernmost entrance of the cave. This work was completed prior to the initiation of the determination of eligibility process.

A project to rehabilitate the Crystal Cave Road, which is a contributing resource to the proposed Crystal Cave Historic District, may occur in the future as funding allows. If determined necessary, the NPS would work with CA SHPO to ensure that rehabilitation work is designed and implemented in a manner that would ensure the preservation of the historic character of the roadway.

Beneficial effects from the rehabilitation of National Register-eligible contributing resources in the Crystal Cave area would occur as a result of implementing this project. Existing historic features, structures, and the potentially eligible historic landscape would be retained. Overall the cumulative effect would be long-term and beneficial.

IMPACTS OF ALTERNATIVE C

Historic Resources

The effects on cultural resources under alternative C are similar to those explained under alternative B with one exception - the historic comfort station, associated stairway and handrails would be demolished and removed from the site. This would result in an adverse effect on this National Register-eligible contributing resource.

Cultural Landscapes

Contributing resources associated with the proposed Crystal Cave Historic District would be altered, including the removal of the Mission 66-era comfort station, stairs, and railings. New elements to the Crystal Cave Historic District include a 720 square foot kiosk which would replace the existing (non-contributing) kiosk and new vault toilets in the upper Crystal Cave area. New construction would be compatible with the parks' Architectural Review Guidelines. The contemporary non-contributing pergola in the lower Crystal Cave area and portions of the non-contributing chain link fence along the trail would be removed. The existing footprint of the parking area and cave access trail would not change. The circulation patterns and overall design of the area would remain.

Because a contributing structure would be removed from the historic district, it would result in an adverse effect on the cultural landscape.

Cumulative Effects of Alternative C

This alternative has similar cumulative effects as alternative B, except that the removal of the historic comfort station and associated stairway would be considered an adverse effect. This alternative would result in the protection of the other contributing structures in the historic district. Therefore the cumulative effects are both adverse and beneficial, and long-term.

CONCLUSION

Alternative A would result in no short term adverse effects on historic resources and the cultural landscape of the Crystal Cave area. However, in the long-term, there could be adverse effects resulting from the continued degradation of the trail and trail structures. Alternative B would result in the greatest

preservation of the historic district, by retaining the comfort station, conducting preservation maintenance actions on the trail and trail structures, and removing several non-contributing structures. Alternative C would result in the removal of the historic Mission 66 comfort station and the associated stairways which would result in an adverse effect on the historic district. When considered with past, present, and future planned activities, the cumulative effects would not be significant.

VISITOR USE AND EXPERIENCE

METHODOLOGY

NPS *Management Policies 2006* (NPS 2006a) state that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks and that the NPS is committed to providing appropriate high-quality opportunities for visitors to enjoy the parks. Part of the purpose of the parks is to offer opportunities for recreation, education, inspiration, and enjoyment. Consequently, one of the parks' 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.

Each alternative was examined to determine its effect on visitor enjoyment of the Crystal Cave area. Internal and public scoping input combined with an assessment of what is available to visitors under current park management, were used to assess the potential effects of the alternatives. For purposes of this analysis, visitor use and experience includes visitor understanding, satisfaction, and safety, as well as availability of visitor services and amenities. Short-term impacts on visitor use and experience were considered to be those impacts that would last only during project implementation activities, while long-term impacts would be those that extend beyond project implementation. Specific context for assessing impacts of the alternatives on visitor use and experience includes:

- Expectations of visitors to experience Crystal Cave and learn about the area's resources.
- Opportunities for education and interpretation.
- The ability of visitors to enjoy a safe experience while visiting the Crystal Cave area.
- The availability and quality of facilities, cave access trail, and visitor amenities in the Crystal Cave area.

ALTERNATIVE A: NO ACTION

Under the no action alternative, basic visitor services would continue to be provided; however, there would be no comprehensive plan implemented to rehabilitate infrastructure that supports visitor use and services within the Crystal Cave area. SPC staff would continue to provide a valuable educational and interpretive tour of the cave. NPS and SPC staff would continue to perform routine maintenance work to facilities and trails to keep the area operational and safe, however, facilities and trails would continue to deteriorate and degrade, making routine maintenance difficult, costly, and arduous. Waysides and exhibits in the area would be updated on an ad hoc basis; there would be no comprehensive interpretive and educational plan implemented.

The inadequately-sized existing visitor services kiosk would continue to serve as the main contact station for visitors recreating in this area. Visitors would continue to have access to the comfort station until such time as water becomes unavailable, at which time portable toilets would be made available. The parking area would not be rehabilitated, making it difficult for visitors to navigate the area and find available parking. Interruption to visitors in the area could increase as infrastructure continues to deteriorate and emergency repair work is required.

Overall, the continued existence of substandard and out-of-date facilities in the Crystal Cave area would result in a degraded visitor experience for many visitors.

Cumulative Effects of Alternative A

There are a number of past, present, and reasonably foreseeable projects occurring within the Crystal Cave area that impact visitor use and experience. Past work within the cave includes maintenance work to maintain the Crystal Cave interior trail and restoration work to protect the cave resources. These actions have likely improved the experience for those visitors participating in cave tours.

The continued rehabilitation of the Generals Highway and future work on the Crystal Cave access road may require closures and vehicular delays for visitors accessing the Crystal Cave area, which would result in temporary adverse effects to visitors; the long-term effects would be beneficial as a result of improved road conditions.

The Hidden Fire resulted in adverse effects on the visitor experience due to periodic trail and cave closures that occurred as a result of ongoing erosion and tree failures. This would continue to occur under the no action alternative.

A comprehensive visitor services and facilities plan in the Lodgepole, Wolverton, and Wuksachi areas will be developed in the next few years with the goal of improving visitor services and facilities in those areas, resulting in beneficial effects to visitors. The Cave and Karst Management Plan is anticipated to be updated in the next few years, and would consider cave management activities, including assessing the visitor capacity of Crystal Cave and additional restoration actions, which may benefit the visitor experience by restoring the cave resources.

Under the no action alternative, beneficial effects from continued visitor access and cave tours at Crystal Cave would persist, and there would continue to be improvements to the visitor experience in the general area from road and facility improvements. However, the continued deterioration and degradation of visitor-related amenities and potential temporary closures due to trail erosion and emergency maintenance work would result in localized adverse effects on visitor use and experience in the Crystal Cave area. When combined with past, present, and future projects, there would be both long-term beneficial and adverse cumulative effects on visitor use and experience from the no action alternative.

IMPACTS OF ALTERNATIVE B (NPS PREFERRED)

Under the preferred alternative, services and opportunities would be improved for most visitors to the Crystal Cave area. A number of actions would be implemented to improve the visitor experience: a new visitor information services kiosk would be constructed; more wayside exhibits and displays would be present at the trailhead and along the cave access trail; vault toilets would provide a reliable and more environmentally-friendly human waste disposal system; the parking area would be rehabilitated and optimized to provide adequate parking, and to provide a better 'sense of arrival' to visitors; the picnic area would be rehabilitated and designed to accommodate accessibility needs and provide a pleasant experience to visitors. In all, these actions would result in an improved visitor experience at Crystal Cave.

Project work on the trail and lower Crystal Cave area would occur over several seasons, for approximately 3-5 years, and may shorten the operational season at Crystal Cave. Depending on weather conditions, crews would begin rehabilitation work from April to mid-May, then continue work in October until such time as weather or staffing permits. Tours of Crystal Cave would not be available during project work because there is no alternative access route to the cave. The shorter operating season may result in short-term adverse impacts to some visitors' experience if they are visiting the parks and expect to go on a tour when the cave is closed. Public notification of the closures and anticipated operating

season would occur to help mitigate impacts to visitors. There would be long-term beneficial effects to visitor use and experience from rehabilitating the trail, providing formalized trail pull-offs for visitor rest and interpretive opportunities, and improving the tour orientation and gathering areas.

Cumulative Effects of Alternative B

The past, present, and reasonably foreseeable projects as discussed in alternative A are the same for alternative B. What differs is the contribution of alternative B to the overall cumulative effects on visitor use and experience. Under alternative B, short-term adverse effects would occur to visitor use and experience during project work on the trail and in the lower Crystal Cave area resulting in closures and a shortened tour operating season. Upon completion of this work, long-term beneficial effects from improved visitor services in the Crystal Cave area would result. When combined with the other improvements to visitor services that have occurred in the past in the Giant Forest, and that are anticipated to occur at Lodgepole/Wolverton/Wuksachi, the overall cumulative effects to the visitor experience would be beneficial and long term.

IMPACTS OF ALTERNATIVE C

The impacts of alternative C on the visitor experience would be similar to alternative B, except that the visitor services kiosk would be larger. Both alternatives B and C would result in an improved visitor experience.

Cumulative Effects of Alternative C

The cumulative effects of alternative C are the same as described under alternative B.

CONCLUSION

Under alternative A, the visitor experience at the Crystal Cave area would remain similar to current conditions in the short term. The facilities would continue to be inadequate to serve current visitation. In the long term, conditions would continue to deteriorate resulting in decreased opportunities for visitors. Both alternatives B and C would improve the visitor experience and facilities at Crystal Cave, resulting in beneficial effects on most visitors to the area. Considering past, present, and future ongoing projects in the area that would result in a beneficial effect on the visitor experience, the cumulative effects range from short-term and adverse during project work, to long-term and beneficial after project work is completed and services and facilities are improved.

GEOLOGY, SOILS AND VEGETATION

METHODOLOGY FOR ANALYZING IMPACTS

Impacts to geology, soils, and vegetation were assessed by reviewing existing literature and characterizing the effects based on the types of impacts that could occur, and analyzing factors that could contribute to impacts under each alternative. Site visits and surveys were conducted to help inform alternatives, identify potential impacts, and develop mitigation measures to reduce the level of impact. Predictions about short- and long-term impacts were based on professional judgment and experience gained from previous projects.

Soils are susceptible to several types of physical and chemical impacts including erosion, compaction, contamination, and direct removal. There are also a variety of ways in which potential impacts to soils can be avoided or mitigated, including considerations in trail and facility design, and routine maintenance activities. These factors were considered in determining the potential impacts on soils under each alternative.

A plant survey of the lower Crystal Cave area (NPS 2010) was conducted to help inform alternatives and to evaluate potential impacts to vegetation. In addition, numerous site visits were conducted to determine impacts to vegetation in the trailhead/parking area from proposed activities.

IMPACTS OF ALTERNATIVE A: NO ACTION

Under the no action alternative, there would be no new impacts to geology, soils, and vegetation in the upper and lower Crystal Cave areas. Visitors would continue to move off the trail to allow others to pass, thereby trampling nearby vegetation and/or expanding informal dirt pull-offs. The current configuration of the lower Crystal Cave area does not fully support the congregation of larger groups of people, or the ingress and egress of visitors taking tours of the cave during the peak season. During times of congestion and crowding, visitors may move off the developed trail, trampling vegetation, compacting soils, and expanding the surface area of bare soils. However, the level of impact would be minimal due to the topography and seasonal use of the trail.

Cumulative Effects of Alternative A

There are a number of past, present, and reasonably foreseeable projects occurring within the parks that have an impact on geology, soils, and vegetation. Past restoration work within the cave, such as removing blast rubble and reducing trail width, have reduced impacts to geology and soils in the cave. Unplanned events, such as the Hidden Fire of 2008 resulted in adverse impacts to soils and vegetation in the vicinity of the Crystal Cave area from implementing fire suppression activities such as building hand line, creating helispots, sling sites, spike camps, and retardant drops. While the wildfire scorched soils and burned or killed trees within a 3,685 acre area, suppression activities led to the direct removal of vegetation and scraping of soils, compaction of soils, and the introduction and/or spread of non-native plants. A Burned Area Rehabilitation Plan was implemented to rehabilitate areas adversely affected by fire suppression activities and to mitigate the introduction and potential spread of non-native plants.

Ongoing work that has the potential to affect geology, soils, and vegetation include road maintenance, and hazard tree mitigation activities. Future or foreseeable projects within the parks that could affect geology, soils, and vegetation include rehabilitation of the Crystal Cave Road. Geology, soils, and vegetation affected by these projects would be localized.

Since there would be no change to the current conditions under this alternative and impacts to geology, soils, and vegetation would be minimal, there would be no significant cumulative impact associated with this alternative when combined with past, present, and reasonably foreseeable actions.

IMPACTS OF ALTERNATIVE B (NPS PREFERRED)

Under alternative B, disturbance to geology, soils, or vegetation could result from the following activities: constructing vault toilets, constructing the new kiosk, removing above-ground utility infrastructure trail rehabilitation activities, expanding the tour introduction area, rehabilitation of the entrance area, and improving the existing staff tent site.

Two new vault toilets would be constructed at the southern end of the overflow parking area. The vault toilets would be situated on the existing paved parking. No vegetation would need to be removed. An approximately 15' x 12' x 5' area of the parking lot, or 66.6 cubic yards of soil would be excavated to install vaults for the toilets.

Under alternative B, a 486 square foot building would be constructed in a currently undisturbed location adjacent to the parking area and near the existing kiosk. Approximately 544 cubic yards of soil and rock

would be excavated to prepare the site for construction of the new visitor services kiosk. Approximately three living trees and two dead trees (three cedars and two oaks) would be removed from the area along with brushy vegetation. The site limits would be established to minimize impacts to vegetation and soils. This project component would result in a permanent removal of soils and vegetation from an approximately 550 square foot area.

There would be temporary impacts to soils and vegetation from the demolition and removal of above-ground wastewater infrastructure in the upper and lower Crystal Cave areas. Vegetation and soils would be removed or disturbed during this project work. Following removal of wastewater infrastructure, site restoration would occur and in the long term the area would be naturalized.

The cave access trail would be rehabilitated predominantly within the existing footprint. However, during project work, it is anticipated that the soils and vegetation proximate to the trail would be disturbed in the short term from rebuilding the rock walls and re-laying the edges, removing the asphalt with equipment, and removing approximately 15 trees from the trail edge. These trees are currently growing into the trail surface, rock walls, and the stairways, causing upheaval and deterioration of the structures, and also creating safety issues for visitors and staff. There are about four areas upslope of the trail where the bank is eroding and damaging the trail. These sites would be stabilized through the removal or modification of soils in that area.

Approximately 5-7 existing informal pullouts along the trail would be formalized with a hardened surface to provide rest areas and interpretive opportunities. These sites are small areas (about 4' x 4') that are previously disturbed by trampling and visitor use; the soils are compacted and the vegetation absent. Formalizing these sites would result in a slight change to current conditions because the soils would be covered with concrete and wayside exhibits or benches would be placed at these locations.

The rehabilitation of the tour introduction area would result in the removal of vegetation adjacent to the existing site. The surrounding shrubs and several small trees would need to be removed, and the soils would be graded and the surface hardened. A short, narrow path from the introduction area to the water fall would be delineated and vegetation planted on either side. Delineating a short-trail for visitor use would allow for adjacent vegetation to reestablish, resulting in beneficial effects.

The existing staff tent site would be upgraded and would result in trimming of vegetation adjacent to the site and the placement of local fill to establish a more level and safe site.

The existing surface material in the entrance area of the cave would be removed and resurfaced with concrete. Resurfacing would occur within the existing footprint and no new impacts to geology and soils in the cave entrance area would occur.

Equipment and materials needed to accomplish the project work in the lower Crystal Cave would be transported by helicopter. The preparation of the sling load sites would require removal of approximately seven trees in the lower Crystal Cave area.

Cumulative Effects of Alternative B

The projects and actions described under the cumulative effects section in alternative A are the same for alternative B; however, the contribution of alternative B to the overall cumulative effects to geology, soils, and vegetation differs. Under alternative B, a new visitor services kiosk would be constructed, the tour introduction area expanded, pull-outs formalized along the trail, a staff tent platform improved, and vault toilets installed. While most rehabilitation work would occur within the existing footprint, some project work would occur in undisturbed areas and alter the soil properties through hardening of surfaces thereby resulting in a long-term, localized, adverse contribution to the overall cumulative effects. When

considering the cumulative effects of alternative B with past, present, and future projects as a whole, there are no meaningful additive effects that would constitute a significant cumulative effect to geology, soils, and vegetation.

IMPACTS OF ALTERNATIVE C

Under alternative C, the level of disturbance to geology, soils, and vegetation would be the same as described in alternative B for the following activities: constructing vault toilets, removing above-ground utility infrastructure, trail rehabilitation activities, expanding the new tour introduction area, rehabilitation of the entrance area, and improving the existing staff tent area. The primary difference between alternatives B and C is the size of the new visitor kiosk, and the removal of the comfort station and restoration of the area.

Under alternative C, a 720 square foot building would be constructed in the same location as described in alternative B. Approximately 604 cubic yards of soil and rock would be excavated to prepare the site for construction of the new visitor services kiosk. Removal of trees and brushy vegetation, as described in alternative B, is anticipated to be the same and impacts to vegetation would be minimized by optimizing the orientation of the building. This project component would result in long-term adverse effects to soils and vegetation in an approximately 800 square foot area.

The existing comfort station in the upper Crystal Cave area would be removed and the site restored. Implementation of this action would require removal of the existing concrete stairway and placement of fill to create a gradual slope for equipment to access the building for demolition. In addition, three cedar trees would likely need to be cut and removed from the slope to allow access to the site. There would be disturbance to approximately 1/3 acre during demolition activities. The site would be restored to natural contours and revegetated, as necessary, upon completion of this activity. This project component would result in long-term beneficial effects to soils and vegetation once naturalization occurs.

Cumulative Effects of Alternative C

The projects and actions described under the cumulative effects section in alternative A are the same for alternative C. The cumulative effects on geology, soils, and vegetation would be similar to those described under alternative B. Under alternative C, a larger visitor services kiosk would be constructed and contribute to a long-term, adverse, localized cumulative effect on soils and vegetation. Alternative C would also contribute a long-term beneficial effect resulting from the removal of the comfort station and restoration of the site. When considered with past, present, and future project work, alternative C would result in beneficial and adverse, long-term, localized contributions to the overall cumulative effects on geology, soils, and vegetation. When considered as a whole, there are no meaningful additive effects that would constitute a significant cumulative effect to geology, soils, and vegetation.

CONCLUSION

Under alternative A, there would be no change from current conditions in the short term. The trail would continue to deteriorate which could lead to increased erosion and/or compaction. Soils and vegetation would continue to be impacted by trampling and visitor use. Alternatives B and C would result in short-term adverse effects on the soils and vegetation during project work, and long-term adverse effects from the placement of the new kiosk. Alternative C would impact a larger area from the construction of the new kiosk, but this would be offset by the removal of the comfort station and the restoration of soils and vegetation in that area. The adverse effects of both action alternatives would be localized, short and long term. There would be long-term beneficial effects to soils as a result of stabilizing the trail and trail structures. None of the alternatives, when considered with past, present, and reasonably foreseeable future actions, would result in significant cumulative effects.

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CONSULTATION AND COORDINATION

SCOPING

Public Scoping

On August 24, 2009, public scoping for the proposed project was initiated. A news release was distributed to 56 local and regional media outlets, and a letter was emailed or mailed to approximately 366 individuals, agencies, businesses, and interest groups, along with 24 tribal representatives or individuals affiliated with area tribes. Public scoping notices were published in several newspapers and internet sites, including the Orange Cove Area Chamber of Commerce website on August 26; the Visalia Times-Delta (website and newspaper) on August 26; the Kaweah Commonwealth Newspaper on August 28; the Fresno Bee website and newspaper on August 27; and the Valley Voice on August 27. In addition, on September 5 there was a link to scoping information on the MSN website through the local news link.

On September 1, 2009, 29 people attended an informational public meeting at Crystal Cave to discuss potential options and answer questions concerning the proposed project. The public was provided with a flier and information on how to provide input on the proposed project.

The 30-day public scoping period ended September 25, 2009. During that time, the parks received comments from seven different sources. Six of the comment letters received were from unaffiliated individuals, and one comment letter was submitted by the SPC. All commenters supported improvements to the Crystal Cave area and many provided recommendations for alternatives. Many of these recommendations have been incorporated into the alternatives section of this EA.

CONSULTATION AND PERMITTING REQUIREMENTS

On May 4, 2012, the NPS sent a letter to the CA SHPO to seek review and comment on the draft DOE for the *Crystal Cave Historic District*. On October 29, 2014, the NPS requested feedback from CA SHPO on the status of the DOE and the identified Area of Potential Effect (APE) for the proposed project. On January 2, 2015, the NPS received a response from the CA SHPO requesting clarification and additional information. Coordination with the CA SHPO is ongoing as of the date of preparation of this document.

Permitting Requirements

The NPS would consult with the Army Corps of Engineers to acquire a Clean Water Act Section 404 Nationwide permit and with the CA RWQCB for 401 notification or certification for the proposed work on the abutments of the Cascade Creek bridge, as appropriate.

AGENCIES, ORGANIZATIONS, AND INDIVIDUALS CONSULTED

The following agencies and organizations received a printed copy, CD, email, or written notification of the EA:

CONGRESSIONAL REPRESENTATIVES

- Senator Barbara Boxer, California
Office of Senator Boxer, Fresno – District Director Ameen Khan
- Senator Dianne Feinstein, California

Office of Senator Feinstein – Field Representative Sarah Moffat

- Representative Kevin McCarthy, 23rd District, California

Office of Representative McCarthy – Field Representative Keenan Hochschild

- Representative Tom McClintock, 4th District, California

Office of Congressman McClintock, California – District Director Rocky Deal

FEDERAL AGENCIES

U.S. Army Corps of Engineers

U.S. Bureau of Management, Field Manager- Bakersfield

U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento Fish & Wildlife Office

U.S. Geological Survey, Biological Resources Division, Western Ecological Research Center

U.S. Forest Service: Sequoia and Sierra National Forests

Federal Highway Administration

CALIFORNIA STATE GOVERNMENT REPRESENTATIVES

- Governor Jerry Brown, State of California

- State Senator Jean Fuller, California

- State Assemblyman Jim Patterson, California

Office of State Assemblyman Patterson – Alicia Wolfe, Field Representative

- State Assemblywoman Connie Conway, California

Office of State Assemblywoman Conway – Stuart Anderson, Field Representative

- State Senator Tom Berryhill, California

STATE, COUNTY, AND LOCAL AGENCIES

County Government Representatives

Fresno County Board of Supervisors

Fresno County Office of Tourism

Fresno County Sheriff's Office

Tulare County Board of Supervisors

Tulare County Civic Center

Tulare County Conservation District

Tulare County Environmental Health

Tulare County Sheriff's Office

Tulare County Resource Conservation District

City Government Representatives

City of Clovis, Business Manager

City of Dinuba, Deputy City Clerk

City of Fowler, City Clerk

City of Fresno, Communications Office

City of Hanford, City Manager

City of Kingsburg, City Clerk

City of Orange Cove, Mayor

City of Parlier, City Manager
City of Reedley, City Council
City of Reedley, Mayor
City of Sanger, Mayor
City of Selma, Executive Director
City of Tulare, City Manager
City of Visalia, Convention and Visitor Bureau
City of Visalia, Mayor
City of Visalia, Community Relations Manager
City of Visalia, Transit Analyst
City of Woodlake, City Council

STATE AGENCIES

California Travel and Tourism Commission
California Department of Pesticide Regulation
California Department of Toxic Substances Control
California Environmental Protection Agency
California Department of Forestry and Fire
California Air Resources Board
California Conservation Corps
California Department of Conservation
California Department of Transportation
California Department of Fish and Wildlife
California Farm Bureau Federation
California Geological Survey
California Highway Patrol
California Resources Agency
California State Board of Education
California State Clearinghouse
California State Office of Historic Preservation
California State University: Bakersfield, Fresno
California State Water Resources Control Board
Fresno Yosemite International Airport
Kern Valley Resource Conservation District
University of California, Merced

AMERICAN INDIAN TRIBES, ORGANIZATIONS, AND INDIVIDUALS

American Indian Council of Mariposa County
Benton Paiute Reservation
Big Pine Paiute Tribe of Owens Valley
Big Sandy Rancheria of Mono Indians
Bishop Indian Tribal Council
Bishop Paiute Tribe
Bridgeport Paiute Indian Colony
California Basket Weavers Association
California Native American Heritage Commission
Chemehuevi Reservation
Chumash Native Nation
Cold Springs Rancheria of Mono Indians

Dumna Wo-Wah Tribal Government
Dunlap Band of Mono Indians
Eshom Valley Band / Wuksache Indian Tribe
Fort Independence Paiute Indians
Fort Mojave Indian Tribe
Haslett Basin Traditional Committee
Kawaiisu Tribe
Kern River Paiute Council
Kern Valley Indian Community Tribal Council
Kings River Choinumni Farm Tribe
Kitanemuk & Yowlumne Tejon Indians
Kutzadika Indian Community Cultural Preserve
Lone Pine Paiute-Shoshone Reservation
Mono Lake Indian Community
Native American Heritage Commission
North Fork Mono Tribe
North Fork Rancheria of Mono Indians
Northern Band of Mono Yokuts
Ramona Band of Cahuilla Mission Indians
San Manuel Band of Mission Indians
Santa Rosa Rancheria
Serrano Nation of Mission Indians
Sierra Nevada Native American Coalition
Squaw Valley Tribe
Table Mountain Rancheria
Tejon Indian Tribe
The Choinumni Tribe of Yokuts
The Mono Nation
Traditional Choinumni Tribe
Tubatulabals of Kern Valley
Tule River Indian Tribe
Tule River Tribal Elders Committee
Wukchumni Tribal Council

NPS CONCESSIONERS

Delaware North Companies Parks and Resorts

LOCAL ORGANIZATIONS

Central California Hispanic Chamber of Commerce
Central Sierra Chamber of Commerce
College of the Sequoias
Dinuba Chamber of Commerce
Exeter Chamber of Commerce
Fresno Chamber of Commerce
Fresno Economic Development Corporation
Fresno Parks & Recreation
Greater Fresno Area Chamber of Commerce
Greater Reedley Chamber of Commerce
Kern Valley Resource Conservation District

Kingsburg Chamber of Commerce
Lindsay Chamber of Commerce
Lone Pine Chamber of Commerce
Porterville Chamber of Commerce
Sequoia Foothills Chamber of Commerce
Sequoia Natural History Association
Sequoia Parks Foundation
Sequoia Riverlands Trust
Sierra Business Council
Sierra Nevada Conservation
Tulare Kings Hispanic Chamber of Commerce
Visalia Chamber of Commerce

OTHER SPECIAL INTEREST, BUSINESSES, AND PRIVATE ORGANIZATIONS

Backcountry Horsemen of California
Californians for Western Wilderness
California Preservation Foundation
California Travel and Tourism Commission
Center for Biological Diversity, California and Pacific Office
Fresno Audubon Society
Friends of the Earth
High Sierra Hiker's Association
Mineral King District Association
Mineral King Preservation Society
National Audubon Society; Tulare Audubon Society
National Parks and Conservation Association
The Nature Conservancy, California Field Office
Pacific Crest Trail Association
Public Employees for Environmental Responsibility
Sierra Club - National Headquarters; Tehipite Chapter; Kern-Kaweah Chapter; Sacramento Field Office
Student Conservation Association Northwest Office
The Wilderness Society
Wilderness Land Trust
Wilderness Watch
The Wildlife Society, San Joaquin Valley Chapter
Wilsonia Historic District Trust

AREA LIBRARIES AND UNIVERSITIES

California State University: Bakersfield, Fresno
Clovis Regional Library
Fresno County Libraries:
 Central
 Fowler
 Kingsburg
 Orange Cove
 Parlier
 Reedley
 Sanger
 Selma

Sunnyside
 Kern County Library, Bakersfield
 Porterville Public Library
 Tulare County Libraries:
 Lindsay
 Dinuba
 Three Rivers
 Visalia
 University of California: Merced

UNAFFILIATED INDIVIDUALS AND BUSINESSES

List is available upon request.

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REFERENCES

LAWS CITED OR REVIEWED

- The Antiquities Act of 1906 (June 8, 1906)*. 16 USC §§ 431-433.
- Archaeological Resources Protection Act of 1979*, as amended. 16 USC 470aa–mm; PL 96-95. October 1, 1979.
- Architectural Barriers Act of 1968*. 42 USC 4151 et seq. Implementing Regulation: 41 CFR Subpart 101-19.6.
- Clean Air Act of 1963*, as amended. 42 USC 7401 et seq.; Pub. L. 88-206; 77 Stat. 392.
- Clean Water Act of 1972*, as amended. 33 USC 1251 et seq.; Pub. L. 92-500; 86 Stat. L. 816. October 18, 1972.
- Council on Environmental Quality (CEQ)*. 40 CFR 1500 et seq.
- Endangered Species Act of 1973 (ESA)*, as amended. 16 USC 1531–1544; Pub. L. 93-205; 87 Stat. L. 884. Approved December 28, 1973.
- Executive Order 11988, Floodplain Management*. 42 FR 26951. May 24, 1977.
- Executive Order 11990, Protection of Wetlands*. 42 FR 26961. May 24, 1977.
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. 59 FR 7629. February 11, 1994.
- Federal Noxious Weed Act*. 93-629 (January 3, 1975) 7 USC 2801 et seq.
- Federal Water Pollution Control Act*, as amended November 27, 2002. 33 USC 1251 et. Seq. (PL 107-303).
- Fish and Wildlife Coordination Act (March 10, 1934)*. 16 USC 661-667e.
- General Authorities Act*. 16 USC 1a-1; Pub. L. 91-383; 84 Stat. L. 825. August 18, 1970.
- National Environmental Policy Act of 1969 (NEPA)*, as amended. 42 USC 4321 et seq.; Pub. L. 91-190, Sec. 2; 83 Stat. L. 852. Jan. 1, 1970.
- National Historic Preservation Act of 1966 (NHPA)*, as amended. 16 USC 470 et seq.; Pub. L. 89-665. October 15, 1966.
- National Park Service Organic Act*. 16 USC 1 et seq. August. 25, 1916.
- National Register of Historic Places*. 36 CFR 60. July 1, 2004.
- Native American Graves Protection and Repatriation Act of 1990*. 25 USC 3001–3013; Pub. L. 101-601; 104 Stat. L. 3048. November 16, 1990.
- Omnibus Public Land Management Act of 2009*. H.R. 146. March 30, 2009. 16 USC 1901-1904.
- Protection of Historic Properties, Section 106 Procedures*. 36 CFR 800. July 1, 2003.
- Redwood Act*. 16 USC 1a-1; Pub. L. 95-250; 92 Stat. L. 163. March 27, 1978.
- Rehabilitation Act of 1973*, as amended, section 504. 29 USC 794; Pub. L. 93-112.
- Secretarial Order 3175: Identification, Conservation, and Protection of Indian Trust Assets*. November 8, 1993.

SELECTED BIBLIOGRAPHY

- Carpenter, Scott L. Preliminary Archeological Survey of Crystal Cave. Sequoia National Park, California. Big Sky Montana: InteResources Planning, November 1996.
- Gerlach, J.D., Jr., P.E. Moore, D.M. Rubin, B. Johnson, G. Roy, P. Whitmarsh, D.M. Graber, and J.E. Keeley. 2001. Exotic species threat assessment and management prioritization for Sequoia-Kings Canyon and Yosemite National Parks. Final Report submitted to the NPS.
- Hickman, J.E., ed. 1993. The Jepson Manual - Higher Plants of California. University of California Press. Berkeley and Los Angeles, CA.
- U.S. Department of the Interior, National Park Service (NPS).
2015. *Crystal Cave Entrance Rockfall Risk Assessment, Sequoia National Park*, prepared by Eric Bilderback, PhD, Geomorphologist. Geologic Features and System Branch, Geologic Resources Division, National Park Service- Natural Resources Stewardship and Science.
2012. *Draft Determination of Eligibility for the Crystal Cave Historic District, including the Crystal Cave Road, Parking Lot, Access Trail, Appurtenant Structures, Spiderweb Gate, and Cave Trail System*. Sequoia and Kings Canyon National Parks.
2010. *Crystal Cave Entrance Trail Project Plant Survey*, narrative by Erik Frenzel, photos by Corie Cann. Sequoia and Kings Canyon National Parks. May 20, 2010.
2008. *Climate-Friendly Parks: Sequoia and Kings Canyon National Parks Action Plan*. National Park Service. Available at Sequoia and Kings Canyon National Parks.
2007. *Final General Management Plan and Comprehensive River Management Plan / Final Environmental Impact Statement, Sequoia and Kings Canyon National Parks*.
2006. *Management Policies 2006*. Acquired online at:
<http://www.nps.gov/policy/mp/policies.html>
2005. *Museum Handbook*. National Park Service Museum Management Program. Available online at: <http://www.nps.gov/history/museum/publications/handbook.html>
2004. *Natural Resource Management Reference Manual #77*. In progress.
2004. *Director's Order 83: Public Health*. October 21, 2004.
2003. "National Park Service Cultural Landscapes Inventory – Sequoia and Kings Canyon National Parks, Level I Reports." Pacific Great Basin Support Office, Oakland, CA.
2003. *Interim Technical Guidance on Assessing Impacts and Impairment to Natural Resources*. Natural Resource Program Center, National Park Service. April 2003.
2001. *Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making*. December 8, 2001.
1998. *Director's Order 28: Cultural Resource Management*. June 11, 1998.

1991. *Director's Order 77- Natural Resource Management Natural Resource Management Guidelines.*

1989. Sequoia and Kings Canyon Architectural Character Guidelines. January 1989.

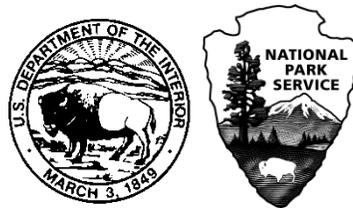
U.S. Department of the Interior, Fish and Wildlife Service, (FWS).

2015. List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project. Consultation Code: 08ESMF00-2015-SLI-0937. Current as of: July 24, 2015. Official Species List generated on July 24, 2015.

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

2014. *Technical Memorandum: Rockfall Mitigation Alternatives along Crystal Cave Trail, Sequoia and Kings Canyon National Parks*, by Dominic Monarco and Khamis Haramy. Prepared in cooperation with the National Park Service. December 15, 2014.

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

NPS SEKI (November 2015)