National Park Service
U.S. Department of the Interior

Grand Canyon National Park
Arizona

# Narrowband/Digital Radio System Conversion Environmental Assessment

## May 2007

NPS Photo by Ken Phillips

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# Environmental Assessment

# Narrowband/Digital Radio System Conversion

# Grand Canyon

**National Park • Arizona**

## SUMMARY

The National Park Service (NPS) is proposing to convert all radio communications at Grand Canyon National Park (GRCA) from wideband/analog to narrowband/digital technology to be in compliance with federal regulations and policies. The park's radio system is a critical component necessary for managing and protecting park resources, in providing for public and employee health and safety, and in accomplishing all park management activities. This Environmental Assessment (EA) analyzes the impacts of two alternatives: 1) no action and 2) construction of new radio repeaters, antennae, and shelters with radio repeater equipment at four primary sites (Grand Canyon Village Emergency Services Building, Hopi Point Fire Tower, Desert View Ranger Station, and CC Hill) and one secondary site (Mt. Emma), as well as an optional secondary site (Kanabownitz Fire Tower). Sites outside of the park include a primary site at Paria (Glen Canyon National Recreation Area), and two secondary sites at VT Ridge (Kaibab National Forest), and O'Leary Peak Fire Tower (Coconino National Forest). For the sites outside the park, environmental compliance requirements are being discussed with the respective agencies and will be considered separately. Impacts to historic structures, cultural landscapes, soils, vegetation/wildlife, special status species, visual quality, park operations, and wilderness are described in this document.

## PUBLIC COMMENT

If you wish to comment on the environmental assessment, we encourage you to post your comments online at http://parkplanning.nps.gov/grca by selecting "Narrowband/Digital Radio System Conversion" from the list of projects, and then scrolling to "Open for Public Comments." Copies of the environmental assessment and related documents may also be obtained online at the above address. Alternatively, you may mail comments to or request copies of the documents from the Superintendent at the address below. This environmental assessment will be on public review for 30 days.

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

Steve Martin, Superintendent
Grand Canyon National Park
ATTN: Radio Comments
P.O. Box 129 (#1 Village Loop)
Grand Canyon, AZ 86023

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# PURPOSE AND NEED

## PURPOSE

The primary purpose of taking action is to comply with the Omnibus Budget Reconciliation Act of 1993, from which the National Telecommunications and Information Administration (NTIA) and the US Department of Commerce have directed conversion of all civilian federal radio users to narrowband technology. Transition to narrowband technology is intended to create more radio spectrum available to federal users so that public safety communication will meet emerging national privacy and security requirements. A secondary purpose is to improve the radio communication capabilities in the park that are necessary to provide for public and employee health and safety, and to provide for almost all park management activities in the field.

Project objectives include: (1) comply with federal regulations that require all federal agencies, including the National Park Service, to convert to narrowband radio communications; (2) provide for improved park radio communications and coverage, to increase public and employee safety and the ability of the park to safely and effectively conduct park management activities; and (3) to improve communications interoperability and services with other agencies.

## NEED

The park's radio system is the key to ensuring the communication that allows the park to respond to public and employee health and safety needs, and to conduct park management activities in developed as well as remote backcountry areas. The park's current radio system provides wideband/analog radio coverage for the majority of the most-visited areas of the park; however, there are currently large areas within the park where radio communications are unreliable or impossible. In addition, the current equipment is also aging and becoming obsolete, and in increasing need of repair or replacement (e.g., several of the towers are showing signs of rust). The current system uses the full spectrum of wideband analog frequencies available to the NPS; therefore, additional frequency is not available for homeland security or other federal agencies. Wideband analog is also not compatible with agencies which have already converted to narrowband/digital technology, as required by the law and regulations cited above.

### SCOPING

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in an Environmental Assessment (EA). Grand Canyon National Park conducted both internal scoping with appropriate NPS staff and external scoping with the public and interested and affected groups and agencies.

Internal scoping defined the purpose and need, identified potential actions to address the need, determined what the likely issues and impact topics would be, and identified the relationship, if any, of the proposed action to other planning efforts at the park.

Both a news release and a public scoping letter describing the proposed action were issued on September 20, 2006 (see appendix A, for the text of both). The Arizona State Historic Preservation Office (SHPO) was also notified by letter on September 18, 2006 of the proposed project and that an EA would be prepared and sent to them for review. The following American Indian tribes traditionally associated with the lands of Grand Canyon National Park and others with whom park staff regularly consults were also apprised by letter of the proposed action on September 18, 2006.

**Table 1, American Indian Groups Notified by Letter of Proposed Action During Scoping**

| | |
|---|---|
| Havasupai Tribe | Hopi Tribe |
| Hualapai Tribe | Navajo Nation |
| Paiute Indian Tribe of Utah | Yavapai-Apache Nation |
| Pueblo of Acoma | Moapa Band of Paiute Indians |
| Las Vegas Paiute Tribe | San Juan Southern Paiute Tribe |
| Kaibab Band of Paiute Indians | White Mountain Apache Tribe |
| Pueblo of Zuni | |

Comments were solicited during public scoping until October 21, 2006. Six letters were received during the public scoping process resulting in seven distinct comments. Table 2 summarizes the substantive scoping comments.

**Table 2, Summary of Public Comments Received During Scoping**

| |
|---|
| US Fish and Wildlife Service recommended implementing conservation measures for California condor and Mexican spotted owl. |
| Interested in having equipment at Desert View site (tower/shed) for commercial/cellular uses. This would also require additional microwave dishes (2) at Hopi Point. |
| Interested in having equipment at Paria site (tower/shed) for commercial/cellular uses. |
| How will the limited space issue at Hopi Point be addressed in EA? The Park's helicopter contractor supports upgrades to the system, but wants to know what allowances will be made for them in the new facility. The link they have now is critical to aviation safety for them. |
| The Sheriff's Department would like to be considered as a potential future user at the communication site at Desert View with the goal of improved radio reception for the department's officers for calls for service, search and rescue, and backup response to officers of the NPS. |
| The Arizona Department of Public Safety would like to be considered as a continued user at the communication site at Desert View to enhance radio coverage for officers of all agencies responding to calls for service, search and rescue and backup response to officers of the NPS. |
| The Navajo Nation Department of Resource Enforcement would like to be considered as a potential future user at the communication site at Desert View. |

After public scoping was closed the proposed action was re-examined to determine if additional inter-agency equipment could be added to the tower(s) without compromising NPS equipment. Additionally, the idea of allowing additional commercial users to place equipment on the tower(s) was considered and eventually eliminated. This is explained in greater detail under the section describing alternatives considered but eliminated from further analysis. Additionally, mitigation measures for species of concern have been included as recommended by the U.S. Fish and Wildlife Service (USFWS).

After considering the space issue with existing and proposed communications equipment at the Hopi Point Fire Tower site, the NPS decided not to attempt to consolidate all equipment at the site onto one NPS tower and shelter, but to require no-cost permits to allow the current non-NPS equipment to remain in place. The sizes of the tower and shelter needed to accommodate a majority of the current non-NPS equipment in addition to the proposed NPS equipment would have been much too large for the site. It is believed that the proposed permit option will best meet the needs of the commenter and all other users of the site, while keeping impacts at acceptable levels.

### RELATIONSHIP OF THE PROPOSED ACTION TO PREVIOUS PLANNING EFFORTS

Converting the park's radio system from wideband/analog to narrowband/digital is consistent with the objectives of Grand Canyon National Park's *General Management Plan* (1995), NPS Management Policies regarding telecommunication sites (NPS 2006) and the Telecommunications Act of 1996.

The General Management Plan (GMP) directs the NPS, among other things, to develop management strategies that enhance the visitor experience while minimizing crowding, conflicts, and resource impacts (NPS 1995). The GMP specifically states, "the locations of most management support operations for both the Park Service and its cooperators will change, and in nearly every case additional space will be provided. When determining specific locations for management support functions, the following will be considered: health and safety needs, visitor experience, the square footage of buildings and disturbed lands, what functions need to be near each other for efficient operations, and future needs. Management support functions remaining in the park will be accommodated by adaptively reusing existing structures and using previously disturbed lands for new structures wherever possible" (NPS 1995:42). In undeveloped areas, the GMP states that administrative activities, including research, search-and-rescue, emergencies, and fire management, should be conducted in a manner that is consistent with NPS policies regarding wilderness management and the minimum tool analysis in recommended wilderness areas (NPS 1995:17).

*National Park Service Management Policies 2006* is the guiding document for management of all national parks within the national park system. It is the basic NPS Servicewide policy document and supersedes the 2001 edition.

According to NPS Management Policies Section 8.6.4.3, requests to site non-NPS telecommunications facilities on NPS land will be considered in accordance with the *Telecommunications Act of 1996* (47 USC 332 note), which authorizes but does not mandate that proposals be accepted. The policy also includes guidance to avoid or minimize potential impacts of telecommunications facilities.

While it is important to note that Section 8.6.4.3 of the NPS Management Policies applies only to non-NPS telecommunications facilities, the Park is endeavoring as much as possible to be consistent with that section in siting NPS telecommunications facilities to accomplish park management purposes.

There is no wilderness management plan for the park, but most of the recommended wilderness in the park is managed in accordance with the park's 1988 Backcountry Management Plan (BCMP). The goals for backcountry management in that plan include *"to provide and promote a variety of backcountry recreational opportunities for visitors consistent with resource protection and visitor safety which is consistent with applicable legislation and policies."* The Mt. Emma site is in the Toroweap Valley use area (NM9), which is classified in the Threshold management zone under the 1988 BCMP. The management objective for structures allowed in the Threshold zone in the 1988 BCMP is "*Toilets, pack bars, ranger station only at Hermit Creek. Fire grates permitted at designated rim areas only. Temporary scientific structures and emergency communication facilities which are not normally visible and which do not leave permanent impacts."* However, almost all visitation to the use area occurs along the primitive dirt road access to the Tuweep Ranger Station, the primitive campground and overlook at Toroweap Overlook, and the dirt road to Lava Falls Overlook. The Mt. Emma site receives little or no visitation, and is about five miles from the nearest road.

## IMPACT TOPICS

Issues and concerns affecting or affected by the proposed action were identified by specialists in the NPS. Impact topics are the resources of concern that could be affected by the range of alternatives. Specific impact topics were developed to ensure that alternatives were compared on the basis of the most relevant

topics. The following impact topics were identified on the basis of federal laws, regulations, orders, and NPS Management Policies, 2006. A brief rationale for the selection of each impact topic is given below, as well as the rationale for dismissing specific topics from further consideration.

## CULTURAL RESOURCES

The NPS is mandated to preserve and protect its cultural resources through the Organic Act of August 25, 1916, and through specific legislation such as the Antiquities Act of 1906, NEPA of 1969 (as amended), National Historic Preservation Act of 1966, NPS Management Policies, Cultural Resource Management Guideline (Director's Order-28), and the Advisory Council on Historic Preservation's implementing regulations regarding "Protection of Historic Properties" (36 CFR §800). Other relevant policy directives and legislation are detailed in Director's Order-28.

### Historic Structures

One site (Kanabownitz Fire Tower) proposed for the in-kind replacement of radio equipment is likely to be eligible for the National Register of Historic Places. The proposed action would remove existing radio equipment from two historic buildings (Desert View Watchtower and Yavapai Observation Station) that are part of the park's current radio system network. Additionally, the proposed action would remove some equipment from the Hopi Fire Tower and possibly the Park Headquarters building. Therefore, this topic will be analyzed in this document.

### Cultural Landscapes

As defined in the NPS *Cultural Resource Management Guideline* (Director's Order-28), cultural landscapes are settings that humans have created in the natural world. The proposed tower at CC Hill would lie just north of the North Rim Bright Angel Peninsula Cultural Landscape. The existing and proposed site at Desert View Ranger Station could affect the Desert View Cultural Landscape. Additionally, the existing and proposed site at Hopi Fire Tower could affect the West Rim Drive Cultural Landscape and the Grand Canyon Village National Historic Landmark District. The radio tower at the Grand Canyon Village EMS building site could also affect the Grand Canyon Village National Historic Landmark District. Therefore, this topic will be analyzed in this document.

## SOILS

The proposed action would result in surface disturbance through digging holes for concrete pads to construct self-supporting towers (most often 10 ft x 10 ft x 4 ft). Building a cement pad and trenching utilities from the shed to the tower could potentially mix soil profiles or remove soil from the site and could potentially cause soil contamination from construction equipment. Therefore, this topic will be analyzed in this document.

## VEGETATION AND WILDLIFE

Grand Canyon National Park is extremely diverse in terms of topography and vegetation and provides habitat for a wide variety of wildlife species. The potential for impacts to occur to vegetation and wildlife populations are minimized by the fact that the majority of the project areas are existing disturbed sites where radio repeaters/antennae or other structures already exist. Disturbance at each of the six sites is anticipated to encompass an area of approximately 100ft X 100ft, which could introduce or spread noxious weeds and/or exotic vegetation. Migratory and resident birds also have the potential to collide with the towers/antennae. Helicopter use proposed for transport of materials needed to construct the Mt. Emma site is one method that could disrupt wildlife populations due to the higher than normal noise generated in the

immediate vicinity of the tower location, or near the flight path. Minor vegetation trimming would also be needed at the Mt. Emma site to maintain the ability to safely land a helicopter at that site for maintenance of the radio repeater equipment. For these reasons, this topic will be analyzed in this document.

## SPECIAL STATUS SPECIES

Section 7 of the Endangered Species Act of 1973, as amended, requires all federal agencies to consult with the USFWS to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats. NPS staff and the Arizona Heritage Database were consulted for a listing of federally and state listed special status species that could be affected by proposed construction and operation of the radio repeaters at the sites within the park. Only two sensitive avian species have potential to be affected by the proposed radio towers and antennae: an experimental/nonessential population of California condor (*Gymnogyps californianus*) and peregrine falcon (*Falco peregrinus*) a species that is no longer federally listed but is considered sensitive by the park.

There are no protected activity centers for Mexican spotted owls (*Strix occidentalis lucida*) within one mile of the current or proposed radio repeater sites within the park. The USFWS commented during public scoping about the potential to affect Mexican spotted owls at the O'Leary Peak Fire Tower. O'Leary Peak Fire Tower is included in a communication plan implemented by the Coconino National Forest (CNF 2001) and outside the scope of this EA. Radio Equipment at the O'Leary Fire Tower would only involve "in-kind" replacement of existing equipment. NPS staff will coordinate with Coconino National Forest and USFWS staff to assure that impacts to MSO are avoided by implementing any required mitigation measures according to the communication plan.

For these reasons, this topic will be analyzed in this document.

## VISUAL QUALITY

Vulnerability to visual impacts is a function of a site's visibility, the size of the development, and the site's capacity to absorb change. Placement of radio infrastructure could affect the viewshed for park visitors. Although it is preferable to site the radio infrastructure in places where it is less visible, the technical requirements of the system (i.e., optimum radio reception) may require the placement of equipment in areas that may have a greater impact on the viewshed. Therefore, this topic will be analyzed.

## PARK OPERATIONS

The superintendent of Grand Canyon National Park is responsible for managing the park, its staff and residents, all of its programs, and its relations with persons, agencies, and organizations interested in the park. Park staff provides the full scope of functions and activities to accomplish management objectives and meet requirements in law enforcement, emergency services, public health and safety, science, resource protection and management, visitor services, interpretation and education, community services, utilities, housing, fee collection, and management support. The park's radio system is a critical component necessary for managing and protecting park resources, in providing for public and employee health and safety, and in accomplishing all park management activities. Therefore, this topic will be analyzed in this document.

### WILDERNESS

More than 90 percent of Grand Canyon National Park has been recommended for wilderness designation. NPS policies require that areas recommended for wilderness designation be managed essentially the same as designated wilderness, including conducting a minimum requirements analysis for all activities that might impact wilderness character, resources, or values. One of the existing and proposed secondary sites (Mt. Emma) is within recommended park wilderness, and one other proposed optional secondary site (Kanabownitz) and one proposed primary site (CC Hill) are adjacent to recommended wilderness. Structures and installations, motorized equipment, and landing of aircraft are all prohibited uses according to the Wilderness Act, except as they are necessary to meet minimum requirements for the administration of the area as wilderness. A Minimum Requirements Analysis has been prepared for this project (see Appendix B) consistent with NPS wilderness management policies. Therefore, this topic will be analyzed in this document.

## IMPACT TOPICS DISMISSED FROM FURTHER CONSIDERATION

The rationale for dismissing specific topics from further consideration is given below. These topics will not be carried forward through the analysis.

### ENVIRONMENTAL JUSTICE

Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The proposed action would affect everyone equally and would not have disproportionate health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency's Environmental Justice Guidance (1998).

### CULTURAL RESOURCES

#### Archeological Resources

Site files for GRCA archeological resources were accessed to determine the presence of cultural resources near the proposed radio repeater sites and also to determine if previous archeological resource surveys had been completed within the area of potential effect. Comprehensive archeological resources investigations have been completed at all the proposed radio repeater locations within the areas of potential effect. The closest archeological site is on CC Hill, approximately 100 yards northeast of the proposed radio repeater location and would not be affected by the proposed undertaking. Based on previous survey work and the site file search, no known archeological resource sites would be affected by the proposed undertaking. Standard mitigation has been added to ensure that impacts to archeological resources do not exceed a negligible level.

#### Ethnographic Resources

The lands of Grand Canyon National Park are traditionally affiliated with several tribes of the southwest—the Havasupai, Hopi, Hualapai, White Mountain Apache, Pueblo of Acoma, Pueblo of Zuni, Yavapai Apache, Las Vegas Paiute Tribe, Kaibab Band of Paiute Indians, San Juan Southern Paiute Tribe, Navajo Nation, Paiute Indian Tribe of Utah, and Moapa Band of Paiute Indians. Letters were sent to the tribes during the public scoping process. None of the affiliated tribes responded with concerns for ethnographic resources that could be affected by the proposed undertaking. No ethnographic resources (e.g., plant gathering areas or ceremonial sites) are known to occur in either the project area or its general

vicinity. If ethnographic resources are identified during tribal review, consultation with appropriate tribal representatives would be conducted and mitigation measures developed. Standard mitigation has been added to ensure that impacts to ethnographic resources do not exceed a negligible level.

### Museum Collections

No objects would be collected as a result of this project.

## Air Quality

Project construction would result in an increase in fugitive dust from soil exposure and disturbance. However, this effect would only occur during the construction period and would be localized and negligible. The proposed activities would also increase vehicle emissions from operating construction vehicles and hauling materials. However, the increased emissions would be localized and would not have a measurable effect on regional or local pollutant levels. Best management practices (BMPs) would be implemented (e.g., not allowing construction equipment to idle for more than 5 minutes). Standard mitigation has been added to ensure that impacts to air quality do not exceed a negligible level.

## Water Quality

The NPS seeks to restore, maintain, and enhance the quality of all surface and ground waters in the park, consistent with the Federal Water Pollution Control Act, as amended, and other applicable federal, state, and local laws and regulations. None of the proposed radio repeater sites are located within a 100-year floodplain, nor are they within or near any washes, wetlands, major drainages, or other water sources.

## Floodplains

Executive Order 11988 (“Floodplain Management”) requires an examination of impacts to floodplains. The 2006 NPS Management Policies, DO-12, and the 1995 Final GMP provide guidelines on developments proposed in floodplains. None of the proposed radio repeater sites are located within a 100-year floodplain, nor are they within or near any washes, wetlands, major drainages, or other water sources.

## Wetlands

Executive Order 11990 (“Protection of Wetlands”) requires federal agencies to avoid, where possible, impacts on wetlands. Proposed actions that have the potential to adversely impact wetlands must be addressed in a Statement of Findings. Soils, hydrology, and vegetation typical of a wetland environment classify jurisdictional wetlands. No jurisdictional wetlands exist at or near the proposed radio repeater sites.

## Prime and Unique Farmland

In August 1980, the Council on Environmental Quality (CEQ) directed that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) as prime or unique. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. According to NRCS, none of the soils in the project area are classified as prime and unique farmlands.

## SOCIOECONOMIC VALUES

The local economy and most businesses of the communities surrounding the park are based on construction, recreation, transportation, tourist sales, services, and educational research; the regional economy is strongly influenced by tourist activity. There may be short-term, negligible benefits to the local and regional economy resulting from construction-related expenditures and employment. Park businesses would not suffer any appreciable adverse short or long-term economic impacts from any of the alternatives, and no businesses would be closed for construction purposes. None of the proposed radio repeaters would change local or regional land use.

## VISITOR USE AND EXPERIENCE

Visitor use and experience has been eliminated as an overall topic carried through the analysis because the proposed radio equipment does not directly or indirectly affect the way visitors use or experience the park. However, description of impacts on park operations, wilderness, and visual quality contain discussion of the aspects of those topics that relate to visitor use and experience, which indicate that most impacts of the proposed action on visitors would be beneficial, and any adverse impacts would be negligible in most cases (to localized minor impacts in wilderness).

## SOUNDSCAPE

The NPS is mandated by NPS Management Policies (2006) to articulate their operational policies that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources. Natural sounds are intrinsic elements of the environment that are often associated with parks and park purposes. They are inherent components of “the scenery and the natural and historic objects and the wildlife” protected by the Organic Act. Natural sounds may provide valuable indicators of the health of various ecosystems. Intrusive sounds are of concern because they sometimes impede the ability of the NPS to accomplish their mission.

Noise impacts from this project would only occur during construction. After construction is completed, noise level impacts would return to their natural condition. All construction would occur during daylight hours, when for most sites roads and the associated traffic already impact the area. Therefore, the proposed radio repeaters would have no more than a negligible effect soundscape.

## LIGHTSCAPE

The 2006 Management Policies guide the NPS in cooperating with park neighbors and local agencies to minimize the intrusion of artificial light into the night scene. Elements such as the stars, planets, and moon that are visible during clear nights influence many species, including humans. In natural areas, artificial outdoor lighting is limited to basic safety requirements and is shielded when possible. Lights at the sites would only be used when someone was at this site at night. This is anticipated to occur on a rare to infrequent basis, and therefore, the proposed radio repeaters would have no more than a negligible effect the lightscape.

# ALTERNATIVES CONSIDERED

## NO-ACTION ALTERNATIVE: CURRENT SITUATION

Grand Canyon National Park currently has six repeater sites located on the North and South Rims (Figure 1) within the park and two sites outside the park boundary (VT Ridge and O'Leary Peak). The site at Yavapai Observation Station, however, is currently out-of-service. Table 3 provides information on the current system used in the park. These repeaters provide wideband VHF communication for the four major operational networks (Law Enforcement, Fire, Medical, and Administrative). The current system provides radio coverage for the majority of the most-visited areas in the park; however, large portions of remote, backcountry and inner-canyon areas do not have radio coverage.

An additional tactical network provides incident-response communications for the system. One of the current sites (Hopi Point) supports all four operational networks and the tactical network. All other sites provide a single repeater to expand coverage for one of the four operational networks. The Dispatch/Central Communications Site is at Park Headquarters while several control stations (mobile subscribers) are located throughout the park at access gates and ranger stations. No data connectivity currently exists between any of the sites and the Dispatch Facility. One of the sites (Mt. Emma) is within recommended park wilderness and another (Kanabownitz Fire Tower) is adjacent to recommended wilderness. Two sites (Desert View Watchtower and Yavapai Observation Station) are National Historic Landmarks and two sites (Kanabownitz Fire Tower and Hopi Fire Tower) are likely to be eligible for listing on the National Register of Historic Places.

The current system does not meet the mandate to convert to narrowband technology and uses the full spectrum of wideband analog frequencies available to the NPS from the NTIA. Additional frequency is not available for homeland security or other federal agencies. Additionally, many other agencies have converted to digital technology. The current technology employed by the NPS (wideband analog) is not compatible with the agencies that have converted to digital technology, so as more agencies convert to narrowband technology the park will lose inter-agency communication. Thus, the current radio system is becoming obsolete and is in increasing need of repair or replacement (e.g., several of the towers are showing signs of rust).

## PREFERRED ALTERNATIVE

Four primary sites would accomplish most of the needed communication improvements. Three primary sites would be on the park's South Rim (Grand Canyon Village Emergency Services (EMS) Building, Hopi Point Fire Tower, and Desert View Ranger Station) and one would be on the North Rim (CC Hill near the North Kaibab Trailhead). An additional optional primary site (Paria) would be considered in Glen Canyon National Recreation Area on top of the Vermillion Cliffs near Lees Ferry.

Three secondary sites would provide important additional radio coverage to areas of the park that the primary sites cannot reach. One would be inside the park at Mt. Emma west of Tuweep. The other two secondary sites would be outside park boundaries, one in Kaibab National Forest north of the park (VT Ridge), and one in Coconino National Forest south of the park (O'Leary Peak Fire Tower). Another optional secondary site under consideration would be at Kanabownitz Fire Tower in the park on the North Rim, if needed for adequate radio coverage. Figure 2 shows the location of the proposed primary and secondary sites. Appendix C provides maps of the proposed radio repeaters within the Park along with photographs of the existing sites.

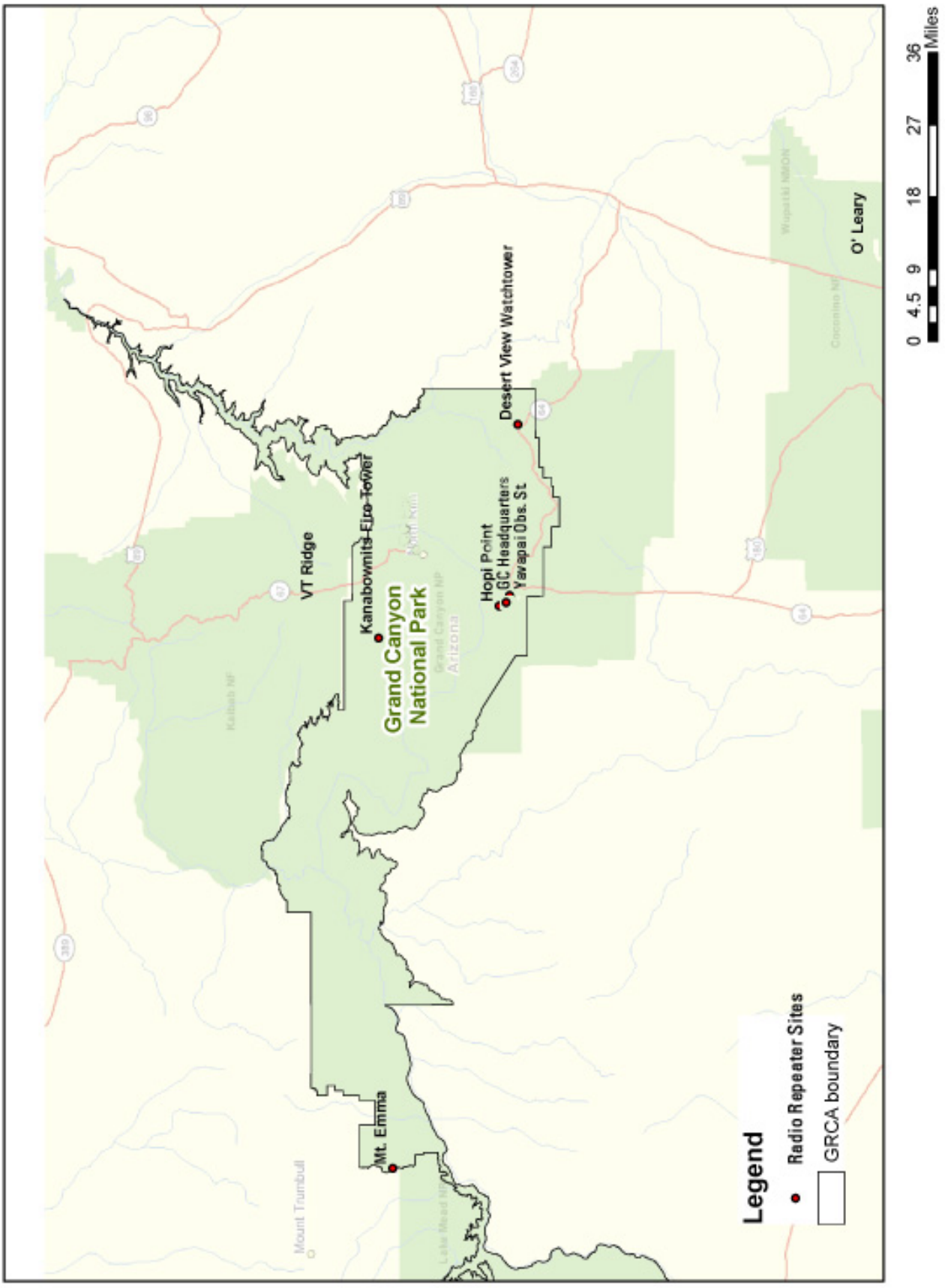


**Figure 1, Existing Radio Repeater Locations**

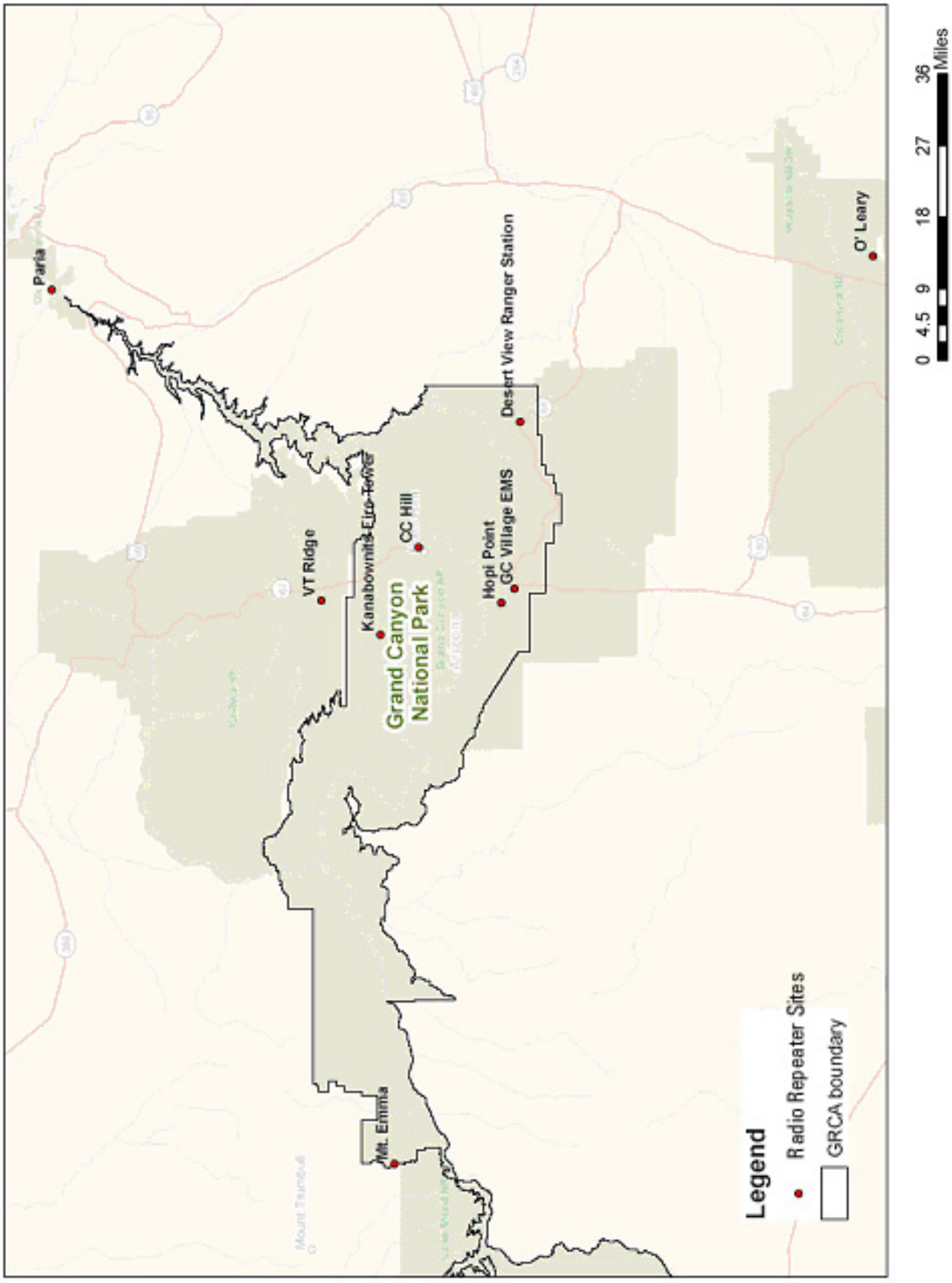


**Figure 2, Proposed Radio Repeater Locations**

**Table 3, Comparison of Current Situation (No Action Alternative) and the Preferred Alternative**

| Sites | | Location | Shelter | Tower and Antennae | Power |
|---|---|---|---|---|---|
| Grand Canyon Village Primary site (GRCA) | No Action Alternative | At Park Headquarters Building. | Equipment and Dispatch Center on top and inside of headquarters building. | No tower, multiple antennae on roof of NPS headquarters building. | Commercial at building. |
| | | Yavapai Observation Station | No shelter. | No tower, 2 antennae attached to top of building. Currently damaged by lightning and out of service. | Commercial at building. |
| | Preferred Alternative | Move all equipment and Dispatch Center to New Emergency Services (EMS) Building at Clinic. | If possible, equipment and Dispatch Center will be inside new EMS building. Otherwise, a new 12ft X 16.5ft X 10.5ft modular shelter will be bolted to a concrete pad next to EMS Building, plus Dispatch Center inside EMS building. | One 60 ft self-supporting lattice tower with concrete anchor (10ft X 10ft, 4 ft deep). Approx. current number of VHF and UHF antennae; however, up to three 4 ft diameter microwave dishes added. The base of the tower would be fenced with 6 ft chain link. | Commercial at EMS building. |
| Hopi Point Fire Tower Primary site (GRCA) | No Action Alternative | Shelter and 2 poles near Fire Tower (also inside fire tower) for NPS equipment. Additional 3 poles and building with non-NPS equipment. | All NPS equipment in small shed (approx. 8ft X 8ft X 8ft). Non-NPS radio equipment in small cabin (approx. 14ft X 14ft X 12 ft). | Two wooden NPS poles, multiple NPS antennae. Three connected wooden non-NPS poles with numerous non-NPS antennae. | Commercial at nearby pole. |
| | Preferred Alternative | Consolidate all NPS equipment in new NPS shelter and tower adjacent to current NPS shelter and poles. Non-NPS equipment will remain in place. | New 12ft X 16.5ft X 10.5ft modular shelter on concrete pad adjacent to current NPS shed. | One 60 ft self-supporting lattice tower with concrete anchor (10ft X 10ft, 4 ft deep). The base of the tower would be fenced with 6 ft chain link. Approx. current number of VHF and UHF NPS antennae, including up to three 4 ft diameter microwave dishes. Non-NPS equipment would remain in place, but no-cost permits would be required. | Commercial at nearby pole. |
| Desert View Primary site (GRCA) | No Action Alternative | On top of Desert View Watchtower. | No shelter. Box inside Desert View Watchtower. | One 40 ft tower attached to the Desert View Ranger Station with DPS antennae. Two NPS antennae attached to top of Watchtower. | Commercial at Watchtower. |

| Sites | | Location | Shelter | Tower and Antennae | Power |
|---|---|---|---|---|---|
| | Preferred Alternative | Move all equipment to Desert View Ranger Station in residential area. | New 12ft X 16.5ft X 10.5ft modular shelter on concrete pad adjacent to ranger station. | One 60 ft self-supporting lattice tower with concrete anchor (10ft X 10ft, 4 ft deep). The base of the tower would be fenced with 6 ft chain link. Approx. current number of VHF antennae, although one or two microwave dishes would be added. Also, space on tower available to accommodate equipment for DPS, Coconino County Sheriff's Office, and Navajo Nat. Dept. of Resource Enforcement | Commercial at ranger station. |
| CC Hill Primary site (GRCA) | No Action Alternative | None. | None. | None. | Commercial available near site. |
| | Preferred Alternative | All new shelter, tower, antennae and equipment in previously impacted area. | New 12ft X 16.5ft X 10.5ft modular shelter on concrete pad. | One 150 ft self-supporting tower with concrete anchor (17ft X 17ft, 4 ft deep). The base of the tower would be fenced with 6 ft chain link. Approx. 2 VHF and 2 UHF antennae, including up to three microwave dishes. | Commercial with new trenching along existing dirt road. |
| Mt. Emma Secondary site (GRCA) | No Action Alternative | At top of Mt. Emma near park boundary in recommended wilderness. | Two small boxes (approx. 2 ft X 2 ft X 4 ft each) at base of tower. | 25 ft tower with guy wires, 2 antennae. | Solar. |
| | Preferred Alternative | Replace all equipment adjacent to current location. | New 6ft X 8ft X 8ft modular shelter on rock pylons adjacent to current tower. | One 40 ft articulated pole tower attached to shelter (no guy wires or concrete pad). Approx. current number of VHF antennae (no dish). | Solar. |
| Kanabownitz Optional site (GRCA) | No Action Alternative | Equipment attached to fire tower in park adjacent to recommended wilderness. | Box in fire tower. | Antenna attached to fire tower. Approx. 1 VHF antenna (no dish). | Solar. |

| Sites | | Location | Shelter | Tower and Antennae | Power |
|---|---|---|---|---|---|
| | Preferred Alternative | Replace all equipment on fire tower at same location. | Replace box with new cabinet in fire tower. | Antenna attached to fire tower. Approx. 1 VHF antenna (no dish). | Solar. |
| Proposed Sites Outside of Grand Canyon National Park | | | | | |
| Paria Optional Primary Site (Glen Canyon National Recreation Area) | Current Situation | No Grand Canyon equipment – currently only Glen Canyon equipment on top of Vermillion Cliffs about 500 ft. from existing powerline in Glen Canyon National Recreation Area. | Approx. 6ft X 6ft X 6ft box. | No tower, one 12ft antenna attached to shelter box. | Solar. |
| | Proposal | Replace tower and shelter to accommodate both Grand Canyon and Glen Canyon equipment adjacent to current tower/shelter. Extend powerline and access road to repeater site. | 8ft X 8ft X 8ft modular shelter on rock pylons adjacent to current shelter. | One 45 ft articulated pole tower attached to shelter (no guy wires or concrete pad). Approx. 2 VHF and 2 UHF antennae (no dish). | Commercial from pole to be constructed at site. |
| VT Ridge Secondary site (Kaibab National Forest) | Current Situation | Along powerline adjacent to road in Kaibab National Forest. | Approx. 10ft X 10ft X 10ft brick shelter on concrete pad. | Approx. 75ft tower with guy wires, several antennae (no dish). | Commercial at nearby pole. |
| | Proposal | Replace all equipment adjacent to current location. | New 8ft X 8ft X 8ft modular shelter on same size concrete pad adjacent to current shelter. | One 100 ft self-supporting lattice tower with concrete anchor (12ft X 12ft, 4 feet deep) (no guy wires). Approx. current number of VHF antennae (no dish). | Same. |
| O'Leary Peak Secondary site | Current Situation | Equipment attached to fire tower in Coconino National Forest. | Approx. 8ft X 8ft X 8ft external cabinet adjacent to fire tower. | Antenna attached to fire tower. 1 VHF antenna (no dish). | Solar. |

| Sites | | Location | Shelter | Tower and Antennae | Power |
|---|---|---|---|---|---|
| (Coconino National Forest) | Proposal | Replace all equipment on fire tower at same location. | Replace with new 8ft X 8ft X 8ft external cabinet adjacent to current cabinet. | Replace in-kind at same location on fire tower, 1 VHF antenna (no dish). | Solar. |

All but three of the sites are part of the park's current radio system network and have some sort of radio repeaters and antennae that would be replaced at the same site adjacent to the current equipment (see Table 3 for site-specific information). The three new sites would be CC Hill, Grand Canyon Village EMS Building, and Desert View Ranger Station. All sites have some level of human disturbance, but all sites except Kanabownitz would receive new towers and antennae, some sort of new shelter to protect new radio electronic equipment, perimeter fencing (at CC Hill, Desert View, Hopi Fire Tower, and Grand Canyon EMS), and varying levels of ground disturbance. Most of the sites have electricity very close to the repeater site except for CC Hill (which would trench a powerline within the road from the existing underground line to the proposed site—approximately 1,000 feet) and Grand Canyon Village EMS building (which would trench a powerline from the existing electrical to the proposed site). All sites except Mt. Emma already have road access for construction and periodic maintenance; Mt. Emma would require helicopter access including minor vegetation trimming to maintain the landing area near the repeater site.

As with most construction proposals, this proposal has progressed only to the design stage sufficient to evaluate the impacts at the various sites within a reasonable range of design parameters, and to facilitate a decision whether to proceed. If the sites and general design are approved through this environmental compliance process, then a much more detailed level of design would need to occur before the exact configuration of equipment at each site would be determined. The detailed design would be evaluated to determine if it still falls within the parameters evaluated in this EA; if it does not, then additional NEPA compliance would be necessary. Due to the level of the design, in addition to this EA, a Memorandum of Agreement will be developed with the State Historic Preservation Office (SHPO) that outlines how the NPS will further consult with the SHPO and associated American Indian groups, in compliance with Section 106 of the NHPA and its enabling legislation. This agreement must be completed before the NEPA decision document can be completed.

Existing office spaces in the Clinic building, which is adjacent to the new EMS building, are to be renovated. Park Dispatch will also be located in this renovated space in the Clinic. Most of the radio equipment associated with Dispatch would be located in a prefabricated equipment structure (approximately 12' x 16.5' x 10.5') directly behind the Clinic and EMS buildings, most likely to the north and east in a small clearing within the pinyon-juniper woods. The radio tower would be located adjacent to the equipment building to simplify electrical issues. It is possible that one or two mature pinyon or juniper trees would need to be removed to accommodate the tower and equipment building, depending upon the exact location chosen.

The proposal anticipates very limited capability to accommodate additional non-NPS electronics on the towers and in the shelters. At the Hopi Fire Tower site, non-NPS equipment would remain in place on the existing non-NPS poles; however, a new requirement would be instituted for no-cost permits for the non-NPS equipment to ensure compatibility with other equipment at the site. Requests from Arizona Department of Pubic Safety, Coconino County Sheriff's Office, and Navajo Nation Department of Resource Enforcement to allow for their equipment to be placed on the Desert View Tower may be possible without increasing the tower height above what was initially proposed. However, it would require that proper equipment spacing occur to prevent interference with NPS equipment. Figure 3 illustrates a shed and Figures 4 through 6 provide examples of the various types of towers proposed.

All existing radio equipment would be removed from two historic buildings (Desert View Watchtower and Yavapai Observation Station) that are part of the park's current radio system network. Radio equipment and the park Dispatch Center would be moved from the Park Headquarters Building to the EMS Building in Grand Canyon Village.

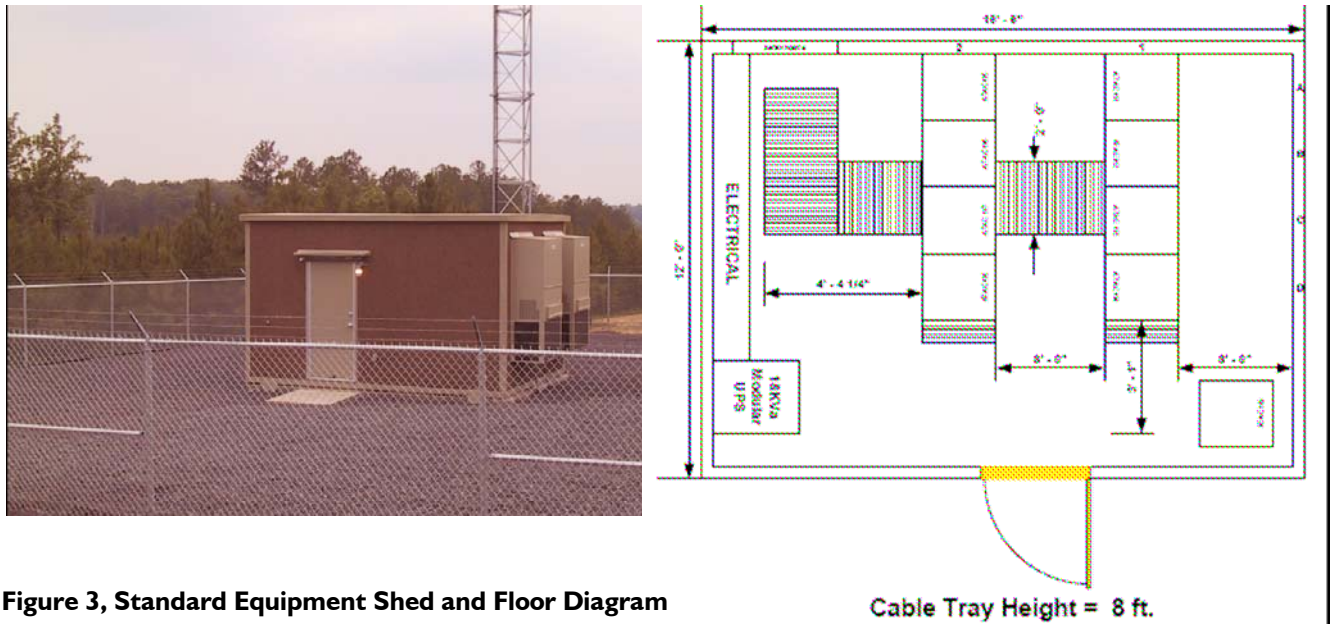


**Figure 3, Standard Equipment Shed and Floor Diagram**

**Figure 4, Example Radio Tower (self supporting 60 ft. lattice tower of the type and size proposed for Desert View, Hopi Fire Tower, and Grand Canyon EMS)**

**Figure 5, Example Radio Tower (self supporting 100 ft lattice tower of the type proposed for CC Hill, however the CC Hill tower would be 150 ft tall and would not be red/white striped)**

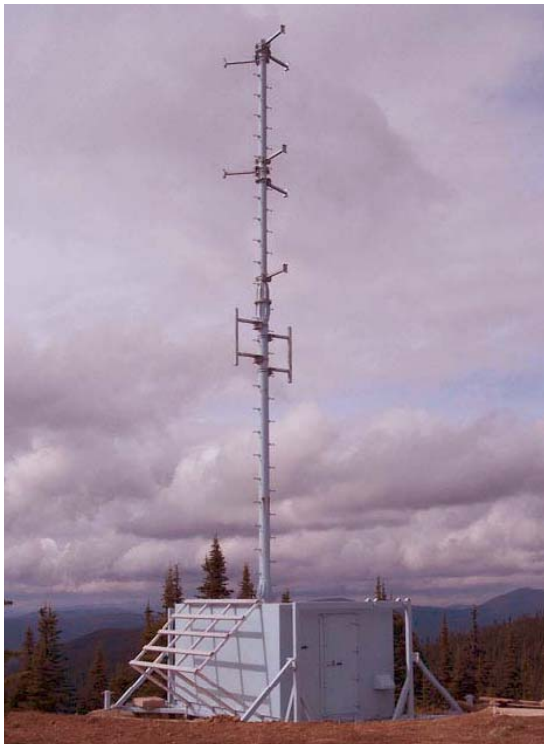

**Figure 6, Example Radio Tower (self supporting 40 ft. articulated tower attached to a removable shed of a similar type to that proposed for Mt. Emma)**

## MITIGATION MEASURES

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

- Construction zones will be identified and fenced with construction tape, snow fencing, or similar material prior to any construction activity. The fencing will define the construction zone and confine activity to the minimum area required for construction. All protection measures will be clearly stated in the construction specifications and workers will be instructed to avoid conducting activities beyond the construction zone as defined by the construction zone fencing.
- Silt fencing fabric will be installed and inspected weekly or after every major storm. Accumulated sediments will be removed when the fabric is estimated to be approximately 75% full. Silt removal will be accomplished in such a way as to avoid introduction into any floodplains, wetlands or other water bodies.
- Although soil side-cast during construction will be susceptible to some erosion, such erosion will be minimized by placing silt fencing around the excavated soil. Excavated soil may be used in the project or stored in approved areas and used elsewhere in the park at NPS' discretion.
- The color and other visual aspects of the towers, associated antennae and other equipment, and sheds, will be reviewed and approved by the park's landscape architect and/or historical architect, as appropriate for individual sites, to minimize the impact to visual resources and blend in with the surrounding background and/or landscape. Additional measures beyond color may be required on a site-specific basis to camouflage the structures to minimize their visual impacts.
- Should construction unearth previously undiscovered archeological resources, work will be stopped in the area of any discovery and the park cultural staff immediately notified. Park cultural staff will determine if further consultation with the state historic preservation officer/tribal historic preservation officer and the Advisory Council on Historic Preservation is necessary. In the unlikely event that human remains are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (1990) will be followed.
- The NPS will ensure that all contractors and subcontractors are informed of the penalties for illegally collecting artifacts or intentionally damaging archeological sites or historic properties. Contractors and subcontractors will also be instructed on procedures to follow in case previously unknown archeological resources are uncovered during construction. Equipment traffic will be minimized in the area of the sites and will also avoid known archeological resources.
- Inventories for existing populations of exotic vegetation at construction sites will occur where prescribed by the NPS Vegetation Program Manager and any populations found will be treated prior to construction activities.
- A restoration biologist will provide input on tree avoidance at project sites where necessary. A restoration biologist will also spot-check the work progress for adherence to mitigation measures related to vegetation.
- All construction equipment that will leave the road (e.g., bulldozers and backhoes) will be pressure washed prior to entering the park.
- Parking of vehicles will be limited to existing roads or disturbed areas.
- Any fill, rock, or additional topsoil needed will be obtained from a park-approved source.

- If necessary, all areas disturbed by construction will be revegetated where prescribed by the NPS Vegetation Program Manager using site-adapted native seed and/or plants.
- Construction workers and supervisors will be instructed about special status species that are known to occur in the project area. If special status species are discovered during construction, all work in the immediate vicinity of the discovery will be halted until GRCA staff re-evaluates the project and the work modified to allow for any protection measures determined necessary to protect the special status species.
- If a condor enters the construction site, construction will cease until it leaves on its own or until techniques are employed by permitted GRCA staff or Peregrine Fund personnel that results in the individual condor(s) leaving the area.
- Construction workers will be informed to refrain from interacting with condors and to immediately contact the appropriate GRCA or Peregrine Fund personnel when condor(s) are seen at the construction site.
- The construction site will be cleaned up at the end of each work-day (i.e. trash disposed of, scrap material picked up) to minimize the likelihood of condors and other wildlife visiting the construction site.
- To prevent soil and water contamination as well as potential poisoning of California condors or other wildlife, a vehicle fuel leakage and spill plan will be developed and implemented. The plan will include immediate clean up of any hazardous substance and notification of NPS. The plan will define how each hazardous substance will be treated in case of leakage or spill.
- The flow of vehicle traffic on the road will be maintained as much as possible during the construction period. Construction delays will normally be limited to 30 minutes. There may be some periods when the nature of the construction work may require temporary road closures. All efforts will be made to reduce these as much as possible and to alert park staff as soon as possible if delays longer than normal are expected. Visitors will be informed of construction activities and associated delays.
- Contractors will coordinate with park staff to minimize disruption to normal park activities. Equipment will not be stored along the roadway overnight without prior approval of park staff. Construction workers and supervisors will be informed about the special sensitivity of park values, regulations, and appropriate housekeeping.
- The NPS will re-evaluate the wilderness locations (Mt. Emma and Kanabownitz) in 5 years to see if there is new technology that would eliminate the need for the wilderness sites.

## ALTERNATIVES CONSIDERED BUT ELIMINATED

During development of the alternatives analyzed in this document, other alternatives were considered but eliminated from further consideration. These alternatives included components that failed to meet the project objectives. The nature of the dismissed alternatives and the rationale for their elimination are outlined below.

1. **Increase the tower height at one or more sites to accommodate commercial uses such as cellular telephone.**
   The NPS carefully considered the concept of increasing the height of one or more towers to allow them to consolidate all communications uses that might be proposed for a site, including commercial uses such as cellular telephone. One of the letters received during scoping for this project specifically asked the NPS to consider adding capability for cellular telephone equipment at Desert View, Hopi Fire Tower, and Paria. In examining this issue, the NPS determined that the height of the tower was one of the most important factors in creating impacts on park resources and visitors. The NPS decided that one tall tower was likely to have much greater visual impacts than two shorter towers,

especially in the case of Desert View and Hopi Fire Tower. At Desert View, the top of the proposed 60 ft. tower is expected to be at or just below the tree-line (i.e., not visible or at most barely visible) as viewed from the watchtower, a National Historic Landmark. Any increase in the height of the tower at that location would make it easily visible from the watchtower. Similarly, a taller tower at Hopi would also be expected to greatly increase the visibility of the tower and antennae at that site. The proposed tower heights and shed dimensions at all sites were reduced before the public scoping period to the minimum to accommodate NPS needs, with no more than a very limited capability in a few cases for equipment of cooperating law enforcement/resource agencies, such as Arizona Department of Public Safety, Coconino County Sheriff's Office, and the Department of Resource Enforcement of the Navajo Nation. Addition of new equipment would also require an engineering interference analysis (to be sure that new equipment does not interfere with the old) and a structural analysis of the towers (to be sure that they would support the added equipment and weight under high wind conditions). Therefore, due primarily to the increased impacts of taller towers, but also to the technical issues, it was decided to evaluate any future proposals for commercial uses such as cellular telephone on their own merit, and not as part of this project, and not as part of the proposed towers or sheds.

**2. Preferred alternative without Mt. Emma site or with a different location than Mt. Emma to address the wilderness issue.**

Grand Canyon staff along with their consultants explored several options to the Mt. Emma site, including Tuweep Ranger Station and Mt. Trumbull. From this analysis, it was determined that the Mt. Emma site is critical to the overall radio coverage, particularly in the Tuweep area.

The elevation of Mt. Emma (nearly 1,000 feet above Tuweep) and its proximity to the canyon's rim (approximately 10 miles closer than Mt. Trumbull) make this location essentially the only viable location for a radio repeater on the west end.

The team looked at the possibility of co-locating Grand Canyon radio facilities with repeaters for Grand Canyon-Parashant National Monument at Mt. Logan and Mt. Dellenbaugh, but those sites are too far away from the canyon to provide any significant amount of the radio coverage needed below the rim in the park. To provide coverage similar to Mt. Emma, multiple sites within the recommended wilderness in the park would be needed, which would be a much greater impact on the park's recommended wilderness than the one Mt. Emma site (see the minimum requirements analysis in Appendix B).

3. **Repeater Site Locations at CC Hill.**

In addition to the proposed location, two other areas were considered on CC Hill: one in the boreal forest south of the mule barn and concessionaire's buildings and the other in the island west of the mule barn and buildings. The location to the south of the mule barn would be closer to the Ken Patrick Trail and the North Kaibab Trailhead, and a tower in this location could be intermittently visible from people on the trail. The location to the west of the mule barn and buildings would be closer to known archeological sites than what is currently proposed. Construction of a radio tower (150 feet high) at either of these alternate locations would likely require removal of mature trees, which would open up the area, making it potentially more visible from visitor use areas. Because of this, the location at the maintenance area was determined to be the location with the least impact and the location carried forward through the analysis.

4. **Using a "mobile repeater" at one or more sites instead of constructing radio repeaters**.

   A mobile repeater is actually a power booster that is used with the mobile radio in patrol vehicles that acts as a repeater for the ranger using a handheld unit outside of the vehicle. It still relies on a true repeater (e.g., Mt. Emma to broadcast to Dispatch). It is permanently mounted in each individual vehicle. This option still relies on a repeater and antennae so is not a viable alternative option alone.

5. **Other locations considered but eliminated from further analysis**.
   Grand Canyon staff along with their consultants explored many options to provide the greatest coverage to the park. Preliminary analysis looked at additional sites on the North Rim (i.e., helibase vicinity, Lindbergh Hill, lodge area), and in western Grand Canyon (i.e., Grandwash Cliffs, trail west, Hualapai tribal lands, Mt. Dellenbaugh, Snap Point, plug site). The current proposed sites were found to best meet the project objectives as well as minimize impacts.

## ENVIRONMENTALLY PREFERRED ALTERNATIVE

The Council on Environmental Quality defines the environmentally preferred alternative as "…the alternative that will promote the national environmental policy as expressed in the National Environmental Policy Act's §101." Section 101 of the National Environmental Policy Act states that "… it is the continuing responsibility of the Federal Government to …

(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

(2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

(3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

(4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice;

(5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and

(6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

Alternative A would provide for continued use by GRCA staff of the analog radio system. Under this alternative, park resources would continue to be protected while providing opportunities for the public to see and learn about some of the natural and cultural resources found in the park. This alternative strives to and meets policies 1, 4, 5, and 6 to varying degrees. However, this alternative does not fully meet policies 2 or 3.

Alternative B is the environmentally preferred alternative. Alternative B strives to and meets policies 1 through 6 more fully than Alternative A by improving health and safety issues by implementing a better radio system.

# SUMMARIES

The project objectives were identified in the Purpose section at the beginning of this EA. Table 4 compares the ability of the alternatives to meet the project objectives.

Table 5 is a matrix of environmental consequences to the impact topics identified in the Purpose and Need section as a result of implementing the alternatives.

**Table 4, Methods Each Alternative Uses to Meet Objectives**

| Objective | Alternative A – No Action | Alternative B – Preferred Alternative |
|---|---|---|
| 1. Comply with federal regulations that require all federal agencies, including the National Park Service, to convert to narrowband radio communications | Does not comply. The current system uses wideband analog. The NPS uses the full spectrum available to them from the National Telecommunications Information Administration (NTIA) and does not have any frequency available for homeland security or other federal agencies. | Will comply. The proposed system is an advanced digital solution that complies with the Association of Public Safety Communications Officers (APCO) Project 25 Common Air Interface (CAI). APCO is a network of local, state, and federal government agencies and international public safety organizations that evaluate technologies in advanced land mobile radios to determine the best solutions to serve the needs of public safety. |
| 2. Provide for improved park radio communications and coverage, to increase public and employee safety and the ability of the park to safely and effectively conduct park management activities | Several regions within the park complex lack radio coverage, creating a potential risk to public safety if an emergency occurs and the respondent cannot call for help on the radio from the location of the incident. | The proposed system would increase the radio coverage within the park and alleviate problems with lack of coverage and increasing reliability in response to emergency situations. The proposed system combines digital technologies with advanced voice processing techniques to provide narrowband digital systems that deliver audio quality that often exceeds that of analog systems. Narrowband technology helps alleviate the problem of RF communication congestion by utilizing increased spectral efficiency while requiring only half as much bandwidth (12.5 kHz vs. 25 kHz) per channel. Additionally, the proposed system has consistent audio quality throughout a defined coverage area on radios that are capable of the proposed system. |
| 3. Improve communications interoperability and services with other agencies | Many other agencies have converted to digital technology. The current technology employed by the NPS (wideband analog) is not compatible with the agencies that have converted to digital technology. | Many other agencies have converted to digital technology. The proposed system would be compatible with the agencies that have converted to digital technology. |

## Table 5, Summary Comparison of Impacts

| Impact Topic | Alternative A – No Action | Alternative B – Preferred Alternative |
|---|---|---|
| **Historic Properties** | Direct, indirect, and cumulative impacts to historic properties would be localized, minor, long-term and adverse by continuing to house radio equipment in eligible or potentially eligible historic properties. | Direct, indirect, and cumulative impacts would be localized, minor, long-term and adverse primarily from the visibility of the radio repeater equipment from historic structures such as Desert View Watchtower and Hopi Fire Tower. Beneficial impacts from removing radio equipment from eligible or potentially eligible properties (Desert View Watchtower, Hopi Fire Tower, Yavapai Observation Station, and Parks Headquarters Building) would be localized, negligible to minor and long-term. |
| **Cultural Landscapes** | Direct, indirect, and cumulative impacts to cultural landscapes would be localized, negligible to minor, long-term and adverse by continuing to house radio equipment in Desert View Watchtower, Hopi Fire Tower, Yavapai Observation Station, and Parks Headquarters Building, therefore, affecting these historic districts and cultural landscapes. | Direct, indirect, and cumulative impacts would be localized, negligible to minor, long-term and adverse as well as beneficial because radio repeater equipment at (Hopi Fire Tower, Desert View Ranger Station, CC Hill, and Grand Canyon Village EMS Building) may be intermittently visible from cultural landscapes associated with Grand Canyon Village National Historic Landmark District, Desert View Watchtower Historic District, West Rim Cultural Landscape, and North Rim Bright Angel Peninsula Developed Area Cultural Landscape. Beneficial impacts to these historic districts and cultural landscapes would occur from removing radio equipment from Desert View Watchtower, Hopi Fire Tower, Yavapai Observation Station, and Parks Headquarters Building and would be localized, negligible to minor and long-term. |
| **Soils** | No direct or indirect impacts to soils would occur. Cumulative impacts would be site-specific, minor, adverse and short-term. | Direct, indirect, and cumulative impacts would be site-specific, minor short-term and adverse as a result of soil removal/profile mixing (approx. 87.2 $ft^3$) and potential soil pollution from equipment leakage/failure during construction. |
| **Vegetation and Wildlife** | Direct, indirect and cumulative impacts would be site-specific, negligible, long-term and adverse because of minor vegetation trimming that would be needed to maintain the ability of helicopters to land safely at Mt. Emma. | Direct and indirect impacts would be site-specific, negligible to minor, short-term and adverse because of the limited amount of disturbance expected from construction (one acre spread over six sites) and the fact that many of the site are in already disturbed areas with limited vegetation and wildlife use. Any potential impact from noxious weeds/exotic species would be mitigated to a negligible level. Cumulative impacts are expected to be localized, minor, long-term and adverse. |
| **Special Status Species** | No direct or indirect impacts to special status species would occur. Cumulative impacts would be site-specific, negligible, adverse and long-term. | Direct and indirect impacts would be site-specific, negligible, short-term and adverse because none of the proposed radio tower/shed locations occur in habitat considered suitable for nesting for condors or peregrines, and special status species are not likely to be permanently displaced as a result of this project due to the small amount of disturbance and the availability of similar habitat in the surrounding area. Cumulative impacts are expected to be negligible, adverse and long-term. |
| **Visual Quality** | No direct impact. Indirect and cumulative impacts would be localized, minor, long-term and adverse because continuing to house radio equipment on the Desert View Watchtower, Hopi Point Fire Tower, Park Headquarters Building, and the Yavapai Observation Station would adversely impact viewsheds in those areas. | Direct and indirect impacts would be localized, minor to moderate, long-term and adverse at the following sites (Desert View, Hopi Point, and CC Hill) generally from the radio tower extending above the treeline and intermittently visible from sensitive viewpoints. At Grand Canyon Village EMS, direct and indirect impacts would be localized, minor, long-term and adverse. At Mt. Emma, direct and indirect impacts would be localized, negligible to minor, long-term and adverse. At Kanabownitz, direct and indirect impacts would be localized, negligible, long-term and adverse. Beneficial |

| Impact Topic | Alternative A – No Action | Alternative B – Preferred Alternative |
|---|---|---|
| | | impacts would be localized, minor and long-term at Desert View Watchtower because existing equipment would be removed. Cumulative impacts would be localized, moderate, long-term and adverse. |
| **Park Operations** | Direct, indirect, and cumulative impacts to park operations would be regional, moderate, long-term and adverse because the existing system is outdated and contains large areas within the park that cannot receive or transmit radio communication, uses the full spectrum available to the NPS so that there is no additional frequency available for homeland security or other federal agencies, and won't allow for interoperability with other agencies that have converted to digital technology. Finally, the current park radio system is not only becoming obsolete but is in such increasing need of repair, replacement and maintenance that the park now estimates that the deferred maintenance costs associated with the current radio system. | Direct, indirect, and cumulative impacts to park operations would be regional, moderate, long-term and beneficial because it would provide increased radio coverage throughout the park, use an advanced digital solution that complies with the APCO Project 25 CAI, and would be compatible with any other agencies that have converted to digital technology and would allow for interconnectivity with these agencies. |
| **Wilderness** | Direct, indirect, and cumulative impacts to wilderness character would be localized, minor to moderate adverse and long-term because of the increased need for maintenance on the existing radio system that is aging. | Short-term (construction related) direct and indirect impacts to wilderness character would be localized, moderate and adverse as a result of implementing the Preferred Alternative primarily from increased traffic on the access roads during construction, construction noise and increased human activity to the site during construction, which has the potential to impact backcountry visitors in the nearby wilderness. Long-term direct and indirect impacts would be adverse and range from negligible at Kanabownitz to minor at Mt. Emma and CC Hill as a result of constructing a radio repeater equipment in an area adjacent to or within recommended wilderness areas. Cumulative impacts would be moderate adverse and long-term. |

# ENVIRONMENTAL CONSEQUENCES

## METHODOLOGY

Potential impacts are described in terms of type (are the effects beneficial or adverse?), context (are the effects site-specific, local—associated with project sites and up to five miles from the project site, or regional—beyond five miles from the project site?), duration (are the effects short-term—lasting less than one year, or long-term—lasting more than one year?), timing (is the project seasonally timed to avoid adverse effects?), and intensity (are the effects negligible, minor, moderate, or major?). Because definitions of intensity (negligible, minor, moderate, or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this environmental assessment.

In addition, National Park Service's *Management Policies, 2006* require analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the NPS, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

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

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park.

## CUMULATIVE IMPACT SCENARIO

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

Cumulative impacts were determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects at Grand Canyon National Park and, if applicable, the surrounding region. These projects include:

**South Rim:**

**Transportation Plan.** (2006-2012) The purpose of the South Rim Visitor Transportation Plan is to provide a transportation system that addresses the park's most pressing transportation issues through the year 2020. While it is not anticipated that the new transportation system will use the new NPS radio system for communications, it will need a radio communications system that will be compatible with the NPS radio system.

**Rehabilitation of Hermit Road.** (2008-2010) The approximately 7-mile historic Hermit Road would be rehabilitated, including widening and resurfacing of the road and possibly constructing a multi-modal greenway trail between the Abyss and Hermits Rest. The road would be closed for most of its length during the construction period, scheduled for spring 2008–fall 2009. The improvements under consideration by this project in the vicinity of the Hopi Fire Tower site are important to considering the site for continued use as a radio repeater site as part of this project.

**Rehabilitation of Park Headquarters Building**. (2007-2010) This project will rehabilitate the building and convert space now being used for other purposes to provide office and workspace for park employees. The park's dispatch office is currently located in the park headquarters building, but is being considered for relocation under the preferred alternative. Completing interior construction of the GC Village EMS building may allow the transfer of the park's dispatch office to this building.

**Bright Angel Trailhead Area Design Plan/Bright Angel Trailhead Restroom Design.** (2006-2010) Rehabilitate the Bright Angel Trailhead area historic landscape, which is used by nearly four million visitors a year. The preliminary proposal includes such things as repair of deteriorated stone walls, rehabilitation of pedestrian walkways, revegetation of denuded areas, and better definition of parking areas and walkways. The need for a restroom in this general area would also be evaluated.

**Desert View:**

**Housing and Management Support**. (2003-2012) Complete construction of several buildings (containing approximately 70 housing units) and support facilities at Desert View to replace substandard units and meet additional housing needs. Also, construct a new ranger operations and maintenance facility, and a new maintenance support facility for the park concessioner. The proposed radio repeater in the housing/administrative area at Desert View took the housing and support project into consideration.

**Improvements and Road Realignment**. (2003-2009) redevelop Desert View as a transportation hub of the South Rim located near the east entrance to Grand Canyon National Park, including realignment of Desert View Drive to move traffic away from the rim; construction of a new entrance station, parking lot, and bus transit facility; installation of additional visitor services; and rehabilitation of the south entrance road and portions of Desert View Drive. Some of this project has been completed; location of the radio repeater in the Desert View area took these already-approved developments into consideration.

**North Rim:**

**Tuweep Ranger Station Rehab.** (2007-2008) repair and enlarge the Tuweep Ranger Office, and upgrade the hybrid photovoltaic power system. The possible use of the Tuweep ranger station area as a possible alternative to the Mt. Emma radio repeater site took such already-approved improvements into consideration.

**Implement North Rim Development Plan**. (ongoing) the plan will focus on improving existing facilities and services. This plan was considered in proposing CC Hill area as a possible radio repeater site, and in considering but rejecting other sites as possible alternatives to CC Hill.

**Rehab Toroweap Road.** (2007) This project will rehabilitate the first 4.25 miles of the 5.5 mile unsurfaced Toroweap Road (main road).

Inner Canyon: For all of these projects, project specific monitoring and other implementation will rely heavily on good radio communications.

**Tamarisk Removal in Side Canyons.** (2005-2011) Eradicate tamarisk in side canyons, tributaries, and springs other areas in the park to restore more natural conditions and prevent any further loss or degradation of the existing native biota in side canyons. Most of this project will occur in the park's recommended wilderness.

**Colorado River Management Plan (CRMP) Monitoring, Mitigation and Other Plan Implementation.** (ongoing) The 2006 Colorado River Management Plan regulates recreational use on the Colorado River as it flows through Grand Canyon National Park in recommended or potential wilderness.

**Backcountry Management Plan (BCMP).** (2007-2011) The BCMP provides guidance for managing the park's recommended wilderness. The BCMP revision process will occur three phases: 1) data collection and resource assessments; 2) NEPA planning process, 3) BCMP implementation.

**Spring and Seeps Monitoring.** (ongoing) The project objective is to use low-cost electronic resistance sensors and temperature sensors to conduct a baseline survey of spring flow occurrence and timing.

**Establishment of Humpback Chub Refugia.**(2007-2010) NPS and other agencies responsible for endangered species management, are considering options for establishment of refugia for this endangered fish species that occurs in the Colorado River. Options under consideration include translocation of fish from the Little Colorado River to other suitable locations in side canyons within park boundaries.

**Parkwide:**

**Parkwide Routine Exotic Plant Species Management Plan.**(2005-2009) To be proactive regarding the control of exotic plant species populations in the park, NPS is proposing a parkwide plan to survey and control these species. Radio communications are important to such projects in the remote areas of the park's recommended wilderness.

**Internal Aviation Management Plan.**(ongoing) The purpose of the internal aviation management plan (IAMP) is to establish general guidelines for the official and professional use of aircraft on park business. Radio communications are important to such projects in the remote areas of the park's recommended wilderness.

**Wildlife Inventory and Monitoring.**(ongoing) Programmatic project for GRCA wildlife staff to complete wildlife inventories, assessments, and documentation in the backcountry, wilderness and developed areas as part of the service wide

inventory and monitoring initiative. Activities include inventories-trapping, observations, monitoring, in-field documentation and analysis, preparation of resource maps with appropriate attributes, photo documentation, development and implementation of natural resource inventory and monitoring plans and guidelines. Radio communications are important to such projects in the remote areas of the park's recommended wilderness.

**Programmatic Archeological Surveying and Monitoring.** (ongoing) GRCA Cultural Resource staff complete paper records, photo documentation, and other documentation to assess the effects of natural and human agents on archeological sites, in accordance with §106 and §110 of NHPA. Radio communications are important to such projects in the remote areas of the park's recommended wilderness.

**Programmatic Maintenance to Archeological Sites** (ongoing) GRCA Cultural Resource staff complete routine maintenance activities at archeological sites such as erosion control, masonry stabilization, vegetation removal, and social trail obliteration in accordance with §106 and §110 of NHPA. Radio communications are important to such projects in the remote areas of the park's recommended wilderness.

## IMPACTS TO CULTURAL RESOURCES

In this EA, impacts to cultural resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the Council on Environmental Quality (CEQ) that implement the National Environmental Policy Act (NEPA). Context (regional or local) in terms of cultural resources is different from other resources. Regional impacts would occur to several specific resource sites or a single site having regional or national significance under the NHPA. Local impacts would be restricted to a specific site of local significance or localized site areas.

These impact analyses are intended to comply with the requirements of NEPA. In accordance with the Advisory Council on Historic Preservation's regulations implementing §106 of the NHPA (36 CFR Part 800, Protection of Historic Properties), impacts to cultural resources must also be identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places; (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and (4) considering ways to avoid, minimize or mitigate adverse effects.

As with most construction proposals, this proposal has progressed only to the design stage sufficient to evaluate the impacts at the various sites within a reasonable range of design parameters, and to facilitate a decision whether to proceed. If the sites and general design are approved through this environmental compliance process, then a much more detailed level of design would need to occur before the exact configuration of equipment at each site would be determined.

Due to the level of the design, in addition to this EA, a Memorandum of Agreement will be developed with the State Historic Preservation Office (SHPO) that outlines how the NPS will further consult with the SHPO and associated American Indian groups, in accordance with the Advisory Council on Historic Preservation's regulations implementing §106 of the NHPA (36 CFR Part 800, Protection of Historic Properties). This agreement must be completed before the NEPA decision document can be completed.

CEQ regulations and the National Park Service's Conservation Planning,

Environmental Impact Analysis and Decision-making (Director's Order #12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact (e.g., reducing the intensity of an impact from major to moderate or minor). Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by §106 is similarly reduced. Although adverse effects under §106 may be mitigated, the effect remains adverse.

# HISTORIC STRUCTURES

## AFFECTED ENVIRONMENT

**Kanabownitz Fire Tower, potentially eligible for listing on the National Register of Historic Places:** was built in 1940 by the Civilian Conservation Corps (CCC). It was the last of four fire towers built for the NPS at Grand Canyon. It is located on the North Rim, just east of Shinumo Amphitheater at the head of Kanabownitz Spring. At an elevation of 8,241 feet above mean sea level at the base of the tower, it stands 82.5 feet in height (Figure 7). Although the Kanabownitz Fire Tower was placed relatively close to the other three lookout towers in the area, it proved to be a valuable station. In 1940 two-way radios were just gaining importance as fire fighting tools at Grand Canyon. When all lookouts were occupied, and especially the Kanabownitz tower, fire fighters were able to convey a more accurate idea of fire and weather behavior to each other. Presently the lookout tower is occasionally used to offer assistance in spotting and monitoring fires (Lorenz 1998).

**Figure 7, Kanabownitz Fire Tower**

**Figure 8, Hopi Fire Tower**

**Hopi Fire Tower, potentially eligible for listing on the National Register of Historic Places:** The Hopi Fire Tower was built in 1909 under the supervision of the US Forest Service. It has gone through numerous modifications, including being rebuilt after it was destroyed by fire in 1952. It is located near Hopi Point, south of West Rim Drive (Hermit Road). The tower itself stands about 40 feet high. The NPS became responsible for the fire tower in 1919(Lorenz 1998). The Hopi Fire Tower (Figure 8) has been significantly altered with man-made structures, equipment, and utilities that have been added with little apparent planning for what and where things would be placed, resulting in scattered disturbance.

**Desert View Watchtower, listed as a National Historic Landmark:** stands at the eastern end of the South Rim of Grand Canyon. It was built in 1933. Building a structure that provides the widest possible view of the Grand Canyon yet harmonizes with its setting was architect Mary Colter's goal when the Santa Fe Railroad hired her in 1930 to design a gift shop and rest area at Desert View Point. From a distance the building's silhouette looks like the Ancestral Puebloan watchtower it was meant to mimic (Figure 9). In plan the structure is composed of one enormous circle at the north, a small circle at the south, and gently arched forms connecting the two. Standing at 70 feet, with a 30-foot base, the tower was unique in having a concrete foundation and a steel framework well hidden in the stones of the tower. The ground level of the tower was a large, round observation room with a spectacular view of the Grand Canyon. Upstairs the Hopi Room presents paintings by Hopi artist Fred Kabotie, who took the room's theme from the Hopi Snake Dance. An outdoor observation deck is directly above the observation room.

**Figure 9, Desert View Watchtower**

Desert View possesses additional regional significance in its tower paintings of Native American design—they were copied from prehistoric pictographs and petroglyphs at a New Mexico archeological site that is now destroyed. These may be the only surviving record of that rock art. Desert View Watchtower was designated a United States National Historic Landmark in 1987 (Page & Turnbull, Inc. 2006).

The Historic Structure Report prepared by Page & Turnbull, Inc. in 2006 provides detailed information on the building, including character-defining features, alterations, current condition, and recommendations for rehabilitation.

**Yavapai Observation Station, listed as a National Historic Landmark**: (also known as the Yavapai Museum) was built in 1928 expressly for observing and understanding the geology of Grand Canyon. It is an example of the Park’s pursuit of a singular and aesthetically appropriate architecture for the park system. The building is also an excellent illustration of Pueblo architecture (Figure 10). The prominent architect, Herbert C. Maier, designed the building, inspired by Mary Colter. The building was among the earliest interpretive structures in the park system. Yavapai Observation Station was listed on the National Register of Historic Places in 1990 because of its significance in relation to its role in the development of interpretive structures within the park system. The boundary of the historic property encompasses a perimeter 25 feet around the building. It also includes a corridor along the rim to the west and to the east (NPS 2007).

The Historic Structure Report prepared by Architectural Resources Group in 2001 provides detailed information on the building, including character-defining features, alterations, current condition, and recommendations for rehabilitation (ARS 2001b).

**Figure 10, Yavapai Observation Station**

**Park Headquarters Building, contributing element to the Servicewide thematic study of Mission 66 Visitor Centers:** The Grand Canyon Visitor Center and Park Headquarters is an excellent example of the NPS' pursuit of a singular and aesthetically appropriate architecture for the park system in the post-war era. Designed in 1954 by Cecil John Doty, the building's expression, materials, and method of construction epitomize the Mission 66 campaign. Mission 66 was an aesthetic departure from a long-established NPS architectural vocabulary that reflected ideals such as a faith in modern materials that were promoted as new, light, and economical; a design philosophy that held that mankind was in control of nature; and, minimal emphasis on ornament. As shown in Figure 11, Mission 66 design involved simple contemporary buildings that perform their assigned function and respect their environment. Mission 66 style used broad, simple surfaces; horizontal emphasis; and, setbacks—all of which are central themes to NPS Southwestern design. Flat roofs and low silhouettes correlate to the lines of Mission 66 design (Architectural Resource Group 2001).

Cecil John Doty designs established a connection between the building and the landscape. In the case of the Grand Canyon facility, the location of which did not afford views of the canyon, Doty brought the landscape into the building by planting the interior courtyard with an indigenous garden. He also incorporated basic visitor center elements (e.g., exhibit areas, audio-visual rooms, auditoriums, restrooms, and lobbies) into the building. Finally, he combined modern materials with wood and stone to give the impression of modesty (Ibid.).


Figure 11, Park Headquarters Building

## METHODOLOGY

In order for a structure or building to be listed in the National Register of Historic Places, it must meet one or more of the following criteria of significance: a) associated with events that have made a significant contribution to the broad patterns of our history; b) associated with the lives of persons significant in our past; c) embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; d) have yielded, or may be likely to yield, information important in prehistory or history. In addition, the structure or building must possess integrity of location, design, setting, materials, workmanship, feeling, association (National Register Bulletin, How to Apply the National Register Criteria for Evaluation). For purposes of analyzing potential impacts to historic structures/buildings, the thresholds of change for the intensity of an impact are defined as follows:

*Negligible*: Impact(s) is at the lowest levels of detection—barely perceptible and not measurable.

*Minor*: **Adverse**: impact would not affect the character defining features of a National Register of Historic Places eligible or listed structure or building.

**Beneficial**: stabilization/ preservation of character defining features in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties.

*Moderate*: **Adverse**: impact would alter a character defining feature(s) of the structure or building but would not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized.

**Beneficial**: rehabilitation of a structure or building in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties.

*Major*: **Adverse**: impact would alter a character defining feature(s) of the structure or building, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register.

**Beneficial**: restoration of a structure or building in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties.

## REGULATIONS AND POLICIES

Current laws and policies require that the following conditions be achieved in the park:

| Desired Condition | Source |
|---|---|
| Historic properties are inventoried and their significance and integrity are evaluated under National Register criteria.<br><br>The qualities that contribute to the eligibility for listing or listing of historic properties on the NRHP are protected in accordance with the Secretary of the Interior's Standards (unless it is determined through a formal process that disturbance or natural deterioration is unavoidable). | National Historic Preservation Act; Executive Order 11593; Archeological and Historic Preservation Act; the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; NPS Management Policies |

## IMPACTS OF THE PREFERRED ALTERNATIVE

# Impact Analysis

Direct impacts related to construction of the proposed radio towers/sheds could impact two potentially eligible historic structures (Hopi Fire Tower and Kanabownitz Fire Tower). Construction at Kanabownitz, if the site is needed, would involve only "in-kind" replacement of existing equipment. No character-defining features would be impacted and the historic integrity of the structure would not be affected. Therefore, implementation of the Preferred Alternative would result in direct impacts to Kanabownitz that are localized, negligible, long-term, and adverse.

No new equipment would be added to the Hopi Fire Tower; however, erecting a new radio tower/shed near the fire tower would impact the landscape surrounding the fire tower. Consolidating the NPS equipment on a new tower and shelter would allow removal of fire antennae from the fire tower in addition to removal of the current NPS shed and two wood poles near the fire tower. The Hopi Fire Tower and NPS poles are visible from the rim trail between Verkamps and the El Tovar within the National Historic Landmark District, and also at the Yavapai Observation Station; however the distance is 1.2 to 2 miles from those points so the tower and antennae are not very discernible to the naked eye. Measures would be taken when deciding final placement of the radio tower to position it so that it appears behind the Hopi Fire Tower and not a separate feature as viewed from Hopi House to El Tovar. For these reasons, implementation of the Preferred Alternative would result in direct and indirect impacts to Hopi Fire Tower that are localized, minor, long-term, adverse as well as localized, negligible, long-term and beneficial.

At Desert View, the proposed radio repeater equipment and shed would be attached or adjacent to the ranger station and would be within the existing parking footprint. The tower would stand 60 feet high and it is anticipated that a single antenna would extend about 20 feet above the tree line. Based on the distance from the ranger station to the Desert View Watchtower, the antenna extending above the treeline would likely only be visible from inside the watchtower looking out the windows on the top floor out towards the ranger station. Although views of the canyon from the watchtower are in the opposite direction of the proposed radio tower, the watchtower provides for panoramic views of the surrounding area, including views towards the San Francisco Peaks within the general viewshed of the existing ranger station where the radio repeater would be constructed. It is not anticipated that the proposed radio tower/shed would be visible from any other contributing features of the Historic District. Therefore, implementation of the Preferred Alternative would result in direct and indirect impacts to Desert View Watchtower that are localized, minor, long-term, and adverse.

Beneficial impacts to historic structures may result from implementing this alternative by removing incompatible equipment (external antennae and internal equipment) from two National Historic Landmarks—Desert View Watchtower and Yavapai Observation Station (Figures 9 and 10)and the potentially eligible Hopi Fire Tower. The Historic Structures Report for Desert View Watchtower recommends that all non-original alterations and additions should be removed but doesn't specifically address the antennae (Page & Turnball 2006). The Historic Structures Report for Yavapai Observation Station recommends that exterior elements that detract from the historical character should be removed and in the case of the excess roof equipment, antennas and the like should be obscured from view, either through relocation or reduced in scale (Architectural Resources Group 2001b). Additionally, it is likely that the antennae atop the Park Headquarters Building would be removed and taken to the Grand Canyon EMS building in the foreseeable future. The Historic Structures Report for Park

Headquarters Building generally recommends that exterior elements that detract from the historic character should be removed and specifically states that obsolete equipment from the roof, including the defunct solar panels should be removed (Architectural Resources Group 2001). For these reasons, implementation of the Preferred Alternative would also result in direct and indirect impacts to historic structures that are localized, minor, long-term and beneficial.

## Cumulative Effects

Past, present, and foreseeable future projects that may affect historic structures potentially affected by the radio repeaters include rehabilitation of Hermit Road, rehabilitation of Yavapai Observation Station, rehabilitation of Park Headquarters Building, and Desert View Housing and Support. Most of these recent projects have actually rehabilitated structures resulting in an overall beneficial impact to historic structures; however, modern buildings have intruded on the historic setting. Foreseeable future projects that have the potential to affect historic structures have been discussed with SHPO to ensure that any adverse effects of future projects on historic structures are minimized to the extent possible. Therefore cumulative impacts to historic structures would be localized, minor, long-term and adverse as well as beneficial.

## Conclusion

Implementation of the Preferred Alternative would result in direct, indirect, and cumulative impacts to historic structures that are localized, minor, long-term, and adverse primarily from the visibility of the radio repeater equipment (tower/antenna/shed) from historic structures such as Desert View Watchtower and Hopi Fire Tower. No new equipment would be added to the Hopi Fire Tower; however, erecting a new radio tower/shed near the fire tower would impact the landscape surrounding the fire tower. In-kind replacement of equipment on the Kanabownitz Fire Tower would not change the character defining features of the tower; therefore, impacts to that structure would be localized, negligible, long-term and adverse. Beneficial impacts to historic structures may result from implementing this alternative by removing incompatible equipment from the Desert View Watchtower, Yavapai Observation Station, Hopi Fire Tower, and Park Headquarters Building. Beneficial impacts would be localized, negligible to minor and long-term. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's historic structures.

### Impacts of Alternative A – No Action

## Impact Analysis

The No Action Alternative has the potential to affect historic structures by continuing to house radio equipment on the Desert View Watchtower, the Yavapai Observation Station, the Park Headquarters Building, and the potentially eligible Hopi Fire Tower. This would continue as a localized, minor, long-term, adverse impact. The Historic Structures Report for Desert View Watchtower recommends that all non-original alterations and additions should be removed but doesn't specifically address the antennae (Page & Turnball 2006). The repeater at Yavapai Observation Station is currently not operable due to a lightning strike, but would need to be repaired if the No Action Alternative was implemented. The Historic Structures Report for Yavapai Observation Station recommends that exterior elements that detract from the historical character should be removed and in the case of the excess roof equipment, antennae and the

like should be obscured from view, either through relocation or reduced in scale (Architectural Resources Group 2001b). Additionally, it is likely that the antennae atop the Park Headquarters Building would be removed and taken to the Grand Canyon EMS building in the foreseeable future under the No Action Alternative. The Historic Structures Report for Park Headquarters Building generally recommends that exterior elements that detract from the historic character should be removed and specifically states that obsolete equipment from the roof, including the defunct solar panels should be removed (Architectural Resources Group 2001).

### Cumulative Effects

Past, present, and foreseeable future projects that may affect historic structures potentially affected by the radio repeaters include rehabilitation of Hermit Road, rehabilitation of Yavapai Observation Station, rehabilitation of Park Headquarters Building, and Desert View Housing and Support. Most of these recent projects have actually rehabilitated structures resulting in an overall beneficial impact to historic structures; however, modern buildings have intruded on the historic setting. Foreseeable future projects that have the potential to affect historic structures have been discussed with SHPO to ensure that any adverse effects of future projects on historic structures are minimized to the extent possible. Therefore cumulative impacts to historic structures would be localized, negligible, long-term and adverse as well as beneficial.

### Conclusion

Direct and indirect, impacts to historic structures would be localized, minor, long-term, and adverse as a result of implementing the No Action Alternative. The existing equipment is not in keeping with the original design of the buildings that make them eligible properties for listing on the National Register. Cumulative impacts to historic structures would be localized, negligible, long-term and adverse as well as beneficial. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of the park's historic structures.

## CULTURAL LANDSCAPES

### AFFECTED ENVIRONMENT

The Cultural Landscapes Inventory Professional Procedures Guide (Page 1998) prepared by the NPS defines cultural landscapes as:

"…settings that human beings have created in the natural world. They reveal fundamental ties between people and land ties based on our need to grow food, give form to our settlements, meet requirements for recreation, and find suitable places to bury our dead. Cultural landscapes are intertwined patterns of things both natural and constructed plants and fences, watercourses, and buildings. They range from formal gardens to cattle ranches, from cemeteries and pilgrimage routes to village squares. They are special places expressions of human manipulation and adaptation of the land."

**Desert View Cultural Landscape within the Desert View Watchtower Historic District:** The boundary of the Historic District includes the canyon rim along the north and west; the extent of the site of the CCC camp on the east; and the extent of the historic housing complex on the south. The cultural landscape extends beyond this boundary to include the water treatment facility on the south and the campground on the east. In 2001, a Cultural Landscape Inventory report (CLI) and a Cultural Landscape Treatment Recommendations report (CLTR) were prepared for Desert View (Milner 2003). The purposes of the reports are to identify, document, analyze, and evaluate contributing and non-contributing cultural landscape characteristics within the cultural landscape; to record other cultural landscape information; and to serve as supporting documents for implementation of the GMP.

Although the CLI recognizes the potential of ethnographic and archaeological resources as they relate to the cultural landscape of Desert View, Milner and Associates (2003) determined the landscape's primary period of significance to be from 1914 to 1942. Features established at Desert View during this time period, including the Desert View Watchtower, are of national importance because they convey the landscape's recreational heritage and its association with early development of the National Park System (Milner 2003). However, given that the larger landscape includes additional cultural resources and preserved natural areas associated with the period of significance, the CLTR recommends expanding the size of the Desert View Watchtower Historic District to encompass all areas between the rim and the limits of the employee housing area to the south and the campground and treatment plant to the east (Ibid.). The CLTR also recommends that any planned and potential improvements take into account these additional resources and features so that the integrity of the cultural landscapes is not diminished by project undertakings (Ibid).

In addition to the seven buildings identified as contributing to the Desert View Watchtower Historic District, the CLTR recommends that the following resources be considered as contributing to the integrity of the greater historic landscape. The resources are grouped into "Landscape Character Areas" that reflect the evolution of such things as spatial organization, circulation patterns, vegetation patterns, and the development of visitor services and management facilities over time.

• **NPS Residence (Building No. 149)**. The National Register of Historic Places registration form for the Desert View Watchtower Historic District determined this building to be a non-contributing element of the historic district. The CLTR, on the other hand, recommends Building No. 149 be considered as a contributing element of the cultural landscape. This recommendation is not based on the building possessing important architectural attributes but, rather, because it is part of a cluster of buildings (including Building Nos. 912, 914, and 915) that define the historic character of the landscape in the Historic Residences Landscape Character Area.

• **Indian Employee Quarters (Building No. 915)**. The National Register of Historic Places registration form for the Desert View Watchtower Historic District determined this building to be a non-contributing element of the historic district. The CLTR, on the other hand, recommends Building No. 915 be considered as a contributing element of the cultural landscape. This recommendation is not based on the building possessing important architectural attributes but, rather, because it is part of a cluster of buildings (including Building Nos. 149, 912, and 914) that define the historic character of the landscape in the Historic Residences Landscape Character Area.

• **Water Supply Reservoir (Cistern)**. This structure, located in the Parking Lot Landscape Character Area, is a cistern that was part of a former water supply system installed in the late 1920s. The structure is largely subterranean, but

extends partially above ground at the edge of the north shoulder of Desert View Drive.

• **Rim Trail**. A historic trail with intact stone edging and drainage features along the edge of the canyon rim north of the watchtower, within the South Rim/Watchtower Landscape Character Area.

• **Walkways**. Access walkways that connect the parking and visitor services areas to the watchtower. Portions of the walkway routes may date to the 1940s or earlier. The walkways are within the South Rim/Watchtower Landscape Character Area.

• **Road to CCC Camp Site**. This unpaved access road connects the site of the CCC camp (part of the CCC Camp Site Landscape Character Area) with the visitor services and Watchtower areas. The access road traverses the northeastern portion of the South Rim/Watchtower Landscape Character Area.

• **Parking Lot Area**. This area includes the existing parking lot, connecting access drives to Desert View Drive, and pedestrian systems (all within the Parking Lot Landscape Character Area). The parking lot includes an expansion area on the east end and a reconstructed section on the west that was originally developed in the early 1940s. The parking lot area was re-designed in the 1960s, but the re-design maintained the overall design character established in the 1940s.

• **Desert View Drive/East Entrance Road**. Desert View Drive (access to Desert View) and its environs represent a historic road corridor dating to the early twentieth century. The road has undergone periods of expansion and reconstruction since its original establishment.

• **Unpaved Drive Remnants**. This is an unimproved path in the Historic Residences Landscape Character Area that provides access between the historic residences area (vicinity of Building Nos. 149, 912, 914, and 915) and the parking lot and the watchtower area.

• **Road to Cedar Mountain**. This is an unpaved road, evident on 1930s maps of the area that runs along the northern margin of the park employee housing area (Employee/Staff Housing Landscape Character Area), beginning at the maintenance area (Maintenance Landscape Character Area) and extending eastward to Cedar Mountain. The road passes through the Forest Landscape Character Area.

• **Borrow Pits/Quarries**. Several borrow pits and rock quarrying areas, some of which date to the early twentieth century, exist along Desert View Drive in the vicinity of Desert View. These features have their own Landscape Character Area designation.

**West Rim Drive Cultural Landscape:** A CLI has been completed for West Rim Drive (Hermit Road), Overlooks and Trails (NPS 2003) and a CLTR was recently completed for Hermit Road (Milner 2004). The purposes of these documents are to identify, document, analyze, and evaluate contributing and noncontributing cultural landscape characteristics within the cultural landscape, and to provide specific recommendations and comprehensive vision for the landscape that can guide long-term management. The West Rim Drive Cultural Landscape includes the paved road that winds its way along the south rim starting at its intersection with the Village Loop Road and ending at the Hermits Rest Trail Head, all associated overlooks (auto pullouts and pedestrian), and the West Rim Trail. The Hopi Fire Tower is adjacent to the cultural landscape but outside its boundaries. The West Rim Drive CLI documents that Hermit Road, its associated overlooks and trail cultural landscape features are eligible for listing on the National Register of Historic Places as a district. The integrity of the landscape is classified as “medium/high” and is in “good” condition. The Hermits Rest parking area, masonry walls and curbstones along the roadway and at overlooks and pullouts are just a

few of the many features that contribute to the landscape's significance as an historic district.

Hermit Road and its associated overlooks and parking areas are historic, designed and constructed in 1934/35 by the National Park Service and the Bureau of Public Roads (with assistance from the CCC) as a scenic road, first paved in 1937. The property retains a high degree of integrity. The roadway is two-lane and narrow, with vegetation close to the road shoulder on both sides. The road was designed for vegetation to edge the road. Historic pullouts and overlook parking areas were designed to allow automobiles an opportunity to pull off the road to view the canyon rather than look over the edge while driving.

Another pattern of spatial organization is located between the road and the rim, which is occupied by native vegetation and informal social trails. This space varies greatly in width depending on how closely the road approaches the rim. The original intent of the road designers was, for safety reasons, to prevent drivers from having direct views into the canyon from the road.

The aspects of the eligible property include culverts and headwalls; walls at pullouts and overlook parking areas; benchmarks and brass cap monuments; West Rim Trail; and the rural road character.

**Grand Canyon Village Historic District, listed as a National Historic Landmark**: The Grand Canyon Village Historic District encompasses an extensive assemblage of 269 buildings and structures, 42 landscape structures and 3 sites. Historic resources contributing to the district's significance span the period of significance from 1898 to 1941, associated with early tourism development at the South Rim, and subsequent National Park Service expansion of the developed area. The arrival in 1901 of the Santa Fe Railway and its subsidiary, the Fred Harvey Company, provided the impetus for substantial tourist-related construction in the area prior to establishment of Grand Canyon National Park in 1919. The district retains a high degree of integrity reflecting the 1924 NPS master plan for the village; the original street plan, organization of developed areas, natural and constructed landscaping, and overall setting remain largely intact (NPS 1997).

Most of the district's structures date from the 1930s, constructed in the prevailing rustic style that incorporated native building materials, primarily wood and stone. Four early district structures built in the "Craftsman Rustic" and "NPS Rustic" styles are designated individually as National Historic Landmarks: El Tovar Hotel (1905), Grand Canyon Railway Depot (1910), Grand Canyon Powerhouse (1926), and Grand Canyon Park Operations Building (1929). Two additional NHL's, Hopi House (1905) and Lookout Studio (1914), were built by the Santa Fe Railway and designed by renowned architect Mary Jane Colter in her own distinctive rustic style. While located within the Grand Canyon Village Historic District, Hopi House and Lookout Studio are also grouped thematically in the Mary Jane Colter NHL Historic District together with Hermits Rest and Desert View Watchtower, two other Colter-designed buildings.

Center Road represents a portion of the original South Entrance Road alignment, constructed in 1927-28 to accommodate the park's growing number of motoring tourists. Designed by the Bureau of Public Roads, it was the first road built to automotive standards in the park, and for nearly 30 years served as the principal southern entrance route. In 1953-54, the present South Entrance Road was constructed as a replacement to handle increased vehicle volumes, and the old alignment (then designated Center Road) served as a service road for NPS and Fred Harvey Co. employees stationed at Grand Canyon Village (NPS 1997). Center Road is identified as a cultural landscape structure contributing to the NHL significance of the Grand Canyon Village Historic District.

**North Rim Bright Angel Peninsula Developed Area Cultural Landscape**: A CLI has been prepared for the North Rim Bright Angel Peninsula Developed Area (Milner 2004b). The North Rim Developed Areas include the North Entrance Road Corridor, CC Hill, and the Bright Angel Peninsula. The purposes of the CLI were to identify, document, analyze, and evaluate contributing and non-contributing cultural landscape characteristics within the cultural landscape, and to provide specific recommendations and comprehensive vision for the landscape that can guide long-term management. The CLI serves as a supporting document for implementation of the GMP. The CLI recommends that portions of the North Rim developed area be considered for listing on the National Register as two new, separate historic districts; The North Entrance Road historic district and the Bright Angel peninsula historic district. The CLI also discusses all development areas of concern in the development plan (headquarters area, campground area, concessionaire area, Lodge area, CC Hill) and provides specific recommendations for some proposed projects. The areas with specific relevance to the proposed radio repeater project are CC Hill and the North Kaibab Trail. How these areas tie into the cultural landscape for the North Rim Bright Angel Peninsula Developed Area is provided below.

**CC Hill**. CC Hill is located east of the North Entrance Road and is bounded to the north by Cape Royal Road, to the east by the canyon rim, and to the south by Roaring Springs Canyon. This area has not been formally evaluated for its historical significance, but the CLI suggests that the area likely does not possess historic integrity. Contemporary alterations and additions to the upper and lower CC Hill (Kaibab Trailhead area) landscapes since 1942 likely prohibit the landscape from reflecting many of the seven aspects of integrity. The parking area was likely constructed in the 1970's. The cleared areas associated with upper CC Hill may have retained the historic relationship to the road and corridor but it is not certain if these areas are remnants of a CCC camp scar or if the clearings are contemporary and relate to the current mule concessionaire use and possible NPS maintenance activities. Currently, upper CC Hill contains NPS maintenance structures and mule concessionaire facilities. One shed may survive from the period of significance, but its date of construction is currently unknown. Because there is so little documentation concerning CC Hill, it is difficult to compare historic vegetation to existing conditions. As stated in the CLI, "it is probable that the vegetation character, density, and species have changed very little, as the site was used for temporary encampments and not for intense development" (Milner 2004b). Contributing features on the upper CC Hill include the boreal forest encompassing the hill and the equipment shed located in the NPS maintenance area.

**The North Kaibab Trail.** Associated with lower CC Hill, this trail is a part of the trans-canyon trail corridor along Bright Angel Canyon and is a contributing element of the Cross Canyon Corridor historic district. This district was determined eligible as an historic district in 1980. Although the trailhead is not considered a contributing feature, the trailhead location is likely historic. The North Kaibab Trail is also a component of the National Trails System, and the Arizona Trail.

## METHODOLOGY

Cultural landscapes are the result of the long interaction between people and the land, the influence of human beliefs and actions over time upon the natural landscape. Shaped through time by historical land-use and management practices, as well as politics and property laws, levels of technology, and economic conditions, cultural landscapes provide a living record of an area's past, a visual chronicle of its history. The dynamic nature of modern human life, however, contributes to the continual reshaping of cultural landscapes; making them a good source of information about specific times and places, but at the same time rendering their long-term preservation a challenge.

In order for a cultural landscape to be listed in the National Register, it must meet one or more of the following criteria of significance: a) associated with events that have made a significant contribution to the broad patterns of our history; b) associated with the lives of persons significant in our past; c) embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; d) have yielded, or may be likely to yield, information important in prehistory or history (National Register Bulletin, How to Apply the National Register Criteria for Evaluation). The landscape must also have integrity of those patterns and features—spatial organization and land forms; topography; vegetation; circulation networks; water features; and structures/buildings, site furnishings or objects—necessary to convey its significance (Secretary of the Interior's Standards for the Treatment of Historic Properties With Guidelines for the Treatment of Cultural Landscapes). For purposes of analyzing potential impacts to cultural landscapes, the thresholds of change for the intensity of an impact are defined as follows:

Negligible: Impact(s) is at the lowest levels of detection—barely perceptible and not measurable.

Minor: Adverse: impact would not affect the character defining pattern(s) or feature(s) of a National Register of Historic Places eligible or listed cultural landscape.

Beneficial: preservation of character defining patterns and features in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes.

Moderate: Adverse: impact would alter a character defining pattern (s) or feature(s) of the cultural landscape but would not diminish the integrity of the landscape to the extent that its National Register eligibility is jeopardized.

Beneficial: rehabilitation of a landscape or its patterns and features in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes.

Major: Adverse: impact would alter a character defining pattern(s) or feature(s) of the cultural landscape to the extent that it is no longer eligible to be listed in the National Register.

Beneficial: restoration of a landscape or its patterns and features in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes.

## REGULATIONS AND POLICIES

Current laws and policies require that the following conditions be achieved in the park:

| Desired Condition | Source |
|---|---|
| The treatment of a cultural landscape will preserve significant physical attributes, biotic systems, and uses when those uses contribute to historical significance. Treatment decisions will be based on a cultural landscape's historical significance over time, existing conditions, and use. Treatment | National Historic Preservation Act; Executive Order 11593; Archeological and Historic Preservation Act; the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; Programmatic Memorandum of Agreement Among the NPS, |

| Desired Condition | Source |
|---|---|
| decisions will consider both the natural and built characteristics and features of a landscape, the dynamics inherent in natural processes and continued use, and the concerns of traditionally associated peoples. | Advisory Council on Historic Preservation, and the National Council of State Historic Preservation Officers (1995); NPS Management Policies (2006) |
| The treatment implemented will be based on sound preservation practices to enable long-term preservation of a resource's historic features, qualities, and materials. There are three types of treatment for extant cultural landscapes: preservation, rehabilitation, and restoration. | |
| Cultural landscapes are listed in the National Register when their significant cultural values have been documented and evaluated within appropriate thematic contexts and physical investigation determines that they retain integrity. Cultural landscapes are classified in the National Register as sites or districts or may be included as contributing elements of larger districts. | |

### IMPACTS OF THE PREFERRED ALTERNATIVE

## Impact Analysis

At Desert View, the proposed radio tower would be attached or adjacent to the ranger station and the shed would be within the existing parking footprint. This is approximately ¼ mile south of the Desert View Historic District Boundary. The tower would stand 60 feet high and it is anticipated that a single antenna would extend about 20 feet above the tree line. Based on the distance from the ranger station to the Desert View Watchtower, the antenna extending above the treeline would likely be visible from inside the watchtower (a character defining feature) looking out the windows on the top floor out toward the ranger station. Although views of the canyon from the watchtower are in the opposite direction of the proposed radio repeater, the watchtower provides for panoramic views of the surrounding area, including views towards the San Francisco Peaks (of cultural importance) within the general viewshed of the existing ranger station where the radio repeater would be constructed. However, the roofline from the newly constructed employee housing and light poles from the parking area are also visible from the watchtower in this general direction. Construction of the radio tower in this location would also be apparent from the road to Cedar Mountain (also a character defining feature) because the road runs adjacent to the ranger station property on the side of the building that the tower would be built. Additionally, the new repeater tower and antenna may be visible to visitors traveling into the park along the East Rim Road in the vicinity of the new east entrance station, as the top of the ranger station and existing DPS tower and antenna are visible there. Beneficial impacts may result from removal of incompatible equipment (antennae) from atop the Desert View Watchtower (Figure 9) improving the views of the watchtower itself from the surrounding area. For these reasons, implementation of the Preferred Alternative would result in direct and indirect impacts to cultural landscapes that are localized, minor, long-term and adverse as well as localized, negligible, long-term and beneficial.

At CC Hill, the proposed radio tower/shed would be constructed in the NPS maintenance area. A large cleared area with various scrap materials/ equipment, buildings, and a large dirt pile dominates the existing landscape. One character defining feature (equipment shed—building #1432) is located in this area. As proposed, the tower would stand 150 feet high, extending above the treeline of surrounding trees, which are approximately 75-120 feet high. It is anticipated that the boreal forest (also a character defining feature) surrounding CC Hill would screen the tower from view from other structures on upper and lower CC Hill, and trails leading from the parking lot, including the Widforss Trailhead, Ken Patrick Trail, North Kaibab Trailhead and parking lot, and all points on Bright Angel Peninsula and the North Rim Entrance Road; however, the tower would be within 100 feet of the character defining equipment shed and unable to be screened from view from this contributing structure. A powerline would be trenched within the existing road that traverses from the mule barn road (where electrical lines exist) to the proposed site (approximately 1,000 feet west). No vegetation would be disturbed to bury the powerline. It is also expected to be screened from viewpoints on the South Rim, as the Bright Angel Peninsula would be between CC Hill and all South Rim viewpoints west of Grandview Point (approximately 16 miles from CC Hill). For these reasons, implementation of the Preferred Alternative would result in direct and indirect impacts to cultural landscapes that are localized, minor, long-term and adverse.

At Hopi Point, the proposed radio tower/shed would be constructed in an area adjacent to the existing fire tower. The fire tower is about 350 feet south of West Rim Road. The existing landscape surrounding the fire tower contains many communication-related structures and equipment, including two wooden NPS poles with multiple NPS antennae, in addition to three connected wooden non-NPS poles with numerous non-NPS antennae. The existing vegetation (mature pinyon/juniper woodland) helps to essentially screen the fire tower and adjacent structures/equipment from view by visitors along West Rim Road and Hopi Point; however, the new repeater may be intermittently visible from along West Rim Road for short periods of time. The Hopi Fire Tower and NPS poles are visible from Verkamps to El Tovar; although, not very discernible. Figure 12 depicts the existing view of the Hopi Fire Tower from the Verkamps area. The fire tower is not visible at other locations in the National Historic Landmark District away from the rim trail. Measures would be taken when deciding final placement of the radio tower to position it so that is appears behind the Hopi Fire Tower and not a separate feature as viewed from Verkamps to El Tovar, therefore, the views from any character defining features within the Grand Canyon Village National Register Historic District should not change. Under the Preferred Alternative, the existing NPS-pole structures would be removed and replaced with one 60-foot-high self-supporting lattice tower with up to three (4 ft. diameter) microwave dishes attached. Construction of the new repeater and removal of the existing NPS-pole structures would not change any character-defining elements associated with Hermit Road or the West Rim Trail. The myriad of non-NPS equipment in the vicinity of the Hopi Fire Tower would be allowed to remain in place (with a requirement to obtain no-cost permits). The current NPS equipment would be replaced with one tower and shed adjacent to the current NPS poles and shed. Therefore, implementation of the Preferred Alternative would have localized, negligible, long-term adverse and beneficial impacts on the cultural landscape at Hopi Point.

At the Grand Canyon Village EMS building, the proposed radio tower/antennae/ shed would be constructed in an area adjacent to the recently constructed EMS building. This area is not within the boundaries of any defined cultural landscapes or historic districts; however, erecting a 60-foot radio tower would most likely be visible from the two trailview visitor overlooks along West Rim Road (within the West Rim Road Cultural Landscape). Because of the topography and vegetation in the area, the new tower is not expected to be visible from the Grand Canyon Village National Historic Landmark District. Up to three (4 ft. diameter) microwave dishes may be attached but would most likely be at or near

tree level and probably not visible from any character defining features of historic districts. Therefore, implementation of the Preferred Alternative would have localized, minor, long-term adverse impacts on the cultural landscape of West Rim Road.

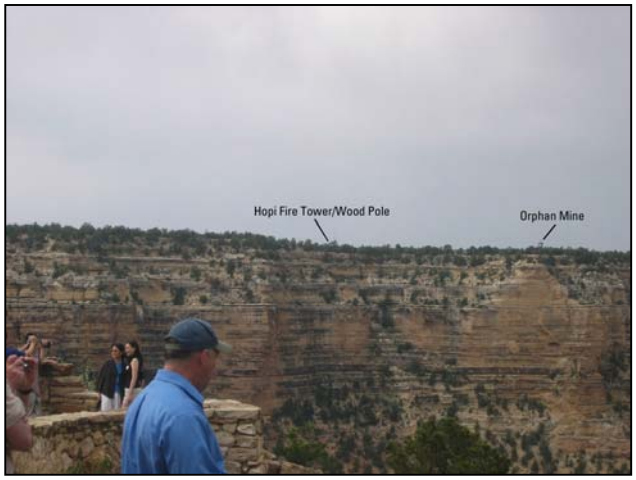


**Figure 12, View Towards Hopi Point from El Tovar (using zoom lens at 3 times normal magnification)**

## Cumulative Effects

The radio repeaters with the potential to cumulatively affect cultural landscapes are at Desert View, Grand Canyon EMS, Hopi Point, and CC Hill. Past, present, and foreseeable future projects that may affect the cultural landscape include rehabilitation of Hermit Road, rehabilitation of Yavapai Observation Station, rehabilitation of Park Headquarters Building, and Desert View Housing and Support. Recent projects have added various elements to the cultural landscape that have adversely affected the setting including structures, disturbed or modified vegetation, changes in traffic circulation, and modification to buildings. The majority of the foreseeable future projects that have the potential to affect cultural landscapes have been discussed with SHPO. Consultation with SHPO and using the treatment recommendations made in the applicable CLIs as mentioned above, as the basis for future projects ensure that any adverse effects of future projects on cultural landscapes would be minimized to the extent possible. Therefore cumulative impacts to cultural landscapes would be localized, minor, long-term and adverse as well as beneficial.

## Conclusion

Implementation of the Preferred Alternative would result in direct, indirect, and cumulative impacts to cultural that are localized, negligible to minor, long-term, adverse as well as beneficial. The antenna extending above the treeline at Desert View would likely be visible from inside the Desert View Watchtower (a character defining feature), along the road to Cedar Mountain (also a character defining feature) and intermittently along the East Rim Road in the vicinity of the new east entrance station. The 150-foot radio tower/antennae at CC Hill would be visible from the equipment shed—building #1432 (a character defining feature); however, the boreal forest (also a character defining feature) surrounding CC Hill would screen the repeater from view at any other character defining feature, trail, or parking lot. The radio

tower at Grand Canyon EMS would be visible from viewpoints along West Rim Road (character defining features of West Rim Road Cultural Landscape). The repeater at Hopi Fire Tower would be visible intermittently from West Rim Road, from the rim trail between Verkamps and El Tovar, and at the Yavapai Observation Station. Beneficial impacts may result from removal of incompatible equipment (antennae) from atop the Desert View Watchtower, Hopi Fire Tower, Yavapai Observation Station, and Park Headquarters Building. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's cultural landscapes.

### IMPACTS OF ALTERNATIVE A – NO ACTION

## Impact Analysis

The No Action Alternative would have no direct effect on identified cultural landscapes within the park. However, the No Action Alternative has the potential to affect cultural landscapes by continuing to house radio equipment on the Desert View Watchtower, Hopi Point Fire Tower, and the Yavapai Observation Station, thereby adversely impacting cultural landscapes in those areas and their respective viewsheds. For these reasons, implementation of the No Action Alternative would result in localized, negligible to minor, long-term adverse impacts to cultural landscapes.

## Cumulative Effects

The radio repeaters with the potential to cumulatively affect cultural landscapes are at Desert View, Grand Canyon EMS, Hopi Point, and CC Hill. Past, present, and foreseeable future projects that may affect the cultural landscape include rehabilitation of Hermit Road, rehabilitation of Yavapai Observation Station, rehabilitation of Park Headquarters Building, and Desert View Housing and Support. Recent projects have added various elements to the cultural landscape that have adversely affected the setting including structures, disturbed or modified vegetation, changes in traffic circulation, and modification to buildings. The majority of the foreseeable future projects that have the potential to affect cultural landscapes have been discussed with SHPO. Consultation with SHPO and using the treatment recommendations made in the applicable CLIs as mentioned above, as the basis for future projects ensure that any adverse effects of future projects on cultural landscapes would be minimized to the extent possible. Therefore cumulative impacts to cultural landscapes would be localized, minor, long-term and adverse as well as beneficial.

## Conclusion

Direct and indirect impacts to cultural landscapes would be localized, negligible to minor, long-term and adverse as a result of implementing the No Action Alternative by continuing to house radio equipment on the Desert View Watchtower, Hopi Point Fire Tower, and the Yavapai Observation Station, thereby adversely impacting cultural landscapes in those areas and their respective viewsheds. Cumulative impacts to cultural landscapes would be localized, minor, long-term and adverse as well as beneficial. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents,

there would be no impairment of Grand Canyon National Park's cultural landscapes.

# SOILS

## AFFECTED ENVIRONMENT

Grand Canyon National Park is in the southern portion of the Colorado Plateau. The soils tend to be shallow and poorly developed with frequent rock outcroppings. Underlying the soils is Kaibab limestone, a very porous and fossil-laden rock layer. Due to its porosity, this layer has numerous solution channels and sinks, creating subdued karst topography. Precipitation quickly penetrates the soil and rock layers, so little or no surface water is present except during heavy precipitation events. Detailed soils mapping was not completed for the project area. Soils have been identified using the General Soils Map of Arizona (Hendricks 1985). Soils within the project areas generally consist of the Thermic Arid soils associated with Torriorthents-Camborthids Rock Outcrops. These soils are mostly shallow and moderately deep soils and rock outcrops of canyons, cliffs, and mesas (Ibid.)

## METHODOLOGY

Available information on general Arizona soils in the park was compiled. Impacts to soils are considered adverse and not beneficial. The thresholds of change for the intensity of an impact to soils are defined as follows:

Negligible: An action that could result in a change to soils, but the change would be so small that it would not be of any measurable or perceptible consequence. Soils would not be affected or the effects to soils would be below or at the lower levels of detection. Any effects to soil productivity or fertility would be slight and no long-term effects to soils would occur.

Minor: An action that could result in a change to soils, but the change would be small and localized and of little consequence. The effects to soils would be detectable. Effects to soil productivity or fertility would be small, as would the area affected. If mitigation were needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.

Moderate: An action that would result in a change to soils; the change would be measurable and of consequence. The effect on soil productivity or fertility would be readily apparent, likely long-term, and result in a change to the soil character over a relatively wide area. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.

Major: An action that would result in a noticeable change to soils; the change would be measurable and result in a severely adverse or major beneficial impact. The effect on soil productivity or fertility would be readily apparent, long-term, and substantially change the character of the soils over a large area in and out of the monument. Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.

## IMPACTS OF THE PREFERRED ALTERNATIVE

### Impact Analysis

Potential effects on soils from construction and operation of the radio repeaters involve soil removal/profile mixing due to digging holes or trenches, or installing grounding wires or fences, and soil pollution from equipment leakage/failure during construction.

Although already disturbed areas would be used whenever possible, an area up to 100 ft x 100 ft may need to be graded and/or cleared of vegetation at the Hopi Fire Tower and Grand Canyon Village EMS building for construction of the tower, fence and shelter at the site. The repeaters at Desert View Ranger Station and CC Hill, would be within existing developed (graded) areas primarily devoid of native vegetation so the maximum area graded for the radio repeaters would be less than 100 ft x 100 ft. In addition, the Kanabownitz site would only require in-kind replacement of equipment on the existing tower and would not require ground disturbing activities. The site at Mt. Emma would involve an area 6 feet x 8 feet. All of the sites except CC Hill already have a tower and associated radio equipment and all sites are already disturbed.

Digging a hole for the concrete pad and trenching for underground utility lines (at CC Hill and Grand Canyon EMS) would have the greatest potential to mix soil profiles. Concrete pads would be built on all the sites inside the park except Mt. Emma and Kanabownitz. Holes for the concrete pads would be 4 feet deep. Soil excavated from the holes would total 87.2 $ft^3$ (CC Hill: 42.8 $ft^3$, Hopi Point: 14.8 $ft^3$, Desert View Ranger Station: 14.8 $ft^3$, and Grand Canyon EMS: 14.8 $ft^3$). Soils removed from the holes would be stockpiled and spread evenly over the disturbed construction area once the tower is erected or transported from the site and used elsewhere as approved. Large rocks excavated from the holes or trenches would be placed on-site or used elsewhere as approved.

All potential impacts to soils would be avoided or reduced to localized, minor, short-term and adverse levels by implementing mitigation measures during construction.

### Cumulative Effects

The combined impact of this proposal with past, present, and foreseeable future actions would result in the continued displacement of soils from construction and development projects. Displacement from soil removal and potential soil erosion would probably be the impact of greatest concern because of the extent of soil disturbed during construction. However, soil loss would be minimized through implementation of standard erosion control measures. Cumulatively, impacts to soils would be site-specific, minor to moderate, short-term and adverse.

### Conclusion

Direct and indirect impacts to soils would be site-specific, minor, short-term and adverse as a result of soil removal/profile mixing and soil pollution from equipment leakage/failure during construction. Cumulatively, impacts to soils would be site-specific, minor to moderate, short-term and adverse. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park’s general management plan or other relevant National Park

Service planning documents, there would be no impairment of Grand Canyon National Park's soils.

### IMPACTS OF ALTERNATIVE A – NO ACTION

## Impact Analysis

No direct or indirect impacts to soils would result from implementing the No Action Alternative because no ground disturbing activities would occur.

### Cumulative Effects

The combined impact of this proposal with past, present, and foreseeable future actions would result in the continued displacement of soils from construction and development projects. Displacement from soil removal and potential soil erosion would probably be the impact of greatest concern because of the extent of soil disturbed during construction. However, soil loss would be minimized through implementation of standard erosion control measures. Cumulative impacts would be site-specific, minor, adverse and short-term.

## Conclusion

No direct or indirect impacts to soils would result from implementing the No Action Alternative. Cumulative impacts to soils would be site-specific, minor, adverse and short-term as a result of implementing the No Action Alternative. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's soils.

# VEGETATION AND WILDLIFE

### AFFECTED ENVIRONMENT

The Park contains several major ecosystems. Its great biological diversity can be attributed to the vast change in elevation from the river to the highest point on the North Rim (nearly 8,000 feet of vertical change). Climate, geomorphology and geology influence the composition and distribution of plant species found in 129 distinct vegetation communities within the park. Over 1,500 plant, 355 bird, 89 mammalian, 47 reptile, 9 amphibian, and 17 fish species are found in the park.

The South Rim is generally considered in the Upper Sonoran Life Zone and includes species such as gray fox, mule deer, bighorn sheep, and rock squirrels.

The North Rim lies in the Boreal Zone. This zone includes the Kaibab Plateau at an elevation of over 8,250 to 9,000 feet. Mountain lions, Kaibab squirrels, and northern goshawks are all species found here.

**Desert View Ranger Station and Hopi Fire Tower Sites:**
The pinyon/juniper woodland ecosystem was found at the Desert View Ranger Station and Hopi Fire Tower sites. Although the site at Desert View is mostly void of native vegetation, surrounding the area one can find pinyon pine, , big sagebrush, snakeweed, Mormon tea, banana and narrowleaf yucca, winterfat, Indian ricegrass, and needlegrass. The dominant species at the Hopi Fire Tower include pinyon pine and one-seed and Utah juniper. Many of the other species noted above are also found at the Hopi Fire Tower.

**Grand Canyon Village EMS Site:**

The site at Grand Canyon Village EMS lies in a transition zone between the pinyon/juniper woodland and ponderosa pine ecosystems. The site for the radio repeater would most likely lie adjacent to and behind the EMS building and parking area in an area and includes species such as ponderosa pine, pinyon pine, one-seed and Utah juniper, big sagebrush, and snakeweed.

**Mt. Emma Site:**
At nearly 7,700 feet above mean sea level, the dominant species at the Mt. Emma site was manzantia, buckbrush, pinyon pine, Gambel oak, big sagebrush, locust, and rubber rabbitbrush.

**CC Hill and Kanabownitz Fire Tower Sites:**
Two sites lie above 8,200 feet above mean sea level (CC Hill and Kanabownitz). The tower at CC Hill would be in the existing NPS maintenance area that is mostly open; however, native vegetation surrounds the site. In addition to ponderosa pine other species occur at these sites, including aspen, Englemann spruce, blue spruce, Douglas fir, white fir, and several species of perennial grasses, ferns, groundsels, cinquefoil, and asters. The site at Kanabownitz would involve in-kind replacement of equipment on the existing fire tower; however, some clearing of overgrown vegetation on the access road to the tower may be needed. Vegetation noted above is also found at Kanabownitz.

## METHODOLOGY

Impacts to vegetation and wildlife are considered adverse and not beneficial. The thresholds of change for the intensity of an impact to vegetation and wildlife are defined as follows:

Negligible: An action that would result in no native vegetation and wildlife disturbed or limited disturbance to individual plants, but there would be no effect on native species populations. The effects would be short-term, on a small scale, and no species of special concern would be affected. Additionally, the action could result in the spread of noxious weeds, but the change would be so small that it would not be of any measurable or perceptible consequence.

Minor: An action that could result in disturbance to some individual native plants and wildlife and could also affect a relatively minor portion of that species' population. Mitigation to offset adverse effects, including special measures could be required and would be effective. Additionally, the action could result in the spread of noxious weeds. The change would be small and localized and of little consequence

Moderate: An action that could result in disturbance to some individual native plants and wildlife and would also affect a sizeable segment of the species' population in the long-term and over a relatively large area. Mitigation to offset adverse effects could be extensive and would likely be successful. Some species of special concern could also be affected. Additionally, the action could result in the spread of

noxious weeds. The change would be measurable and of consequence to the species or resource but more localized.

Major: An action that could result in a considerable long-term effect on native plant and wildlife populations, including species of special concern, and could affect a relatively large area inside or outside the park. Mitigation measures to offset the adverse effects would be required, extensive, and success of the mitigation measures would not be guaranteed. Additionally, the action could have a noticeable invasion of noxious weeds. The change would be measurable and result in a severely adverse or major beneficial impact, and possible permanent consequence, upon the biotic community or resource.

### REGULATIONS AND POLICY

Current laws and policies require that the following conditions be achieved for vegetation and wildlife in the park:

| Desired Condition | Source |
|---|---|
| Populations of native plant and animal species function in as natural condition as possible except where special management considerations are warranted. (Areas with special management considerations will be determined through management zoning decisions in the GMP.) | Park's enabling legislation; NPS Management Policies (2006) |

### IMPACTS OF THE PREFERRED ALTERNATIVE

## Impact Analysis

The proposed radio repeater sites would result in only minimal new ground disturbance. The majority of the project areas are disturbed sites where radio system equipment already exists and/or where vegetation is limited (Desert View Ranger Station, Grand Canyon EMS building, CC Hill, and Hopi Fire Tower). While plant removal may be necessary in some situations, this would be minimal, and site-specific. Efforts would be taken to avoid plant removal, especially trees, as much as possible. There is a potential to increase disturbance to adjacent biotic communities from the spread or introduction of exotic vegetation and noxious weeds. For these reasons, the NPS Vegetation Program Manager would be consulted on the exact site location and amount of disturbance to determine if noxious weeds are present and need to be mitigated. Some routine maintenance involving vegetation trimming around the radio repeater site (particularly at Mt. Emma) may be necessary to prevent overgrowth and the potential for vegetation to damage the repeater or equipment. Additionally, a helicopter landing area at Mt. Emma would be maintained and may involve tree/shrub trimming.

Implementation of the Preferred Alternative would not result in substantial changes in overall ground disturbance or habitat disturbance compared to the existing condition. Only a total of about one acre of disturbance is expected, and this is spread out over six sites, most of which are in disturbed areas or adjacent to existing parking areas. Habitat quality at most of the radio repeater sites is already diminished due to existing disturbance. The minor changes proposed under the Preferred Alternative would not result in measurable changes in habitat over the long-term with the exception of the possibility of short-term adverse impacts due to increased construction noise in project areas during project implementation.

The chance of any bird species flying into one of the towers is very unlikely. There are several risk factors associated with towers that can affect the probability of birds flying into towers: height, lighting, weather, and proximity to migration corridors. Tall towers appear to be much more dangerous, especially guyed towers over 1,000 feet high. In addition, any tower over 199 feet tall must be lit to prevent airplanes from hitting it; which can be an attractant to birds in bad weather or at night. Areas of low visibility (e.g., foggy) can also create problems for birds. Towers located near wetlands, coastlines, or migration corridors appear to be the most dangerous for bird collisions (USFWS-Partners in Flight 2005). None of these types of areas (wetlands, coastlines, etc.) exist at any of the proposed radio repeater sites. The proposed radio repeaters account for the other considerations by proposing self-supporting towers (no guy wires) that would be less than 200 feet high so they will not need lighting at the top. These actions should minimize the potential hazard for bird collisions. Additionally, microwave dishes attached to the towers would be covered to prevent birds from landing on the dishes.

Construction materials would be transported to the Mt. Emma site using helicopters. Minor vegetation trimming would be needed to maintain the ability of helicopters to land safely near the site during construction and periodically for maintenance at the site. The proposed transport of construction materials into the project sites via helicopter would affect wildlife near the flight path during this transport. It is anticipated that construction activities could be completed within one week and that no more than three to five helicopter trips to Mt. Emma would be needed for construction of the repeater/shed. With the replacement of the existing repeater/antennae, the need for maintenance would be reduced and would result in fewer helicopter trips to Mt. Emma for routine maintenance.

For these reasons, the Preferred Alternative would result in site-specific, negligible to minor, short-term and adverse impacts to vegetation and wildlife.

## Cumulative Effects

Vegetation and wildlife habitat have been lost in and around Grand Canyon from past developments. Future projects may increase the potential for vegetation and wildlife to be disturbed; however, most projects (including the proposed radio repeaters) in the park have been designed to use already disturbed areas to the extent practicable to minimize impacts to vegetation, wildlife habitat, and the environment. Cumulatively, impacts would be site-specific, minor, adverse and long-term.

## Conclusion

Direct and indirect impacts to vegetation and wildlife would be site-specific, negligible to minor, short-term and adverse as a result of implementing the Preferred Alternative because of the limited amount of disturbance expected from construction and the fact that many of the sites are in already disturbed areas with limited vegetation and wildlife use. Cumulative impacts are expected to be site-specific, minor, long-term and adverse. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park’s general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park’s vegetation and wildlife resources.

### IMPACTS OF ALTERNATIVE A – NO ACTION

## Impact Analysis

In general, no direct or indirect impacts to vegetation and wildlife would result from implementing the No Action Alternative because no ground disturbing activities would occur. However, minor vegetation trimming at Mt. Emma would be needed to maintain the ability of helicopters to land safely near the site periodically for maintenance. The proposed use of helicopters would affect wildlife near the flight path during this transport. The existing tower is beginning to rust and would likely require increased maintenance to keep it in service. Direct or indirect impacts to vegetation and wildlife would be site-specific, negligible, long-term and adverse as a result from implementing the No Action Alternative.

## Cumulative Effects

Vegetation and wildlife habitat have been lost in and around Grand Canyon from past developments. Although no radio repeaters would be built under this alternative, the increased frequency of maintenance to the existing radio equipment may disturb wildlife (particularly helicopter trips to Mt. Emma), but at a minor level. Future projects may increase the potential for vegetation and wildlife to be disturbed; however, most projects in the park have been designed to use already disturbed areas to the extent practicable in order to minimize impacts to vegetation, wildlife habitat, and the environment. Cumulatively, impacts would be site-specific, minor, adverse and long-term.

## Conclusion

In general no direct or indirect impacts to vegetation and wildlife would occur because no ground disturbing activities would be involved in the No Action Alternative. However, direct and indirect impacts at Mt. Emma would be site-specific, negligible, long-term and adverse as a result from implementing the No Action Alternative because of the need to conduct routine maintenance and trimming of vegetation. Cumulative impacts would be site-specific, minor, adverse and long-term. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park’s general management plan or other relevant National Park Service planning documents, there would be no impairment of the park’s vegetation and wildlife resources.

# THREATENED, ENDANGERED, AND SENSITIVE SPECIES

### AFFECTED ENVIRONMENT

NPS staff and the Arizona Heritage Database were consulted for a listing of federally and state listed special status species that could be affected by proposed construction and operation of the radio repeaters at the sites within the park. Only two sensitive avian species have potential to be affected by the proposed radio towers and antennae: an experimental/nonessential population of California condor (*Gymnogyps californianus)* and peregrine falcon (*Falco peregrinus*) a species that is no longer federally listed but is considered sensitive by the park. At this time, California condors are known to occupy Grand Canyon National Park and have nested near Hopi Point in years past. Additionally, peregrine falcons are known to occur near the Hopi Fire Tower. A

brief description of the special status species applicable to this project is provided below.

Mexican spotted owls (*Strix occidentalis lucida*) are not discussed further in the impacts analysis because there are no protected activity centers for Mexican spotted owls within one mile of any of the current or proposed radio repeater sites in the park; therefore, it is determined that there would be "no effect" on this species due to this project. The USFWS commented during public scoping about the potential to affect Mexican spotted owls at the O'Leary Peak Fire Tower. O'Leary Peak Fire Tower is included in a communication plan implemented by the Coconino National Forest (CNF 2001). Radio Equipment at the O'Leary Fire Tower would involve "in-kind" replacement of existing equipment. NPS staff will coordinate with Coconino National Forest and USFWS staff to assure that impacts to MSO are avoided by implementing any required mitigation measures according to the communication plan.

**California Condor**. The California condor was listed as an endangered species in March 1967. In 1996, the USFWS established a nonessential, experimental population of California condors in northern Arizona. By declaring the population "nonessential, experimental", the USFWS can treat this population as "threatened" and develop regulations for management of the population that are less restrictive than mandatory prohibitions covering endangered species. This facilitates efforts to return the condor to the wild by providing increased opportunities to minimize conflict between the management of the condors and other activities. Within Grand Canyon National Park, the condor has the full protection of a threatened species. In December 1996 the first condors were released in the Vermilion Cliffs area of Coconino County, Arizona, approximately 48 km (30 miles) north of Grand Canyon National Park. Twenty-three subsequent releases of over 80 additional condors have occurred in the same vicinity and in the Hurricane Cliff area, which is about 96 km (60 miles) west of Vermilion Cliffs. By the close of 2005, there were 59 free-ranging condors in the Arizona/Utah population and nine awaiting release (Peregrine Fund website, 2007).

All of the California condors in northern Arizona are fitted with radio transmitters that allow field biologists to monitor the condors' movements. Condors have been observed as far west as the Virgin Mountains near Mesquite, Nevada; south to the San Francisco Peaks outside of Flagstaff, Arizona; north to Zion and Bryce Canyon National Parks and beyond to Minersville, Utah; and east to Mesa Verde, Colorado and the Four Corners region. Monitoring data indicate condors are using habitat throughout Grand Canyon National Park, with concentration areas in Marble Canyon, Desert View to the Village on the South Rim, and the Village to Hermits Rest. The North Kaibab National Forest is also used frequently for perching, roosting and foraging. Potential nesting habitat exists throughout the park. One nesting attempt was documented in the Marble Canyon area in 2001. Two nest sites on the South Rim, one on The Battleship and one on Dana Butte, were initiated in 2002. Both nest sites failed. In 2003, a condor chick hatched in the Salt Creek drainage area, the first condor born in the wild since reintroduction efforts began. In 2005, the Salt Creek nest was active again as was the Vermillion Cliffs nest. A new nest in the King's canyon area of the Kaibab National Forest failed. In 2006, all three nest attempts in Northern Arizona failed (NPS 2006c).

Most California condor foraging occurs in open terrain. Typical foraging behavior includes long-distance reconnaissance flights, lengthy circling flights over a carcass, and hours of waiting at a roost or on the ground near a carcass. Roost sites include cliffs and tall trees, including snags (61 FR 54043-54060).

**American Peregrine Falcon**. The American peregrine falcon was listed as endangered in 1970. On August 25, 1999, the USFWS removed the peregrine falcon from the federal list of endangered and threatened wildlife due to its recovery. The principal cause of the peregrine's decline was chlorinated pesticides, especially DDT and its metabolite DDE, which accumulated in peregrines as a result of feeding on contaminated prey. This interfered with calcium metabolism and caused a decline in reproductive success as the result of thin eggshells.

The population of peregrine falcons in Arizona is steadily increasing. In 1991, the peregrine falcon population in the Rocky Mountain/Southwest region was 367 known pairs; in 1998, the number of pairs had increased to 535. In Arizona, the known number of peregrine falcon pairs was 159 in 1999 (64 FR 46542-46558).

Peregrine falcons generally nest on cliffs near water. However, river cutbanks, trees, and manmade structures have been used as nesting habitat (NPS 2006c). Peregrine falcons feed primarily on other birds such as songbirds, shorebirds, and waterfowl. The usual method of obtaining prey is by attacking flying birds from above or chasing them from behind. An eyrie has been established about 0.2 miles northeast of the Hopi Fire Tower.

## METHODOLOGY

The baseline information used to assess impacts to special status species includes park staff knowledge of the resources and site; review of existing literature and park studies; information provided by specialists within the NPS and other agencies; and professional judgment. Detailed information on natural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area. Impacts to special status species are considered adverse and not beneficial. The thresholds of change for the intensity of an impact to special status species are defined as follows:

Negligible: An action that could result in a change to a population or individuals of a species or designated critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence. For federally listed species, negligible effect would equate with a "no effect" determination in USFWS terms.

Minor: An action that could result in a change to a population, individuals of a species, or designated critical habitat. The change would be measurable but small and localized and of little consequence. For federally listed species, an adverse minor effect would equate with a "may affect, not likely to adversely affect the species or critical habitat".

Moderate: An action that would result in some change to a population or individuals of a species or designated critical habitat. The change would be measurable and of consequence. For federally listed species, an adverse moderate effect would equate with a "may affect, not likely to adversely affect the species or critical habitat".

Major: An action that would result in a noticeable change to a population or individuals of a species or resource or designated critical habitat. For federally listed species, an adverse major effect would equate with a "may affect, likely to adversely affect the species or critical habitat" or a jeopardy opinion.

## REGULATIONS AND POLICY

Current laws and policies require that the following conditions be achieved for species of special concern in the park:

| Desired Condition | Source |
|---|---|
| Federal- and state-listed threatened and endangered species and their habitats are sustained. | Endangered Species Act; NPS Management Policies, National Environmental Policy Act |

### IMPACTS OF THE PREFERRED ALTERNATIVE

## Impact Analysis

Implementation of the Preferred Alternative would not result in substantial changes in overall ground disturbance or habitat disturbance over the existing condition. Only a total of about one acre of disturbance is expected, and this is spread out over six sites, most of which are in disturbed areas or adjacent to existing parking areas. Habitat quality in these areas is already diminished due to existing disturbance. The minor changes proposed under the Preferred Alternative would not result in measurable changes in habitat over the long-term and would not impact any sensitive species habitat requirements such as nesting and/or roosting sites with the exception of the possibility of site-specific, short-term, negligible, adverse impacts due to increased construction noise in project areas during project implementation.

The chance of any species of concern flying into one of the towers is very unlikely. There are several risk factors associated with towers that can affect the probability of birds flying into towers: height, lighting, weather, and proximity to migration corridors. Tall towers appear to be much more dangerous, especially those guyed towers over 1,000 feet high. Any tower over 199 feet tall must be lit to prevent airplanes from hitting it; which can be an attractant to birds in bad weather or at night. Areas of low visibility (e.g., foggy) can create problems for birds. Additionally, towers located near wetlands, coastlines, or migration corridors appear to be the most dangerous for bird collisions (USFWS-Partners in Flight 2005). None of these types of areas (wetlands, coastlines, etc.) exist at any of the proposed radio repeater sites. The proposed radio repeaters account for the other considerations by proposing self-supporting towers (no guy wires) that would be less than 200 feet high so they will not need lighting at the top. These actions should minimize the potential hazard for bird collisions. Additionally, microwave dishes attached to the towers would be covered to prevent birds from landing on the dishes.

**California Condor**: Impacts to California condors as a result of implementation of the Preferred Alternative would be primarily a result of noise disturbance from construction activity, but could also occur from the presence of the towers and antennae. Mitigation measures have been developed jointly with the U.S. Fish and Wildlife Service to minimize the likelihood for adverse impacts, including breeding season restrictions on these activities where necessary. If blasting is deemed necessary for any particular site, this would be restricted to the non-breeding season if within one mile of a confirmed nesting area. None of the proposed radio tower/shed locations occur in habitat considered suitable for nesting. Condors are not likely to be permanently displaced as a result of this project due to the small amount of disturbance and the availability of similar habitat in the surrounding area. Therefore, adverse impacts to condors are expected to be negligible and short-term. The NPS project manager for this project would be required to coordinate with NPS biologists or the Peregrine Fund prior to construction to determine if any active condor nests are near the proposed radio repeater sites. A determination would be made by NPS biologists prior to construction if additional mitigation measures are needed to avoid impacts to California condors. Therefore, impacts to California condors would be site-specific, short-term, negligible and adverse.

**Peregrine Falcon**: Impacts to peregrines would be primarily a result of noise disturbance during construction activity. None of the proposed radio tower/shed locations occur in habitat considered suitable for peregrine nesting. Peregrines are not likely to be permanently displaced as a result of this project due to the small amount of disturbance.

The proposed radio repeater site at Hopi Fire Tower is within 0.2 miles of a known eyrie. If blasting is deemed necessary for this site, this would be restricted to the non-breeding season if within one mile of a confirmed eyrie. Therefore, impacts to peregrine falcons would be site-specific, short-term, negligible and adverse.

## Cumulative Effects

Implementation of the Preferred Alternative, in combination with past, present and reasonably foreseeable future actions would potentially result in changes to special status species populations and habitats. However, species-specific protective measures for any current or planned individual project would be incorporated into the project to minimize the potential for adverse impacts. Detailed biological assessments for current and future projects with the potential for impacts to special status species would be prepared and would form the basis for consultation with the USFWS. Projects ongoing and planned are, in general, located in existing developed areas in the park. Generally, the cumulative impact of implementation of these actions would be confined to areas where habitat quality for many special status species has been previously degraded and is not currently providing high-quality habitat, or may be just on its periphery. Confining future short-term noise impacts and ground disturbing activities to these existing developed areas would minimize the likelihood of adverse impacts to special status species populations within the park. For these reasons, cumulative impacts to special status species would be site-specific, negligible, adverse and long-term.

## Conclusion

Implementation of the Preferred Alternative would result in a “no effect” determination for species protected under the Endangered Species Act. Direct and indirect impacts to special status species would be site-specific, negligible, short-term and adverse because none of the proposed radio tower/shed locations occur in habitat considered suitable for nesting for condors or peregrines, and special status species are not likely to be permanently displaced as a result of this project due to the small amount of disturbance and the availability of similar habitat in the surrounding area. Cumulative impacts are expected to be site-specific, negligible, adverse and long-term. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park’s general management plan or other relevant National Park Service planning documents, there would be no impairment of the park’s special status species.

### IMPACTS OF ALTERNATIVE A – NO ACTION

## Impact Analysis

The No Action Alternative would maintain the project area in its current state. Habitat quality in the immediate area of the repeater sites would remain relatively low due to the existing level of development and human activity. Without a change in vegetation or human use in the project area, populations of special status species would generally remain the same. Selection of the No Action Alternative would therefore have no direct or indirect impact on special status species.

## Cumulative Effects

Implementation of the No Action Alternative, in combination with past, present and reasonably foreseeable future actions would potentially result in changes to special status species populations and habitats. However, species-specific protective measures for any current or planned individual project would be incorporated into the project to minimize the potential for adverse impacts. Detailed biological assessments for current and future projects with the potential for impacts to special status species would be prepared and would form the basis for consultation with the U.S. Fish and Wildlife Service. Projects ongoing and planned are, in general, located in existing developed areas in the park. Generally, the cumulative impact of implementation of these actions would be confined to areas where habitat quality for many special status species has been previously degraded and is not currently providing high-quality habitat, or may be just on its periphery. Confining future short-term noise impacts and ground disturbing activities to these existing developed areas would minimize the likelihood of adverse impacts to special status species populations within the park. For these reasons, cumulative impacts to special status species would be site-specific, negligible, long-term and adverse.

## Conclusion

Implementation of the No Action Alternative would result in a “no effect” determination for species protected under the Endangered Species Act. No direct or indirect impacts to special status species would result from implementing this alternative. Cumulative impacts would be site-specific, negligible, long-term and adverse. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park’s general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park’s special status species.

# VISUAL QUALITY

### AFFECTED ENVIRONMENT

Conserving national park scenery and providing for visitor enjoyment are fundamental purposes of the NPS according to the 1916 Organic Act. Grand Canyon was designated a national park in 1919 and a World Heritage Site in 1979, in large part because of its “exceptional natural beauty” and its “aesthetic importance” (UNEP-WCMC 2007). Best known of the park’s scenic qualities are the expansive views of Grand Canyon from the rims. On clear days, a deeply eroded landscape of canyons, buttes and cliffs may be visible for 160 miles or more

from many overlooks on the North and South Rims. The Colorado River, flowing a mile below in the Inner Gorge, can be glimpsed from vantage points. For visitors on the South Rim looking directly across the canyon, the high, forested Kaibab Plateau can be seen on the North Rim, over ten miles away.

**Grand Canyon Village (EMS building).** The visual character of the landscape surrounding Grand Canyon Village has been significantly altered by man-made structures, roads, utilities, buildings, parking areas, vehicles. The gentle topography of the South Rim area combined with the varied canopy of trees (mature ponderosa pines, pinyon pines, juniper, and oak) provides a moderately high degree of visual absorption capacity for the landscape. The Grand Canyon (GC) Village EMS building is depicted in Figure 13. The proposed radio repeater equipment is expected to be located toward the left one-third of the photo.

**Figure 13, Grand Canyon EMS Building**

**Desert View**. Visual character of the landscape beyond the rim at Desert View is typical of the Kaibab Plateau, rolling plateaus of Great Basin conifer woodland occasionally cut by shallow, dry drainages. These drainages are ephemeral streams that tend to expose rock outcrops, which exhibit desert varnish, a visual feature unique to the region. The spatial qualities of the Desert View area are defined by open woodland of mature pinyon and juniper trees averaging 20 to 30 feet in height scattered across the landscape to the edge of the rim. The visual quality would be considered moderately high, based on the degree of topographic relief and landform diversity, without any disturbance. However, even though the area still has a forested appearance and feel, the Desert View area has been impacted by roads, buildings, and other uses that have created areas of disturbance within the open woodland. Overhead utilities, parking areas, and a variety of buildings of divergent architectural styles have been introduced into the landscape. The visual quality of the developed area now would be considered urbanized, with moderately low to low visual quality. The exception would be the watchtower, a visual and historic landmark, and the views from the rim into the Grand Canyon. Figure 14 shows the Desert View Ranger Station with the existing DPS tower and antenna. The proposed radio repeater tower/antenna would replace this tower at or adjacent to the same location as the DPS tower.

**Figure 14, Desert View Ranger Station with Existing DPS Tower/Antenna**

**Kanabownitz Fire Tower.** The visual character of the landscape surrounding Kanabownitz is predominately undisturbed. The wilderness character of the land surrounding the tower is unaltered, with the exception of the road (W-4), the fire tower, and the Kanabownitz cabin. The vegetation is mature ponderosa forest that essentially screens views. The Kanabownitz Fire Tower is depicted in Figure 7.

**Hopi Point.** The visual character of the landscape surrounding Hopi Point has been moderately altered by man-made structures, roads, utilities, buildings, parking areas, vehicles. The views along the West Rim Road vary and include views of pinyon-juniper forest, partial views through the forest to the canyon, and full canyon views in a few places. Visitors' attention is mostly directed toward the canyon because of its scenic complexity and changing form. Views off the road to the south (away from the canyon) have a lower interest value than views to the north (toward the canyon).

The Hopi Point Fire Tower has been significantly altered with man-made structures, equipment, and utilities that have been added with little apparent planning for what and where things would be placed, resulting in scattered disturbance. The fire tower itself is shown in Figure 8. The NPS shed and two wood poles surrounding the Hopi Fire Tower is shown in Figure 15 and the non-NPS shed and three wood poles is shown in Figure 16.

Figure 15, NPS Facilities surrounding Hopi Point Fire Tower

Figure 16, Non-NPS Facilities as viewed from Hopi Point Fire Tower (to remain in place with permits)

**CC Hill**. The visual character of the landscape surrounding CC Hill has been moderately altered by man-made structures, roads, trails, utilities, buildings, parking areas, NPS maintenance equipment/storage, mule corrals, and vehicles.

The proposed site for the radio repeater would be at the NPS maintenance area (Figure 17). A large cleared area with various scrap materials/equipment, buildings, and a large dirt pile dominate the landscape where the tower would be placed. The surrounding boreal forest is mature with trees standing 60-120 feet high and would screen the tower from view from most other structures on upper and lower CC Hill, and trails leading from the parking lot.

**Figure 17, CC Hill Proposed Radio Repeater Site**

**Mt. Emma**. The visual character of the landscape surrounding Mt. Emma is mainly undisturbed. The wilderness character of the land surrounding the existing radio repeater is unaltered, with the exception of the radio tower/shed site which is in a small clearing on the mountain's summit where vegetation has been trimmed to maintain a helicopter landing area for repeater maintenance. The nearest road is approximately five miles from the radio repeater site atop Mt. Emma. The vegetation is predominantly pinyon-juniper with subdominant shrubs that partially screen views. The proposed location for the tower/shed at Mt. Emma is depicted in Figure 18.

**Figure 18, Mt. Emma Radio Repeater Site**

## METHODOLOGY

All available information on visual resources was compiled. Effects of the alternatives on visual resources were evaluated via on-site visits. Impacts to

visual quality are considered adverse and not beneficial. The thresholds of change for the intensity of an impact are defined as follows:

Negligible: A change in visual quality that is barely detectable.

Minor: A change in visual quality that is slight but detectable and would be noticed by some visitors.

Moderate: A change in visual quality that is readily apparent and would be noticed by many visitors.

Major: An extreme change in visual quality that would be noticed by the majority of visitors.

### IMPACTS OF THE PREFERRED ALTERNATIVE

## Impact Analysis

Overall, visitors' attention is mostly directed toward the canyon because of its scenic complexity and changing form. For all the proposed radio repeaters, this is the viewshed away from the proposed sites. Although the forest contributes to the overall landscape, it is the canyon that provides the most significant interest.

The lattice towers would provide the greatest alteration to the viewshed. To analyze the impacts to the viewshed, various existing lattice towers were studied throughout Arizona, including the existing 125-foot-high Qwest telephone tower in Grand Canyon Village, to determine the distance at which point the towers fade into the background and are no longer visually evident. Most of the towers that were visited were found along major road corridors in relatively open areas with limited vegetation screening. For a typical 60-foot-high tower, the distance at which it disappears is between 2 and 3.5 miles. For a 200-foot-high tower, this distance increases to between 5-10 miles. The density of vegetation, type of vegetation, height of vegetation, degree of varying topography, and the viewer's vantage point (i.e., whether the viewer sees the tower against a background of sky or dark forest, etc.) affect the distance at which the tower would be visible.

Based on the studies completed above, a qualitative description of the viewshed impact at each site is provided below. Prior to approval, the NPS may complete additional studies at selected sites to pinpoint if any portion of the towers would be visible from visitor viewsheds.

**Desert View.** An existing DPS 40-foot tower is attached to the ranger station and would be replaced with a 60-foot self-supporting lattice tower with antennae and a microwave dish at about 50 feet high), a 6 ft chain-link fence around the base of the tower, and an equipment shed. Depending on where a person is standing, all or most of this equipment would be visible at the ranger station. The closer one is to the radio repeater site, the more noticeable the shed and fencing may be than the tower. However, as one moves away from the repeater site, vegetation and landform begin to screen the shed and fence, and the tower may become the only equipment visible until that is eventually obscured from view.

The existing tower is not visible from the watchtower, but are visible from the area near the new east entrance station. It is anticipated that a single antenna would extend about 20 feet above the tree line. A microwave dish also would be added to this tower at a height of about 50 feet above ground surface and would be facing toward the canyon. Based on the distance from the ranger station to the Desert View Watchtower, the antennae extending above the treeline would be visible from inside the watchtower looking out the windows on the top floor towards the ranger station. Measures would be implemented, such as painting the

towers/equipment camouflaging colors or requiring the use of lattice microwave dishes, to assist the towers in fading into the surrounding landscape and background more quickly. Although views of the canyon from the watchtower are in the opposite direction of the proposed radio repeater, the watchtower provides for panoramic views of the surrounding area, including views towards the San Francisco Peaks within the general viewshed of the existing ranger station where the radio tower would be constructed. However, the roofline from the newly constructed employee housing and light poles from the parking area are also visible from the watchtower in this general direction. Additionally, as visitors enter the park along the East Entrance Road, they would be able to see the top of the ranger station, tower and antenna from the area near the new east entrance station. For these reasons, implementation of the Preferred Alternative would result in direct and indirect impacts that are localized, minor to moderate, long-term and adverse. Beneficial impacts would also be localized, minor, and long-term from removal of antennae from atop the Desert View Watchtower, improving the views of the watchtower itself from the surrounding area.

**Grand Canyon Village EMS**. No tower currently exists at this site. The proposed lattice tower would be 60-feet-high with antennae and up to 3 microwave dishes at about 50 feet in height, a 6ft chain link fence around the base of the tower, and an equipment shed. Depending on where a person is standing, all or most of this equipment would be visible at the EMS building. The closer one is to the radio repeater site, the more noticeable the shed and fencing may be than the tower. However, as one moves away from the repeater site, vegetation and landform begin to screen the shed and fence, and the tower may become the only equipment visible until that is eventually obscured from view.

Its location is expected to be in a relatively clear area of forest to the northeast of the EMS building. As stated above, measures would be implemented if necessary that would help to absorb the radio tower/antennae/shed into the background. At 60 feet in height, the radio tower would be half the size of the Qwest cellular tower in Grand Canyon Village. Based on the visual analysis for this tower, it is anticipated that the radio tower at Grand Canyon Village EMS would be intermittently visible from the two Trailview Overlooks on the West Rim Drive; however, the viewpoints are 1.5 to 1.75 miles from the EMS building. Again, the canyon views are in the opposite direction of the radio tower, but visitors looking out over the forest may be able to distinguish the radio tower/antennae above the treeline. It is not anticipated that this tower would be visible from Center Road. Removal of the antennae on the Park Headquarters building would improve the visual quality in that area. For these reasons, implementation of the Preferred Alternative would result in direct and indirect impacts that are localized, minor, long-term and adverse, as well as localized, minor, long-term and beneficial.

**Hopi Point**. Actions associated with the landscape away from the canyon side of the road would have less of a visual/scenic impact than actions between the road and canyon rim. The existing structures have impacted the viewshed surrounding Hopi Fire Tower. Most of the structures would remain in place; however, the existing NPS shed and two wood pole structures would be replaced with a 60-foot lattice tower with antennae (and up to 3 microwave dishes at about 50 feet in height), a 6 ft chain link fence around the base of the tower, and an equipment shed. Depending on where a person is standing, all or most of this equipment would be visible at the fire tower. The closer one is to the radio repeater site, the more noticeable the shed and fencing may be than the tower. However, as one moves away from the repeater site, vegetation and landform begin to screen the shed and fence, and the tower may become the only equipment visible until that is eventually obscured from view.

It is anticipated that the lattice tower may be intermittently visible for short distances along West Rim Road. The forest vegetation, however, provides

screening that aids in obscuring man-made elements away from the road. The Hopi Fire Tower and NPS poles are currently visible from the rim trail between the El Tovar and Yavapai Observation Station, so it is likely that the proposed 60 ft tower would also be visible from these locations. However, although visible, they are barely discernable to the naked eye. Measures would be taken when deciding final placement of the radio tower to position it so that it appears behind the Hopi Fire Tower and not a separate feature as viewed from these locations. For these reasons, implementation of the Preferred Alternative would result in direct and indirect impacts that are localized to regional, minor to moderate, long-term and adverse.

**Kanabownitz**. This proposed site would involve "in-kind" replacement of antennae and equipment, so no change to the viewshed is anticipated. For these reasons, implementation of the Preferred Alternative would result in direct and indirect impacts that are localized, negligible, long-term and adverse.

**CC Hill**. No tower currently exists at this site. The proposed radio tower/shed would be constructed in the NPS maintenance area. A large cleared area with various scrap materials/equipment, buildings, and a large dirt pile dominate the landscape where the tower would be placed.

The proposed tower would be 150-feet-high with 4 antennae (and up to 3 microwave dishes), a 6 ft chain link fence around the base of the tower, and an equipment shed. Depending on where a person is standing, all of this equipment would be visible from the maintenance yard. The closer one is to the radio repeater site, the more noticeable the shed and fencing may be than the tower. However, as one moves away from the repeater site, vegetation and landform begin to screen the shed and fence, and the tower may become the only equipment visible until that is eventually obscured from view.

It is anticipated that the tower would extend above the treeline of surrounding trees that stand about 75- to 120-feet-high; however, the boreal forest surrounding CC Hill would screen the tower from viewpoints near CC Hill, including the Widforss Trailhead, Ken Patrick Trail, North Kaibab Trailhead and parking area, Cape Royal Road, North Rim Entrance Road, and all points on Bright Angel Peninsula. It is also expected to be screened from viewpoints on the South Rim, as the Bright Angel Peninsula would be between CC Hill and all South Rim viewpoints west of Grandview Point (approximately 16 miles from CC Hill). For these reasons, implementation of the Preferred Alternative would result in direct and indirect impacts to visual resources that are localized, minor to moderate, long-term and adverse.

**Mt. Emma**. A 25-foot-high tower with guy wires is currently stationed at this site. It would be replaced with a 40-foot articulated pole attached to a shelter (6ft X 8ft X 8ft) with a solar panel. The closest visitor viewshed would be from Vulcans Throne (approximately 6 miles southeast of Mt. Emma), Toroweap Overlook (approximately 7 miles southeast of Mt. Emma), or Tuweep Ranger Station (approximately 7 miles northeast of Mt. Emma). The existing structure is not visible from these locations and it is anticipated that the new structure would not be visible without the aid of binoculars. The Mt. Emma site is also immediately adjacent to the park boundary and the designated Mt Logan Wilderness on the other side of the boundary, on BLM land within Grand Canyon-Parashant National Monument. For these reasons, implementation of the Preferred Alternative would result in direct and indirect impacts to visual quality that is localized, negligible to minor, long-term and adverse.

## Cumulative Effects

Past actions and ongoing actions in the park have affected the scenic quality of surrounding areas, particularly in Grand Canyon Village and the North Rim Developed Area where buildings, roads, trails, and other facilities have removed

native vegetation and, in some cases, impeded canyon views and vistas. Foreseeable future projects have the potential to adversely affect visitor viewsheds; however, most projects are being designed carefully to make use of existing disturbed areas to the extent possible, be subordinate to the sites, and blend into the surrounding landscape. For these reasons, combining implementation of the Preferred Alternative with past, ongoing and foreseeable future actions would result in localized, moderate, adverse impacts to visual resources.

## Conclusion

Direct and indirect impacts to visual resources would be localized, minor to moderate, long-term and adverse at the following sites (Desert View, Hopi Point, and CC Hill) generally from the radio tower and antennae extending above the treeline and intermittently visible from sensitive viewpoints. At Grand Canyon Village EMS, direct and indirect impacts would be localized, minor, long-term and adverse. At Mt. Emma, direct and indirect impacts would be localized, negligible to minor, long-term and adverse. At Kanabownitz, direct and indirect impacts would be localized, negligible, long-term and adverse. Beneficial impacts would be localized, minor and long-term at Desert View Watchtower because existing equipment would be removed. Cumulative impacts would be localized, moderate, long-term and adverse. Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or (3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of the park's visual resources.

### Impacts of Alternative A – No Action

## Impact Analysis

The No Action Alternative would have no direct effect on visual resources within the park. However, the No Action Alternative has the potential to affect visual resources by continuing to house radio equipment on the Desert View Watchtower, Hopi Point Fire Tower, Park Headquarters Building, and the Yavapai Observation Station. The existing antennae are visible from these buildings and would be noticed by some visitors to these locations. This may detract from the buildings, particularly Desert View Watchtower and Yavapai Observation Station where visitors might not expect to see non-visitor related equipment. For these reasons, implementation of the No Action Alternative would result in localized, minor, long-term and adverse impacts to visual resources.

## Cumulative Effects

Past actions and ongoing actions in the park have affected the scenic quality of surrounding areas, particularly in Grand Canyon Village and the North Rim Developed Area where buildings, roads, trails, and other facilities have removed native vegetation and, in some cases, impeded canyon views and vistas. Foreseeable future projects have the potential to adversely affect visitor viewsheds; however, most projects are being designed carefully to make use of existing disturbed areas to the extent possible, be subordinate to the sites, and blend into the surrounding landscape. This alternative would not improve the viewsheds at Desert View Watchtower, Hopi Point, or Yavapai Observation Station. For these reasons, combining implementation of the No Action Alternative with past, ongoing and foreseeable future actions would result in localized, moderate, long-term, and adverse impacts.

### Conclusion

No direct impacts to visual resources would be expected under the No Action Alternative. Indirect impacts to visual quality would be localized, minor, long-term and adverse because continuing to house radio equipment on the Desert View Watchtower, Hopi Point Fire Tower, Park Headquarters Building, and the Yavapai Observation Station would adversely impact viewsheds in those areas. The antennae would be visible to some visitors to these locations where they detract from the visitor setting (e.g. Desert View Watchtower and Yavapai Observation Station). Cumulative impacts would be localized, moderate, long-term and adverse. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's visual resources.

## PARK OPERATIONS

### AFFECTED ENVIRONMENT

Park operations refer to the quality and effectiveness of park infrastructure (including communication) and management activities in protecting and preserving park resources and providing for a quality visitor experience. The park superintendent is ultimately responsible for managing the park, its staff and residents, all of its programs, and its relations with persons, agencies, and organizations interested in the park. Park staff provides the full scope of functions and activities to accomplish management objectives and meet requirements in law enforcement, emergency services, public health and safety, science, resource protection and management, visitor services, interpretation and education, community services, utilities, housing, fee collection, and management support.

The park's radio system is a critical component necessary for managing and protecting park resources, in providing for public and employee health and safety, and in accomplishing almost all park management activities. Grand Canyon National Park currently has seven repeater sites located on the North and South Rims of the Grand Canyon that provide conventional wideband VHF communications for the four major operational networks (Law Enforcement, Fire, Medical, and Administrative). There are large areas within the park that cannot receive or transmit radio communication. A tactical network provides incident-response communications. One of the current sites supports all four operational networks and the tactical network. All other sites provide a single repeater to expand coverage for one of the four operational networks. The Dispatch/Central Communications Site is located at the Park Headquarters Building while several control stations (mobile subscribers) are located throughout the park at access gates and ranger stations. No data connectivity currently exists between any of the sites and the Dispatch Facility.

Because there are large areas of the park with inadequate radio coverage, the park currently supplements the radio system with satellite telephone and/or satellite radio technology. However, due to the dramatic terrain in the park and the movement of the satellites, the park has found that the satellite technology is less reliable in the park than a good radio system. There has often been a loss of satellite connection after only a short time, requiring attempts at re-connecting and re-starting the communication again. The park also often

supplements its hand-held radios with antenna boosters (e.g., “sky probes” or long whip antennas) that improve the radio signal in some situations.

### METHODOLOGY

Baseline information used to assess impacts to park operations includes park staff knowledge of the resources, sites, and operational needs; review of existing literature and park studies; information provided by specialists within the NPS and other agencies and professional judgment. The following definitions are used to define intensity levels:

Negligible: A change in operations that is not measurable or perceptible.

Minor: A change in operations that is slight and localized with few measurable consequences.

Moderate: Readily apparent changes to park operations with measurable consequences.

Major: A severely adverse or exceptionally beneficial change in park operations.

### IMPACTS OF THE PREFERRED ALTERNATIVE

## Impact Analysis

Overall, the park’s ability to conduct management operations would be greatly improved due to the vast amount of increased coverage and improved signal that would be realized from the proposed radio system. In addition to the increased area of coverage, the proposed radio system would use an advanced digital solution that complies with the Association of Public Safety Communications Officers (APCO) Project 25 Common Air Interface (CAI). APCO is a network of local, state, and federal government agencies and international public safety organizations that evaluate technologies in advanced land mobile radios to determine the best solutions to serve the needs of public safety. The proposed radio system combines digital technologies with advanced voice processing techniques to provide narrowband digital systems that deliver audio quality that often exceeds that of analog systems. Narrowband technology helps alleviate the problem of RF communication congestion by utilizing increased spectral efficiency while requiring only half as much bandwidth (12.5 kHz vs. 25 kHz) per channel. Additionally, the proposed system has consistent audio quality throughout a defined coverage area on radios that are capable of the proposed system. Finally, the proposed system would be compatible with any other agencies that have converted to digital technology and would allow for interconnectivity with these agencies (Motorola 2005).

Employee and public safety, as well as the park’s ability to effectively conduct management activities, especially in remote areas, would also improve due to the greatly increased capability of people to contact each other with the park’s radio system, and call for help, supplies or assistance.

The Preferred Alternative would accomplish the project objectives to: 1) comply with federal regulations that require all federal agencies, including the National Park Service, to convert to narrowband radio communications; 2) provide for improved park radio communications and coverage, to increase public and employee safety and the ability of the park to safely and effectively conduct park management activities; and 3) to improve communications interoperability and services with other agencies. For all the above reasons, the Preferred Alternative would result in regional, moderate to major, long-term beneficial impacts to park operations.

## Cumulative Effects

Combining implementation of past, present and reasonably foreseeable future actions with implementation of the Preferred Alternative would result in regional, moderate to major, long-term, beneficial impacts to park operations.

## Conclusion

Direct, indirect, and cumulative impacts to park operations would be regional, moderate to major, long-term and beneficial because it would provide increased radio coverage throughout the park, use an advanced digital solution that complies with the APCO Project 25 CAI, and would be compatible with any other agencies that have converted to digital technology and would allow for interconnectivity with these agencies.

### IMPACTS OF ALTERNATIVE A – NO ACTION

## Impact Analysis

The existing system is outdated and contains large areas within the park that cannot receive or transmit radio communication. The current system uses wideband analog and uses the full spectrum available to the NPS, so that there is no additional frequency available for homeland security or other federal agencies. Additionally, many other agencies have converted to digital technology. Wideband analog technology is not compatible with agencies that have converted to digital technology and would not allow for interagency connectivity. Because the No Action Alternative would not convert to digital technology, it would not meet the project's objective #1 to comply with federal law requiring such conversion, or #3 to improve interagency interconnectivity. It would also not meet objective #2 to improve park radio communications and coverage, and to improve public and employee safety and the park's ability to conduct management activities. For these reasons, maintaining the current radio system would have moderate adverse long-term impacts on park operations.

The current park radio system is not only becoming obsolete but is in such increasing need of repair, replacement and maintenance, that the park now estimates that the deferred maintenance costs associated with the current radio system (i.e., the No Action Alternative) are essentially the same as the cost to replace it with the proposed system (i.e., the Preferred Alternative).

## Cumulative Effects

Combining implementation of past, present and reasonably foreseeable future actions with implementation of the Preferred Alternative would result in moderate adverse impacts to park operations over the long-term.

## Conclusion

Direct, indirect, and cumulative impacts to park operations would be regional, moderate, long-term and adverse because the existing system is outdated and contains large areas within the park that cannot receive or transmit radio communication, uses the full spectrum available to the NPS so that there is no additional frequency available for homeland security or other federal agencies, won't allow for interoperability with other agencies that have converted to digital technology, and is in such need of increasing repair/replacement/maintenance that the deferred maintenance cost would essentially equal that of building the proposed new system.

# WILDERNESS

## AFFECTED ENVIRONMENT

Over ninety percent of Grand Canyon National Park has been recommended for inclusion in the National Wilderness Preservation System (Figure 19). The Wilderness Act of 1964 required the Secretaries of Agriculture and Interior to evaluate land under their jurisdiction for possible wilderness classification. The Grand Canyon National Park Enlargement Act of January 3, 1975, as amended by the Act of June 10, 1975, required the Secretary of the Interior to prepare a wilderness recommendation. In 1976, the NPS prepared a draft environmental statement and preliminary wilderness proposal that was reviewed by the public. In 1977, a wilderness recommendation was sent to the department's Legislative Counsel, where it was held in abeyance pending the completion of the park's first comprehensive River Management Plan. Upon completion of the 1980 Colorado River Management Plan, the park submitted to the Department of Interior a proposal to designate 980,088 acres within the park as wilderness and an additional 131,814 acres as potential wilderness.

In 1993, the park conducted an internal review and update of the 1980 Wilderness Recommendation. Recent acquisition of grazing, mineral and other leases and completion of land use studies necessitated a revision of the recommendation. The update was based upon changes in the land status of recommended potential wilderness and refinements in acreage estimates determined by Geographical Information Systems (GIS). All modifications were consistent with the intent of the 1980 recommendation. In 1993, the Park Superintendent transmitted this recommendation to the Director of the NPS. Action on this recommendation is still pending.

The 1993 Final Wilderness Recommendation includes two units totaling 1,139,077 acres. Of this total, 1,109,257 are recommended for immediate wilderness designation; and 29,820 are recommended for designation as potential wilderness. Potential wilderness areas include those places that do not qualify for immediate designation as wilderness due to temporary, non-conforming or incompatible conditions. Mt. Emma is within recommended wilderness. The Kanabownitz Fire Tower (along with the Kanabownitz cabin) was excluded from recommended wilderness but lies adjacent to recommended wilderness. CC Hill is also adjacent to recommended wilderness.

The existing repeater site at Mt. Emma is also a component of the proposed radio conversion as a secondary site. Alternative sites to Mt. Emma that are outside recommended wilderness boundaries were considered (e.g., Tuweep Ranger Station and Mt. Trumbull), but the elevation of Mt. Emma, the existing equipment at the site, and the proximity to the canyon make this site a crucial component to the existing and proposed radio system. The existing equipment is considered temporary. If necessary, the equipment could be removed and the site (over time) returned to a natural state.

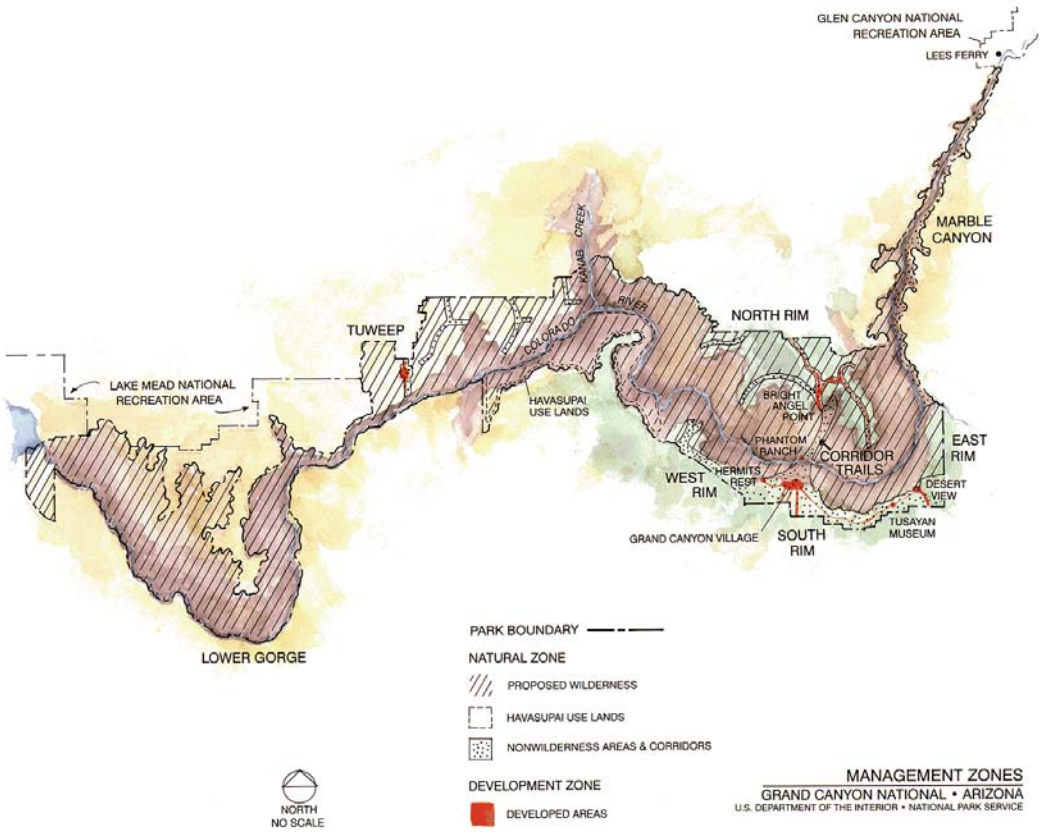


Figure 19, Management Zones at Grand Canyon National Park Identifying Recommended Wilderness Areas (source: GRCA 1995 General Management Plan)

The Mt. Emma site is also immediately adjacent to the park boundary and the designated Mt. Logan Wilderness on the other side of the boundary, on BLM land within Grand Canyon-Parashant National Monument. Also, the BLM maintains a radio repeater on Mt. Logan within the Mt. Logan Wilderness Area.

The Kanabownitz Fire Tower is also part of the existing radio communication system and a proposed optional secondary site. This site would only be used if it was determined after the other sites were built that replacing the equipment at Kanabownitz would increase the radio coverage within the park. Standard Operating Procedures for determining minimum requirements for management actions adjacent to recommended wilderness can sometimes apply if there is the potential for wilderness to be affected, depending on the scope of the project and type of activity.

The proposed primary radio tower/shed site at CC Hill also occurs adjacent to recommended wilderness. Standard Operating Procedures for determining minimum requirements for management actions adjacent to recommended wilderness can sometimes apply if there is the potential for wilderness to be affected, depending on the scope of the project and type of activity.

## METHODOLOGY

Under each alternative, wilderness is considered and addressed through the description of impacts to “wilderness character.” As stated in the Wilderness Act of 1964, wilderness character is made up of qualities such as “untrammeled”,

"natural", "undeveloped", and "potential for primitive recreation/solitude." Application of the minimum requirement analysis (MRA) is a part of both alternatives and included as Appendix B to this document. Additional sources of information on wilderness in Grand Canyon National Park used as a basis for this evaluation are as described above in the affected environment section. The thresholds of change for the intensity of an impact to wilderness are defined as follows:

Negligible: A change in wilderness character could occur, but it would be so small that it would not be of any measurable or perceptible consequence.

Minor: A change in wilderness character and associated values would occur, but it would be small, and, if measurable, would be localized.

Moderate: A change in wilderness character and associated values would occur. It would be measurable, and localized.

Major: A noticeable change in wilderness character and associated values would occur. The change would be measurable, and would have a substantial or possibly permanent consequence.

## REGULATIONS AND POLICIES

Current laws and policies require that the following conditions be achieved in the park:

| Desired Condition | Source |
|---|---|
| Proposals having the potential to impact wilderness resources will be evaluated in accordance with NPS procedures for implementing the National Environmental Policy Act (NEPA). Administrative actions impacting wilderness must be addressed in either the environmental assessment or environmental impact statement accompanying the approved wilderness management plan or as a separate environmental compliance document.<br><br>Managers contemplating the use of aircraft or other motorized equipment or mechanical transportation within wilderness must consider impacts to the character, esthetics, and traditions of wilderness before considering the costs and efficiency of the equipment.<br><br>Administrative facilities such as radio and/or cellular telephone antennas, radio repeater sites, may be allowed in wilderness only if they are determined to be the minimum requirement necessary to carry out wilderness management objectives and are specifically addressed within the park's wilderness management plan or other appropriate planning documents.<br><br>However, section 4(d)(1) of the Wilderness Act (16 USC 1133(d)(1)) authorizes the Secretary—where legislation designating the wilderness specifically makes this provision applicable—to allow the | NEPA, Wilderness Act of 1964, National Park Service Management Policies (DO-41 Wilderness Preservation and Management), Grand Canyon National Park's GMP, Grand Canyon National Park's Standard Operating Procedure (SOP-8213-004), Grand Canyon's 1988 Backcountry Management Plan |

| Desired Condition | Source |
|---|---|
| continuation of motorboat and aircraft use under certain circumstances in which those activities were established prior to wilderness designation.<br><br>The Service will strive to preserve or restore the natural quiet and natural sounds associated with the physical and biological resources of parks. To do this, superintendents will carefully evaluate and manage how, when, and where motorized equipment is used by all who operate equipment in the parks, including park staff. Uses and impacts associated with the use of motorized equipment will be addressed in park planning processes. Where such use is necessary and appropriate, the least impacting equipment, vehicles, and transportation systems should be used, consistent with public and employee safety. | |

## IMPACTS OF THE PREFERRED ALTERNATIVE

## Impact Analysis

The Preferred Alternative would not result in any changes to recommended wilderness boundaries as described in the Grand Canyon National Park Final Wilderness Recommendation, 1993 Update.

The proposed radio repeater equipment (i.e., tower, shed, antennae and associated electronics) for Mt. Emma (a secondary site) fall under the “minimum requirement concept,” which allows for Park superintendents to determine if the management action is necessary to successfully and safely accomplish the management objectives and to determine the methods or equipment needed to ensure that impacts on wilderness resources and character are minimized. The proposed “in-kind” replacement of antennae and equipment at Kanabownitz (an optional secondary site) and the new tower at CC Hill (a primary site) would occur adjacent to recommended wilderness, but would still fall under the “minimum requirement concept” discussed above. The minimum requirements analysis to determine the necessity of the proposed action and the tools and methods necessary for both the installation and long-term maintenance of the radio repeater equipment within or adjacent to recommended wilderness is included as Appendix B.

Construction materials would be transported to the Mt. Emma site using helicopters to confine ground impacts to the repeater site only. Minor vegetation trimming would be needed to maintain the ability of helicopters to land safely near the site during construction and periodically for maintenance at the site. The proposed transport of construction materials into the Mt. Emma site via helicopter would affect wilderness and visitors near the flight path during this transport. It is anticipated that construction activities could be completed within one week and that no more than three to five helicopter trips to Mt. Emma would be needed for construction of the repeater/shed. Changes to wilderness character such as naturalness and potential for solitude would occur where audible in wilderness areas below the flight path, but it would be localized. While this adverse impact is short-term, lasting only the duration of construction at this site, it would be moderate in intensity. Increased construction noise and increased human activity at the site during construction

has the potential to impact backcountry visitors; however, backcountry use in this area is very low. With the replacement of the existing repeater equipment, the need for maintenance would be reduced and would result in fewer helicopter trips to Mt. Emma for routine maintenance. This could positively impact wilderness qualities such as the potential for primitive recreation and solitude. While these construction activities would affect the qualities of untrammeled, undeveloped, and the opportunities visitors accessing the nearby wilderness would have for solitude, these impacts would be short-term, lasting only the duration of the construction. Long-term impacts to wilderness character would be minor.

In addition to the radio equipment being visible from the park's recommended wilderness surrounding Mt. Emma, the park's radio equipment at the Mt. Emma site would be visible from the Mt. Logan Wilderness immediately adjacent to the site, but it is expected to only be intermittently visible due to the trees and shrubs on Mt. Emma screening views of the structure. Also, that part of the Mt. Logan Wilderness receives very little visitation, and the radio equipment is not expected to be visible from areas within the wilderness that receive significant visitation.

Should the Kanabownitz site be needed to improve radio coverage it may require the use of existing roads to transport construction materials to the fire tower. Increased traffic on the access road during construction and construction noise and increased human activity at the fire tower during construction has the potential to impact backcountry visitors and wilderness character in the nearby wilderness. It is anticipated that construction activities could be completed within one week. With the replacement of the existing repeater equipment, the need for maintenance would be reduced and would result in fewer trips to Kanabownitz for routine maintenance. This could positively impact wilderness qualities such as the potential for primitive recreation and solitude. The in-kind replacement of equipment on the fire tower would not alter the appearance of the tower from its current state. While short-term construction activities would affect the qualities of untrammeled, undeveloped, and the opportunities visitors accessing the nearby wilderness would have for solitude, these impacts would be short-term, lasting only the duration of the construction. Long-term impacts to wilderness character at Kanabownitz would be localized, negligible and adverse.

CC Hill has been classified as nonwilderness; however, it is adjacent to wilderness. Increased traffic on the access road during construction and construction noise and increased human activity to the site during construction has the potential to impact backcountry visitors in the nearby wilderness. It is anticipated that construction activities could be completed within 2 weeks. While these construction activities would affect the qualities of untrammeled, undeveloped, and the opportunities visitors accessing the nearby wilderness would have for solitude, these impacts would be short-term. Long-term impacts to wilderness character would be localized, minor and adverse and result from having a radio repeater constructed next to recommended wilderness.

## Cumulative Effects

Combining this proposal with implementation of past, present, and reasonably foreseeable future actions would not result in changes to backcountry use area designations or the potential for areas to be designated as wilderness at some point in the future. None of the alternatives or any foreseeable future actions would result in any changes to recommended wilderness boundaries in the park. Current and foreseeable future actions with the potential for impacts to wilderness would be the subject of a minimum requirement analysis and a determination of the minimum tool necessary to implement project. The application of the minimum requirements analysis process would ensure that cumulative impacts to wilderness character are minimized. However, some of the

projects may require helicopter flights or other mechanized equipment for implementation. Even if these are ultimately deemed the minimum tool, it would still result in impacts to wilderness character that would be moderate, long-term and adverse, when combined with other past and future projects.

## Conclusion

Short-term (construction related) direct and indirect impacts to wilderness character would be localized, moderate and adverse as a result of implementing the Preferred Alternative primarily from increased traffic on the access roads during construction (or in the case of Mt. Emma increased helicopter flights to Mt. Emma), construction noise and increased human activity to the site during construction, which has the potential to impact backcountry visitors and wilderness character in the nearby wilderness. Long-term direct and indirect impacts would be adverse and range from negligible at Kanabownitz to minor at Mt. Emma and CC Hill as a result of constructing radio repeater equipment in an area adjacent to or within recommended wilderness areas. Cumulative impacts would be moderate adverse and long-term. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's wilderness character.

### IMPACTS OF ALTERNATIVE A – NO ACTION

## Impact Analysis

The No Action Alternative would not result in any changes to recommended wilderness boundaries as described in the Grand Canyon National Park Final Wilderness Recommendation, 1993 Update. Implementation of Alternative A would not result in impacts to wilderness designations or wilderness character. With no changes in existing conditions at existing repeater sites included in the No Action Alternative, no changes in helicopter flights or access to recommended wilderness areas would occur. The equipment at Mt. Emma requires periodic maintenance and is beginning to show signs of aging (rusting), which may require replacing or removing the structure in the future. Minor vegetation trimming would be needed to maintain the ability of helicopters to land safely near the site for maintenance. For these reasons, impacts to wilderness would be localized, minor, adverse and long-term. A minimum requirements analysis to determine the minimum tools or methods necessary for the long-term maintenance of the existing radio repeater equipment within or adjacent to recommended wilderness was completed and is included as Appendix B to this document.

## Cumulative Effects

Combining taking no action at this time with past, present and reasonably foreseeable future actions would continue to result in short-term indirect minor impacts to wilderness due to the use of occasional administrative helicopter use or other access over or through wilderness to access project areas. None of the alternatives or any foreseeable future actions would result in any changes to recommended wilderness boundaries in the park. Current and foreseeable future actions with the potential for impacts to wilderness would be the subject of a minimum requirement analysis and a determination of the minimum tool necessary to implement project. The application of the minimum requirements analysis process would ensure that cumulative impacts to wilderness resources and character in the park are minimized. However, some of the projects may require helicopter flights or other mechanized equipment for implementation. Even if these are ultimately deemed the minimum tool, it would still result in impacts

to wilderness character that would be moderate, long-term and adverse, when combined with other past and future projects.

## Conclusion

Direct, indirect, and cumulative impacts to wilderness character would be localized, minor to moderate, adverse and long-term as a result of implementing the No Action Alternative because of the increased need for maintenance on the existing radio system that is aging. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's wilderness character.

# CONSULTATION/COORDINATION

## AGENCIES/TRIBES/ORGANIZATION/INDIVIDUALS CONTACTED

The Environmental Assessment (EA) will be released for public review in May 2007. To inform the public of the availability of the EA, the NPS is publishing and distributing a press release, and a letter to various agencies, tribes, and members of the public that responded to the public scoping in 2006. Copies of the EA will be available for review at http://parkplanning.nps.gov/grca. Copies of the EA will also be provided to interested individuals upon request.

The EA will be open for a 30 day public comment period. During this time, people are encouraged to submit their written comments to the National Park Service, as instructed at http://parkplanning.nps.gov/grca and in the Summary at the beginning of this document. Following the close of the comment period, all public comments will be reviewed and analyzed, prior to the release of a decision document.

As described in the Purpose and Need section at the beginning of this document, letters initiating tribal consultation for this project were sent on September 18, 2006 to American Indian Tribes traditionally associated with the lands of Grand Canyon National Park. Since then, consultation meetings have occurred with several tribes at which this project has been discussed among a number of Grand Canyon projects. In addition to this Environmental Assessment, a Memorandum of Agreement will be developed with the State Historic Preservation Office (SHPO) that outlines how the NPS will further consult with the SHPO and associated American Indian groups, in accordance with the Advisory Council on Historic Preservation's regulations implementing §106 of the NHPA (36 CFR Part 800, Protection of Historic Properties). This agreement must be completed before the NEPA decision document can be completed.

During scoping, the following agencies and individuals provided information or comments:

Arizona Department of Public Safety

Arizona State Historic Preservation Office

Coconino County Sheriff's Office

Navajo Nation Department of Resource Enforcement

U.S. Fish and Wildlife Service

U.S. Forest Service

Jack Doggett, Doggett Real Estate LC

M. Borden Miller, Papillon Airways, Inc.

American Indian Tribes were sent letters concerning this project during the scoping period as described in the Purpose and Need section at the beginning of this document. In addition, this project was discussed with representatives of most of the Tribes listed below during consultation meetings on Grand Canyon projects occurring between Fall 2006 and Spring 2007.

# PREPARERS

Sonny Kuhr, Corporate Manager/NEPA Specialist, MNA Environmental Solutions, Inc. B.A. Biological Sciences/Environmental Science Emphasis, 16 years NEPA-related experience. Responsible for purpose and need, alternatives descriptions, environmental consequences, consultation/coordination, references, and appendixes.

Rick Ernenwein, Project Planning Leader, Grand Canyon National Park, Office of Planning and Compliance. B.S. Renewable Natural Resources, 28 years NPS/BLM. Responsible for project environmental compliance.

# PRINCIPLE PROJECT CONSULTANTS

**National Park Service, Intermountain Region**

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Mike Archer, Deputy Chief Ranger, Project Leader

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Chris Pergiel, Chief Ranger, Project Leader

Robert Powell, Historical Architect

Michael Terzich, Landscape Architect/Visual Resources

Lori Tuttle, Park Dispatch Supervisor

R.V. Ward, Park Wildlife Biologist

# LIST OF RECIPIENTS

## FEDERAL AGENCIES

Advisory Council on Historic Preservation

Forest Service

Coconino National Forest

Kaibab National Forest

Department of Interior

Bureau of Land Management

Arizona Strip Field Office

Grand Canyon-Parashant NM

Grand Staircase-Escalante NM

Fish and Wildlife Service

National Park Service

Flagstaff Area Offices

Glen Canyon NRA

Grand Canyon-Parashant NM

Lake Mead NRA

## INDIAN TRIBES

Havasupai Tribe

Hopi Tribe

Hualapai Tribe

Kaibab Tribe of Paiute Indians

Las Vegas Paiute Tribe

Moapa Band of Paiute Indians

Navajo Nation

Navajo Nation Department of Resource Enforcement

Paiute Indian Tribe of Utah

Pueblo of Acoma

Pueblo of Zuni

San Juan Southern Paiute Tribe

Yavapai-Apache Nation

White Mountain Apache Tribe

## STATE AND LOCAL AGENCIES

Arizona Department of Environmental Quality

Arizona Department of Public Safety

Arizona Game and Fish Department

Arizona Office of the Governor

Arizona State Historic Preservation Office

Coconino County Sheriff’s Office

### ORGANIZATIONS

Arizona Wilderness Coalition

Grand Canyon Association

Grand Canyon Field Institute

Grand Canyon National Park Foundation

Grand Canyon Trust

Grand Canyon Wildlands Council

National Parks Conservation Association

Public Employees for Environmental Responsibility

Sierra Club

Southern Utah Wilderness Alliance

The Wilderness Society

### LOCAL LIBRARIES

Flagstaff, Arizona

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## REFERENCES

ARCHITECTURAL RESOURCES GROUP

2001 Grand Canyon Park Headquarters Historic Structures Report. Prepared for Grand Canyon National Park, National Park Service, U.S. Department of the Interior.

ARCHITECTURAL RESOURCES GROUP

2001b Yavapai Observation Station Historic Structures Report. Prepared for Grand Canyon National Park, National Park Service, U.S. Department of the Interior.

COCONINO NATIONAL FOREST

2001 O'Leary Peak Communication Site Plan. Coconino National Forest. Flagstaff, Arizona.

LORENZ, DAVID

1998 Fire Lookout Towers of the Grand Canyon. Fire Lookout Research Volume 2. Prepared for Grand Canyon National Park Museum Collection. Grand Canyon Arizona.

MILNER AND ASSOCIATES, JOHN

2003 Desert View Cultural Landscape Inventory and Treatment Recommendations. Prepared for Grand Canyon National Park, National Park Service, U.S. Department of the Interior. Charlottesville, Virginia.

2004 West Rim Drive, Trails and Overlooks Area Cultural Landscape Report/ Treatment Recommendations. Prepared for Grand Canyon National Park, National Park Service, U.S. Department of the Interior. Charlottesville, Virginia.

2004b North Rim Bright Angel Peninsula Developed Area Cultural Landscape Inventory and Treatment Recommendations. Prepared for Grand Canyon National Park, National Park Service, U.S. Department of the Interior. Charlottesville, Virginia.

MOTOROLA, INC.
2005 Proposal to NPS Grand Canyon ASTRO 25 Digital Narrowband Voting System. Columbia, Maryland.

NATIONAL PARK SERVICE, U.S. DEPARTMENT OF INTERIOR
1995 Final General Management Plan and Environmental Impact Statement, Grand Canyon National Park. Intermountain Region, Denver, Colorado.

1997 National Historic Landmark Nomination, Grand Canyon Village, Grand Canyon National Park. Grand Canyon National Park, U.S. Department of the Interier.

2003 Cultural Landscapes Inventory – West Rim Drive, Overlooks and Trails. Grand Canyon National Park, U.S. Department of the Interior.

2006 Management Policies. U.S. Department of the Interior, National Park Service. Washington, D.C.

2006b Lees Ferry Improvements Finding of No Significant Impact (FONSI), Glen Canyon National Recreation Area. Intermountain Region, Denver, Colorado.

2006c Hermit Road Rehabilitation Environmental Assessment, Grand Canyon National Park. Intermountain Region, Denver, Colorado.

2007 Grand Canyon National Park Profile. Available via the park website at http://www.nps.gov/grca/publications/park-profile2006.pdf

PAGE, ROBERT R.

1998 Cultural Landscapes Inventory Professional Procedures Guide. Washington.

PAGE & TURNBULL, INC.

2006 Preliminary Draft Historic Structures Report for Desert View Watchtower. Grand Canyon National Park. Grand Canyon. Arizona.

PEREGRINE FUND
2007 Information extracted from “Notes from the Field”. Available on Internet @ http://www.peregrinefund.org/notes_condor.html

US FISH AND WILDLIFE SERVICE-PARTNERS IN FLIGHT
2005 The Trouble with Towers: A Guide to Bird Collisions at Communication Towers. Available on internet at http://www.usfws.gov

UNITED NATIONS ENVIRONMENT PROGRAMME-WORLD CONSERVATION MONITORING CENTRE

2007 List of Protected Areas and World Heritage: Grand Canyon National Park. Available on internet at: http://www.unep-wcmc.org/sites/wh/grandcan.html