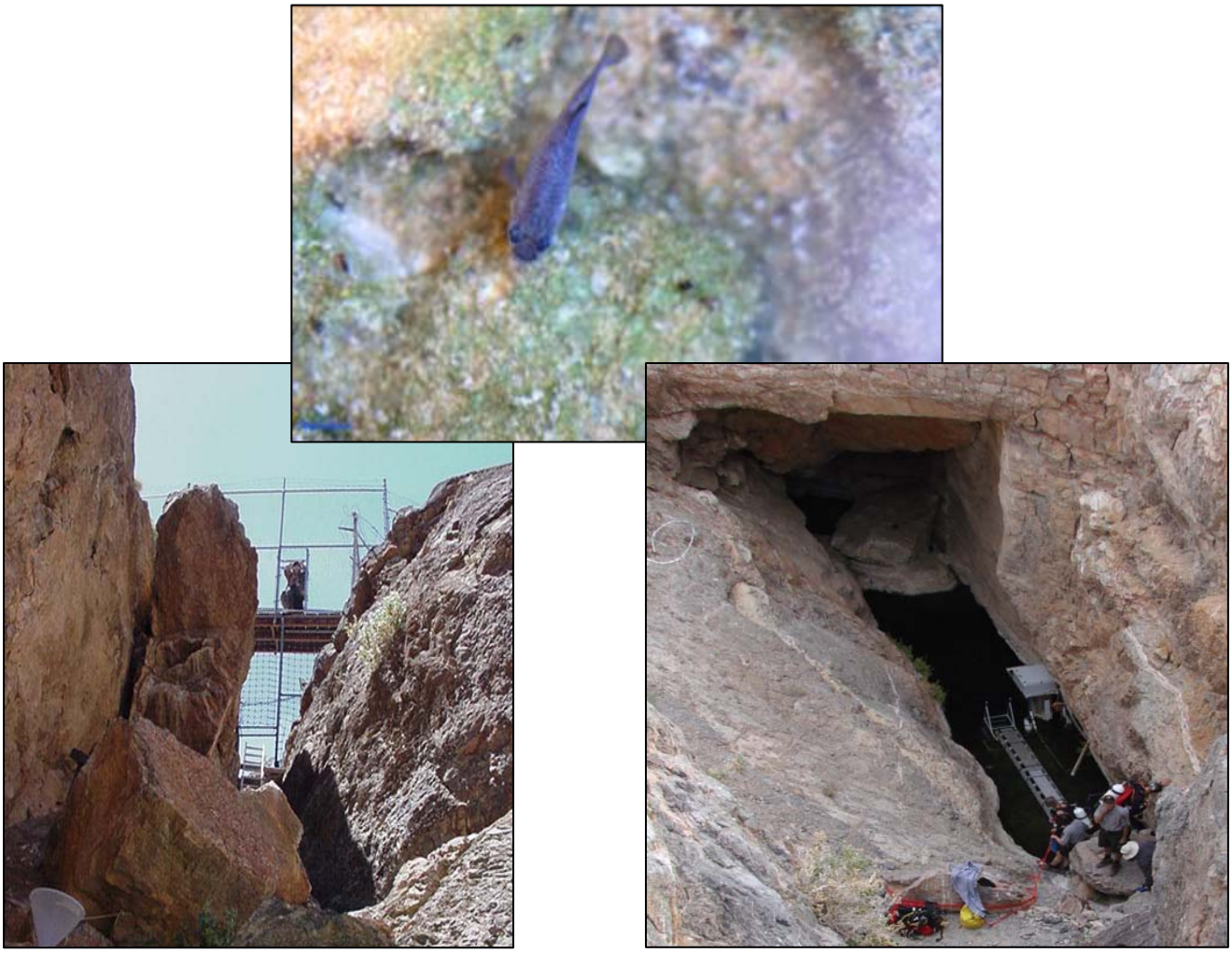
U.S. Department of the Interior
National Park Service

Death Valley National Park

DEVILS HOLE SITE PLAN

Environmental Assessment

July 2009



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SUMMARY

Death Valley National Park ("the Park") proposes to make a series of improvements to the Devils Hole site, which contains the single remaining population of the endangered Devils Hole pupfish. The site is located within the Ash Meadows National Wildlife Refuge (AMNWR), but is managed as a detached unit of the Park. The heart of the site consists of a cavepool, the collapsed top of a stretch fault leading to a flooded cave system (Shepard, 2000), which contains the single remaining population of an endangered species, the Devils Hole pupfish (*Cyprinodon diabolis*). The pool and the rocky area immediately adjacent to it are referred to herein as "the Hole".

These improvements are intended to support maintenance and recovery of the pupfish, by:

- Providing the species and habitat with better protection from intrusion and vandalism
- Improving interpretive and educational opportunities for visitors
- Enabling safe and effective scientific research and ecological monitoring, and
- Restoring the natural ecosystem processes upon which the pupfish rely

Specifically, the actions include different treatments of fence reconstruction, redesigned access to the visitors platform overlooking Devils Hole, design of a permanent access into the Hole, creation of a more stable monitoring platform, improvements to the security and communications systems at the site, upgrading the interpretive treatment, and habitat restoration.

The purpose of this Environmental Assessment is to describe the affected environment and analyze potential impacts associated with the alternatives.

Neither of the action alternatives considered in this EA would have impacts on prime and unique farmlands, environmental justice, air quality, lightscape management, waste management, land use, museum collections, archaeological resources, or historic structures and buildings.

Alternative A (the Preferred Alternative)

Alternative A will have minor short-term adverse impacts on soil and water resources due to construction of the new fence, enclosing the visitors platform and removing the fencing below, creating an enclosed access trail, installation of the ships ladder, and creation of a sectional portable monitoring platform. It should have beneficial long-term moderate impacts to surface and groundwater flow due to the partial restoration of natural flows from extension of the fence

further towards the natural drainage, which will restore natural sediment and nutrient flows into the Hole. Creation of a sectional removable monitoring platform would improve the safety, convenience and effectiveness of ongoing monitoring operations. The security upgrades should help prevent and defend against intrusions, and improve the effectiveness of Park enforcement response against site intrusion. Overall, interpretation would be improved in a moderate way with the addition of a webcam and other displays at Death Valley National Park's Furnace Creek Visitor Center and the Ash Meadows NWR visitor center that is yet to be constructed. Visitor access to the viewing platform would not be restricted and would allow the casual visitor an opportunity to see into Devils Hole without a park ranger escort. It is not anticipated that the proposed site improvements will draw significant increases in visitor traffic.

It is possible that the enhanced security presence, represented visually by the enclosed fence and the more intrusive Twinbar fencing, will be received negatively by visitors and affected tribes. The safety of researchers will be significantly improved with a permanent ladder, and convenience will be improved by the construction of the sectional portable monitoring platform. Impacts on the endangered pupfish from the enhancement of natural flows and habitat restoration should be beneficial, long-term and, to the extent that they ensure its survival and contribute to its recovery, major. Cumulative impacts to the natural resources of the site could occur with further water project developments that threaten the water level in the Hole, which the Park would likely contest if they jeopardized the pupfish.

The Pahrump Paiute and Timbisha Shoshone tribes have strong historical and cultural ties to Devils Hole, and prefer that its resource conditions not be further degraded by actions that significantly increase physical disturbance or add to the potential for such due to increased visitation. The actions within Alternative A would help sustain the habitat conditions that support the pupfish, thereby sustaining some of the basis of its cultural appeal. The Timbisha Shoshone have, with some reservations, selected Alternative A as their preferred alternative.

Alternative B

Alternative B would have minor short-term adverse impacts on soil and water resources due to construction of the new fence, erection of permanent handrails down the cliffside, building the railed access trail, and removal of fencing under the visitors platform. It should have beneficial long-term moderate impacts to surface and groundwater flow due to the restoration of natural flows from extension of the fence to encompass the natural drainage, which will restore natural sediment and nutrient flows into the Hole. The installation of a fixed monitoring platform bolted directly into the eastern cliffside would enhance safety and convenience for researchers monitoring the Hole, though the construction would pose greater risk of rock and sediment deposition directly into the Hole. The security upgrades should help prevent and defend against intrusions, and improve the effectiveness of Park enforcement against site intrusion. Overall, interpretation would be improved in a moderate way with the addition of a webcam and other displays at Death Valley National Park's Furnace Creek Visitor Center and the Ash Meadows NWR visitor center that is yet to be constructed. Visitor access to the viewing platform would be restricted and only allowed as part of a park led tour of the site. It is not anticipated that the proposed site improvements will draw significant increases in visitor traffic.

It is possible that the enhanced security presence, represented visually by the enclosed fence and the more intrusive Twinbar fencing, will be received negatively. The limiting of access to supervised tours only would provide enhanced interpretation to visitors, but it could be perceived negatively by the public because of limited access. The safety of researchers will be somewhat improved with a permanent handrail. Impacts on the endangered pupfish from the enhancement of natural flows and habitat restoration should be beneficial, long-term and, to the extent that they ensure its survival and contribute to its recovery, major. Cumulative impacts to the natural resources of the site could occur with further water project developments, which the Park would likely contest if they jeopardized the pupfish.

The actions within Alternative B would help sustain the habitat conditions that support the pupfish, thereby sustaining some of the basis of its cultural appeal. The Timbisha Shoshone have indicated that they prefer Alternative A over Alternative B. It is not anticipated that the proposed site improvements will draw significant increases in visitor traffic.

A note on comments

Comments on this Environmental Assessment (EA) may be submitted during the 30-day open comment period via the national planning web site at http://parkplanning.nps.gov. Comments must be postmarked or transmitted no later than 5 p.m. on September 18, 2009.

For people wishing to submit comments on this EA: Before including your address, phone number, email address, or other personal identifying information in your comment, be aware that your entire comment – including your personal identifying information – may be made public. While you can ask us to withhold your personal identifying information from public review, we cannot guarantee that we would be able to do so. We would always make submissions from organizations or businesses, and from individuals identifying themselves as representatives of officials of organizations or businesses, available for public inspection in their entirety.

Written comments may be also sent by regular mail to:

Mike Bower
Fish Biologist
Death Valley National Park
1321 So. Highway 160, Suite 1
Pahrump, NV 89048
775-537-0787 phone
775-537-6380 fax
Mike_R_Bower@nps.gov

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enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to assure that their development is in the best interests of all. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

July 2009

TABLE OF CONTENTS

List of Tables

List of Figures

ACRONYMS AND ABBREVIATIONS

AMNWR	Ash Meadows National Wildlife Refuge
BMPs	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Cfs	Cubic Feet per Second
CWA	Clean Water Act
Cy	Cubic yards
DO	NPS Director's Order
EA	Environmental Assessment
FPPA	Farmland Protection Policy Act
FHA	Federal Highways Administration
GMP	General Management Plan
Mya	Million years ago
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
RMP	Resource Management Plan
SHPO	State Historic Preservation Office
SR	State Road
SNWA	Southern Nevada Water Authority
T&E	Threatened and Endangered
THPO	Tribal Historic Preservation Office
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

1.0 INTRODUCTION

1.1 PURPOSE AND NEED FOR ACTION

Devils Hole is a 40-acre site located on lands within the Ash Meadows National Wildlife Refuge (AMNWR) but managed as a detached unit of Death Valley National Park ("the Park"). At the heart of the site lies a cavepool, the collapsed top of a stretch fault leading to a flooded cave system (Shepard, 2000), which contains the single remaining population of an endangered species, the Devils Hole pupfish (*Cyprinodon diabolis*). See Figure 1-1. The Park manages the ongoing recovery actions for the species in collaboration with the U.S. Fish & Wildlife Service (USFWS) and Nevada Department of Wildlife (NDOW), and attempts to secure and enhance the remaining population while building public support for protection of the habitat features on which the species relies—in particular, maintaining the groundwater table at sufficiently high depth below ground to allow for normal feeding, breeding, and spawning activities of the fish.

The purpose of the proposed action is to redesign the man-made features of the Devils Hole site in a way that does no permanent harm to the species or its habitat, and achieves the following goals:

- Provide the species and habitat with better protection from intrusion and vandalism
- Improve interpretive and educational opportunities for visitors
- Enable safe and effective scientific research and ecological monitoring
- Restore the natural ecosystem processes upon which the pupfish rely

The need for the proposed action is based primarily on the fragility and long-term decline of the Devils Hole pupfish, composed as it is of a single small population. An April 2006 population survey counted 38 individuals, the lowest on record, furthering a trend of decline from previous years. The most recent count in April of 2009 was 70 (±13.5 SE), likely representing an increase over recent spring surveys. The fragility of the population is due to a combination of several factors, many of which are inherent to the Devils Hole site. Specifically, the Devils Hole pupfish is vulnerable to changes in its habitat as it is restricted to a single water-filled cavern. Unlike most other fishes, the Devils Hole pupfish has no ability to migrate to fulfill its life history requirements or seek optimal habitats. If the habitat of Devils Hole changes to become less suitable, the Devils Hole pupfish population is likely to decline as a consequence.

Threats to habitat suitability for the Devils Hole pupfish could include a variety of anthropogenic factors such as global warming, airborne dust from nearby roads, accidents by researchers, intentional vandalism, accidental introduction of invasive species, habitat alteration by site infrastructure, or groundwater development and resulting water level declines. It is hoped that by enabling scientific research and monitoring, the causes of the recent decline in abundance of the Devils Hole pupfish can be better understood, hopefully preventing such declines in the future.

The project purpose described above also includes improvements to the visitor interpretive experience. As an ecologically unique site, and because of the presence of the lone remaining population of the endangered pupfish, Devils Hole has been recognized as deserving of federal protection. This protection involves a limitation on groundwater pumping throughout Ash

Meadows and further into the Amargosa Valley. As development pressures continue to move west from Las Vegas, it becomes increasingly important to maintain public support for such limitations on development through education and interpretation of the area's ecological resources and processes. This forms the basis of need for the enhancements to the interpretive experience embedded in the project purpose.

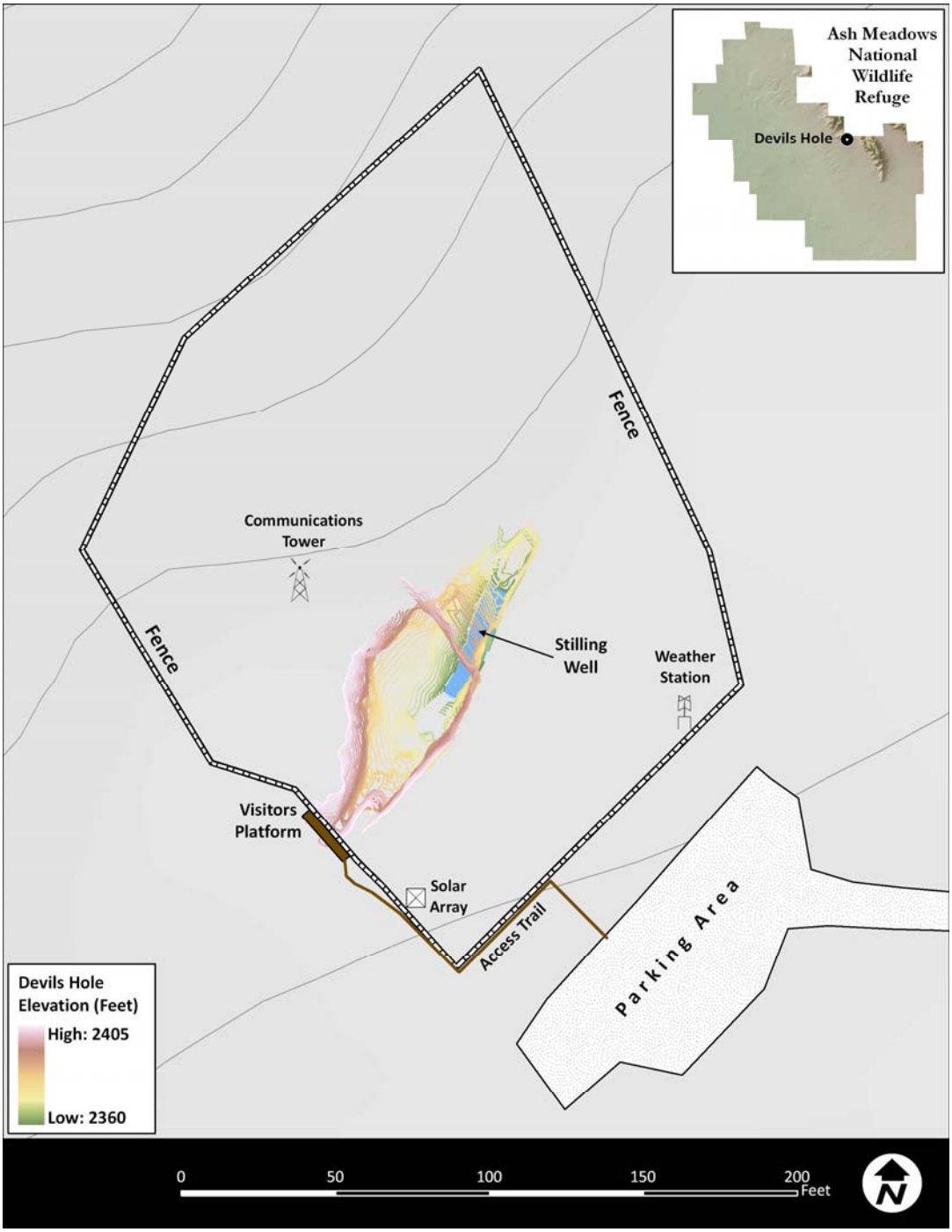

Figure 1.1. Devils Hole Site within Ash Meadows NWR

1.2 PARK PURPOSE AND SIGNIFICANCE

The purpose and significance of Death Valley National Park are defined in the *Final General Management Plan* (NPS, 2002). According to this document, which is based on the park's enabling legislation and Presidential Proclamations, the purposes of Death Valley National Park include:

- To preserve the unrivaled scenic, geologic, and natural resources of these unique natural landscapes, while perpetuating significant and diverse ecosystems of the California desert in their natural state, and to ensure the maximum protection of wilderness values provided by law.
- To preserve the cultural resources of the California desert associated with prehistoric, historic and contemporary Native American culture, patterns of western exploration, settlement and mining endeavors.
- Provide opportunities for compatible public outdoor recreation and promote the public's understanding and appreciation of the California desert by interpreting the natural and cultural resources.
- Retain and enhance opportunities for scientific research in undisturbed ecosystems.

Some features of the park that contribute to its significance include the following:

- Death Valley National Park contains the lowest point in North America at 282' below sea level. The valley floor receives the least precipitation in the United States (averaging 1.84 inches per year) and has the nation's highest recorded temperature (134^0 F).
- The Park is world renowned for its exposed, complex and diverse geology and tectonics.
- Death Valley has been the continuous home of Native Americans, from prehistoric cultures to the present-day Timbisha Shoshone Tribe.
- Death Valley contains one of the nation's most diverse and significant fossil records and most continuous volcanic histories.
- Ninety-five percent of the Park is designated wilderness, providing unique opportunities for quiet, solitude, and primitive adventure in an extreme desert ecosystem.
- The Park's natural resources are extremely diverse. The area preserves large expanses of creosote bush valleys and other vegetation typical of the Mojave Desert. Extreme conditions and isolation provide habitat for an unusually high number of plant and animal species that are highly adapted to these conditions (of which the Devils Hole pupfish is a prime example).

1.3 DEVILS HOLE SIGNIFICANCE

Devils Hole is administered by the Park but located within a larger spring complex in Nevada that is part of the Ash Meadows National Wildlife Refuge. A limestone cave at Devils Hole is the only natural habitat of the Devils Hole pupfish, listed as endangered by the U.S. government and the State of Nevada. The cavepool at Devils Hole is essentially the "skylight" to the aquifer which feeds it. The aquifer itself is regionally significant - it is the source of water for other springs in the Ash Meadows area as well as on the eastern side of Death Valley--and the aquifer also determines the cave's water level. The feeding and spawning of the pupfish depend on the existence of a shallow (but submerged) limestone shelf within the 90-degree waters of the cavepool at Devils Hole.

In 1952, the forty acres surrounding Devils Hole was set aside as part of the Death Valley National Monument, for the purpose of protecting the Devils Hole pupfish. Despite this protection, in the late 1960s well-drilling for groundwater caused a decline of the Devils Hole pupfish population, driving litigation which eventually resulted in a historic water rights decision: the U. S. Supreme Court in 1976 determined that the National Park Service had a reserved water right to a certain level of groundwater at Devils Hole (*Cappaert v. United States,* 1976), and stopped well drilling that affected the site. The purpose of the reserved water right is to maintain the water level in Devils Hole to assure the survival of the Devils Hole pupfish. This reserved water right affects 21,760 acres of essential habitat for the pupfish surrounding Devils Hole, where groundwater removal would cause the greatest impact on the Hole (NPS, 2002). These acres are within an area much coveted by private developers in the fast growing corridor west of Las Vegas.

In 1984, the Ash Meadows National Wildlife Refuge was created to conform quite closely with this area of groundwater impact, largely for the purpose of further ensuring protection of the spring-fed wetlands and groundwater network that support the Devils Hole ecosystem. It is located approximately 90 miles northwest of Las Vegas in the Amargosa Valley of southern Nye County, Nevada. Devils Hole is surrounded on three sides by AMNWR; on the north side it abuts Bureau of Land Management land (Ash Meadows, 2007).

1.4 PROJECT BACKGROUND

Actions to improve the access, security and safety of the Devils Hole site have been contemplated since at least 2002, due to periodic episodes of vandalism at the site and the deteriorating safety and security conditions for researchers, who monitor habitat conditions at the site on a continuing basis. While some of the actions have progressed to the design stage, none has ever been evaluated in an Environmental Assessment.

Previous plans have included:

- A new design for the scientific monitoring platform, which is used by researchers for various scientific measurements. In the new design, the platform would fold down mechanically when needed, from a vertical storage position along the cliffside, and rest just above the cave pool, thereby making it safer and more convenient than the current situation.

- Installing additional cameras and communications equipment on the existing communications tower, to enable remote communications between the Park's Law Enforcement personnel and the site.
- New fence design, placement and configuration, to improve intrusion protection and to enable a more natural flow of sediments into the hole (the current gate impedes the natural flow of larger materials).
- General concepts to improve the interpretive treatment at the site, while still enhancing its security.

1.5 RELATIONSHIP OF THE PROPOSED ACTION TO PREVIOUS PLANNING EFFORTS

Several plans, projects, and standards that the National Park Service and Death Valley National Park either have in place or have in progress may affect decisions regarding the Devils Hole Site Plan project. In addition, the site's location within AMNWR requires planning and coordination with U.S. Fish & Wildlife Service for any actions that could impact Refuge resources.

The *General Management Plan* (NPS, 2002) established the guiding management philosophy for the Park and provides strategies for addressing issues and achieving management objectives. The emphasis of the GMP is protection and preservation of natural and cultural resources.

- The GMP established water resource objectives that include the goal of maintaining the water levels at Devils Hole. This project complies with the GMP by attempting to restore and protect the natural conditions and processes that keep the water table at its required level.
- The GMP also mandates biannual fish counts. This project is intended to make the fish counting process safer for scientific staff by upgrading the ladder access to the pool.
- The GMP calls for continued protection of the water right established by the U.S. Supreme Court for the protection of the pupfish. The security improvements included in the proposed action are intended to secure this protection.

The Devils Hole pupfish recovery plan (USFWS, 1990) states recovery criteria which, when met, will enable the Devils Hole pupfish to be downlisted to threatened (a species with a single natural population cannot be delisted (USFWS, 2007)). These recovery criteria include a minimum water level of 1.4 feet below a copper washer installed along the cave cliff in 1976, a population of 300 individuals during winter and 700 during late fall, and two refugia populations established offsite from the Hole. This project attempts to make monitoring easier and safer for Park researchers towards those ends, and to restore and improve the natural flow of sediment, nutrients and surface water into the Hole.

AMNWR is in the planning stages on several projects that could impact Devils Hole:

- AMNWR faces numerous transportation challenges, including managing the access points to the Refuge and the use of existing routes. The Desert Refuge complex has undertaken a transportation survey that will provide recommendations for improvements to the existing network of roads and parking lots and address transportation, management, maintenance, and

coordination threats and challenges faced by the Refuge (Ash Meadows, 2007). The goal of these improvements is to enhance visitor safety and to support the resource protection mission and policies of the NWR.

- The Refuge also faces substantial issues related to existing hydrologic and geologic challenges in terms of planning and maintaining a road network. The high water table and presence of springs near or under roadways cause significant damage to roads and often make segments impassable. Roadway maintenance and planning must be conducted in close coordination with other ongoing efforts that will affect water flow and water location within the Refuge, including sub-basin restoration and modifications to existing dams.

- The Desert NWR Complex is preparing a Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) that includes four refuges: Desert, Ash Meadows, Pahranagat and Moapa. The CCP/EIS describes the resources, public use, goals, objectives, and strategies for AMNWR and for the other refuges. It also identifies potential environmental effects of potential actions under consideration. The CCP/EIS effort was started in 2004; the administrative draft has been completed; and the final draft is currently being prepared. The goals of the CCP/EIS are very broad, with supplemental studies called step-down plans being developed to recommend more specific measures that implement CCP/EIS policies.

1.6 SCOPING

Scoping is an open process to determine the breadth of environmental issues and alternatives to be addressed in an EA. Scoping involves obtaining internal and external input on project-related issues from resource specialists and the public, respectively. The Park conducted internal scoping with appropriate NPS, Nevada Department of Wildlife (NDOW), and USFWS staff and external scoping with the public, including interested and affected groups or individuals and non-NPS agency personnel.

An interdisciplinary team comprising Park, NDOW, and USFWS staff members contributed to the internal scoping process. This process resulted in definition of the purpose and need, identification of potential actions to address the need, determination of what the likely issues and impact topics would be, and identification of the relationship, if any, of the Proposed Action to other planning efforts in the Park.

For external scoping, a public scoping letter describing the Proposed Action and requesting public input on the proposal was issued to private parties; State, Federal, and local agencies in November, 2007. Two public meetings were held, which drew a total of five participants. The main issues raised by commenters were: (1) the importance of communicating the pupfish "story" and its significance to the public, while (2) minimizing the actual disturbance to the habitat itself that could be caused by attracting more visitors. The Park staff gathered specific suggestions for how off-site interpretation could be enhanced towards meeting both goals simultaneously. The external scoping period ended on December 26, 2007.

Discussions have begun with members of the Timbisha Shoshone and Pahrump Piute tribes, pursuant to §106 of the National Historic Preservation Act, as amended in 1992 (16 USC 470 *et seq.*; NHPA). These are further described in Section 5.2.

1.7 THE ENVIRONMENTAL ASSESSMENT

This environmental assessment (EA) analyzes the environmental impacts that would result from the alternatives considered, including the No Action alternative. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code (USC) 4321 et seq.), the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations (CFR) 1500 through 1508) for implementing NEPA, and the NPS NEPA compliance guidance handbook (DO-12, *Conservation Planning, Environmental Impact Analysis, and Decision-making*).

1.8 ISSUES

Issues and concerns affecting the Proposed Action were identified by specialists at Death Valley National Park, NDOW, USFWS and input from the public and Federal agencies. External and internal scoping meetings and analysis of previous projects, plans and design concepts were conducted to identify and explore concerns that have led to the current planning stage. The following issues shaped the development of alternatives and the consideration of impacts:

- The interpretive experience—Limited on-site interpretation has failed to create the level of public education necessary to support the resource-intensive protection efforts for the Devils Hole pupfish.
- Researcher safety—The current mode of staff access to the cavepool and construction of the makeshift monitoring platform are "an accident waiting to happen", thereby risking the safety of Park Service employees.
- Hindrance of natural flow—The location of the current fence, inside the perimeter of the drainage wash down the hillside into the Hole, somewhat impedes the natural flow of sediment and organic materials into the cavepool, although structural measures (such as raising the bottom of the fencegate) have been taken to allow as much material as possible to flow through.
- Shading of the water surface—The current viewing platform casts some shadows on the water surface of the pool, thereby restricting direct sunlight and impacting primary productivity in the Hole. The monitoring equipment also casts shadows to a lesser extent. Any new location or configuration of the visitors platform and monitoring equipment should create no more impact, and preferably less, on direct sunlight.
- Security from intrusion—There have been periodic episodes of vandalism and intrusion at the site, which could lead to harm to the pupfish directly (apparent attempts to capture fish) or to the pool (apparent attempts to dump foreign matter). These intrusions also cost law enforcement resources to respond to alarms and to restore damaged fencing. Other considerations that result from the need for improved security are the demand for enhanced power and enhanced data communications, both of which could create more environmental impacts as the infrastructure is built.

- Monitoring—Beyond the safety issue, the inconvenience of having to construct the monitoring platform at each monitoring visit costs researchers time, by requiring multiple staff members for each site visit.

1.9 IMPACT TOPICS

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, and executive orders; NPS *Management Policies 2006*, and NPS knowledge of limited or easily impacted resources. A brief rationale for the selection of each impact topic is given below, as well as the rationale for dismissing specific topics from further consideration.

1.9.1 Impact Topics Analyzed in this Environmental Assessment

Soils and Geology

Construction activities, such as excavation and the use of heavy equipment, would disturb soils and potentially cause soil compaction and erosion in the project area, and increase sediment deposition into the Hole. Site preparation and construction of platforms and related project components would require excavation and subsequent disposal of rock and fill material. Therefore, soils and geology are addressed as an impact topic in this EA.

Water Resources

A primary constituent element for survival of the Devils Hole pupfish is an adequate water level in the cave pool. A second is a natural flow of nutrients and organic material into the Hole, which means that water quality must be protected. A third is water temperature. Devils Hole is dependent on the health of the spring-fed aquifer network that flows within the AMNWR--the so-called Ash Meadows flow system (Riggs & Deacon, 2004). Any project in the impact area must be evaluated for its effects on the water level and water quality in the cavepool itself and the groundwater resources that feed it.

In addition, NPS *Management Policies 2006* require protection of water quality consistent with the provisions of the Clean Water Act of 1977, a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters and to prevent, control, and abate water pollution. Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers (USACE) to prohibit or regulate, through a permitting process, the discharge of dredged or fill material into U.S. waters. Executive Order 11990, *Protection of Wetlands*, NPS *Management Policies 2006*, Section 4.6.5, *Wetlands*, and NPS DO #77-1, *Wetland Protection*, require an examination of impacts to and protection of wetlands.

Construction activities have the potential to affect water quality in the project area. In the short term, construction activities will compact and/or erode soil and could increase sediment flows into the sensitive Hole ecosystem. In the long run, the project is intended to have a beneficial impact on water quality by helping maintain the natural chemical, biological and energy balance

of the ecosystem. Therefore, water resources, particularly ground and surface water flows, are discussed in detail in this EA.

Biotic Communities—Vegetation & Wildlife

Biotic communities would be disturbed by construction activities. They would also be impacted by relocation or removal of the visitors platform and gate that currently impede some sediment flow. Therefore, biotic communities will be addressed as an impact topic in this EA.

Threatened, Endangered, and Candidate Species and Species of Special Concern

The Endangered Species Act (ESA), 16 USC 1531 *et seq.*, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants, as well as the preservation of the ecosystems on which they depend. ESA Section 7 requires any federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of critical habitat of such species. Because the key purpose of the action is to enhance the survival of the endangered Devils Hole pupfish, T&E species will be addressed as an impact topic in this EA. The consultation letter from the Park to U.S. Fish & Wildlife Service is included in Appendix B.

Visitor Use and Experience

The alternatives under consideration in this EA would preclude visitor use of the Devils Hole site itself during at least some portions of construction activities, although because the site is isolated from other visitor destinations within the Park and the Ash Meadow Refuge, construction would not affect the visitor experience of the main Park and of the Refuge overall. On an ongoing basis, the proposed action is by its very purpose intended to enhance the visitor's experience of Devils Hole. Therefore, visitor use and experience, including effects from changes in visual and interpretive treatments, will be addressed as an impact topic in this EA.

Park Operations

Project implementation would benefit park operations in the project area by reducing the number and improving the efficiency of ranger patrols and emergency responses, through the use of improved detection and data communications. It would further benefit park operations by improving the safety of monitoring and research activities for Park staff and other scientists who conduct scientific experiments at the Hole. Therefore, these two aspects of park operations will be addressed as impact topics in this EA.

Ethnographic Resources

Archeological evidence shows that the Devils Hole area has been occupied for at least 9,000 years, and the Southern Paiute and Timbisha Shoshone tribes still inhabit the surrounding area today. In 1994, Congress enacted the California Desert Protection Act, P.L. 103-433, including section 705 (b), which preliminarily addressed the need of the Timbisha Tribe for a recognized land base. It was followed in 2000 by the Timbisha Homeland Act, which established a 7000-

acre land base for the Timbisha Shoshone Tribe within its ancestral homelands. Approximately three hundred acres of this homeland lie within the Park, and the remaining acres are located around the homeland in southern Nevada and California. The Timbisha have a land base of 1,000 acres at Death Valley Junction (NPS, 2002d:94). Devils Hole is approximately 10 miles from the closest Timbisha land base. The Pahrump Paiute are a non-federally recognized group, with members living in the Pahrump and Las Vegas area.

Devils Hole is believed to fit the definition of a Traditional cultural property, owing to its long history with the Timbisha Shoshone and Pahrump Paiute tribes. As such, the Park will undertake consultations with these tribes on the effects of the proposed action pursuant to Section 106 of the National Historic Preservation Act (further detailed in Section 5.2). The tribes are also allowed access to the property under the American Indian Religious Freedom Act of 1978. Therefore, the impact of the alternatives on the cultural values that make Devils Hole a Traditional cultural property will be discussed in this EA.

A variety of laws and policies apply to the protection of cultural resources at Park Service units:

National Historic Preservation Act

The National Historic Preservation Act (NHPA), 16 USC § 470 *et seq.*, requires NPS to consult with the California State Historic Preservation officer (SHPO) prior to any construction to ensure that no historical properties will be adversely affected by a proposed project. NPS must also afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the proposed project. Regulations for implementing NHPA are found in 36 CFR 800-812.

Archaeological Resources Protection Act

The Archaeological Resources Protection Act, 16 USC § 470aa *et seq.*, requires a permit for excavation or removal of archaeological resources from publicly held or Native American lands. The Act requires that excavations further archaeological knowledge in the public interest, and that the resources removed remain the property of the United States. Regulations for implementing the Act are found in 43 CFR 7 and 36 CFR 296.

American Indian Religious Freedom Act

The American Indian Religious Freedom Act, 42 USC § 1996, establishes policy to protect and preserve the inherent and Constitutional right of Native Americans to believe, express, and exercise their traditional religions. The law ensures the protection of sacred locations, access of Native Americans to those sacred locations and traditional resources that are integral to the practice of their religions, and establishes requirements that would apply to Native American sacred locations, traditional resources, or traditional religious practices potentially affected by construction and operation of proposed facilities. Regulations for implementing the Act are also found in 43 CFR 7.

Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act, 25 USC § 3001, directs the Secretary of the Interior to guide the repatriation of federal archaeological collections and collections that are culturally affiliated with Native American tribes and held by museums that receive federal funding. NPS would follow the provisions of this Act if any excavations associated with the proposed construction led to unexpected discoveries of Native American graves or grave artifacts. Regulations for implementing the Act are found in 43 CFR 10.

1.9.2 Impact Topics Dismissed from Further Consideration

Traffic and Transportation

The Proposed Action does not involve changes to the roads that access Devils Hole. It is anticipated that any changes made for the visitor experience as well as for staff convenience would not require any reconfiguration of existing roads. For this reason, transportation is not addressed as an impact topic in this EA.

Prime and Unique Farmlands

In August 1980, the CEQ directed that Federal agencies assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's Natural Resources Conservation Service 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. Although agricultural irrigation has previously threatened the water level on which the Devils Hole pupfish depends, there are no prime or unique farmlands in the project area, and none would be reached by the proposed action. Therefore, the topic of prime and unique farmlands was dismissed as an impact topic in this EA.

Visitor Safety

Neither the Proposed Action nor any of the alternatives would have any impact on visitor safety. Access to Devils Hole would continue to be in maintained pathways, and any interaction with the steep inclines directly surrounding the site would be prevented with improved fencing. Therefore, visitor safety was dismissed as an impact topic in this EA.

Air Quality

Devils Hole is in the Nye County attainment area of Nevada, which is in attainment on all National Ambient Air Quality Standards pollutants, with the exception of the Pahrump Valley, almost 20 miles southeast, which has been designated non-attainment for particulate matter (PM_{10}) and is operating under a Memorandum of Understanding with USEPA. Air quality at Devils Hole could be impacted during the construction phase of the project; however, impacts would be temporary and minor in intensity. Overall, there would be a slight and temporary degradation of local air quality due to dust generated by activities and emissions from construction equipment. These effects would last only during construction activities. Best

Management Practices (BMPs) would be utilized to limit dust generation and dispersal. To keep equipment emissions down, equipment would be properly maintained. The Refuge's air quality would not be affected by this action. Therefore, air quality was dismissed as an impact topic in this document.

Archaeological Resources

The National Park Service is required to, "preserve collections of prehistoric and historic material remains, and associated records, recovered under the authority of the Antiquities Act (16 U.S.C. 431-433), the Reservoir Salvage Act (16 U.S.C. 469-469c), section 110 of the National Historic Preservation Act (16 U.S.C. 470h-2), or the Archaeological Resources Protection Act (16 U.S.C. 470aa-mm)" (36 CFR Part 79). These regulations, promulgated under the authority of the Secretary of the Interior, apply to findings made by historic preservation professionals that meet qualification standards for Federal projects.

An archaeological survey was conducted on 30 of the 40 acres of the Devils Hole site. Eleven isolated finds were found during the survey, most of which were historic or modern. These include a prehistoric flake, a trail segment, NPS boundary rock cairns, a prospect, and a glass scatter. The date of the prehistoric flake is unknown, but is probably over 100 years old. The historic finds appear to mostly date to the time that the NPS took over management of the site, though the prospect pit is probably older. As all of the remains found during the survey were isolated finds, they are not eligible for nomination to the National Register of Historic Places.

The undertaking is occurring in an area with no sites, and therefore it is not expected to have an effect on archeological resources. Therefore, archeological resources were dismissed as an impact topic in this document.

Historic Structures/Buildings

The National Historic Preservation Act (NHPA), as amended in 1992 (16 USC 470 *et seq*.); NEPA of 1969 (42 USC 4321 *et seq*.); NPS DO #28, *Cultural Resource Management Guideline (*1998a), NPS *Management Policies 2006*, and NPS DO #12, *Conservation Planning, Environmental Impact Analysis, and Decision Making* (2001b) require the consideration of impacts on historic structures and buildings listed in or eligible for listing in the National Register of Historic Places. Because there are no structures that would be affected by the project, Historic Structures/ Buildings was dismissed as an impact topic in this EA.

Cultural Landscapes

Cultural landscapes are defined by the NPS as "a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions" (DO #28: *Cultural Resource Management Guideline*, 1998a).

The entire Ash Meadows area has been identified as a potential Cultural Landscape by the Timbisha Shoshone Tribe and Pahrump Paiute, with Devils Hole being one landmark inside of the greater landscape. However, since all of the impacts associated with this project will be occurring at Devils Hole, which has also been identified as a potential Traditional Cultural Property, tribal use of the site is discussed under Ethnographic Resources.

Museum Collections

The NPS' *Management Policies 2006* and DO #28, *Cultural Resource Management Guideline (*1998a) require the consideration of impacts on museum collections (historic artifacts, natural specimens, and archival and manuscript material). None of the items in the park's museum collection, nor those on display in the visitor center, would be affected by the Proposed Action. Therefore, Museum Collections was dismissed as an impact topic in this document.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian Trust Resources from a proposed project or action by Department of the Interior agencies be explicitly addressed in environmental documents. The Federal Indian Trust responsibility is a legally enforceable obligation on the part of the U.S. to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of Federal law with respect to American Indian and Alaska Native Tribes. No Indian Trust Resources are designated within the project area, and no portion of the project area is held in trust by the Secretary of the Interior for the benefit of any American Indian tribe or group. Therefore, Indian Trust Resources was dismissed as an impact topic in this EA.

Lightscape Management

In accordance with NPS *Management Policies 2006*, the Park strives to preserve natural ambient lightscapes, which are defined as those that exist in the absence of human-generated light. The Park also strives to limit the use of artificial outdoor lighting, using only what is necessary for basic safety requirements.

The Proposed Action would not affect outdoor lighting. Any short-term lighting necessary for public safety would be directed downward to reduce unnecessary illumination, and use would be restricted. Therefore, Lightscape Management was dismissed as an impact topic in this EA. The effect on the pupfish of reductions in direct sunlight due to shading from the proposed visitors platform is discussed in the section on Threatened and Endangered Species (Section 4.2.3.5).

Land Use

The proposed project would not change the land use of the Devils Hole site. It will still be dedicated to the recovery of the pupfish, and to visitor interpretation of the site. If the No Action alternative were chosen, and site security continued to degrade over time, it could possibly result in further degradation and perhaps elimination of the pupfish. If this scenario were to unfold to its conclusion and the pupfish were eliminated from Devils Hole, the federal water right could be

overturned by the appeals of private interests. This in turn could lead to additional groundwater pumping by developers in the Amargosa Valley, in pursuit of further development in the region. Ultimately, the pace of development in the Valley would quicken, hastening land use changes. However, this chain of events, if it ever began to unfold, would do so over decades and would be heavily litigated. At this point, it is purely speculative. Therefore, land use was dismissed from further analysis in this EA.

Waste Management

Construction activities would generate a small amount of solid, sanitary, and landscape/ vegetative waste; it is anticipated that no hazardous wastes would be generated. All construction wastes, including asphalt, rebar, and masonry materials, would be temporarily stored, transported, and disposed of in approved disposal facilities, at remote distances, in accordance with State and Federal laws and regulations and NPS policies. Soils removed from construction activities would be reworked into the landscape via aeration and re-vegetation activities once construction is finished. Existing disposal facilities have sufficient capacity to accommodate these wastes. No long-term impacts on waste management would occur as a result of any of the alternatives. Therefore, this topic was dismissed from further analysis in this EA.

Environmental Justice

According to the U.S. Environmental Protection Agency (USEPA), environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, State, local, and tribal programs and policies.

Presidential 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 the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The alternatives would not have disproportionate health or environmental effects on minorities or low-income populations or communities as defined in the USEPA's Draft Environmental Justice Guidance (July 1996). Therefore, Environmental Justice was dismissed as an impact topic in this EA.

Socioeconomic Issues

The Proposed Action and alternative are small construction projects, which would provide a small number of construction jobs on a temporary basis to local/regional workers. These jobs, expected to number fewer than 15 full-time equivalent jobs, producing roughly $50-60,000 in direct labor costs, could most likely be filled by contracting with firms in the southern Nevada area. Any housing needs for temporary laborers could be easily accommodated in the Pahrump area. In addition, construction materials would likely be available from within the region, in quantities too small to have more than a negligible economic impact.

There would be no permanent jobs created by the project, and it is not expected to bring additional visitors and/or tourism expenditures to the Park or the Refuge. Therefore its socioeconomic impact is dismissed as an impact topic in this EA.

2.0 ALTERNATIVES CONSIDERED

2.1 NO ACTION ALTERNATIVE

Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14) require the assessment of the No Action alternative in NEPA documents. The No Action alternative provides a basis for comparing the management direction and environmental consequences of the proposed action and must be considered in every EA.

Under the No Action alternative, none of the project activities would be undertaken: no improvements or replacements would be made to the security fence, and no enhancements would be made to the intrusion detection capability; no changes would be made to the interpretive treatment or themes; no changes would be made to the access ladder or monitoring platform to improve researcher safety; no changes would be made to restore natural water and sediment flows from the watershed into the Hole; no efforts would be made to improve the overall visitor experience; and no revegetation plan would be developed for the project area.

The figures referred to are located in Appendix A. Figure A-1 displays a schematic of the No Action Alternative.

2.2 ALTERNATIVES ANALYZED IN THIS EA

Each alternative analyzed in this EA consists of specific configurations of the following project components:

- Fenceline boundary
- Visitors platform, access trail, and Interpretive Treatment
- Access stairway into Devils Hole for scientific staff
- Monitoring platform & equipment
- Intrusion detection security system & additional viewing cameras
- Telecommunications infrastructure
- Power supply
- Habitat restoration

2.2.1 ALTERNATIVE A (THE PREFERRED ALTERNATIVE)

Figure 2.1 displays an overall site schematic of Alternative A.

Fenceline

Alternative A consists of retaining the existing perimeter chainlink fence, with the addition of 1200 linear feet (length dimension supplied by NPS) of chainlink fencing in the form of a 'dogleg' that extends further from Devils Hole than the current fence, so as to allow for more natural drainage and sediment passage (Figure A-2). Existing chainlink along the south boundary, which would become unnecessary (approximately 125 ft), will be removed and stored

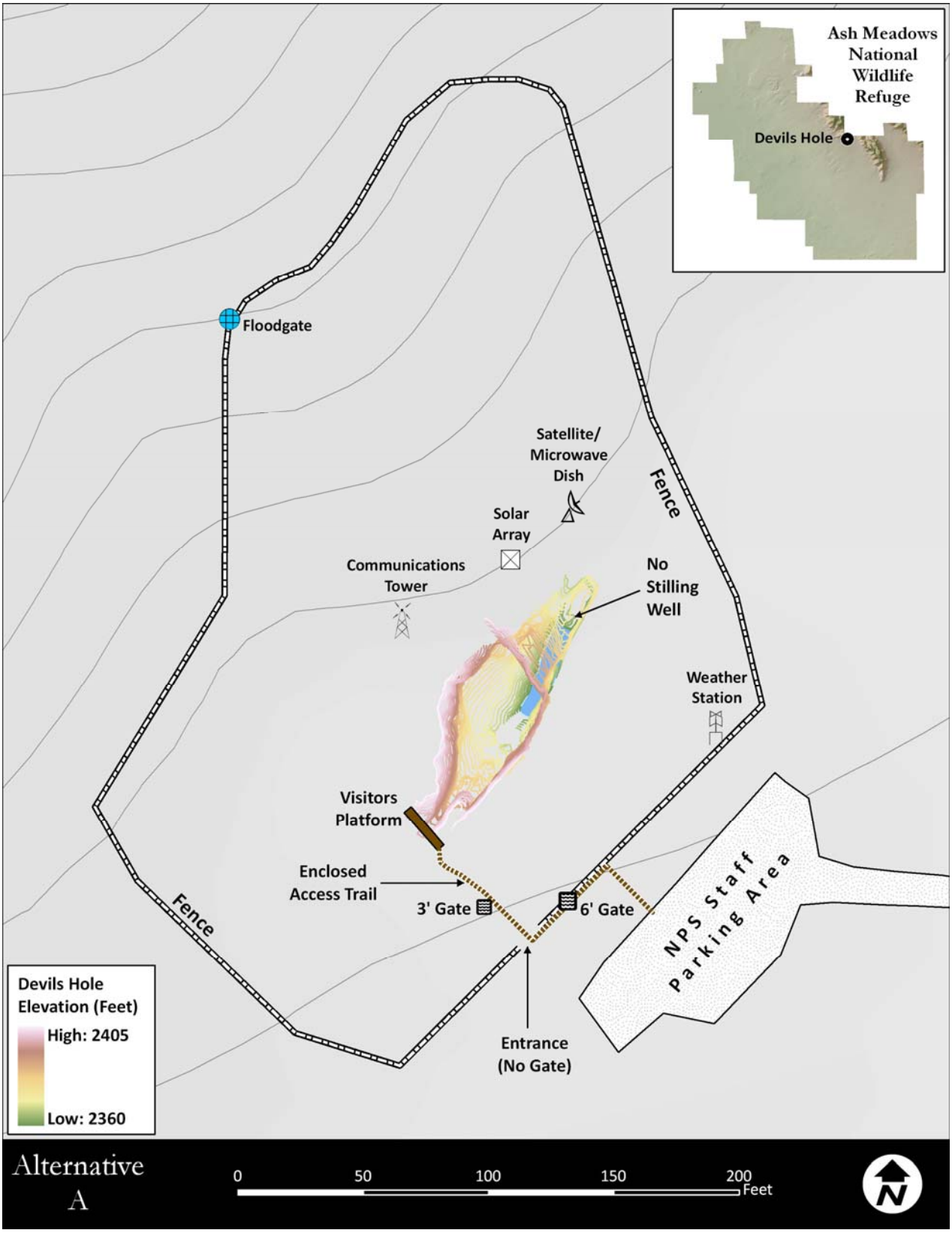

Figure 2.1. Alternative A (Preferred Alternative)

for reuse elsewhere. To improve the aesthetics of the site, 164 linear feet of perimeter fence along the east boundary will be new Twinbar High Security fence & hardware in standard gray color with double angled tops strung with barbed wire. One hundred sixteen linear feet of this Twinbar type fence will be installed on the existing east perimeter fenceline. Twenty-four linear feet (equal to 3 panels) will be used to turn the northeast corner. Twenty-four linear (equal to 3 panels) will be used to turn the southeast corner. An opening in the fence equal to one panel (8 ft.) will allow visitor access to the trail leading to the Visitors' Platform. See description below. This Twinbar fence length will also include one 6' wide gate (two 3' panels) installed using high security hardware, on the east perimeter north of the visitors tunnel, for staff access to the Southeast corner of the fenced area. The entire fence would be 8' high. To further enhance drainage, a flood gate would be constructed along the natural drainage pathway in the 'dogleg ' fenced area.

Demolition will include removal of that portion of chainlink fencing that to be replaced by Twinbar fencing (with possible storage for reuse). Then the existing fencing and gate under the existing Visitors' Platform will be removed and disposed of.

The new chainlink material and posts for the construction of the 'dogleg' and floodgate will be moved into place by pick-up truck or Bobcat on tracks, equipped with a bucket. A large posthole drill, probably run off the Bobcat, will be used to dig the holes, which will minimize site disturbance. Site disturbance will also be minimized by confining vehicles to a path parallel to the fenceline rather than criss-crossing the site. Batches of concrete for post footings will be moved into place by pick-up truck or Bobcat bucket. The floodgate spillway will not be covered in concrete at this time. Fence installation will be done by installing posts every 8 feet using a large post hole drill along the perimeter, installing the 10.6-foot galvanized aluminum posts into non-shrink poured concrete. The posts will be dug two feet deep.

Visitors Platform, Access Trail & Interpretation

In Alternative A the existing viewing platform would be retained. The fencing and gate beneath the platform will be removed using hand tools and a pickup truck.

The trail to the Visitors' Viewing Platform and the platform itself will be enclosed in a tunnel over the existing trail from the east perimeter fenceline (Figure A-3). This tunnel will be constructed of 185 lf of Twinbar High Security fence panels (90 linear feet on each side of the trail and 5 feet enclosing the end of the Visitors' Platform). From the 8' wide entrance the tunnel will taper to 4.5 feet wide (3.5 feet walkway plus 6" either side to accommodate posts), entirely enclosed and excluding visitors from the site. Two uncovered viewing openings, each three feet long and 18 inches high, will be cut out of the new Twinbar High Security fence. The windows will be placed so one is placed for easy adult viewing, the other for easy child viewing. The Twinbar fence of which the tunnel will be made will not include the double angled tops. Instead the tunnel will be covered over by a rounded hoop of chainlink fabric. The hoops will be fabricated by bending standard chainlink fence poles the same outside diameter of those used for the 'dogleg'. (The 1/2 circle diameter bend of the post will be (in most cases) 4.5 feet (width of walkway), making the height in the center of the tunnel 2.25 ft high. These hoops will be welded to standard chainlink fence posts and installed *inside-site* side of the Twinbar Fence. The same

type of chainlink fabric that will fence the 'dogleg' will be used to cover the tunnel hoops (only). A tension band will be woven in and out of the Twinbar Fence to secure the chainlink fabric to the hoops. A 3-ft (single panel) gate opening out will be created on the south side of the tunnel. No additional paving will be added to the existing trail, but other trail upgrades such as steps or waterbars would be implemented as necessary for safety and to control trail erosion.

The interpretive theme for Alternative A is based on combining enhanced off-site interpretation, through the use of a full-motion video cam located in the crevasse of the site that transmits over the Internet, with a joint Death Valley/Ash Meadows web site dedicated to Devils Hole interpretation. This website will be featured in an interpretive display at the Ash Meadows Visitors Center and Death Valley National Park's Furnace Creek Visitor Center. The display would likely also include a video of a Tribal elder talking about the importance of Devils Hole/Ash Meadows. The underwater video enabled in this alternative represents a significant improvement the Park's ability to interpret the ecosystem.

Access Ladder

For Alternative A, the existing ad hoc ladder is replaced by a steep incline stairway commonly referred to as a ships ladder (Figure A-4). Starting at the location of the existing support, the ladder descends 13' at a 68° incline into the hole. The existing support would be replaced with a 4" structural steel square tubing. Like the existing support, the new support spans both walls so that the top of the staircase does not impede the natural drainage. New anchors may have to be drilled for this support, if the existing support's anchors are found to be inadequate.

Two methods of anchoring the ladder support are possible:

- A 6" square plate is welded or bolted to the each side of the support. For each plate, 4 holes for ½" diameter anchor bolts are drilled into the rock surface to a 6" depth. 4- 1/2" x 8" long adhesive anchor bolts hold the plate slightly above the rock surface. Grout is added underneath each plate to remove all gaps.
- An 8" hole is made in the rock for each anchor location using a core drill. The core depth should be 1 1/2-2' for the ladder supports. The support is located in the center of holes and concrete is poured around it to form a solid concrete anchor.

The new support has mounting brackets for the ships ladder. These brackets create a pivot at the top of the ladder. The bottom legs of the ladder rest on small concrete blocks atop the natural surface. The pivots would allow the ladder to swing in the event of a large flood. However due to the geometry of the ladder, only large boulders would have enough momentum to move the ladder.

The ladder's incline is steep enough that handrails would be required on both sides of the ladder to safely ascend and descend.

The ships ladder would be fabricated offsite. Due to the ladder's size and weight, along with the difficult access to the Hole, a crane would be required for the installation. However, since the ships ladder will be fully constructed prior to the install, the time and labor spent onsite will be minimized.

Monitoring Platform & Equipment

Alternative A consists of a sectional portable monitoring platform that could be stored away from the water surface within the Devils Hole crevasse and assembled as needed (Figure A-5). The platform consists of individual aluminum sections shown in Figure A-6. A five-ft section would weigh approximately 40 lbs.

The first platform segment is constructed with two rods permanently fixed to both its north and south end. The remaining platform sections are similar but only have one rod fixed on the north end of the platform. (Figures A-7, A-8). When set in place, the rods from each platform section rest on permanently installed anchors. Anchors shown in Figure A-5 are attached to both the east and west walls and provide a stable means of support for the platform. Anchor holes would be drilled using industrial power hand tools, such as a 1- 9/16" (13.7 lb.) rotary hammer. There are 10 anchor plates, each with four anchor bolts, so a total of 40 ½" diameter holes would be required. Holes would be 4-6" deep.

The platform is also constructed with a built-in measurement system to allow researchers to easily georeference their sampling locations (Figure A-9). A ruler sits freely in a slide which can move freely along the length of the platform to determine the coordinates of any location of interest. Grids are created by marking 2 points along the axis of the ruler, then sliding the ruler a number of inches, and marking 2 more points along the ruler, as shown in Figure A-10.

In this alternative, the entire stilling well and frame structure will be removed and the Park will rely on pressure transducers and a new staff gage (the existing staff gage is connected to the stilling well) to measure water level. The Park will attempt to use existing anchors to affix the new staff gage in a location along the east wall that is easily accessible from the south shore, but it may be necessary to install two new anchor bolts in the east wall as necessary. Given that the current access scenario for conducting monitoring involves resting a ladder on the existing frame structure, the new access platform will be installed before removing the existing frame and stilling well. The existing frame and stilling well are bolted to anchors set in the east wall. These anchors will be left in place and the stilling well frame simply unbolted. In the event that an anchor is frozen, the Park would use a pneumatic cutting device similar to the "jaws of life" used in vehicle accident extrications. This will limit the amount of disturbance to pupfish and their habitat.

Security System

For Alternative A, one of the existing cameras on the communications tower would be replaced with a full-motion video camera (#1) and the second would be replaced with a video camera with infrared (IR) capability (#2). See Figure A-11. A video recorder and transmitter interface with compositing software would enable images from multiple cameras to be displayed on a single monitoring screen; this would enhance remote monitoring capabilities. Camera feeds could also be switched in software. In addition, two video cameras that could transmit full-motion video images over the internet for site interpretation and resource monitoring would be installed within the crevasse, one along the cliff (#3) and one on the cavern ceiling (#4). See Figure A-12. A

remote monitoring system, along with improved intrusion detection via intrusion sensors located at multiple access points, would be installed.

A fifth camera on the visitor platform or up the hillside would be installed (#5). Lastly, a waterproof camera would be suspended from a cable and hung in the water at a fixed depth (#6). A cable would bring the video signal back to an electronics enclosure mounted remotely but fairly close by. The electronics processes the signal and develops the recordable video signal. This camera is fairly small (4"x6" cylinder). The best method of suspending it in the water will be determined.

Installing higher end video cameras would cause minor disturbance of the area around the tower to replace and re-wire cameras #1 and #2. Installing the cameras in the crevasse (#3 on the cliff and #4 in the cavern) would involve drilling into the cliff face and the cavern ceiling to mount the camera supports, and extending buried cable from the solar power inverter to the camera mount. Installing camera #5 on the visitors platform would require installing a mounting post and routing cable as well. As mentioned above, minimizing vibration while drilling into rock for the camera mounts is an important consideration, because of the proximity of sensitive fish to the cliff face. A 13.7-lb rotary hammer would be used for rock drilling.

Communications Infrastructure

Alternative A, which requires at least 640kbps of upstream bandwidth (but would optimize at 1MB or higher), would use either satellite or microwave communications for transmitting data and images to the Ranger Station and other interpretive sites. This would involve installing a small satellite or microwave dish. If the dish cannot be installed on the communication tower, it would be mounted on a 3’ by 3’ concrete pad. Over 100’ of fiber optic cables from the video controller to the satellite or microwave dish would be buried underground.

Power supply

After considering other ways of providing power (see Section 2.3), the Park is proposing to use solar power for all its onsite power requirements in both alternatives.

The Preferred Alternative would require 575 watts of power for the cameras and monitors, plus excess power to recharge the batteries. This requires approximately 300 square feet of photovoltaic cells. The array (15′ x 20′) would be bracketed and mounted onto the ground at a location west of the Hole, chosen to balance the desire to minimize visibility and maximize power efficiency, with the large storage batteries stored underneath (and thus shaded by) the solar array. The solar power system is sized to provide 24-hour power for the site as well as 2 days of backup of battery storage during reduced solar power input due to poor weather conditions.

The panels will face as closely as possible to the south. In order to minimize the required depth and diameter of support footings, the panel frame will be mounted on six 2-1/2” or 3” diameter posts, with three posts located at the center and on either end on the upper and lower areas of the

frame. Posts will be anchored in concrete footings, approximately 2' diameter and 3' deep (to be determined by the solar panel vendor during final design).

The panels will be adjusted face on an angle of approximately 50º, which provides a midrange compromise to the sun's elevation from winter to summer.

Site revegetation

Much of the project area has been previously disturbed and remains sparsely vegetated. All revegetation plans will be conducted in consultation with Park Service botanists. Restoration in Alternative A would consist of:

- Replicating the mix of plant species in the restoration area by:
  - Making a count of the genus and species of plants and the percentage of each in the five acres surrounding the area to be restored.
  - Raising or acquiring the appropriate mix of local species
  - Handplanting the site with minimal soil disturbance
- After planting, lightly spraying the area with water and then minimally covering the root zones with stones to hold in moisture and installing fiber rolls at the top of Devils Hole to prevent and water runoff into the Hole (fiber rolls or logs are made of coconut fiber, rice wattle and wheat wattle inside a jute mesh).
- Continue watering 1 acre with .5" of water twice per week for three weeks or as specified by the Park's botanist.

2.2.2 ALTERNATIVE B

Figure 2.2 depicts Alternative B.

Fenceline

For Alternative B the fence will consist of 176 lf of Twinbar High Security fencing with double angled tops (outriggers) and hardware, and one 6' gate on the east perimeter and 2350 lf of chainlink fence to enclose the natural drainage (Figure A-13). However there will be no access to the Visitors' Platform except with a ranger guided tour, so the gate will be permanently locked and accessible only to Park personnel.

Construction of the fenceline in this alternative is similar to that of Alternative A.

Demolition will include removal of the portion of chainlink fencing to be replaced by Twinbar fencing (with possible storage for reuse). Then the existing fencing and gate under the existing Visitors' Platform will be removed and disposed of offsite.

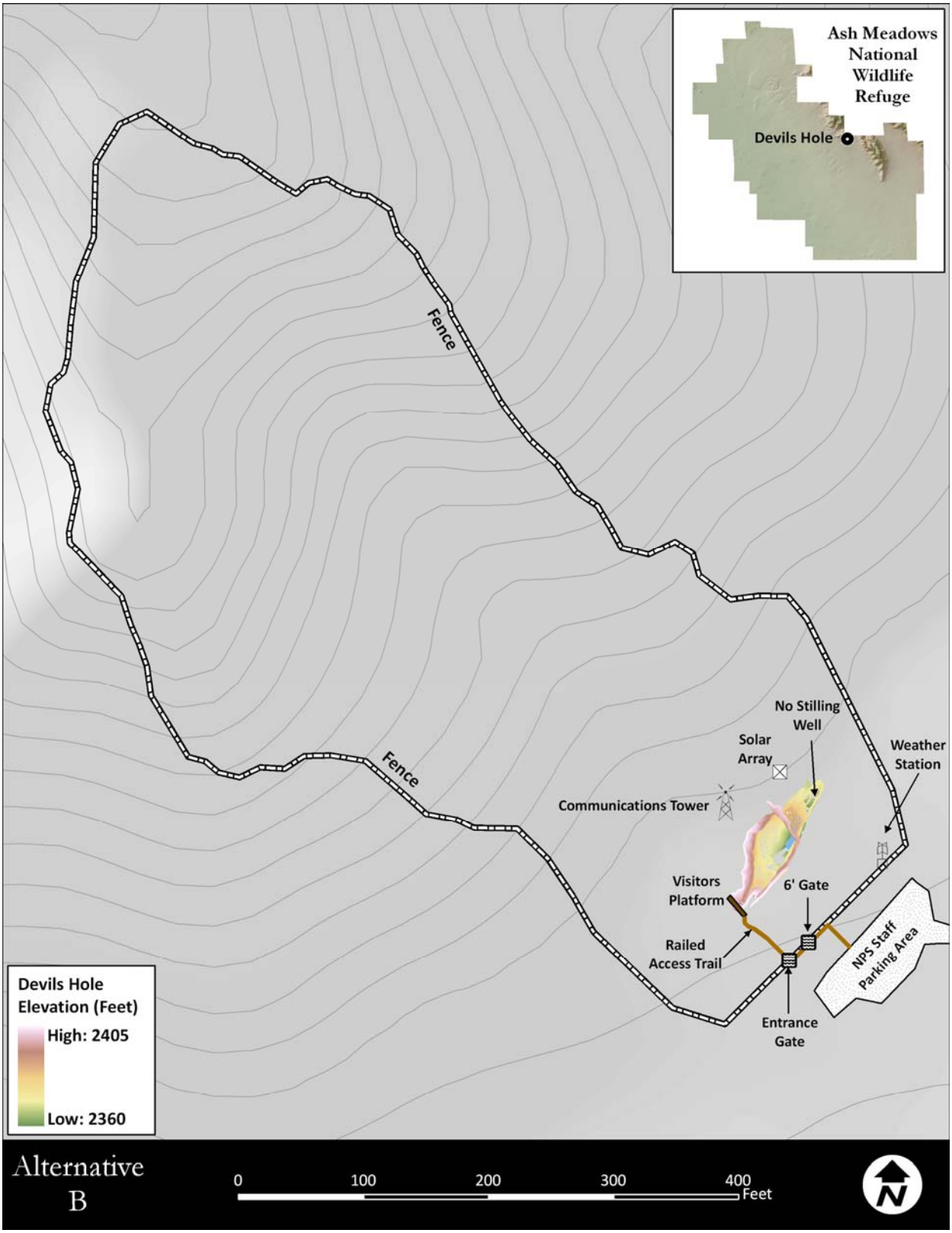

Figure 2.2. Alternative B

Visitors Platform, Access Trail, and Interpretation

In Alternative B the existing Visitors' Platform will remain. The existing fencing and gate underneath this platform will be removed.

The existing trail to this platform will remain and a wooden handrail will be installed on both sides of the trail (Figure A-13). These handrails will be approximately 75 ft long (total 150 ft) and consist of two horizontals along the trail. On both sides and the end of the Visitors' Platform the railing will consist of three horizontals (total length 45 ft), conforming in strength, spacing, horizontal and vertical support to NPS standards for railings. The railing sections will be pre-fabricated off-site and supports installed in the ground using a posthole drill for railings supports along the trail and a wood drill to attach the supports to the existing platform. Site disturbance will be minimal.

The interpretive approach in Alternative B is to limit unsupervised access to the Viewing Platform, but with improved interpretive displays outside the fenced area for the casual visitor that will provide additional information about the pupfish, the ecosystem and the importance and need for protection. The supervised tours provide the opportunity to deliver a more complete message about these issues. In addition, an offsite interpretive exhibit at the Ash Meadows Visitors Center and Death Valley's Furnace Creek Visitor Center will be enhanced by providing refreshed still images of the pool from a camera inside the crevasse. The display would likely also include a video of a Tribal elder talking about the importance of Devils Hole/Ash Meadows.

Access Ladder

Alternative B leaves the existing access ladder as is but increases safety and accessibility by adding a permanent handrail down the side of the cliff (Figure A-14). At the bottom of the ladder, the handrail continues down the remaining 40’ to the water’s edge. The handrail is constructed of 1 ½” round structural steel tubing, with support posts placed every 8’. The railing is cut, welded, and painted onsite.

Each handrail support post will require it own anchoring. As with the ladder support, two methods of anchoring the handrail supports are possible:

- A 6" square plate is welded to the bottom of each post and support. For each support, 4 holes for ½" diameter anchor bolts are drilled into the rock surface to a 6" depth. 4- 1/2" x 6" long adhesive anchor bolts hold the plate slightly above the rock surface. Grout is added underneath each plate to remove all gaps.
- A 6" hole is made in each anchor location using a core drill. The core depth should be 10" for the handrail posts. Posts are located in the center of holes and concrete is poured around them to form a solid concrete anchor.

Anchor holes for the handrail supports, placed every 8’, would be drilled using industrial power hand tools, such as a 1- 9/16" (13.7 lb.) rotary hammer. Such hammers have a large fan and attachable dust collectors to minimize the deposition of shavings and small rock materials down the cliff and into the Hole.

Monitoring Platform & Equipment

The monitoring platform in Alternative B is an implementation of the design produced for the Park by HDR FishPro, in which the platform is bolted to the east wall in a hinged manner which could be lowered by use of a hand-operated pulley system when required. The platform is permanently stored in a raised position bolted to the eastern cliff above the pool (Figures A-15 & A-16).

This platform structure would be installed by setting up temporary scaffolding over the cliff face. (It may be possible to use ropes and harnesses stretched from the top of the hole). Up to six 1-inch anchor holes will be drilled into the cliff face. Anchor holes for the handrail and steps would be drilled using industrial power hand tools, such as a 1- 9/16" (13.7 lb.) rotary hammer. Such hammers have a large fan and attachable dust collectors to minimize the deposition of shavings and small rock materials down the cliff and into the Hole.

Vibration tests, as mentioned above, would be performed in the rock before drilling.

After anchor bolts are in place, the platform itself would most likely need to be lowered into the hole and into place by a small crane. If the platform is light enough to be carried down into the hole, such equipment may not be necessary but scaffolding spanning the water would be required to fasten the platform to the anchors.

For this Alternative, the stilling well and associated frame will be removed and installed in the back of the cave. Installation in the new location will require drilling several new holes for anchor bolts to affix the stilling well frame. Though under this alternative the existing staff gage along with the stilling well will be moved to the back of the cave, there will also be a second staff gage installed along the east wall at a location easily accessible from the south shore, as in the preferred alternative. As in the other alternative, the Park will attempt to utilize existing anchors but may need to drill two new holes to set additional anchors. Given that the HDR access platform design cannot be fully installed without first removing a portion of the stilling well frame (i.e., they occupy the same space), a temporary working surface will need to be suspended above the water surface during removal of the existing infrastructure and installation of the new platform.

Security System

For Alternative B, one of the existing cameras on the communications tower would be refurbished to full functionality (#1) and the second would be replaced with a camera with infrared (IR) capability (#2). See Figure A-17. Both of these cameras would be steerable and have video recording capability, although only one would be configured to transmit video; the other would transmit still motion images to the Ranger Station, controlled by the video software. The camera locations on the communications tower would remain approximately the same as today. A remote monitoring system, along with improved intrusion detection via intrusion sensors located at multiple access points, would be installed, with additional zones to cover the wider fenceline area. Video monitors would be located at the Ranger Station to display still motion images. A third camera would be installed on the northeast face of the cliff wall to

monitor and view the Hole itself. A fourth camera would be installed on the ceiling of the cavern to look outward. The cameras could be camouflaged from view of the visitors to some extent.

Given that this alternative has the fenceline extending almost up to the watershed edge, an additional security camera (#5), installed atop the visitors platform but capable of steering towards the upper hillside, would be needed to provide coverage of the extended area.

Refurbishing and replacing existing cameras on the communications tower would involve minor disturbance of the area around the tower to replace and re-wire the cameras. Installing the cameras in the crevasse would involve drilling into the cliff face and the cavern ceiling to mount the camera supports, and extending buried cable from the solar power inverter to the new locations. Installing an additional steerable camera on the visitors platform would require installing a ground mount, and burying cable as well. Similar procedures as described for Alternative A would be used to minimize vibration and rock debris being transmitted into the Hole.

Communications Infrastructure

Alternative B would use cell phone transmission for the communication of the limited data generated: alarm signals, still images, and voice communications. There is currently cell reception at the site. No additional hardware or software would be installed.

Power Supply

Alternative B would require approximately 480 watts of power for the cameras and monitors. This would in turn require roughly 200 square feet of photovoltaic cells, along with a battery charging system and power conditioning. The array would be bracketed and mounted onto the ground at the same location as the existing array, with the large storage batteries stored underneath (and thus shaded by) the solar array.

Site revegetation

Much of the project area has been previously disturbed and remains sparsely vegetated. All revegetation plans will be conducted in consultation with Park Service botanists. Restoration in Alternative B would consist of:

- Accelerating the re-establishment of the natural mix of plant species
    - Moisten the approximately 2 acres to be restored

- Continue to water the area twice per week with .5" water three weeks in the spring and most likely local plants will seed themselves.

2.3 ALTERNATIVES CONSIDERED BUT DISMISSED

CEQ regulations for implementing NEPA require that Federal agencies explore and objectively evaluate all reasonable alternatives to a Proposed Action, and briefly discuss the rationale for eliminating any alternatives that were not considered in detail. This section describes alternatives to the Proposed Action that were considered and eliminated from further study. The rationale for elimination is given below, by alternative.

1) Bridge over the north side of Hole

Since one of the objectives of the action is to improve the interpretative and educational opportunities for visitors, one alternative considered was the construction of a bridge over the north side of the hole. This would orient visitors looking south over the hole and beyond, thereby giving them a broader view of the entire setting than a platform looking north. A separate interpretive area would be constructed adjacent to the bridge.

Because of physical site limitations, this bridge would have to extend directly over the Hole itself. This was thought to be infeasible because:

- Such a construction would be prohibitively expensive in relation to its benefits for the recovery of the pupfish
- While providing a broader view of the setting and thereby providing additional educational opportunities for understanding the role of the site in the broader ecosystem, the actual views of the Hole itself would be limited except for directly underfoot, which is felt to be limiting for many visitors even if a glass floor were used for the bridge span.
- It was felt that any alternative that allowed visitors unsupervised access inside the fencing should allow direct views of the Hole itself. Otherwise, there would be little benefit to allowing such access

For these reasons, this alternative was dismissed from further consideration in the EA.

2) Extending grid power and landline telecommunications

Currently all activities at the site requiring power are served by a small solar array—3 solar panels, generating 37 watts, and a charge controller—located a few yards from the visitors platform. Data communications within and from the site are over cellular phone infrastructure. The proposed security and interpretive improvements will require additional power and data bandwidth.

One powering option considered by the Park team was to extend grid power from a terminus about 1.5 miles away, within AMNWR. Power would be extended by conventional utility lines to the site. This would require extending above-ground utility poles and lines from the terminus to the site. While this is technically possible, it was considered to be unnecessarily disruptive

and costly, as well as requiring levels of interagency negotiation that could cause delays in the implementation, especially given the natural suitability of solar power for the Devils Hole site.

Similarly, telecommunications bandwidth for security and interpretive functions, using video, two-way voice, and internet, could be delivered by extending landlines from the AMNWR terminus. However, the Park team felt that similar considerations of cost, environmental disruption, and interagency delays make this option infeasible for this project, especially given the relative simplicity of a private satellite ISP system located at the site.

For these reasons, this alternative was dismissed from further consideration in the EA.

3) Joining the monitoring platform directly to the ladder

One of the options considered in designing a secure convenient access for researchers was improving convenience by constructing a single structure that included a ladder with an attached fold-out monitoring platform at its bottom. The Park team felt that because of the required length of the platform to run from its landing point to just beyond the shallow shelf in the pool, an attached platform could not be sufficiently stabilized on the ground and over the pool to provide a meaningful improvement in overall safety.

For this reason this alternative was dismissed from further consideration in the EA.

4) Live video monitors at interpretive station

The Park considered the use of live video monitors as part of the proposed interpretive treatment, on which would be displayed full-motion video streams from the video cameras that are scanning the crevasse and the cavepool. This would involve locating video monitors at the interpretive station located at the Visitors Platform, which would receive video feeds through wired connections to the cameras. Given the relentless heat of Death Valley summers, where temperatures routinely reach 100^0 F in the daytime, the need for environmental conditioning and the likelihood of frequent interruptions of service make this option problematic. In addition, these monitors would likely be a target of attempts at theft or vandalism, creating additional security concerns at the site. The Park felt that a sufficiently high- quality interpretive treatment could be created using a combination of other media and remote viewing opportunities.

For these reasons, the use of live monitors on-site was dismissed from further consideration in the EA.

5) Reconfiguration of road and parking access to the site

The Park considered a reconfiguration of the access for staff and researchers from the main road to the site. Currently, the monitoring staff accesses the site from an unimproved trail/road that leads from the main road through a swinging gate to a parking area, from which staff loads and unloads their monitoring gear and equipment to directly access the cavepool on foot. An historic access road connecting School Springs within AMNWR to Devils Hole (visible on site topographical maps) was considered for use by staff and researchers. In this way, the existing access road connecting the main road to Devils Hole could be reclaimed in favor of a less

substantial foot path for visitors. The parking area could also largely be reclaimed in favor of a new parking area to the West. However, this alternative access route does not get researchers closer to Devils Hole, nor is it more convenient. In fact, it is less convenient and would require that staff and researchers travel an additional distance to access Devils Hole. Further, to resurrect this access road some repairs would likely be needed, causing some amount of surface disturbance. The Park dismissed this alternative following discussions with AMNWR staff in which the Refuge staff expressed concerns that the increased vehicular traffic and/or any road improvements would impact an endangered plant that lives along the route. For this reason, developing the alternative access route was dismissed from further consideration in the EA.

6) Building a new visitors platform at a new location

The Park considered two possible locations for a new visitors platform, both of which were intended to enhance the interpretive experience overall, while preserving the ecological balance of the pupfish habitat:

- An elevated location along the ridgeline south of (further back from) the current platform, along an expanded fenceline. This location would be consistent with moving the fenceline back to accommodate enhanced drainage while keeping the platform behind the fenceline. Using the results of a topographical survey and staff onsite evaluations, it was determined that even the best possible view of the Hole from such a site would be unacceptable for site visitors. Further, it was apparent that to provide even a marginal view of the water surface, the viewing platform would need to extend at least 18' above the ground surface, which would create an unacceptable visual intrusion into the landscape setting. Thus it was considered infeasible and dismissed from further consideration in the EA;
- A location at the eastern cliff-edge directly overlooking the Hole that would be available for supervised tours only. The Park felt there was little reason to build a new viewing platform at this location when a better view was available from the existing platform. Given this view, and the cost and the potential for construction disturbance that could directly harm the pupfish, this alternative was considered infeasible and dismissed from further consideration.

2.4 ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with DO-12, the NPS is required to identify the "environmentally preferred alternative" in all environmental documents, including EAs. The environmentally preferred alternative is determined by applying the criteria in NEPA, as guided by the CEQ. As stated in Section 2.7 (D) of the NPS DO-12 Handbook, "The environmentally preferred alternative is the alternative that will best promote the national environmental policy expressed in NEPA (Section 101(b))." This environmental policy is stated in six goal statements, which include:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. Attain the widest range of beneficial uses of the environment without degradation, risk to health and 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 (NEPA, 42 USC 4321-4347).

In sum, the environmentally-preferred alternative is the alternative that not only results in the least damage to the biological and physical environment, but also best protects, preserves, and enhances historic, cultural, and natural resources.

The Park selected its Environmentally Preferred Alternative by comparing the natural and human impacts for each project component:

Fenceline—Alternative A expands the existing fenceline to include more but not all of the watershed that drains into Devils Hole, with a floodgate installed within the fence to allow natural sediment flows to reach the Hole. This "dogleg" fenceline would install less linear fencing, and thus require substantially less fencing material and construction disturbance than Alternative B, which extends the fenceline to encompass the entire drainage area. The dogleg fenceline of Alternative A provides improved natural drainage to the Hole, but natural flows are still artificially constrained by the fence. Furthermore, releases through the floodgate concentrate flows along a relatively narrow channel, increasing the flow rate and the probability of soil erosion. Alternative B would create more disturbance during installation, but these impacts would be short-term, compared to the long-term benefits from restoring fully natural drainage. Therefore, the fenceline in Alternative B is environmentally preferred.

Visitors Platform, Access & Interpretation—Both alternatives retain the existing visitors platform and remove the fencing below. Alternative A constructs an enclosed access trail and encloses the visitors platform itself, thereby allowing more secure unsupervised use, and preventing off-trail disturbance. Alternative B eliminates unsupervised access and adds supervised interpretive tours, thereby precluding the need for enclosures around the trail and platform. The enclosure of the platform and trail in Alternative A will cause more construction disturbance than Alternative B, as well as detract from the visitor experience and cultural integrity of the site by its intrusive visual presence. Both alternatives will similarly improve the interpretation material onsite and at the Visitors Center, but supervised tours provide a further opportunity for visitor education. Therefore, the trail and interpretation of Alternative B provide a lighter footprint and greater opportunity for education; thus Alternative B is environmentally preferred for these components.

Access Ladder—The ships ladder in Alternative A would improve safety and convenience for researchers by a greater amount than the handrails in Alternative B. While Alternative A could create more disturbance during installation, the use of BMPs would minimize this, and the ladder will prevent researchers from disturbing the cliffside during all subsequent descents, as would still be necessary by repeated placement and removal of the makeshift ladder if only handrails were added. Therefore, the Alternative A access solution is environmentally preferred.

Monitoring Platform & Equipment—Alternative A involves minimal construction disturbance for installation, and minimal disturbance during onsite assembly and use. Alternative B involves extensive drilling and disturbance into the cliffside and the subsequent risk of rock and sediment deposition, even with careful implementation of BMPs. For this reason, Alternative A is the environmentally preferred solution for a new monitoring platform.

In Alternative A, the stilling well and frame are removed, whereas in B they are simply moved to a less intrusive location. Since the functional role of the stilling well will be performed by using pressure transducers to monitor the water level, removal of the equipment is environmentally preferred, since this produces fewer unnatural inputs into Devils Hole.

Security System—Both systems require the same amount of disturbance in construction, operations and maintenance. Therefore, neither is environmentally preferred.

Communications Infrastructure—Alternative A would require installation of a satellite or microwave dish for provision of broadband data and video communication, which could be mounted on the existing communications tower, and the burial of cable. This would create minor short-term disturbance but would enable superior surveillance of the site and site security in the long-term. As Alternative B relies on limited existing cellular service for security system communications, its effectiveness is limited. Due to improved protection from vandalism, Alternative A is the environmentally preferred communications solution.

Power Supply—Despite the small increment in power necessary proposed in Alternative A, the disturbance and impacts from installing the solar arrays in both A and B would be virtually identical. Therefore, neither is environmentally preferred.

Site revegetation—Both alternatives would revegetate the same area, but Alternative A would revegetate faster because it would involve planting rather than waiting for plants to reseed themselves, as in B. The faster vegetation is reestablished on the site, the less chance there is for soil erosion and exotic plant establishment in the disturbed soils. Thus, the revegetation plan in Alternative A is environmentally preferred.

Of the project components for which an environmental advantage could be assigned, Alternative A prevails in four, Alternative B in two, and there is no difference for two. Because the environmental benefits of Alternative A include long-term protection of the ecosystem from vandalism, active site revegetation, and limited near-water installation disturbances, Alternative A is the overall environmentally preferred alternative, by a slight margin.

2.5 PREFERRED ALTERNATIVE

The Park's selection of the Preferred Alternative is based on balancing the multiple objectives of the project, which are detailed in Section 1.1. In addition to improving the natural conditions that will sustain the survival of the pupfish and improving visitor interpretation, these include enhanced security of the site from vandalism and improvements to the safety and convenience for ongoing research and monitoring activities. As mentioned above, the overall environmental

benefits between Alternatives A and B are closely decided in favor of A. Alternative A also best achieves the project's full objectives for the natural and human environment.

2.6 MITIGATION MEASURES

Measures that would be implemented to minimize or avoid adverse impacts on environmental resources as a result of the alternatives are described below.

Minimizing vibration while drilling into rock for support anchors is an important consideration, because of the proximity of sensitive fish to the cliff face. A 13.7-lb rotary hammer would produce vibrations of approximately 2 inches per second per second in a 1000-lb rock, and less than .1 inches per second per second in a 7000-lb. rock (Norton, 2006). The Park will conduct vibration testing on the rocks by drilling a single hole into the rock in which holes will be drilled and measuring and observing vibration. The largest rock sizes feasible should be used to minimize transmitted vibration to the hole. In addition, using the minimum size of drill bit adequate for the anchor hole will minimize vibration. In addition, such hammers have a large fan and attachable dust collectors to minimize the deposition of shavings and small rock materials down the cliff and into the Hole.

During project implementation, standard best management practices (BMPs) would be used during all phases of construction, rehabilitation, and system operation. Adherence to these BMPs would control or reduce potential adverse impacts from surface water runoff, sedimentation, erosion, exotic species propagation, vegetation removal, and water quality degradation. They would also limit any adverse affects from rock drilling in close proximity to the water surface. In addition to these measures, other measures would be implemented to minimize or avoid adverse impacts on environmental resources as a result of the action alternatives. These other measures are listed below. The NPS would implement these measures as part of either of the action alternatives. Adherence to the following mitigation measures, in conjunction with adherence to all applicable and appropriate local, state, and federal regulations and permits, should ensure that the proposed action has no significant impacts to the environment.

Soil & Water Resources

- BMPs at construction sites typically consist of erosion and sediment control measures such as silt fences, straw bales, soil moistening, and other temporary measures to be placed along portions of the site perimeter to control erosion during construction activities;
- These temporary erosion prevention measurements should be maintained in place until the site vegetation is firmly established and soil has stabilized;
- Regular inspections of the erosion and sediment control measures should be performed after any storm event;
- The amount of vegetative clearing during construction activities should be minimized in order to protect the soil cover and minimize erosion risks;
- Under all circumstances, sediment runoff from the site should be captured and prevented from entering any nearby surface or groundwater;

- Care should be taken when working on the cliffs surrounding Devils Hole; workers should avoid erosion of sediment and soils into the Hole to the maximum extent possible;
- Project components along the cliff (access ladder, monitoring platform anchors) should incorporate the natural contours of the cliff edges into their design and installation to the extent possible;
- All fuels should be stored and maintained in a designated equipment staging area to reduce the potential for soil contamination;
- To the extent possible, fence construction will be done from outside the fenceline, not inside, to minimize the flow of construction waste and sediment erosion into the Hole
- A person(s) should be designated as being responsible for equipment fueling who closely monitors the fueling operation, and have an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items, readily available on site in the event of an accidental spill.
- The area of disturbance should be limited. For example, heavy construction equipment would be kept on the road surface when placing slope protection or performing excavation adjacent to the roadway, to the extent possible.
- Construction areas would be identified by and fenced with construction tape, snow fencing, or some similar material prior to any construction activity. The fencing would define the construction zone and confine activity to the minimum area required for construction. All protection measures would be clearly stated in the construction specifications, and workers would be instructed to avoid construction activities beyond the construction zone, as delineated by the construction zone fencing. Construction materials would be stored in previously disturbed areas.
- Topsoil would be removed and stockpiled for reapplication to disturbed areas when construction is complete.
- Disturbed areas would be restored to natural contours to the extent possible to reduce the potential for erosion. Revegetation with native species would use genetic stocks originating in the Park or from plants previously removed from the construction area whenever possible. Revegetation efforts would be designed to reconstruct the natural spacing, abundance, and diversity of native plant species.
- Subsequent to project completion, Park staff would monitor and require removal of any invasive species observed.
- Construction vehicles could leak fluids into the soil, introduce noise pollution, and emit pollutants to the atmosphere. To minimize this possibility, equipment would be checked frequently to identify and repair any leaks, mufflers would be checked for proper operation, and only equipment that is within proper operating specifications would be used.
- Fuel and oil services for construction machinery would be provided in a designated area away from channels or drainages. This would include secondary containment for all fuel storage tanks and on-site availability of a specialized spill kit to contain fuel spills.
- Biological soil crusts would be identified, staked, and flagged by NPS personnel to delineate areas near but outside the work areas that are not to be disturbed.
- Gravel and fill for construction or maintenance would be obtained from certified noxious weed-free sources. Gravel pits and fill sources would be inspected to identify weed-free sources. There would be no quarrying of construction materials from inside the park or from AMNWR.

Biological Resources

- Any area of undeveloped land would be restored as closely as possible to its original condition through soil stabilization BMPs and revegetation with native plants.
- Approval would be obtained prior to the use of any outside fill materials – in order to ensure that any fill/seed materials are certified weed-free.
- Construction activities would be timed to minimize impacts to pupfish survival behaviors. Construction activities would not take place during spawning periods, which typically occur between February and May.
- To the extent possible, construction activities would be timed to avoid sensitive periods such as when barn owls are nesting in the cavern or western pipistrelle (*Pipistrellus hesperus*) or Townsend's big-eared bat (*Corynorhinus townsendii*) are present.
- All electrical equipment should be properly grounded
- Crews will not work in storms
- Exposed wires will be kept as far away from Devils Hole as possible

Air Quality

- Implementation of reasonable measures, such as applying water to exposed surfaces or stockpiles of dirt, would occur when windy and/or dry conditions promote problematic fugitive dust emissions. Adhering to these BMPs would minimize any fugitive dust emissions.

Cultural Resources

- If previously undiscovered archeological resources are uncovered during construction, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented, and an appropriate mitigation strategy developed in consultation with the Nevada State Historic Preservation Office. In the event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (25 United States Code §3001) of 1990 would be followed.

Park Operations

- Any area with vegetation clearing or construction activities would be a safety closure area requiring the use of hard hats.
- Others specific to protection of site-specific features

Visitor Use and Experience, Visitor Safety, and Traffic and Congestion

Measures designed to minimize visitor disruption would be developed prior to construction. Generally accepted methods to protect public health and safety while providing for visitor use and experience include, but would not be limited to:

- Notification to travelers about site closure would be posted at both the Refuge and Park Visitors Centers
- Well-tuned construction equipment with properly operating mufflers would be used and work would be performed during low visitation periods. For example, potential blasting of rock would occur during winter months when site closure would impact fewer visitors.
- The multiple environmental benefits of the proposed action would be explained to visitors to maximize public support and understanding. For example, there could be an interpretive display at the Ash Meadows Visitor Center and Death Valley's Furnace Creek Visitor Center emphasizing the fragility and importance of the Devils Hole pupfish and its surrounding ecosystem.

Any potential for vehicle traffic congestion around the site could be mitigated by the use of a slower speed limit (and accompanying signage).

2.7 COMPARISON OF ALTERNATIVES

Table 2-1 compares the alternatives, along the dimensions of the features developed to meet project objectives.

Table 2-1. Comparison of Alternatives

Project Objective	No Action	Alternative A	Alternative B
Security			
Security System	Existing system retained	Additional components (intrusion detection, replace 2 cameras to transmit full-motion video, add 2 with wider overall site view, and redundant systems added	Additional components (intrusion detection, refurbish 2 cameras transmitting still images, add 1 with wider overall site view)
Communications	• No video transmission capabilities on-site (only recording) • Data telemetry provided via cell phone signal	• Live video provided from 2 points above ground and inside crevasse for security and site interpretation, plus two cameras on the comm. tower, and one underwater live video feed. One additional live video feed could be available from the visitors platform • Dedicated Satellite or Microwave Dish	• Still imagery of site routinely obtained (i.e. a webcam) • Data telemetry provided via cell phone signal
Power	Individual components powered by	Solar panel array (300 sq. ft), battery charging system, and power conditioning	Solar panel array (180 sq. ft), battery charging system, and power conditioning system

Project Objective	No Action	Alternative A	Alternative B
	dedicated solar panels (60 sq. ft)	system installed to power electronic equipment and incorporated into the interpretive themes of the site.	installed to power electronic equipment
Interpretation			
Visitors platform, trail, interpretation	Existing platform retained and modified as necessary to increase handicapped accessibility	• Existing platform retained; unsupervised access • Fully enclosed visitors tunnel leads from fenceline opening to platform • Live video feeds from Devils Hole to Visitors Center • Increase wayside and platform onsite displays provided to interpret ecosystem	• Existing platform retained • Gate in fenceline leads to railed access trail • Supervised tours only • Increase wayside displays outside the fenced area and in visitors parking area provided to interpret ecosystem
Monitoring & Research			
Access Stairway	Access into Devils Hole provided via a temporary ladder in the SW drainage, little permanent footprint.	Existing access ladder replaced by permanently-affixed ship's ladder in the SW drainage	Existing access ladder enhanced by permanent railing fixed to west side of cliff, with single handrail from stair landing to the base of crevasse
Monitoring	• Access to water surface provided via an improvised platform • Retain stilling well and associated framing in existing configuration	• Removable sectional access platform deployed from SE shore • Remove existing stilling well and frame and rely on pressure transducers for water level monitoring	• Mechanical fold-down access platform deployed from eastern rock wall (HDR) • Move existing stilling well to back of Devils Hole cave
Natural Processes			
Habitat Restoration	Disturbed areas allowed to follow their natural succession	Active replanting of replicated mix of native plant species	Allow natural succession
Fencing	Existing fence,	• Security fence is moved	• Security fence is moved

Project Objective	No Action	Alternative A	Alternative B
	chain link, 8' high, crosses drainage	back ("dogleg" version) to improve sediment passage through drainage bottom • Entire fence is 8' high Twinbar, with double outriggers (angled tops facing in and out); • Flood gate	back to encompass the majority of the watershed ("watershed version") • 90% of fence is 8' heavy-gauge chain link with single outrigger, with ~200' of Twinbar with double outrigger in the Visitors Platform area

Table 2-2 compares the alternatives by their environmental impacts of Devils Hole resources.

Table 2-2. Impact Comparison of Alternatives

Impact Topic	No Action Alternative	Alternative A	Alternative B
Soils	Adverse, long-term, minor, and medium-ranged impacts to soils from continued risk of erosion and disturbance due to visitor use and monitoring activities.	Adverse, short-term, minor, and medium-ranged impacts to soils due to construction activities. Beneficial, long-term, minor and medium-ranged impacts to soils due to the addition of new fencing, enclosed visitors trail and researcher facilities. *Negligible cumulative impacts to soils.*	Adverse, short-term, minor, and medium-ranged impacts to soils due to construction activities; more intensive than Alt A (more fencing and more disruption from monitoring platform). Beneficial, long-term, minor and medium ranged impacts to soils due to the addition of new fencing, enclosed visitors trail and researcher facilities. *Negligible cumulative impacts to soils.*
Water Resources	Adverse, short-term, minor, and localized impacts to Devils Hole from each monitoring session; adverse, long-term, minor and localized impacts to Devils Hole from potential erosion due to visitor use and fenceline location.	Adverse, short-term, minor, and medium-ranged impacts to both surface and groundwater due to construction activities. Beneficial, long-term, minor and medium-ranged impacts to both surface and groundwater due to limited restoration of natural surface water flow	Adverse, short-term, minor, and medium-ranged impacts to both surface and groundwater due to construction activities. Higher risk than Alt A of rock deposition from monitoring platform. Beneficial, long-term, moderate and medium-ranged impacts to both

Impact Topic	No Action Alternative	Alternative A	Alternative B
		and decrease in potential erosion. *Potentially adverse, moderate, long-term, and project area-wide cumulative impacts to surface and groundwater from proposed water projects.*	surface and groundwater due to a fuller restoration of natural surface water flow and decrease in potential erosion. *Potentially adverse, moderate, long-term, and project area-wide cumulative impacts to surface and groundwater from proposed water projects.*
Vegetation	Adverse, long-term, negligible and localized impacts to vegetation from access to cavern. *Potentially adverse, long-term, negligible and localized, cumulative impacts from proposed transportation upgrades in the adjacent AMNWR.*	Adverse, long-term, minor and localized, impacts on vegetation from the installation of new facilities. Beneficial, long-term, minor and localized impacts from habitat restoration, improved access to the cavern for researchers, and limitation of access to improved trails. *Potentially adverse, long-term but negligible and localized cumulative impacts from proposed transportation upgrades in the adjacent AMNWR.*	Adverse, long-term, minor and localized, impacts on vegetation from the installation of new facilities. Beneficial, long-term, minor and localized impacts from replanting of native species, habitat restoration, improved access to the cavern for researchers, and limitation of access to supervised tours. *Potentially adverse, long-term, negligible and localized, cumulative impacts from proposed transportation upgrades in the adjacent AMNWR.*
Wildlife	Adverse, short-term, negligible and localized impacts to wildlife from vehicles using the roadway, visitation, and monitoring of conditions in the cavern *Potentially adverse, long-term, negligible and localized cumulative impacts from proposed*	Adverse, short-term and long-term, negligible and localized impacts to wildlife from temporary displacement during construction activities and the permanent exclusion of large terrestrial wildlife species from the fenced area. *Potentially adverse, short-term, negligible and*	Adverse, short-term and long-term, negligible and localized impacts to wildlife from temporary displacement during construction activities and the permanent exclusion of large terrestrial wildlife species from the fenced area. *Potentially adverse, short-term, negligible*

Impact Topic	No Action Alternative	Alternative A	Alternative B
	transportation upgrades in the adjacent AMNWR	*localized cumulative impacts from vehicles using the roadway, visitation, monitoring activities, and proposed transportation upgrades in the adjacent AMNWR*	*and localized cumulative impacts from vehicles using the roadway, visitation, monitoring activities, and proposed transportation upgrades in the adjacent AMNWR.*
Threatened and Endangered Species	Adverse, long-term, major and localized impacts to the Devils Hole pupfish due to habitat alterations caused by the existing fence. *Adverse, long-term, major and localized cumulative impacts to the Devils Hole pupfish from past groundwater pumping, monitoring activities, and proposed future water projects.*	Beneficial, long-term, moderate and localized impacts to the Devils Hole pupfish from replacement of the existing fence to restore natural sediment flow into Devils Hole. *Adverse, long-term, major and localized cumulative impacts to the Devils Hole pupfish from past groundwater pumping, monitoring activities, and proposed future water projects.*	Beneficial, long-term, moderate and localized impacts to the Devils Hole pupfish from replacement of the existing fence to restore natural sediment flow into Devils Hole. *Adverse, long-term, major and localized cumulative impacts to the Devils Hole pupfish from past groundwater pumping, monitoring activities, and proposed future water projects.*
Visitor Use and Experience	Adverse, major, long-term impacts from site degradation	Both adverse and beneficial, minor, and long-term. While visitors might perceive the enclosed tunnel and platform negatively, the interpretive experience itself will be enhanced by the addition of improved interpretive material, complemented by the offsite exhibits and web site.	Beneficial, moderate, and long-term impacts. Interpretive experience will be enhanced by tours and improved interpretive material The offsite interpretive exhibits web site will further enhance the overall visitor experience.
Park Operations	Adverse, moderate, long-term impacts from security failures and safety risks.	Beneficial, moderate, and long term, from increased researcher safety and improved deterrence. *No cumulative impacts*	Beneficial, major, and long term from further improvements in researcher safety and site security. *No cumulative impacts*
Cultural	Adverse, major, long-	Minor, beneficial, long-	Minor, beneficial,

Impact Topic	No Action Alternative	Alternative A	Alternative B
Resources	term impacts from continued degradation of the habitat conditions that sustain the basis of its cultural value	term affect from protection of the water resource; Impossible to analyze impact of access restrictions specifically without further knowledge of affected tribes' actual use. Visual impact of fence enclosure could be perceived by the tribes to be major. The improvements will have minor beneficial impact by increasing public awareness of the unique and fragile nature of the site and the importance of its preservation	long-term affect from protection of the water resource; Impossible to analyze impact of supervised tour restrictions specifically without further knowledge of affected tribes' actual use. Visual impact of fence enclosure could be perceived by the tribes to be major. The improvements will have minor beneficial impact by increasing public awareness of the unique and fragile nature of the site and the importance of its preservation

3.0 AFFECTED ENVIRONMENT

3.1 SOILS AND GEOLOGY

The soils found in this region are located on relict alluvial fans, some derived from limestone and dolomite and others derived from old lacustrine and beach sediments. The soils immediately surrounding the project site at Devils Hole are predominantly of the Commski and Commski-Yermo Associations, with Sanwell-Commski Association soils occurring just south of the site. The Commski soils are typically very gravelly to fine sandy loams. The upper layers of these soils can be up to 55 percent pebbles, and 30 percent cobbles. Only minor amounts of clay (5-15% are present). Overall, they're well-drained with very low to medium amounts of runoff and moderate permeability (NRCS, 2006; NRCS, 2001a; NRCS, 2001b).

The Yermo soils are deeply formed, well-drained soils that also have a high percentage of gravel occurring in their upper layers. The cobbly to gravelly sandy loam is typically comprised of up to 25% cobbles or gravel (NRCS, 2001a). These soils have medium to rapid runoff rates and moderately rapid permeability. Sanwell soils are also very deeply formed, well-drained soils. They're found on shallower slopes than both the Commski and Yermo soils; Sanwell soils form on slopes between 0 – 8% while both Commski and Yermo soils can be found on slopes upwards of 50% (NRCS, 2006; NRCS, 2001b).

Debris and Sediment Flow into Devils Hole

Energy input to Devils Hole results from sunlight, the resulting photosynthesis, and from organic materials that are carried into the fissure from the surrounding area. These materials can include the soils described above, any organic plant material, windborne particles, and other materials carried in by water and terrestrial animals. Precipitation events that cause runoff and erosion likely supply a large portion of this debris into the fissure. The precise amounts of these materials are uncertain, but they are thought to be vital to the Devils Hole ecosystem – particularly as food sources for the pupfish (Riggs and Deacon, 2002).

3.2 WATER RESOURCES

3.2.1 Groundwater & Hydrogeology

Geologic History

Throughout the Paleozoic (570-225 million years ago [mya]), the Ash Meadows region was a warm, tropical, beach environment that experienced repeated rise and fall of sea levels. This resulted in a series of sand, mud, and carbonate deposits that varied based on distance from the rising and falling seas: carbonates – such as limestone and dolomite – were deposited in submerged oceanic environments, while sand deposits occurred on adjacent beaches and mud deposits occurred in brackish and freshwater lagoons further inland. As sea levels fluctuated, these deposits layered on top of one another. The carbonate rocks present today formed from the calcium carbonate shells of marine organisms that lived in the shallow seas during this time (Riggs and Deacon, 2002).

At the beginning of the Mesozoic (approximately 200 mya), the sea withdrew from the Death Valley area and Sierra Nevada became a chain of volcanoes. At this point, volcanic intrusions, uplift, and erosion displaced previously deposited sediments, eventually creating basin and range topography. The early Cenozoic (between 70 – 30 mya) saw the region begin to expand in an east-west direction. This resulted in the thinning out of carbonate deposits and the rise of basin and range topography. While this east-west expansion was occurring, north-south fractures and joints opened up throughout the carbonate rocks which led to the creation of subterranean fissures and openings. These are the most conductive flow paths for groundwater currently (Riggs and Deacon, 2002).

Around 20 mya, the Death Valley region began to look as it does today; a series of linear mountains separating elongated valleys. Between then and now, volcanic activity, thrust faulting and erosion continued and basins filled up with water, creating lacustrine environments. Within the last million years, alluvial fans, playas, salt pans and sand dunes have all developed (USGS, 2004). The continued tectonic and karst activities have resulted in a heterogeneous hydrogeologic area that includes both porous carbonate rocks and less permeable lacustrine, palustrine and alluvial deposits.

Devils Hole is a fissure, formed about 60,000 years ago by a regional expansion of Paleozoic carbonate rocks caused by tectonic activity. Fissures in this region serve as an extensive drainage network transmitting water and snowmelt from the Spring Mountains. This series of drainage pathways has been created by groundwater dissolving units of fractured limestone and dolomite, creating what is known as karst topography and water-bearing rock units, or aquifers (Riggs and Deacon, 2002). Groundwater within this particular aquifer originates as rainwater and snowmelt falling on the Spring Mountains and infiltrates into the carbonate aquifer as it travels downslope (USGS, No date).

The current geologic characteristics of Devils Hole include a main chamber that extends approximately 23 m downward and a series of rock slabs that have fallen off the main cavern walls. Some of these rocks have fallen off the northeast wall below the photic zone where the pupfish live (the photic zone is the pool depth sufficiently exposed to sunlight for photosynthesis to occur) and some have fallen off near the land surface, creating a shelf-like region of rocks (Riggs and Deacon, 2002).

Hydrogeologic Characteristics

Groundwater is scarce, and plays an important role throughout Death Valley National Park, AMNWR, and Devils Hole. The quality, quantity and depth to groundwater vary greatly throughout this region. The dominant groundwater flow direction in the Ash Meadows sub-basin is from northeast to southwest with discharge locations at Ash Meadows, Oasis Valley, Alkali Flat and Death Valley. Dominant groundwater flow direction in the Alkali Flat-Furnace Creek Ranch sub-basin is from north to south. While general groundwater flow information is known, the specific conduits and amounts are difficult to estimate (USGS, No date; USFWS, No date; USGS, 1976).

Devils Hole is within the Ash Meadows Drainage Basin which also houses the AMNWR. The Refuge was created in 1984 in response to declining levels of water within Devils Hole that threatened the pupfish. Irrigation and other pumping activities within the Ash Meadows Drainage Basin lead to a drastic decline in water levels within Devils Hole. Studies were done to determine the extent of the impact area – i.e., the area within which groundwater withdraws would lead to a decline in water level in Devils Hole. It was determined that withdrawals from a series of wells within the southwestern portion of Ash Meadows had the most direct impact on water levels within Devils Hole. This resulted in the creation of the NWR in this area in order to prevent groundwater from being removed within the area where it would result in declining levels in Devils Hole (Belcher, 2007).

Water levels within Devils Hole have varied over the last 60,000 years. From 60,000 until approximately 15,000 years ago, the water table was at least 5 m higher than it is currently. This decrease in the water level is associated with the end of the last glaciation. Water levels change due to barometric pressure, tides, earthquakes, and groundwater pumping. Earthquakes have caused changes in water levels by altering bedrock locations and causing both openings and closings within the already fractured bedrock. Devils Hole serves as a telling seismograph: the presence of certain algal communities at, above, or below the current water level can indicate past water levels and the speed at which they changed. Water levels at Devils Hole are monitored continuously by a recorder attached to a float in a stilling well (USGS, 1993)—see Figure 3-1. Current and recent water levels are approximately 15m (49.2 ft) below the land surface, or 818m (2358 ft.) above mean sea level (Wilson and Blinn, 2007). Fluctuations in climate have also impacted water levels throughout the history of Devils Hole, though this relationship is not well understood at a relatively short time scale.

Over the past several decades, water level fluctuations within Devils Hole and nearby wells have been linked primarily to pumping in the vicinity of Devils Hole, and secondarily to earthquake activity and possibly climate change. Between the 60s and the late 1970s, water levels within Devils Hole declined; this was during a period of active groundwater withdrawal in the region. Throughout the 1980s, water levels in these same wells rose, until the late 1980s when water levels declined through 1997. This is linked to the curtailment of pumping in the region. Water levels rose between 1998 and 1999, due to a significant earthquake in 1999. Following this earthquake, water levels began to decline and continued to do so through 2005. In addition to responding to groundwater pumping activities, further analysis of this data by comparison to other wells indicates that natural processes other than recharge rates – most likely earthquakes and fluctuations in climate – impacted water levels within this region (USGS, 2002; Back, 2008).

From approximately 60,000 years ago until about 15,000 years ago the water table at Devils Hole was at least 5 meters higher than it currently is. At that point, after the end of the last major glaciation, the water table began to fall and declined rapidly. Aside from minor fluctuations that occurred in recent decades, as discussed above, water levels declined until they reached approximately the current level (Riggs and Deacon, 2002).

Other geological characteristics in the region include a buried fault that runs southwest into the project region and a series of springs that seep out for approximately 10 miles within the vicinity of Ash Meadows (USGS, 1999). These springs are formed as a result of the juxtaposition of the

less permeable lacustrine, palustrine and alluvial valley-fill deposits against the highly soluble and subsequently porous carbonate rocks, resulting in the impediment of flow beneath the land surface. Groundwater that travels through the carbonate aquifer eventually reaches points where it cannot continue due to the presence of less permeable rocks which have been shifted along the fault. In this instance, groundwater is forced through the path of least resistance which leads to the formation of springs at the land surface (USGS, No date).

3.2.2 Surface Water

The only surface water within the vicinity of the project area is Devils Hole itself. As the groundwater travels through the karst topography, it precipitates calcium carbonate due to its supersaturated nature. Devils Hole is not considered to be "true karst" topography, but was most likely formed as a result of tectonic activity (Back, 2008). Devils Hole is exposed to the surface, and is considered to be a "skylight to the water table" because of its hydrologic connection to the underlying aquifer.

While Devils Hole is the predominant surface water feature in the area, there are numerous springs, seeps, and wetlands in the surrounding area (USFWS, No date; NPS, 2002). These features are most likely all hydrologically connected, however due to the heterogeneity of the geology here, it is difficult to determine the exact connections. Approximately 5 miles to the northwest of Devils Hole is Carson Slough which drains from a marshy region formed by Fairbanks Spring. Directly to the southeast of the site are a series of springs including Point of Rocks Spring, King Spring, Jack Rabbit Spring and Big Spring (USGS, 1993). These springs discharge an average of 17,000 acre-feet/year of water (USGS, No date).

Water Quality

Within the upper reaches, or photic zone, of the 300+ foot deep Devils Hole, the water environment is warm, rich in dissolved carbonate and has a relatively neutral pH. The lower reaches of the fissure maintain relatively stable temperatures and levels of dissolved oxygen while the photic zone experiences greater variation due to heat and gas transfers that occur near the surface (Shepard et al., 2000). Water temperatures on the shallow rock shelf that is home to the majority of the pupfish range from 32^0 to 36.5^0 C, (90^0 to 98^0 F); they vary based on season, time of day and amount of direct sunlight. The deeper reaches of the Devils Hole fissure typically range in temperature from approximately 33.5 to 34^0C, as is typical of most subterranean water/cavern systems (LCER, 2007)..

Some recent studies have indicated that the water temperature on the ledge where the pupfish live is reaching an upper maximum threshold for successful reproduction by the pupfish. If this proves to be true, any further increase in temperature or drop in water level that results in an increase in temperature could drastically impact the population (LCER, 2007; Riggs and Deacon, 2002).

Water chemistry within the Ash Meadows drainage basin is relatively uniform and Devils Hole has remained relatively chemically stable since the 1970s. Dominant elements include sodium, calcium, magnesium, potassium, strontium, and lithium. Other minor constituents in

groundwater include boron, silica and nitrate. Natural fluctuations occur based on groundwater movement and time of storage within nearby aquifers. When groundwater remains stored in an aquifer, it becomes enriched in sodium, and to a lesser extent, sulfate and chloride (USGS, 1976).

3.3 VEGETATION

A creosote bush vegetation community predominates in the project area. Common plant species include white bursage (*Ambrosia dumosa*), creosote bush (*Larrea tridentata*), and shadscale (*Atriplex confertifolia*). Other plant species found in the immediate vicinity of Devils Hole include chaff bush (*Amphipappus fremontii*) and ephedra (*Ephedra funereal*), while rock nettle (*Eucnide arens*) and Parry's lip fern (*Cheilanthes parryi*) grow along the rock walls of the cavern (Wilson and Blinn 2007). There are 63 known non-native plant species in Ash Meadows. The most common exotic plant species include red brome (*Bromus rubens*), Russian thistle (*Salsola* spp.), tumble mustard (*Sisymbrium altissimum*), halogeton (*Halogeton glomeratus*), and Arabian schismus (*Schismis arabicus*). Of these, Arabian schismus is the only exotic plant species documented in the project area. None of these exotic species is on the State of Nevada's Noxious Weed List (Nevada, 2007). Additional plant species found in the project area are listed in Appendix D.

There are no federally listed plant species known to occur in the project area.

3.4 WILDLIFE

Over 27 species of mammals, 20 reptiles, and 239 species of birds are known to occur in the area surrounding Devils Hole (USFWS, 2007), but only a portion of these are associated with the three habitat types found at the project site: the Mojave Desert creosotebush scrub surrounding the cavern, the above water portions of the cavern, and the aquatic portion of the cavern.

Wildlife species in the creosotebush scrub habitat at Devils Hole are predominately species associated with the Mojave Desert. Mammal species typical for this habitat type and likely to occur in the vicinity include desert bighorn sheep (*Ovis canadensis*), coyote (*Canis latrans*), blacktail jackrabbits (*Lepus californicus*), desert cottontails (*Sylvilagus audubonii*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*). Reptile species include gopher snakes (*Pituophis catenifer*), desert iguana (*Dipsosaurus dorsalis*), and western chuckwalla (*Sauromalus obesus*). Bird species include Gambel's Quail (*Callipepla gambelii*), black-throated sparrows (*Amphispiza bilineata*) and mourning doves (*Zenaida macroura*). No amphibians are known to occur in the vicinity of the project.

Three wildlife species are known to utilize the cavern walls above the pool in Devils Hole. Barn owl (*Tyto alba*) roost and have been observed to nest there and two bat species, the western piptstrelle (*Pipistrellus hesperus*) and Townsend's big-eared bat (*Corynorhinus townsendii*) are present seasonally (Manning, 2008).

The aquatic community includes a single vertebrate, the Devils Hole pupfish (*Cyprinodon diabolis*). Herbst and Blinn (2003) reported a diversity of invertebrates including a springsnail

(*Tryonia variegata*), an amphipod (Hyallela azteca), a flatworm (Dugesia dorotocephala), a water strider (Microvelia beameri), a riffle beetle (Stenelmis calida), a predacious diving beetle (*Neoclypeodytes cinctellus*), several midges (*Culicoides sp., Zavrelimyia sp., Apedilum sp., Chironomus sp., Polypedilum cf. scalaenum, and Tanytarsus sp*.), as well as an unidentified stonefly, cyclopoid copepod, ostracode, aquatic worm, and water mite. Shepard et al. (2000) described algal diversity as low relative to other systems, reporting 84 terminal identifications including diatoms (*Bacillariophyta*), blue-green algae (*Cyanobacteria*), and green algae (*Chlorophyta*). To date, little work has been completed to describe Protozoan or microbial diversity at Devils Hole.

3.5 THREATENED & ENDANGERED SPECIES, CANDIDATE SPECIES, AND SPECIES OF SPECIAL CONCERN

The Endangered Species Act (Act) of 1973, as amended, states "It is further declared to be the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act". For federally sponsored projects, the Act requires examination of potential impacts to Threatened, Endangered, and Candidate Species. Section 7 of the Act requires federal agencies to ensure that any activities they authorize, fund, or implement do not jeopardize the continued existence of any species federally listed as threatened or endangered and do not destroy or adversely modify designated critical habitat. NPS Management Policies 2006 requires examination of potential impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species with potential to occur within the project area. The policies also state that the NPS will fully meet its obligations under the NPS Organic Act and the Endangered Species Act to both pro-actively conserve listed species and prevent detrimental effects on these species. They further state that the NPS will undertake active management programs to inventory, monitor, restore, and maintain listed species' habitats, control detrimental non-native species, control detrimental visitor access, and re-establish extirpated populations as necessary to maintain the species and the habitats upon which they depend. For simplicity, the federal, state, NPS and Nevada Heritage Program listed species identified in this EA as occurring at Devils Hole are collectively described as Special Status Species (Table 3.1). A full listing of federally listed species occurring in the AMNWR surrounding Devils Hole can be found in Appendix C.

Table 3-1. Special Status Species Categories

An **endangered species** is classified under the Endangered Species Act as being in danger of extinction throughout all or a significant part of its range.

A **threatened species** is classified under the Endangered Species Act as likely to become an endangered species in the foreseeable future.

The State of Nevada has also designated special status species on the **Nevada Watchlist**. Species with these classifications are protected under Nevada Administrative Code Chapter 503.

The Nevada Natural Heritage Program collects information on Nevada's at risk, rare, endangered, and threatened biological features. Taxa considered **at-risk** include those with

federal or other Nevada agency status, and those with Global and/or State ranks indicating some level of imperilment.

National Park Service **sensitive species** include species designated by the NPS in addition to those listed, proposed, or candidates under the Endangered Species Act or listed by the State of Nevada as endangered or otherwise protected.

Six special status wildlife species occur in the project area: a federally endangered species, Devils Hole pupfish (*Cyprinodon diabolis*); two species listed as priority species by the State of Nevada, Townsend's big-eared bat (*Corynorhinus townsendii*) and Amargosa tryonia snail (*Tryonia variegate*); these three species, as well as the Devil's Hole warm spring riffle beetle (*Stenelmis calida calida*), are also listed as at-risk by the Nevada Natural Heritage Program; and two species listed as sensitive by the NPS, desert bighorn sheep (*Ovis canadensis*) and western chuckwalla (*Sauromalus obesus*). The Devils Hole pupfish is endemic to Devils Hole.

As mentioned previously, Devils Hole was designated part of the Death Valley National Monument in 1952 in order to protect the habitat of the Devils Hole pupfish. In the late 1960s groundwater pumping by ranchers and developers near Devils Hole caused water levels in the pool to drop so low that it put a severe strain on the pupfish population which dropped to as low as 124 individuals (Deacon and Williams, 1991). As a result, the Devils Hole pupfish was federally listed as endangered in 1967 and, in 1984, the land surrounding Devils Hole was purchased from developers and the 22,000-acre Ash Meadows National Wildlife Refuge was created (USFWS, 1990).

Following these actions, the pupfish survey stabilized at an average of 324 individuals and reached a high of 582 individuals in a September 1994 survey (Riggs and Deacon, 2002). From 1995 to 2004 the population survey declined to an average of less than 225 individuals (Riggs and Deacon, 2002). Then, in 2004, the population dropped dramatically following an incident where one third of the existing population was accidentally killed when traps used to monitor the fish were washed into Devils Hole by a flash flood (Florida Museum of Natural History, 2006). By April of 2006 the population survey had fallen to a low of 38 individuals. Fall pupfish surveys in 2006 and 2007 recorded 85 and 92 fish respectively (NDOW, 2008).

Though the cause of the most recent decline of the Devils Hole pupfish decline remains unknown, a number of hypotheses have been promoted that could singly or cumulatively be responsible. Factors could include inbreeding depression (Wilcox 2001), declining solar radiation or allochthonous nutrients (Wilson and Blinn 2007), shifts in algal community state (Riggs and Deacon 2005), changes in sediment dynamics (Lyons 2005; Riggs and Deacon 2005), loss of a key prey species (i.e., an ostracode) from the primary feeding habitat (Herbst and Blinn 2003), continuing water level declines (Riggs and Deacon 2005; Deacon et al. 2007), and increasing water temperature due to global warming and/or declining water levels (Threloff and Manning 2003).

The Devils Hole pupfish is a member of the Cyprinodontidae family. This species rarely exceeds 2.5 cm and has a life span of about one year. The species is diurnal and omnivorous, feeding primarily on diatoms, amphipods, ostracods, protozoans, and others (Wilson and Blinn

2007; Minckley and Deacon 1975).. Spawning occurs mainly on the shallow upper shelf of Devils Hole (Figure 3-1) between February and May. Peak spawning appears to coincide with the peak algal growth: between April and mid-June. Females lay small numbers of eggs, 4 to 5, which deposited singly onto the substrate and fertilized by the male. Pupfish reach maturity 2- 4 months after hatching. Population levels exhibit a natural high and low cycle, with the population peaking in the fall and lowest in the spring due to die-off during the winter months (USFWS, 1980). Studies on the reproductive ecology of other pupfish taxa suggest water temperatures in Devils Hole are likely to be near the upper maximum threshold for successful egg production and recruitment of young fish into the population (Shrode and Gerkin, 1997). These studies also suggest small increases in water temperature on the order of a few degrees may be sufficient to decrease or eliminate successful recruitment.

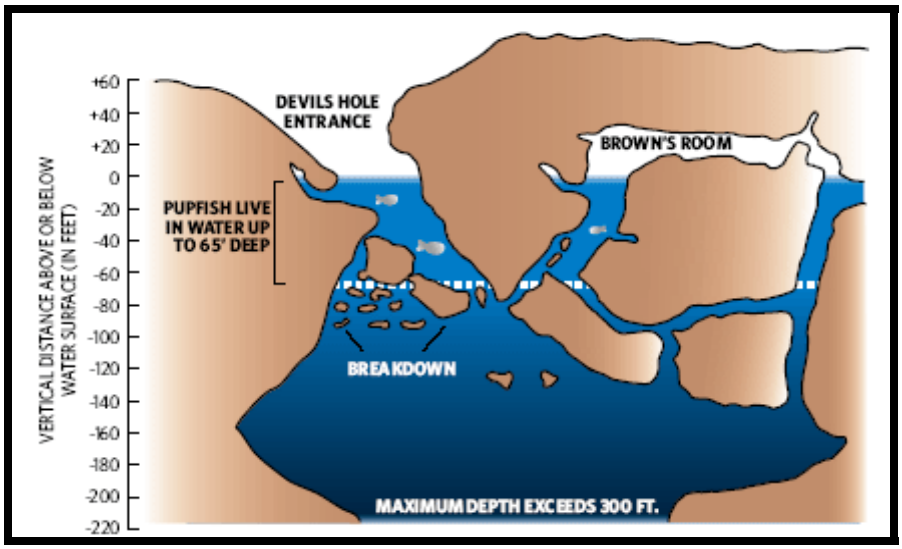

Figure 3-1. Sectional View of Devils Hole
Source: USFWS

Growth and successful reproduction are closely related to the availability of food. The small upper shelf on which the fish spawn also provides a majority of the algae and much of the diatoms on which the fish feed (U.S. Fish and Wildlife Service 1980). Growth during the spring varies between 0.00 and 0.025 inch/week, and little or no growth occurs during the winter (U.S. Fish and Wildlife Service 1990). A 1975 study of the food habits of the Devils Hole pupfish determined that diatoms were the most important food in fall and summer (Minckley and Deacon, 1975). Also included in the pupfish diet are an amphipod (*Hyalella*), an unidentified ostracod, and protozoans. A beetle, (*Stenelmis)*, planarium (*Dugesia*), and snail (*Tryonia*) are much less commonly used as food (Minckley and Deacon, 1975). Wilson and Blinn (2007) found cyanobacteria to be the most important food in summer, with a shift to *Stenelmis calida* and *Dugesia dorotcephala* in winter.

Another factor that shapes the mix of food sources as well as the ability of the fish to spawn successfully is the availability of sunlight. Direct sunlight enables algal growth, which forms a mat on which the fish deposit their eggs and on which the pupfish's food sources depend for their own food supply. Because of its "incised morphometry" (i.e., its presence at the base of a

steep cliff gouged into a hillside), the pool receives less than four hours of direct light per day in the summer (June-August) and no direct light during December and January (Wilson and Blinn, 2007). Currently the only manmade structure producing an impact on direct sunlight is the visitors platform, which reduces available light by 1.15% at the northern end of the hole, and 1.72% at the southern end, where the upper shelf lies, the equivalent of about 15 minutes per day (Weiss, 2005a).

The Townsend's big-eared bat is a medium-sized bat with extremely long ears and a small glandular outgrowth on each side of the snout. Distribution of this bat is correlated largely with rocky areas where caves or abandoned mine tunnels are available. They do not seem to utilize crevices in such sites, and may occasionally inhabit old buildings. In the Devils Hole area this is probably the most characteristic bat of caves and mines.

Townsend's big-eared bats are present seasonally in Devils Hole from early spring to September and do not appear to use it as a hibernaculum (Manning, 2008). The Townsend's big-eared bat may visit or night roost in Devils Hole, but their day roost is in Devils Hole 2 (Baldino, 2008). Males and females occupy separate roosting sites during summer. During this season, males appear to lead a solitary lifestyle while females and young form maternity colonies which may number from 12-200. The bats emerge late in the evening to forage and are swift, highly maneuverable fliers. Prey items include small moths, flies, lacewings, dung beetles, and sawflies. The single young is born in late May to early June, at least in Texas. The baby bat weighs approximately 2.4 g at birth and is pink, naked, and completely helpless. At 4 days of age the newborn bat begins to display hair growth and by 1 month of age is nearly adult size. At 2 months of age the juveniles are weaned and the nursery colonies begin to disperse (Texas Tech, 2008).

Amargosa tryonia (*tryonia variegata)* is a mollusk, or more specifically a gastropod, in the Hydrobiidae family and is the most abundant benthic invertebrate present in Devils Hole (Herbst and Blinn, 2003). Little is known about the biology of this mollusk. Studies have provided little more than taxonomic descriptions, geographic distribution, or use in the diet of Devils Hole pupfish. Most abundant in fall/winter (Oct – Dec – Feb) and least in spring (April) it exhibits a generational turnover of 4-10 months (6 months average) and principally inhabits the gravel substrates at the mid and lower end of the upper shelf (Herbst and Blinn, 2003).

The Devils Hole riffle beetle is endemic to Ash Meadows NWR, found at Devils Hole and several warm springs (Herbst and Blinn, 2003). It is the third most common invertebrate after *Tyronia variagata* and *Hyalella* though total biomass production of the riffle beetle equals that of *Hyalella.*. Little is known about the biology of the Devils Hole riffle beetle though Herbst and Blinn (2003) found abundance to peak in October and that it is found most frequently in gravelly substrates at the shallow southwest end of the upper shelf.

Desert bighorn sheep inhabit hot and dry desert mountain ranges with sparse vegetation and water. Their range extends from Nevada and California to west Texas and south into Mexico. Weights of mature rams range from 125 to 200 pounds, while ewes are somewhat smaller. Due to their unique padded hooves, bighorn are able to climb steep, rocky terrain with speed and agility. Bighorn rely on their keen eyesight to detect potential predators such as mountain lions,

coyotes, and bobcats, and they use their climbing ability to escape. Both sexes develop horns soon after birth, with horn growth continuing more or less throughout life (USFWS, 2002). While bighorn sheep are known to occur in the vicinity of Devils Hole, their use of the project area may be limited.

Western chuckwalla, one of the largest lizards in Nevada, are locally common and widely distributed in rocky habitats throughout the region. The Western chuckwalla's range covers east-central California, southern Nevada, southwestern Utah, western Arizona, and northeastern Baja California. Prime habitat is boulder covered slopes, at elevations of up to 6000 feet, though it is most common at lower elevations. Western chuckwallas are herbivores and feed on plants such as brittle-bush (*Encelia farinosa*), but have also been known to forage on rock nettles. Mating occurs between April and July, with a clutch of as many as 16 eggs laid between June and August. The eggs hatch in the late warm season.

3.6 VISITOR USE AND EXPERIENCE

Death Valley National Park offers a wide range of recreational and educational experiences to Park visitors. However, a relatively small proportion of Death Valley visitors visit Devils Hole, which is a 45-minute drive away and accessible only by unpaved road.

Site-specific survey and visitation data for Devils Hole is not available. But road count statistics for the road that leads to Devils Hole have been collected for several years (Nalen, 2007). Several factors confound projection of actual Devils Hole visits from these road counts: (1) an unknown proportion of the cars are double-counted by the automated road counter because they turn around and return on the same road after visiting the site; and (2) some drivers use the road as a thoroughfare between Rudd Highway and Crystal, so they are counted as travelers but are not visitors to Devils Hole. Starting with a total of 6,793 cars counted from August 2006-July 2007, and using conservative assumptions based on these caveats (half the visitors turn around after their visit, half continue ahead, and 20% use the road as a thoroughfare), the visitor number for the 12 months from August 2006-July 2007 was approximately 3700 cars. This is at best a rough approximation, but probably within the order of magnitude of actual visitation.

According to Park Interpretive staff, many people who visit are on “Sunday drives” from local communities including the Amargosa Valley, Las Vegas, and Pahrump (a fast-growing community of approximately 35,000 people roughly halfway between Las Vegas and Devils Hole). Visitors from Las Vegas and Pahrump are often on a drive to get away from the city and just happen to find Devils Hole. In addition, a number of locals from nearby communities have a past personal connection to the Hole, having visited there a number of years ago. Some people are attracted to the site since it is labeled as a part of Death Valley National Park on some maps (Wolfe, 2007).

Quite a few people are drawn to the site by its name and do not know what to expect when they arrive. Besides the name or having a personal connection, specific interests that draw people to the Hole include: pupfish, rare fish, cave diving, geology (particularly the lengthy calcite climate record), the landmark Supreme Court ruling associated with Devils Hole, having seen Devils Hole on television (a PBS Nature program from the 1970s), college level and younger classes

studying biology, ecology or geology, an interest in the natural world, Death Valley history (i.e. the Lost 49ers visit to the Hole), or collectors of killifish.

3.7 PARK OPERATIONS

Scientific research and site security are two key activities in the implementation of species recovery actions at Devils Hole. These functions bear directly on Park operations and are discussed here.

3.7.1 Security

Species protection takes several forms, but physical security of the site is of paramount importance. The Proposed Action and alternatives are intended to enhance physical security of the site through improvements to the system of intrusion prevention, detection, and response.

The Park is aware of three unambiguous security incidents in about the last two years. More incidents have likely occurred but there has been no evidence of any recently. One incident involved someone likely trying to catch some fish with a wicker basket from the upper level lip. A second incident caused damage to the fence from someone trying to dig under it, most likely to gain access to the upper area (Forner, 2007). A third incident involved someone throwing materials into Devils Hole. Litter has also frequently been found both within the fenced perimeter and within the water.

The security system now in place has been described in Park documents as "down more than up" (RFP, 2007). Its current state can best be characterized as deteriorating, having been vandalized and robbed over the years, but never restored back to its full operating capability.

Though it would not be prudent to further highlight the known drawbacks and limitations of the existing security infrastructure by detailing the system's design in a public document, it has become clear that additional security measures are needed to protect the site and its fragile resources from vandalism.

3.7.2 Scientific Research and Monitoring

The research and monitoring functions at Devils Hole present significant human safety challenges. A primary concern is the climb down to the site. The current mode of access is by a stepladder which is accessed through a gate below the visitors platform. This ladder is not permanently fixed to either end of the climb, and the risk is compounded by the necessity of hauling gear and equipment into the site as well. Furthermore, the walk from the landing of the ladder to the pool itself is steep, rocky, and unsecured (Figures 3-2 & 3-3).

Figure 3-2. Ladder Access to the Site (Ladder in yellow circle)

Figure 3-3. Descent from Ladder Landing to Pool

Ongoing monitoring at Devils Hole consists of two primary types of operations:

1) Biannual Devils Hole pupfish counts—These are typically conducted by laying a temporary monitoring platform across the shallow shelf (see Figure 3-4). The purpose of this walkway is to provide physical separation between personnel and the shelf to reduce disturbance of the shelf from monitoring activities. One end of the walkway rests on the metal frame already in place for water monitoring equipment and the other end on the southern-most portion of the shelf. Placement and removal of the platform currently requires a person stepping approximately halfway between the metal frame and the southern edge of the shelf. A metal diving ladder is placed at the end of the walkway into the hold past the shelf.

Figure 3-4. Divers Entering Devils Hole

Fish counts include both underwater and surface counts. Underwater counts are conducted by experienced divers who are escorted by an NPS employee, and are conducted using established protocol (USFWS (BO), 2001). Surface counts on the spawning shelf would be conducted by three people on the walkway concurrent with the underwater counts. The shelf is divided into zones by imaginary boundaries, with each counter counting the fish within a zone.

The monitoring platform is a temporary makeshift solution to the problem of accessing the submerged spawning shelf without damaging it. If it were needed only twice a year

for one day each, the inconvenience and personal risk associated with carrying the ladder down the steep rockface might be acceptable. But because the platform is needed for other more regular monitoring activities, the Park feels the probability of accident or injury calls this procedure into question.

2) Routine Monitoring and Maintenance of Water Measurement Devices—The collection, maintenance, and evaluation of water level monitoring data is a critical component of the recovery strategy for the Devils Hole pupfish, given that the principal threat it faces is the loss of water over the spawning shelf. Park hydrologists maintain a "scientifically rigorous and court-defensible water level data base for the long range protection of the water level of the spring pool" (USFWS (BO), 2001).

   The water level monitoring program currently consists of the following equipment:
   a. The fixed, reference point mounted in the rock wall above the water level as established by the 1976 U.S. Supreme Court ruling
   b. A stainless steel, submerged equipment-bearing frame
   c. A 12-inch stainless steel stilling well mounted to the frame
   d. Two water level staff gauges mounted to the frame
   e. A 10-inch float contained in the stilling well
   f. Two pulleys mounted in the rock wall over the water surface
   g. A steel line attached to the float and connected to a recording device
   h. A Stevens A71 drum chart recorder and digital shaft encoder which are mounted within an enclosure affixed to the top of the stilling well
   i. Two stainless steel pressure transducers and connecting cables mounted on the stilling well
   j. Two independent plastic water temperature probes
   k. Shore mounted enclosure with battery power sources, data storage devices, and GOES satellite transmitter
   l. GPS antenna
   m. Solar panel for long-term battery maintenance

Operation and maintenance of the facility consist of bi-monthly inspections, monthly data retrieval, periodic and annual maintenance. In addition, NPS staff inspect, service and replace equipment at Devils Hole three to five times a year. Equipment replacement needs are unpredictable and are required because of vandalism or major mechanical failures. Quarterly site inspections are also made by NPS staff to check and verify the accuracy of the staff gauges in relation to the reference point.

Agency personnel that service the water monitoring equipment are trained in techniques designed to ensure that no contaminants are inadvertently introduced into pool waters. Application of chemicals, such as lubricants or solvents, is not normally permitted over the water surface. Accidental introduction of non-native organisms by water monitoring personnel is minimized by sterilizing all mechanical devices and tools that come into contact with the pool surface, and by the use of sterilized footwear or footwear dedicated for use at Devils Hole.

Additional planned monitoring activities include: (1) a long-term ecosystem monitoring effort which will require at least weekly access to the water surface via the monitoring platform; (2) a number of emergency management actions which require access to the water surface, such as experimental breeding and supplemental feeding trials, are being implemented to stabilize the population; (3) research efforts designed to study the potential causes of the observed decline in pupfish abundance. These also require access to the water surface.

3.8 CULTURAL RESOURCES

Devils Hole and the surrounding AMNWR have both largely been surveyed for cultural resources. Thirty of the forty acres of Devils Hole, and the dry portion of the approximately 22,000 acre Refuge were surveyed by HRA, Inc in 2007-2008. The cultural history of the area is discussed in Livingston and Nials (1991) and Lyons et al. (2007), and briefly summarized here.

Native Americans have inhabited the southern Nevada region for the past 12,000 years, but strong archeological evidence for habitation of the AMNWR area shows up approximately 5,000 years before present (Lyons et al 2007:4). This archaic occupation is represented by Pinto series points, and late archaic sites include Gypsum series points and burial pits. During the late prehistoric period, from approximately 1,500 to 3,800 years before present, there is evidence of trade (represented by exotic ceramic potsherds) with other southern Nevada groups, including the Virgin Anasazi (Lyons et al. 2007:10). During the late prehistoric and ethnographic period, there is evidence that Western Shoshone and Southern Paiute lived in the AMNWR area and practiced a hunting and gathering way of life, practicing some horticulture near water sources. Plants grown include corn, squash, beans, and sunflowers (Livingston and Nials 1990:12). Native American festivals were held in the AMNWR area during the fall, with people gathering following completion of their summer foraging (Speulda and Parks 1996:10). Euro-Americans reportedly first entered the AMNWR area in 1849. Two members of the Bennett-Arcan wagon group, William L. Manley and Louis Nusbaumer, mentioned Devils Hole specifically, describing it as a deep hole in the rocks with fresh, clear water (McCracken 1992:14-15 in Lyons et al. 2007:13).

Euroamericans homesteaded in the AMNWR area beginning in 1873, and continued into the midtwentieth century. A homestead occupied by a Paiute family was present approximately 2 km from Devils Hole, known as Bishop's Ranch. The site was reportedly burned to force the family to give up their land. Clarabelle Jim, a Pahrump Paiute member (who was consulted during this project) recalls visiting Bishop's Ranch during the 1940s and 1950s (Nevada Archeological Site Archives).

Twenty-one archeological sites have been recorded within 2 miles of Devils Hole. Prehistoric finds include lithic reduction sites, resource processing sites, and a rockshelter with textile fragments. Historic period sites include trash scatters, and remnants of historic Euroamerican and Native American homesteads. A Native American cemetery is located near Devils Hole, and it is considered a sensitive resource to both the Pahrump Paiute and Timbisha Shoshone. There are undoubtedly more than 21 archeological sites located within 2 miles of Devils Hole, and the results of the HRA, Inc. Ash Meadows survey will be a valuable addition to the archaeological literature for the area.

Archeological Survey Results (DEVA 2008A)

A majority of the Devils Hole allotment was surveyed by DEVA Park Archeologist Leah Bonstead and DEVA VIP Jane Rondthaler on February 15, 2008. The survey area is located in Section 36 of Township 17 South, Range 50 East, and is bounded by NPS boundary markers on all sides. The survey area is comprised of a lower section which is relatively flat and open, with scattered creosote and grasses, and an upper section which is very steep and rocky. In all, 30.7 acres on the flat portion and lower slopes was surveyed, and the upper steep and rocky portion was left unsurveyed. Survey transects were spaced approximately 20 meters apart. Four roads are located in the survey area: (1) the main Ash Meadows Road, located on the east side of the project area; (2) an administrative use road from Ash Meadows Road to Devils Hole; (3) a closed road entering the Devils Hole area from the south; (4) and a closed road from Devils Hole to a small natural depression named Devils Hole 2. Unapproved off road vehicle tracks are also present in the area.

Eleven isolated finds were found during the survey, most of which were historic or modern. These include a prehistoric flake, a trail segment, NPS boundary rock cairns, a prospect, and a glass scatter. The date of the prehistoric flake is unknown, but is probably over 100 years old. The historic finds appear to mostly date to the time that the NPS took over management of the site, though the prospect pit is probably older. As all of the remains found during the survey were isolated finds, they are not eligible for nomination to the National Register of Historic Places.

The Timbisha Shoshone, a federally recognized tribe, have had a long relationship with Devils Hole, and have been active in the Ash Meadows area for thousands of years. One story about the Timbisha Shoshone relationship with Devils Hole is excerpted here:

> Evidence of the cultural significance of Devils Hole to these Native Americans was presented by Barbara Durham, an elder of the Timbisha Shoshone Tribe at the Devils Hole Workshop in Pahrump, Nevada on May 29-31, 2002. In her oral communication, she related the myth of Devils Hole "water babies" ready to swallow children (and perhaps even adults) that stayed at the pool too long. Smith (1993) refers to these water babies as well as to a giant, Tso'apittse, who lives near desert springs lying in wait for unsuspecting victims. In spite of those very powerful deterrents, Ms. Durham reported that she and her childhood friends frequently played at Devils Hole because they enjoyed having the pupfish "tickle their toes." (Riggs and Deacon 2002)

As well, conversations with elders of the Pahrump Paiute tribe have confirmed that Devils Hole was very important to the Paiutes in the past, and that “their ceremonial relationship with the area continue[s] today.” (DEVA, 2008). The Paiute have not been specific in recent discussions with the Park about their relationship with Devils Hole, but previous research suggests it owes much to the cultural significance of the water itself, as the following excerpt describes:

> But springs meant more than survival to Southern Paiute people. Springs and other water sources were also highly symbolic, sacred places, part of a living landscape, a storied place, peopled with animals, plants and other beings that brought it life and

> gave it meaning. Stories and songs that often include the names of springs and other places celebrate great hunts and other events that turn a desert into much more than simple geographic space. They create a landscape and a homeland that once gave, and in many ways still gives, people a strong sense of being and belonging – a sense of place. For Indian people, landscapes and homelands are often more important than events and time (Fowler 2002).

Therefore, Devils Hole is believed to fit the definition of a Traditional Cultural Property, owing to its historic connection with the Timbisha Shoshone and Pahrump Paiute tribes. Additionally, both groups have identified the Ash Meadows area as a Traditional Cultural Landscape, with Devils Hole as one landmark within that larger landscape. As such, the Park has undertaken consultations with these tribes on the effects of the proposed action pursuant to Section 106 of the National Historic Preservation Act (further detailed in Section 5.2). The tribes are also allowed access to the property under The American Indian Religious Freedom Act of 1978.

4.0 ENVIRONMENTAL CONSEQUENCES

This section describes the environmental consequences associated with the alternatives. It is organized by alternatives, so that the environmental impacts of each alternative can be considered together. Within each alternative, the impacts of each project component on all considered resources is presented.

4.1 METHODOLOGY

NEPA requires consideration of context, intensity, and duration of impacts, direct or indirect impacts, cumulative impacts, and measures to mitigate the impacts. NPS policy also requires that "impairment" of resources be evaluated in all environmental documents.

Overall, the NPS based the following impact analyses and conclusions on the review of existing literature and Death Valley National Park studies, information provided by experts within the park and other agencies, professional judgments and park staff insights, and public input.

General Impact Definitions

Potential impacts are described in terms of type (beneficial or adverse), context, duration, intensity, and impairment. The following general definitions were used to evaluate the context, intensity, duration, and cumulative nature of impacts associated with project alternatives. Impairment is discussed below. The specific criteria used to rate the intensity and duration of potential impacts for each resource (e.g., soil, water, biotic communities, etc) are presented at the start of each impact topic in this chapter.

Context of Impact

Context is the setting within which an impact is analyzed, such as local, park-wide, or regional but must relate to the scope of the project area. CEQ requires that impact analysis include discussions of context. Localized impacts are those that affect only a small area within the project site or its immediate surroundings.

Intensity of Impact

Impact intensity is the degree to which a resource would be beneficially or adversely affected by an action. Impact intensities are quantified as negligible, minor, moderate, or major. Resource-specific criteria used to rate the intensity of project impacts are presented within each resource area impact analysis.

Duration of Impact

The duration of impact is analyzed independently for each resource because impact duration is dependent on the resource being analyzed. Depending on the resource, impacts may last as long as construction takes place, or a single year or growing season, or longer. For purposes of analysis,

impact duration is measured in short-term and long-term. Resource-specific criteria used to rate the anticipated duration of resource impacts are presented within each resource area impact analysis.

Direct versus Indirect Impacts

Direct impacts are effects caused by the alternative(s) at the same time and in the same location as the action. Indirect impacts are effects caused by the alternative(s) that occur later in time or farther in distance than the action, but still reasonably foreseeable.

Cumulative Impact Scenario

CEQ regulations (40 CFR 1508.7) require the assessment of cumulative impacts in the decision-making process for Federal projects. A cumulative impact is an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal), organization, or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Cumulative impacts are considered for all alternatives and are presented at the end of each impact topic discussion analysis. To determine potential cumulative impacts, projects in the vicinity of the proposed project site were identified. Potential projects identified as cumulative actions included any planning or development activity that was currently being implemented or that would be implemented in the reasonably foreseeable future.

These cumulative actions are evaluated in the cumulative impact analysis in conjunction with the impacts of each alternative to determine if they would have any additive effects on natural resources, cultural resources, visitor use, or the socioeconomic environment. Because some of these cumulative actions are in the early planning stages, the evaluation of cumulative effects was based on a general description of the project. Known past, current, and reasonably foreseeable future projects and actions in the vicinity of the project area are described below:

Water-Related Projects

- The Southern Nevada Water Authority (consisting of all of the water agencies in the Las Vegas metro area) has proposed to develop approximately 8,000 acre-feet of ground water per year from an area north and northwest of Las Vegas (Tikapoo and Three-Lakes Valleys, immediately east of Creech Air Field, along the Highway 95 corridor). The location would like be roughly 35 to 45 miles east and slightly north from Devils Hole, depending on specific points of diversion. The uncertainties in timing and location of development, and in timing and magnitude of impact on Devils Hole make the project impact very difficult to evaluate. The time frame in which this drawdown would likely occur is 100 to 400 years in the future. The Nevada State Engineer ruled on these water right applications several years ago. However, SNWA has chosen to put the project on hold and there is no definitive timeline when it may be re-activated (Fisk, 2008b).
- The State of Nevada is considering a water rights petition heard in September 2007 involving changes in points of diversion for irrigation pumping in the Amargosa Valley. If those

change applications are granted (over NPS protest), Devils Hole water levels could be affected. Again, there is insufficient information available to project how much the affect may be and when it may occur.

- The Las Vegas metro and the Amargosa Desert are desirable areas for further development, and many projects are proposed for which the State of Nevada could issue water rights. For example, a private company is planning a solar array near Crystal, NV, about 8 miles from Devils Hole, which would involve groundwater pumping in the Amargosa Valley. In addition, as many as 9 projects using concentrated solar power are being proposed within about 20 miles of Devils Hole. The Park Service has the right to challenge any award of water rights that it can demonstrate would threaten the federal reserved water right for Devils Hole. No other specific actions are known at the present time, but the development pressures will undoubtedly continue in the region overall.

Refuge Planning

AMNWR is in the planning stages on several projects that could impact Devils Hole:

- A new wayside interpretive kiosk is being planned for the southern edge of Devils Hole, with a minimal primitive parking area alongside. This would most likely take the configuration of three double-sided panels under a shade structure and brochure boxes. Further details are not yet available, nor is the timing of construction.
- The Desert Refuge complex has undertaken a transportation survey that will provide recommendations for improvements to the existing network of roads and parking lots and address transportation, management, maintenance, and coordination threats and challenges faced by the Refuge (Ash Meadows, 2007). The goal of these improvements is to enhance visitor safety and to support the resource protection mission and policies of AMNWR.

  AMNWR faces numerous transportation challenges, including managing the access points to the Refuge and the use of existing routes. Much of the entering traffic is not destined for the Refuge and consists of commuters and other private and commercial vehicles passing through the Refuge. The high amount of through traffic, often at high speeds, generates environmental impacts. The USFWS strives to provide access to the public but their primary mission is to protect sensitive plant and animal species.

  The Refuge also faces substantial issues related to existing hydrologic and geologic challenges in terms of planning and maintaining a road network. The high water table and presence of springs near or under roadways cause significant damage to roads and often make segments impassable. Roadway maintenance and planning must be conducted in close coordination with other ongoing efforts that will affect water flow and water location within the Refuge, including sub-basin restoration and modifications to existing dams.
- The Desert NWR Complex is preparing a Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) that includes four refuges: Desert, Ash Meadows, Pahranagat and Moapa. The CCP/EIS describes the resources, public use, goals, objectives, and strategies for AMNWR and for the other refuges. It also identifies potential environmental effects of potential actions under consideration. The CCP/EIS effort was started in 2004; the administrative draft has been completed; and the final draft is currently being prepared. The

goals of the CCP/EIS are very broad, with supplemental studies called step-down plans being developed to recommend more specific measures that implement CCP/EIS policies.

- USFWS is planning to conduct a detailed visitor survey for the Refuge. For a full year, contractors will be at AMNWR to survey visitors and identify the types of users (such as local resident visitors or tourists) and characteristics of their use (such as drive through, hunting, wildlife observation, photography, interpretation, and environmental education).
- Road traffic counters have been used at AMNWR, including Devils Hole, to identify the number of vehicles using Refuge roads.
- The Interpretive Plan for AMNWR is also a step down plan from the CCP/EIS for the Complex, and includes recommendations for public access and use within the Refuge. The plan focuses on protecting wildlife first and then providing controlled public use where compatible with AMNWR's mission.
- The Visitor Services Plan is currently underway and will focus on the development of interpretive supportive infrastructure such as boardwalks. Though it is not the intention of USFWS to open new areas of the Refuge to vehicles, it may be desirable to focus and intensify uses in some areas. There are locations that offer a higher quality experience for the visitor and these are sites where interpretive information could be provided. Other initiatives under way include the development of a new visitor area and an interpretive kiosk at Point of Rocks.
- An Integrated Pest Management Plan addressed issues related to the seeds of non-native and invasive species being disbursed by vehicles passing through the Refuge. The plan documents the threat posed by invasive species, noting that almost 100 invasive species are present in the Refuge. Some of these species can alter ecosystem processes and prevent habitat restoration, among other problems.

- The Ash Meadows Geomorphic and Biological Assessment Final Report was completed in April 2006. This report describes the geologic and hydrological features of the Refuge and priorities for restoring hydrologic conditions. The natural drainage patterns of AMNWR have been modified for agricultural and commercial purposes. Alterations such as the construction of dams, roads, development of irrigation networks, and construction of Crystal Reservoir have altered the natural hydrologic processes within the Refuge. The Ash Meadows Geomorphic and Biological Assessment recommends numerous projects that would reestablish spring flow to historic natural channels and would therefore impact the desired location of roadways:

Impairment of Park Resources

In addition to determining the environmental consequences of the Proposed Action and other alternatives, the NPS *Management Policies 2006* and DO-12 require analysis of potential effects to determine if actions would impair a park's resources.

The fundamental purpose of the National Park System, 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 minimize to the greatest degree practicable adverse impacts on park resources and values. However, the laws do give NPS management discretion to allow impacts to park resources and values when necessary and

appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given NPS management discretion to allow certain impacts within parks, that discretion is limited by statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute an impairment. However, an impact would more likely constitute an impairment to the extent it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's Master Plan or General Management Plan (GMP) or other relevant NPS planning documents.

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

The sections below describe the methodology for analyzing impacts on each considered resource.

4.1.1 Soils and Geology

Impact analyses on soils were based on recent soil data from NRCS within the project area and on previous projects conducted within the park.

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

Negligible: Soils would not be affected or the effects on soils would be below or at the lower levels of detection. Any effects to soils would be slight.

Minor: The effects on soils would be detectable. Effects on soil area would be small within the project area. Mitigation may be needed to offset adverse effects and would be relatively simple to implement and likely be successful.

Moderate: The effect on soil would be readily apparent and result in a change to the soil character over a relatively wide area within the project area. Mitigation measures would be necessary to offset adverse effects and likely be successful.

Major: The effect on soil would be readily apparent and substantially change the character of the soils over a large area within the project area. Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.

The thresholds of change for the duration of an impact on soils are defined as follows:

Short-term: Recovers in less than three years.
Long-term: Takes three or more years to recover.

The context for the analyses was:

Localized: the area including Devils Hole and its cliffs
Medium: the area extending beyond Devils Hole to its surficial watershed
Project area wide: the area extending beyond Devils Hole up to the boundary of AMNWR

4.1.2 Water

The thresholds of change for the intensity of an impact on water resources, including groundwater, are defined as follows:

Negligible: Neither surface nor groundwater flow nor hydrology would be affected, or changes would be either non-detectable or, if detected, would have effects that would be considered slight and short-term. Chemical or physical changes to surface or groundwater quality would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

Minor: Changes in surface or groundwater hydrology would be measurable, although the changes would be small and would likely be short-term. No mitigation measure associated with surface or groundwater hydrology would be necessary. Chemical or physical changes to surface or groundwater quality would be detectable, but would be well below water quality standards or criteria and within historical or desired water quality conditions.

Moderate: Changes in surface or groundwater hydrology would be measurable and long-term. Mitigation measures associated with surface or groundwater hydrology would be necessary and the measures would likely succeed. Chemical or physical changes to surface or groundwater quality would be detectable, but would be at or below water quality standards or criteria.

Major: Changes in surface or groundwater hydrology would be readily measurable and would have substantial consequences to the project area. Mitigation measures would be necessary and their success would not be guaranteed. Chemical or physical changes to surface and groundwater quality would be detectable and would be frequently altered from desired water quality conditions. Chemical, physical, or biological water quality standards or criteria would be locally exceeded on a short-term and temporary basis.

The thresholds of change for the duration of an impact on water resources are defined as follows:

Short-term: Following treatment, recovery would take less than one year.
Long-term: Following treatment, recovery would take greater than one year.

Context for the analysis:

Localized: the area including Devils Hole and its cliffs
Medium: the area extending beyond Devils Hole to its surficial watershed
Project area wide: the area extending beyond Devils Hole up to the boundary of AMNWR

4.1.3 Vegetation

This impact analysis focuses on vegetation that is considered most likely to be affected by the project. Information on vegetation was derived from consultation with NPS staff and a review of relevant literature. The impact analysis examines the potential changes to vegetation that may occur as a result of project implementation.

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

Negligible: No native vegetation would be affected or some individual native plants could be affected as a result of the alternative, but measurable or perceptible changes in plant community size, integrity, or continuity would not occur. The effects would be short-term and on a small scale. Impacts would be well within the range of natural fluctuations.

Minor: Effects to native plants would be measurable or perceptible, but would be localized within a small area. The viability of the plant community would not be affected and the community, if left alone, would recover quickly. Impacts would not be expected to be outside the natural range of variability and would not be expected to have any long-term effects on native species, their habitats, or the natural processes sustaining them.

Moderate: The alternative would affect some individual native plants and would also affect a sizeable segment of the species' population in the long-term and over a relatively large area. A change would occur to the native community over a relatively large area that would be readily measurable in terms of abundance, distribution, quantity, or quality. Impacts could be outside the range of natural variability for short periods of time. Mitigation measures to offset/minimize adverse effects would be necessary and would likely be successful.

Major: The alternative would have a considerable long-term effect on native plant populations and affect a relatively large area in and out of the park. Impacts would be expected to be outside the natural range of variability for long periods of time or to be permanent. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

The thresholds of change for the duration of an impact on vegetation are defined as follows:

Short-term: Recovers in one to three years or less.
Long-term: Takes more than three years to recover.

4.1.4 Wildlife

This impact analysis focuses on wildlife species that are considered most likely to be affected by the project. Information on wildlife species potentially present was derived from consultation with NPS staff and a review of relevant literature. The impact analysis examines the potential changes to wildlife and use of the project area that may occur as a result of project implementation.

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

Negligible: Wildlife would not be affected or the effects would be at or below the level of detection, would be short-term, and the changes would be so slight that they would not be of any measurable or perceptible consequence to wildlife populations. Impacts would be well within the range of natural fluctuations.

Minor: Effects on wildlife would be measurable or perceptible, but localized within a small area. While the mortality of individual animals might occur, the viability of wildlife populations would not be affected and the community, if left alone, would recover. Impacts would not be expected to be outside the natural range of variability and would not be expected to have any long-term effects on native species or the natural processes sustaining them. Sufficient habitat would remain functional to maintain viability of all species.

Moderate: A change in wildlife populations would occur over a relatively large area. Effects to wildlife would be readily detectable, long-term, and with consequences at the population level. The change would be readily measurable in terms of abundance, distribution, quantity, or quality of population. Mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park unit. Impacts could be outside the natural range of variability for short periods of time. Sufficient habitat would remain functional to maintain variability of all native wildlife species. Mitigation measures would be necessary to offset adverse effects, and would likely be successful.

Major: Effects on wildlife populations would be readily apparent, long-term, and would substantially change wildlife populations over a large area in and out of the national park. Impacts would be expected to be outside the natural range of variability for long periods of time or to be permanent. Loss of habitat may affect the viability of at least some native species. Extensive mitigation would be needed to offset adverse effects, and the success of mitigation measures could not be assured.

The thresholds of change for the duration of an impact on wildlife are defined as follows:

Short-term: Recovers in one to three years or less.
Long-term: Takes more than three years to recover.

4.1.5 Threatened & Endangered Species, Candidate Species, and Species of Special Concern

Federally listed or candidate species that could be affected by project implementation were identified, as were potentially affected State-listed and NPS identified sensitive species. These analyses were conducted in the context of the population of the species across its range.

The thresholds of change for the intensity of an impact on threatened, endangered, and sensitive species are defined as follows:

Negligible: The action 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 and would be well within natural variability. This impact intensity equates to a USFWS "no effect" or "may affect, not likely to adversely affect" determination.

Minor: The action could result in a change to a population or individuals of a species or designated critical habitat. The change would be measurable, but small and localized and not outside the range of natural variability. Mitigation measures, if needed to offset the adverse effects, would be simple and successful. This impact intensity could equate to either a USFWS "may affect, not likely to adversely affect" or "may affect, likely to adversely affect" determination.

Moderate: Impacts on sensitive or listed species, their habitats, or the natural processes sustaining them would be readily detectable. Listed or sensitive plants or breeding animals of concern are present; animals are present during particularly vulnerable life-stages such as migration or juvenile stages; mortality or interference with activities necessary for survival can be expected and could threaten the continued existence of the species in the park unit, but impacts would not extend to the broader geographical range of a species. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful. This impact intensity equates to a USFWS "may affect, likely to adversely affect" determination.

Major: The action would result in a noticeable effect to viability of multiple populations of a species or resource or designated critical habitat. Impacts on a sensitive or listed species, critical habitat, or the natural processes sustaining them would be detectable, both in and out of the park. Loss of habitat might affect the viability of at least some species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed. This impact intensity equates to a USFWS "may affect, likely to jeopardize the continued existence of a species or adversely modify critical habitat for a species" determination.

The thresholds of change for the duration of an impact on threatened, endangered, and sensitive species are defined as follows:

Short-term: Impacts occur during implementation of the alternative
Long-term: Effects extend beyond implementation, continuing to affect population, community, or designated critical habitat recovery.

4.1.6 Visitor Experience

Public scoping input and observation of visitation patterns, combined with assessment of what is available to visitors under current management, were used to estimate the effects of the actions in the three alternatives in this EA. The impact on the ability of the visitor to experience a full range of Devils Hole resources was analyzed by examining resources and objectives presented in the park significance statement. The potential for change in visitor use and experience proposed by the alternatives was evaluated by identifying projected increases or decreases in interpretational or educational experiences and other visitor uses, and determining whether or how these projected changes would affect the desired visitor experience and to what degree and for how long.

The thresholds of change for the intensity of an impact on visitor use and experience are defined as follows:

Negligible: Changes in visitor use and/or experience, including changes in noise levels and aesthetic resources, would be below or at the level of detection. The visitor would not likely be aware of the effects associated with the alternative.

Minor: Changes in visitor use and/or experience, including changes in noise levels and aesthetic resources, would be detectable, although the changes would be slight. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.

Moderate: Changes in visitor use and/or experience, including changes in noise levels and aesthetic resources, would be readily apparent. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes.

Major: Changes in visitor use and/or experience, including changes in noise levels and aesthetic resources, would be readily apparent and severely adverse or exceptionally beneficial. The visitor would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.

The thresholds of change for the duration of an impact on visitor use and experience are defined as follows:

Short-term: Occurs only during the treatment action.
Long-term: Occurs after the treatment action.

4.1.7 Park Operations

Park operations, for the purpose of this analysis, refers to two issues: security operations and the human safety of researchers and scientific staff who conduct ongoing recovery and monitoring operations at Devils Hole. Park staff involved with these issues were members of the planning team that developed and evaluated each alternative. Impact analysis is based on the current description of Park operations presented in Section 3.0 of this EA.

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

Negligible: Park operations would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on Park operations.

Minor: The effect would be detectable and would be of a magnitude that would not have an appreciable effect on Park operations. If mitigation was needed to offset adverse effects, it would be simple and likely successful.

Moderate: The effects would be readily apparent and result in a substantial change in Park operations in a manner noticeable to staff and the public. Mitigation measures would be necessary to offset adverse effects and would likely be successful.

Major: The effects would be readily apparent, result in a substantial change in Park operation in a manner noticeable to staff and the public, and be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed, extensive, and success could not be guaranteed.

The thresholds of change for the duration of an impact on park operations are defined as follows:

Short-term: Effects lasting for the duration of the treatment action.
Long-term: Effects lasting longer than the duration of the treatment action.

4.1.8 Cultural Resources

The cultural resources at Devils Hole are those derived from the historical, religious, and ceremonial traditions of use by the Timbisha Shoshone and Pahrump Paiute tribes in the region. The Park considers the two primary tangible resource conditions that sustain the cultural significance to be the water level in the Hole and access to the site. Without knowledge of which specific location(s) of the Devils Hole site are visited by the tribes for ceremonial purposes, it is not possible to specify the extent to which the fencing and security actions proposed by the Park will impact those purposes. Therefore, the impact analysis will consider more general site access, as well as impacts to the water therein.

An intangible resource condition, harder to measure and to analyze, is the spiritual energy of the site, which comes through in tribal conversations and stories about the site, and emerges from the tribal worldview of interconnections between all realms of the natural world (Fowler, 2002). The Timbisha Shoshone consider that this spiritual energy is impacted by activities or equipment

that intrude into the water source. This EA acknowledges the difficulty of analyzing impacts in this framework, but acknowledges their existence nonetheless.

In general, the thresholds of change for the intensity of an impact to cultural resources within the Park are defined as follows:

Negligible: The impact would be barely perceptible and would neither alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of beliefs and practices. There would be no change to a group's body of beliefs and practices.

Minor: The impact would be slight but noticeable and would neither appreciably alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of beliefs and practices.

Moderate: The impact would be barely perceptible and would neither alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of beliefs and practices. There would be no change to a group's body of beliefs and practices.

Major: The impact would alter resource conditions. Something would block or greatly affect traditional access, site preservation, or the relationship between the resource and the affiliated group's body of beliefs and practices, to the extent that the survival of a group's beliefs and/or practices would be jeopardized.

With respect to the duration of impacts, to the extent that the cultural values of the site derive from the preservation and integrity of its natural resources, particularly the water, any impacts to cultural resources would therefore track the impacts to the water. That is, if the water level decreased, so would be the cultural resource value; if and when the former recovers, so would the latter.

4.2 ANALYSIS OF ALTERNATIVES

4.2.1 No Action Alternative

4.2.1.1 Soils and Geology

Impacts Analysis

The No Action Alternative will not have any construction-related impacts to area soils, as no infrastructure will be built in or around Devils Hole. If this alternative is chosen, site use can be expected to continue as is. This includes the use of existing monitoring and visitor infrastructure, including the monitoring platform and fencing system. Fencing can be expected to continue to limit natural sediment movement. The continued use of the monitoring platform and sampling techniques has the potential to cause erosion of cliff soils into Devils Hole. Without updated infrastructure and trails, visitors may go off existing trails, displacing vegetation and disturbing soils.

Cumulative Impacts

Currently, none of the water-related or Refuge planning projects can be expected to impact soil resources within the vicinity of Devils Hole. Since each of these projects would exist outside of the Devils Hole surface watershed, no soils would be impacted and no changes to sediment movement would occur. Additionally, these activities would not influence any of the soils that supply nutrients to Devils Hole. The No Action Alternative would not contribute to cumulative impacts from the scenario described above.

Conclusion

Overall, adverse, minor, long-term, and medium range impacts to soils may result from the implementation of the No Action Alternative, due to the continued erosion of soils from the manner in which the hole is accessed by researchers, and the impedance of natural sediment flows from the fence.

The level of impact on soil resources would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.1.2 Water

Impacts Analysis

Under the No Action Alternative, no changes would be made to any of the Devils Hole visitor or monitoring facilities. This may pose a risk to water quality within Devils Hole due to the potential for researchers using the makeshift system of descent to the Hole and the existing monitoring platform to inadvertently cause cliff sediments to loosen and wash into Devils Hole. These sediments could cloud the water in Devils Hole, resulting in a decrease in sunlight

available to the upper reaches of the Hole. Depending on the composition of the sediment, how much is eroded, rainfall levels, potential flooding, and whether or not any other substances being used on the platform combine with the sediment, the chemical composition of the water in the Hole could be altered. During flood events, the potential for erosion could increase, due to higher water levels and faster moving currents. Increased turbidity could cause an increase in water temperature as turbid water heats more readily when exposed to sunlight. Elevated levels of turbidity could also lead to decreases in primary production and dissolved oxygen levels. It is likely that these impacts would be short-term and dissipate shortly after monitoring activities stop and sediment is able to settle. These impacts would potentially re-occur each time monitoring is performed. All sediment movement will remain as it currently is; the existing fenceline will continue to limit natural drainage immediately surrounding Devils Hole. Additional impacts would be possible from visitors going off-trail, displacing vegetation and increasing the potential for soil erosion into the water.

Cumulative Impacts

There have been major, direct and indirect adverse cumulative impacts to the water level in Devils Hole from past groundwater pumping activities. Each of the proposed water-related development projects described in the cumulative scenario has the potential to change groundwater levels and flow rates within the regional aquifer that includes Devils Hole. Lower groundwater levels within the regional karst aquifers could lead to changes in water chemistry. These changes may include an increase in the dissolution of calcium carbonate as less water travels through the same aquifer conduits. Water temperature in Devils Hole would have the potential to increase with a decline in water levels. Sunlight would reach further into the Hole and the location of the photic zone would shift as water levels declined over time. General regional groundwater withdraw also would have the potential to impact levels of some of the springs within the vicinity of AMNWR. The specific interaction of proposed groundwater use activities and groundwater level and quality in Devils Hole is difficult to quantify within the scope of this EA. Any groundwater pumping within the approximately 22,000 acre preserved area surrounding the Hole is most likely to impact groundwater within Devils Hole. But this is unlikely to occur. Each of these proposed projects would occur outside of this protection groundwater region; however, given the unknown hydrogeologic connections in this region, changes in water level in Devils Hole could occur.

Refuge planning projects as they are currently described in the cumulative scenario are not likely to impact surface or groundwater in or around Devils Hole; when more detailed information and planning has been completed a more accurate assessment of the potential impacts can be made. With no construction activities, changes in drainage, or water levels occurring as part of the No Action Alternative, the implementation of this alternative is not likely to contribute to the overall cumulative impacts on water resources within the vicinity of Devils Hole.

In addition, the likelihood of increases in global temperature that have been predicted over the next century could increase the water temperature of the pool (IPCC, 2008). Any increase in water temperature could adversely impact the pupfish, given the evidence that the pupfish may already be existing at the upper edge of the temperature range for sustainable spawning and recruitment (Shrode and Gerkin, 1997).

Conclusion

Overall, adverse, short- and long-term, minor, and localized impacts to Devils Hole are likely, due to the potential for researchers using the makeshift system of descent to the Hole and the existing monitoring platform to inadvertently cause cliff sediments to loosen and wash into Devils Hole. Additional impacts would be possible from visitors going off-trail, displacing vegetation and increasing the potential for soil erosion into the water.

The level of impact on groundwater and surface water resources would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.1.3 Vegetation

Impacts Analysis

As there would be no new actions under the No Action Alternative, there would be no new impacts on vegetation. There would be no need to clear vegetation for the new fence or trails leaving the surrounding vegetation to continue to exist in its current state. Researcher visits to monitor conditions in the cavern would continue to cause damage to vegetation along the access route into the cavern. Continued cyclic maintenance of the access road and trails could also have adverse impacts on vegetation from vegetation removal and trampling.

Cumulative Impacts

Plants in the project area are subject to damage from natural processes, visitation, and periodic NPS road and trail maintenance. In addition, upgrades to the transportation infrastructure of Ash Meadows NWR are being planned. These plans include the following elements that would impact vegetation in the project area:

- A new wayside interpretive kiosk on the southern edge of Devils Hole, with a minimal primitive parking area. Construction of the wayside would cause impacts through the removal of plants in the area of construction introduction of exotic plants.
- The Desert Refuge complex has undertaken a transportation survey that will provide recommendations for improvements to the existing network of roads and parking lots and address transportation, management, maintenance, and coordination threats and challenges faced by the Refuge (Ash Meadows, 2007). The goal of these improvements is to enhance visitor safety and to support the resource protection mission and policies of the NWR. Transportation improvements could increase visitation to Devils Hole and result in additional impacts to vegetation caused by visitors walking off-trail and introduction of exotic plants.

There would be long-term, minor, direct adverse cumulative effects on vegetation from past, present, and foreseeable future actions. The No Action Alternative would contribute negligible adverse cumulative impacts on vegetation.

Conclusion

Researcher visits to monitor conditions in the cavern would continue to cause long-term, negligible, direct adverse impacts to vegetation along the access route into the cavern. There would be short-term, negligible, local, direct adverse impacts to the vegetation as a result of the No Action Alternative due to continued cyclic maintenance of the access road and trails and off-trail hiking.

The level of impact on vegetation would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.1.4 Wildlife

Impacts Analysis

As there would not be any new actions under the No Action Alternative, there would not be any new impacts on wildlife or wildlife habitat. There would not be additional human activity in the area for construction activities, so wildlife would not be affected beyond current disturbance from regular vehicle traffic and visitation. Cyclic maintenance activities, visitation, and monitoring activities that would continue periodically under this alternative would have temporary adverse impacts on wildlife as animals would be disturbed or displaced during human activity.

Cumulative Impacts

Wildlife in the project area is subject to disturbance and damage from natural processes, visitor access, monitoring activities, road maintenance, and traffic. There would be continued adverse effects on wildlife from vehicles using the roadway, visitation, and monitoring of conditions in the cavern. Vehicles passing along the road, visitors to Devils Hole, and monitoring activities cause short- term, local disturbance or displacement of wildlife.

Upgrades to the transportation infrastructure of Ash Meadows NWR are being planned. These plans include the following elements that would impact wildlife in the project area:

- A new wayside interpretive kiosk on the southern edge of Devils Hole, with a minimal primitive parking area. Construction of this wayside would cause temporary displacement of wildlife during the construction period.
- The Desert Refuge complex has undertaken a transportation survey that will provide recommendations for improvements to the existing network of roads and parking lots and address transportation, management, maintenance, and coordination threats and challenges faced by the Refuge (Ash Meadows, 2007). The goal of these improvements is to enhance visitor safety and to support the resource protection mission and policies of the NWR. Transportation improvements could increase visitation to Devils Hole resulting in impacts to wildlife. Effects on wildlife would include mortality, restricted movement, introduction of

exotic plants that could affect wildlife habitat, habitat fragmentation and edge effect, and increased human access to wildlife habitats.

There would be long-term, minor, direct adverse cumulative effects on wildlife from past, present, and foreseeable future actions. The No Action Alternative would contribute negligible adverse cumulative impacts on wildlife.

Conclusion

There would be short-term, negligible, local, direct adverse impacts to wildlife as a result of the No Action Alternative due to vehicles using the roadway, visitation, and monitoring of conditions in the cavern.

The level of impact on wildlife would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.1.5 Threatened & Endangered Species, Candidate Species, and Species of Special Concern

Impacts Analysis

Under the No Action Alternative the survival of Devils Hole pupfish would be jeopardized by two factors:

1. Altered surface runoff and deposition of gravel into the pool caused by the existing fence would impact substrate composition on the shallow upper shelf, the principal spawning area for pupfish. Lack of suitable substrate would likely reduce pupfish spawning success and lead to declines in invertebrate populations, which are the primary food items in the pupfish diet.
2. The existing security system provides inadequate protection from the possibility that vandals could harm critical habitat for the pupfish or that visitors could inadvertently impact the habitat.

The Devils Hole riffle beetle and Amargosa tryonia snail would be impacted by the same two factors as for the pupfish, which could result in disturbance of their primary habitat and declines in populations. Other special status species occurring in the project area are not expected to be affected by the No Action Alternative aside from those impacts previously described in the wildlife section above.

Cumulative Impacts

Special status species in the project area are subject to disturbance and damage from natural processes, visitor access, monitoring activities, road maintenance, traffic, and declining water levels in Devils Hole. There would be continued adverse effects on wildlife from vehicles using the roadway, visitation, and monitoring of conditions in the cavern. Vehicles passing along the

road, visitors to Devils Hole, and monitoring activities cause short- term, local disturbance or displacement to terrestrial wildlife.

Declining water levels resulting from groundwater pumping in Ash Meadows during the late 1960's and early 1970's dramatically lowered water levels in Devils Hole. Water levels recovered once ground water pumping ceased, but since the late 1980's water levels have again steadily declined. The principal threat to the Devils Hole pupfish is water loss. The continued survival of Devils Hole pupfish relies on the availability of shallow water on the upper shelf where pupfish spawn and where the bulk of the primary productivity that supports the aquatic community occurs.

On September 11, 2004 eighty pupfish, one third of the population, were accidentally killed in an incident when traps used to monitor the fish were washed into Devils Hole by a flash flood.

A number of water related projects that could impact future water levels in Devils Hole are in the planning process.

- The Southern Nevada Water Authority (SNWA) has proposed to develop approximately 8,000 acre-feet of ground water per year from an area north and northwest of Las Vegas. The location would be approximately 35 to 45 miles east and north of Devils Hole. The Nevada State Engineer ruled on these water right applications several years ago, however, SNWA has chosen to put the project on hold and there is no definitive timeline when it may be re-activated.
- The State of Nevada is considering a water rights petition heard in September 2007 involving changes in points of diversion for irrigation pumping in the Amargosa Valley. If those change applications are granted, Devils Hole water levels could be affected.
- The Las Vegas metro and the Amargosa Desert are desirable areas for further development, and many projects are proposed for which the State of Nevada could issue water rights. For example, a private company is planning a solar array near Crystal, NV, over 50 miles from Devils Hole, which would involve groundwater pumping in the Amargosa Valley. The Park Service has the right to challenge any award of water rights that it can demonstrate would threaten the federal reserved water right for Devils Hole.
- The Desert National Wildlife Refuge Complex is preparing a Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) that includes four refuges: Desert, ASH MEADOWS, Pahranagat and Moapa. The CCP/EIS describes the resources, public use, goals, objectives, and strategies for ASH MEADOWS and for the other refuges. It also identifies potential environmental effects of potential actions under consideration. The CCP/EIS effort was started in 2004; the administrative draft has been completed; and the final draft is currently being prepared. The CCP may have future beneficial or adverse effects on water levels in Devils Hole depending on management decisions made.

In addition, the likelihood of increases in global temperature that have been predicted over the next century (IPCC, 2008) could increase the water temperature of the pool. Any increase in water temperature could adversely impact the pupfish, given the evidence that the pupfish may already be existing at the upper edge of the temperature range for sustainable spawning and recruitment (Shrode and Gerkin, 1997).

There would be long-term, major, direct and indirect adverse cumulative impacts on T&E species from past, present, and foreseeable future actions. The No Action Alternative would contribute major adverse cumulative impacts on T&E species.

Conclusion

There would be long-term, major, direct and indirect, adverse impacts to the Devils Hole pupfish as a result of the No Action Alternative. The existing fence has been identified as contributing to habitat alterations that would jeopardize the continued existence of these species by adversely modifying critical habitat.

In addition, increased travel on area roads could increase concentrations of airborne particulate matter, decreasing solar energy available to fuel primary production in Devils Hole (Wilson and Blinn 2007).

The level of impact on threatened and endangered species could result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.1.6 Visitor Experience

Impacts Analysis

The No Action Alternative will not directly change the visitor experience, and it will not be likely to change the number or type of visitors to the Devils Hole site. As part of its Visitor Services Plan, the Refuge may construct an informational kiosk south of Devils Hole, which would provide additional information for visitors. Otherwise, no major changes would be made to the convenience or information provided at the site. Without changes, the visitor appeal of the site may degrade over time, thereby leading to less public support for the recovery of the pupfish, though this impact is likely to be minor and difficult to measure. If, however, the No Action were chosen and as a result, the pupfish became extinct, the justification for the security, monitoring, and interpretive infrastructure would be mostly lost, and the visitor experience itself would most likely cease to exist. This is a potentially major indirect impact.

Cumulative Impacts

Some of the projects being planned by the Refuge could impact Devils Hole. The interpretive kiosk tentatively planned for south of the Hole would enhance visitor education, providing positive benefit. If any transportation projects served to significantly increase traffic along Devils Hole Road, that could increase visitors to a point where additional parking facilities might be needed. The visitor survey planned by USFWS could be used to make improvements elsewhere on the Refuge--at the Visitor Center, for example-- that could ultimately provide indirect benefit to visitors to Devils Hole. Other specific projects are insufficiently mature to analyze potential impacts, but given the mission to protect natural resources within the Refuge, it

is unlikely that any projects that could cause cumulative impacts to the pupfish would move forward without sufficient mitigation.

Conclusion

Overall, adverse, major, long-term impacts to the visitor experience may result from the implementation of the No Action Alternative, given that the habitat conditions that sustain the very basis of the visitor experience would continue to degrade.

4.2.1.7 Park Operations

Impacts Analysis

Under the No Action Alternative, no improvements to the security of the site, and no improvements to the convenience and human safety of monitoring activities, would be made. This would lead to the same or increased levels of vandalism or breaches of the security fence, in turn leading to the same mostly ineffective, after-the-fact security responses by Law Enforcement staff. Over time, as those with malicious intent became aware that the Park had declined to enhance site security, malicious attacks could increase, further stressing the fence structure and the security response system, which would invite further attacks in a vicious cycle. This could produce a moderate impact.

With respect to human safety, researchers would continue to use the makeshift access ladder and monitoring platform to conduct their routine activities. It is not possible to predict whether serious injury or accidents will occur, only that the likelihood of them will not decrease without further action. The probability of such an accident increases over time. Any injury accidents that occurred after the Park chose the No Action Alternative would be defined as a moderate impact.

Cumulative Impacts

The potential water projects in the cumulative scenario will not contribute to cumulative impacts from the No Action Alternative to site security or researcher safety, and thus Park operations. Being so distant from the site, any of those projects, if implemented, would not impinge on the site area directly, and so would not compromise or enhance the security infrastructure of the site. Their remoteness from the site would also preclude any impact on researcher safety.

The Refuge planning activities are also not likely to contribute to cumulative impacts of this project on Park operations, with one possible exception: if either the transportation projects or visitors services projects bring significantly increased traffic to (or past) the site, then this could put increased pressure on the security system, simply by increasing the probability of malicious attempts. This could further degrade the fragile habitat of the pupfish, and therefore its recovery.

Conclusion

Overall, the No Action alternative could produce adverse, moderate, short and long-term impacts on Park Operations—specifically, site security—due to continued degradation in the protection afforded by the existing fence.

4.2.1.8 Cultural Resources

Impacts Analysis

In its current form, the Devils Hole site continues to hold the cultural values that render it a Traditional Cultural Property, and it is still used by the Timbisha Shoshone and Pahrump Paiute in their traditional manner. The No Action Alternative would not change the ability of the tribes to continue their current use, although further degradation of the natural resource values through vandalism could occur if none of the proposed additional security measures are taken.

The No Action Alternative would also not make any improvements to the natural flow of sediment into the Hole; therefore, to the extent that the current interference with natural flow causes further degradation to the habitat values of the water and contributes to further decline or extinction of the pupfish, this could degrade the natural resource values—the uniqueness of the groundwater pool--that form the basis of the site's cultural significance. Direct and indirect impacts to water are described in Section 4.2.1 2; these form the basis for any impacts to cultural resource values. Overall, adverse, short- and long-term, minor, and localized impacts to Devils Hole are likely, due to the potential for researchers using the makeshift system of descent to the Hole and the existing monitoring platform to inadvertently cause cliff sediments to loosen and wash into Devils Hole. Additional impacts would be possible from visitors going off-trail, displacing vegetation and increasing the potential for soil erosion into the water.

Thus, to the extent that the No Action Alternative leads to an increased likelihood of vandalism, a degradation in pupfish habitat, and no increase in public awareness or support for protection, it threatens the cultural values that underlie the site, and could therefore lead to adverse impacts.

Cumulative Impacts

Possible groundwater pumping projects mentioned in the Cumulative Scenario (Section 4.1) that jeopardize the water level in the Hole also jeopardize the cultural resources associated with it, because the cultural significance is tied to the presence of the unique waterbody. It is likely that these projects would be challenged if the Park felt they would cause significant impacts to the water level in the Hole. To the extent that No Action contributes to the further deterioration of the integrity of the natural systems that support a healthy water level, its cumulative impact on the cultural resource values could be major.

Conclusion

Overall, adverse, major, long-term impacts to cultural resource values may result from the implementation of the No Action Alternative, given that the habitat conditions that sustain the very basis of its cultural value would continue to degrade. For this reason, the Timbisha Shoshone Tribe have expressed their ultimate preference that no action to be taken at Devils Hole, although they will support Alternative A.

4.2.2 Alternative A

4.2.2.1 Soils and Geology

Impacts Analysis

Fenceline

Soil disturbance is defined as anything that causes the impairment of physical, chemical and biological properties and processes, such as erosion, compaction, displacement, rutting, burning, loss of organic matter and mass movement of soil (Deluca, 2001; USDA-ARS, 2005). Soils would be disturbed during fenceline and floodgate installation. This would require the use of heavy machinery to clear and level the land the fence will be built on, the permanent displacement of soils for the installation of fence posts, as well as a slight alteration in drainage and soils movements. Construction equipment has the potential to compact soil, reducing porosity and conductivity. Such compaction is likely to slightly increase the amount of surface runoff in the immediate area.

Construction equipment to be used during the various facets of site development would include pick-up truck or Bobcat on tracks and a large posthole drill, probably run off the Bobcat. As with almost any construction project involving the use of heavy equipment, there is some risk of an accidental fuel or chemical spill, and the potential contamination of soils. Further, there is the risk of these contaminated soils running off into any nearby surface water. The soils types in and around Devils Hole (see Section 3.1) are well-drained and gravelly with low to medium runoff capabilities. Disturbance of these soils is not likely to cause high levels of runoff as stormwater will likely infiltrate. However, vegetative cover is sparse and the topography is steep; both of these traits can lead to an increase in stormwater runoff in the event of a heavy rainfall. In order to reduce the potential for soil contamination and erosion during construction activities, the BMPs described in Chapter 2 will be applied. Soils that are displaced for the installation of the fence posts will be properly disposed of if they contain any of the fuels or oils discussed above, or, if clean, re-introduced during the Habitat Restoration activities (see below) after construction is completed.

Once operational, the new fenceline will likely be an improvement over current drainage which is closer in to Devils Hole and therefore does not allow sediment to migrate as it would naturally. The placement of the new fenceline further away from the Hole will allow for sediment to move naturally. Any soils that may have migrated during the construction period will stabilize once the fenceline is fully installed. Permanent soils displacement and compaction can be expected to occur as a result of the installation of the fence posts, which require poured concrete in place of soils. Some permanent soil compaction can be expected to result from the use of heavy vehicles and machinery in the vicinity of the Hole. In addition, minor compaction will result from installation of the floodgate. While relocating the fence further from the Hole improves natural drainage, having a fence inside the natural flow of the watershed still constrains natural flow somewhat, requiring the use of the floodgate to allow sediment and nutrient flows into the Hole. Concentration of flows through the floodgate without a concrete spillway will increase erosion of topsoil in the drainage pathway below the floodgate.

Visitors Platform, Access, & Interpretation

Impacts to soils from the installation of the visitors tunnel fencing and removal of the gate below it can be expected to be similar as those discussed above under the fenceline installation. The same types of soils will be disturbed with similar equipment for the duration of construction activities. Some rock and soil deposition into the Hole from removal of the platform is likely to occur, and the same BMPs would be applied. If these measures are taken, impacts will remain minor.

Soils will be permanently displaced and likely compacted during the construction of the fenced tunnel over the existing access trail leading to the visitors platform, as well as the installation of the posts to support the tunnel fencing. The total area of disturbance will be less than 500 square feet. Any displaced soils will be handled as discussed above.

Access Ladder

Installation of the "ships ladder" will result in similar impacts to soils as discussed above. These impacts will mostly be in the form of compaction due to the use of a small crane and scaffolding during installation. The ladder will require anchors into the rock faces for support. These anchors are not expected to impact soils, although the drilling could cause some rock pieces to be dislodged and then deposited near or into the Hole. Some permanent compaction may result from the crane movement over soils; no other soil impacts from the ladder are expected. As described above, construction BMPs would be applied to minimize rock piece deposition, soil contamination, erosion, and disturbance. With these preventive measures, soil impacts should remain minor and temporary.

Monitoring Platform & Equipment

The segmented monitoring platform will be built off-site and stored at the foot of the Devils Hole site. No impacts to soils are expected from the repeated assembly and use of the portable monitoring platform at Devils Hole. The foot traffic along the soils surrounding the Hole will be virtually the same as the No Action alternative, since monitoring will occur at the same frequency regardless of which alternative is chosen.

Drilling the anchor holes at the south end of the water's edge could cause some rock pieces to be dislodged and then deposited into the Hole. This will be minimized by using the smallest adequate drill bit, and employing rotary drilling tools that are equipped with dust-catching bags and internal fan.

The presence of the operational monitoring platform is not expected to impact soils.

As described in Section 2.2.1, in this alternative the entire stilling well and frame structure will be removed and the Park will rely on pressure transducers and a new staff gage (the existing staff gage is connected to the stilling well) to measure water level. The Park will attempt to use existing anchors to affix the new staff gage in a location along the east wall that is easily

accessible from the south shore, but it may be necessary to install two new anchor bolts in the east wall as necessary. As with all drilling activities, the impacts from vibration and deposition will be minimized by using the smallest adequate drill bit, and employing rotary drilling tools that are equipped with dust-catching bags and internal fan.

Security System

The security system upgrades under Alternative A would require temporary land disturbance around the areas of the existing tower and location of the additional security cameras. Small areas of soils would be disturbed for the installation of the buried cables; these soils would be disturbed and compacted for the length of time the cable is in the ground. As described above, construction BMPs would be applied to minimized soil contamination, erosion, and disturbance.

Installing higher end video cameras would cause minor disturbance of the area around the tower to replace and re-wire cameras #1 and #2. Installing the cameras in the crevasse (#3 on the cliff and #4 in the cavern) would involve drilling into the cliff face and the cavern ceiling to mount the camera supports, and extending buried cable from the solar power inverter to the camera mount. Installing camera #5 on the visitors platform would require installing a mounting post and routing cable as well. The Park will conduct vibration testing on the rocks by drilling a single hole into the rock in which holes will be drilled and measuring and observing vibration. The largest rock sizes feasible should be used to minimize transmitted vibration to the hole. In addition, using the minimum size of drill bit adequate for the camera mount will minimize vibration.

Communications Infrastructure

Impacts from the installation of the satellite or microwave dish and fiber optic cables can be expected to be minor and short-term, the same as those discussed above under the fenceline. The placement of these components can be expected to permanently displace soils in the immediate area and along the 100’ of ground where the cable would be buried. No operational impacts can be expected.

Power Supply

The solar panel frame will be mounted on six 2-1/2" or 3" diameter posts, with three posts located at the center and on either end on the upper and lower areas of the frame. Posts will be anchored in concrete footings, approximately 2’ diameter and 3’ deep (to be determined by the solar panel vendor during final design).

Impacts from the construction of the solar array required under this alternative can be expected to be similar as those discussed above under Fenceline. Construction equipment and the installation of the 300 square feet of photovoltaic cells are likely to result in permanent soils compaction and displacement. As described above, construction BMPs would be applied to minimized soil contamination, erosion, and disturbance.

Site Revegetation

Watering and planting of native vegetation as in Alternative A will aid in the formation of stable, permeable, and infiltrative soils that will help support a healthy ecosystem. The higher ground cover in native and semi-native vegetation results in less loss of topsoil. Established natural communities are also better able to resist invasions by alien plant species. So the use of native plants can help prevent the spread of alien species already present in a region and help avert future introductions.

Cumulative Impacts

Currently, none of the water-related or Refuge planning projects can be expected to impact soil resources within the vicinity of Devils Hole. Since each of these projects would exist outside of the Devils Hole surface watershed, no soils would be impacted and no changes to sediment movement would occur. Additionally, these activities would not influence any of the soils that supply nutrients to Devils Hole. However, as the Refuge improvement projects are planned in more detail, specific measures would be taken to ensure that they do not jeopardize or adversely affect critical habitat for the DH pupfish. This would include considering any project components that would alter soil movement in and around Devils Hole. Alternative A would not contribute to cumulative impacts from the scenario described above.

Conclusion

Overall impacts to soils from the implementation of Alternative A can be expected to be partly adverse and partly beneficial, minor, both short- and long-term, and cover a medium sized area around the project site. Some impacts, such as compaction due to construction and installation activities will be short-term, while the installation of poured concrete for fence posts will be long-term. Mitigation measures that will be required to offset these impacts include the implementation of BMPs to decrease erosion, as well as habitat restoration techniques. Adverse impacts to soils will result from the installation of project components (fencing, additional camera locations, the solar array, etc.) that permanently displace soils. In addition, erosion would occur from the use of the floodgate to focus drainage down an exposed pathway. Beneficial impacts can be expected to result from the construction of a safe and protected trail and more secure fencing. These components of the project will help to ensure that visitors stay in approved areas and avoid going off-trail which can lead to additional soil compaction and erosion over time. The cumulative effects on soils from other past, present, and reasonably foreseeable projects, in conjunction with Alternative A, would be negligible.

The level of impact on soil resources would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.2.2 Water

Groundwater

Impacts Analysis

Fenceline

The installation of the fenceline under Alternative A will result in soil compaction, disruption, and potential erosion as discussed under Section 4.2.2.1. These impacts could affect groundwater if any sediment, fuels, or oils reach area aquifers through Devils Hole. If sediment erodes into Devils Hole, it could cloud the surface of the water, blocking sunlight, increasing the water temperature, and altering the levels of dissolved oxygen (DO). Additionally, fuels and oils could potentially contaminate the water found within Devils Hole. Since the Hole is directly connected to groundwater, these impacts could extend to nearby aquifers as the water travels. The risk of this occurring during fenceline installation is minimal due to the majority of the fenceline being sufficiently remote from the Hole, and potential contaminants are not likely to be substantial enough to travel far within a given aquifer. No changes in groundwater level are expected to result from the fenceline installation. BMPs will be utilized throughout construction to minimize sediment or potential fuel leaks or spills from migrating throughout the construction site. If any potential contaminants do reach groundwater, they can be expected to dissipate, especially once construction activities are finished. The depths to which fence posts will be installed (two feet) are not expected to be enough to reach groundwater. Since the fencing would be located where springs are not reaching the surface, it can be assumed the groundwater is far enough below the surface to not be impacted by construction.

Once the fence is fully installed and operated, it would not be expected to influence groundwater quality or movement, because it would be sufficiently separated from any groundwater. Further, this new fenceline will encompass a larger land area than the existing fence, allowing for an improvement in surface drainage and infiltration rates. The improved natural drainage is likely to help maintain groundwater quality, nutrient levels and temperature.

Visitors Platform, Access, & Interpretation

As described above under the impacts of fenceline installation, erosion and runoff caused by construction of the fenced tunnel to the visitors platform, enclosure of the platform, and removal of the fencegate below should not impact groundwater quality. However, if significant rock and sediment were deposited into the Hole at an above-normal rate, it could increase water temperature as these materials absorb solar energy. The risk of this occurring during the enclosure of the visitors platform and the trail would most likely be slightly greater than during the installation of the fencing due to its location closer to Devils Hole. If this were to occur, some of the impact would likely dissipate after construction activities end as sediment particles settle onto substrate. Trail construction would result in loose sediments but they would be unlikely to reach groundwater. Throughout this process, BMPs would be implemented in order to limit sediment movement and any accidental fuel spills from equipment to the maximum extent possible, at both the platform and trail construction sites. Once installed, the enclosure to

the visitors platform and trail are not likely to impact groundwater. As with the fenceline, these facilities are likely to have a beneficial impact on groundwater quality in this area. By limiting visitors to areas within the enclosures, these facilities will protect both Devils Hole and its surrounding groundwater from detrimental impacts.

Access Ladder

The potential impacts to groundwater from the installation of the ships ladder would come from the risk of contamination from sediment, construction waste, and equipment fuel migrating into groundwater at the project site. Construction equipment and activities and their impacts on soil movement and compaction for the ladder are described in Section 4.2.2.1. The risk of groundwater contamination from the installation of the ladder is low. The proximity of the proposed ladder to the surface of Devils Hole increases the risk of eroded sediments reaching the water. Additionally, chipping rocks and drilling anchors into the cliff while working directly on the steep slopes would increase the risk of sediments, concrete, and rocks entering Devils Hole. The BMP requirements discussed in Section 2.5 will aid in sediment control and further limit this risk. These impacts would most likely dissipate once construction is complete.

Once the ladder is constructed and installed, no impacts to groundwater can be expected. The addition of the ladder will aid directly to the protection of natural resources at the Devils Hole site, because allowing researchers safe access to the Hole will prevent the need to drag temporary ladders in and out of the site, which can lead to erosion.

Monitoring Platform & Equipment

As with the access ladder, any potential impacts to groundwater with the installation of a sectional removable monitoring platform would come from the migration of sediment and equipment fuels into Devils Hole. The types of groundwater quality and temperature-related impacts would be the same as described above under the other project components. The level of risk of these impacts occurring would be slightly greater than under the installation of the ladder due to the very close proximity of the installation area to Devils Hole. Segments of the platform will be lowered to their sites and anchored in. Loose rocks and sediment from workers and drilling would have the potential to reach the surface of Devils Hole and migrated into nearby aquifers. BMPs will be applied to help mitigate against the potential contamination from sediment movement. Once installed, the monitoring platform is not expected to impact groundwater quality or movement. Further, safer and permanent access to research locations would likely prevent the erosion caused by the movement of temporary platforms in and out of the vicinity.

Security System

The minor ground disturbances required to install the security systems under Alternative A, including trenching additional cables and mounting cameras, are not expected to impact groundwater quality, movement or temperature. Cable or camera installations would not be expected to be deep enough to reach or impact groundwater. Security system operations would also not impact groundwater directly; to the extent that security improvements deter breaches of

the fenceline, which can lead to disturbance or erosion of sediments into the Hole, groundwater features could be enhanced.

Communications Infrastructure

No impacts to groundwater quality or movement would be expected as a result of the installation or operation of communications infrastructure under Alternative A. Digging and burial will not reach groundwater.

Power Supply

Impacts from the construction of the solar array required under this alternative can be expected to be similar as those discussed above under Fenceline. Construction equipment and the installation of the 300 square feet of photovoltaic cells are likely to result in minor ground disturbances, which are not expected to reach or impact groundwater. Cable installation would not be expected to be deep enough to reach or impact groundwater. Operations would not impact groundwater quality or movement.

Site revegetation

Site revegetation techniques under Alternative A are not likely to have more than a negligible though beneficial impact on groundwater within the vicinity of Devils Hole. The establishment of a native vegetative community would help restore natural drainage and infiltration rates which could benefit groundwater. Steady and natural levels of infiltration via healthy soils would help maintain groundwater quality and temperature. Nutrient and dissolved solids levels would most likely fluctuate within normal limits within a healthy ecosystem over time.

Cumulative Impacts

There have been major, direct and indirect adverse cumulative impacts to the water level in Devils Hole from past groundwater pumping activities. Each of the proposed water-related development projects described in the cumulative scenario has the potential to change groundwater levels and flow rates within the regional aquifer that includes Devils Hole. As discussed in Section 3.2, the underlying hydrogeology of this entire region is heterogeneous and mostly unknown. The specific interaction of proposed groundwater use activities and groundwater level and quality in Devils Hole is difficult to quantify within the scope of this EA. Any groundwater pumping within the approximately 22,000 preserved acres surrounding the Hole is most likely to impact groundwater within Devils Hole. But this is unlikely to occur. Each of these proposed projects would occur outside of this protected groundwater region; however, given the unknown hydrogeologic connections in this region, changes in water level in Devils Hole could occur.

Refuge planning projects as they are currently described in the cumulative scenario are not likely to impact groundwater in or around Devils Hole; when more detailed information and planning has been completed, a more accurate assessment of the potential impacts can be made.

Since the implementation of Alternative A would have only short-term adverse impacts on groundwater but long-term beneficial impacts to the overall hydrology of the region by allowing more natural drainage, no changes to groundwater levels within Devils Hole are expected to result from the implementation of Alternative A. Because of this, Alternative A is unlikely to contribute to the cumulative effects described above.

Conclusion

Overall impacts to water from the implementation of Alternative A can be expected to be partly adverse and minor in the short-term, and beneficial and minor in the long-term, and covering a medium-sized area around the project site. Adverse short-term impacts include potential contamination and decreased infiltration due to construction and installation activities. Mitigation measures that will be required to offset adverse impacts include the implementation of BMPs to minimize deposition of rock material from drilling into the cliff and to decrease erosion, as well as habitat restoration techniques. Beneficial impacts can be expected to result from the construction of a secure accessible trail and secure fencing. These components of the project will help to ensure that visitors stay in approved areas and avoid going off-trail which can lead to additional soil compaction and changes in infiltration over time. The cumulative effects on groundwater from other past, present, and reasonably foreseeable projects, in conjunction with Alternative A, could be expected to be adverse, moderate, long-term, and project area-wide, but virtually none of these effects would be attributable to Alternative A itself. The level of impact on groundwater resources would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

Surface Water

Impacts Analysis

Fenceline

Impacts to surface water from the installation of the fenceline per Alternative A can be expected to result from the potential erosion of soils and any fuel spills or leaks from construction equipment. As discussed in Section 4.2.2.1 and above in the groundwater impacts analysis, soil compaction, disturbance, the removal of vegetation and the use of heavy machinery that requires fuel and oils all have the potential to impact surface water. The risk of potentially contaminated sediments eroding into Devils Hole from the fenceline installation is small. However, if it were to occur, these sediments could cloud the upper reaches of the Hole, absorbing sunlight, increasing water temperature and decreasing DO and primary productivity. This would likely be temporary. Any contaminants, fuels or oils used in construction equipment that might reach the Hole would not likely be water-soluble and would therefore most likely pass through the fish habitat after some time. Although they could impair water quality, it would be for only a short period of time. These potential risks from sediment eroding into Devils Hole are not likely to alter the chemical makeup or nutrient balance of this small body of surface water for a time period any longer than the duration of construction. No changes in water level in Devils Hole would be expected due to fenceline installation. The fenceline in this alternative will not be

constructed near any surface water bodies, with the exception of the south side of Devils Hole itself. While the potential for sediment and other contaminant movement into Devils Hole exists, the implementation of BMPs should help mitigate these risks. Once construction has been completed, the fenceline will allow for more natural migration of sediment as well as surface drainage to resume in the area surrounding Devils Hole. This will aid in protecting surface water quality, temperature and overall chemistry by restoring natural sediment fluctuations and infiltration rates.

Visitors Platform, Access, & Interpretation

Similar impacts to water quality, chemistry and temperature as described above under the fenceline could result from the installation of the enclosed visitors tunnel along the trail to the visitors platform, removal of the fencegate below, and the fenced enclosure of the platform itself. The removal of vegetation, work on steep slopes, soil compaction and disturbance, and the use of machinery requiring fuel and oils can all lead to the potential for contaminated runoff to Devils Hole. As the construction for fenced trail and platform enclosure will be done in closer proximity to the Hole than the majority of the fence, this risk is greater than for the fenceline as presented above. The enclosure of the visitors platform and the construction of the access trail will result in soil compaction, disturbance and therefore minor changes in surface drainage. However, it is likely that any impacts or contamination would only last for the duration of the construction. The fencing that encloses the platform will prevent visitors from throwing rocks or other debris down the slope towards the Hole, which will further prevent erosion and potential surface water damage. The implementation of BMPs throughout the course of construction as well as habitat restoration efforts once the project is complete will lessen the overall impacts to surface water. Limiting visitor access to the fenced trail will also prevent visitors from going off-trail, thus avoiding additional erosion. No components of construction will occur near any surface water bodies aside from Devils Hole.

Access Ladder

The installation of the access ladder on the slope of Devils Hole would require multiple anchors to bolt the structural steel support tubing into both sides of the cliff. Risks to water quality would be similar to those described above under construction of the fenced access, as these components both require work within the slope environment surrounding Devils Hole. As with the fenceline and platform enclosure, the water within Devils Hole could receive eroded sediments and these sediments would possibly contain fuels and oils from construction machinery. Sediment landing in the Hole could result in a temperature increase as described above. In addition, rock pieces could be dislodged by drilling of anchor holes and tumble towards or into the Hole. BMPs described in Section 2.5 would be implemented and special care would be taken to minimize, to the maximum extent possible, the risks from rock piece and sediment runoff. Once in place, the access ladder is not expected to impact surface water quality or drainage. The addition of this ladder would likely aid in the protection of the water within Devils Hole as it would eliminate the need for researchers to place an access ladder in and out of the Hole, which has the potential to cause erosion each time it is done.

Monitoring Platform & Equipment

The installation of the monitoring platform can be expected to add similar impacts to surface water quality and drainage as those discussed above under the access ladder due to the close proximity of the platform to the surface of Devils Hole. The same types of potential impacts from rock fragments falling into the Hole to water quality and temperature could occur due to construction within the slopes and near the water surface of Devils Hole in order to install the anchors for the permanent platform. If the platform is used and maintained as planned, no operational impacts to Devils Hole can be expected. As with the project components discussed above, the addition of a safer, permanent monitoring platform will likely help protect the water within Devils Hole by allowing researchers to not have to move a platform in and out of the Hole area.

Security System

The construction activities required to install the security system upgrades in the upland areas around Devils Hole are not expected to result in more than minor disturbances to land and soils in the immediate area. These minor disturbances would result in loose soils that could be potentially contaminated with the fuels and oils used in the construction machinery. There would be a small risk of these soils eroding into Devils Hole, but the distance from the Hole and the small size of impact would not likely lead to more than negligible impacts.

Installing the cameras in the crevasse (#3 on the cliff and #4 in the cavern) would involve drilling into the cliff face and the cavern ceiling to mount the camera supports, and extending buried cable from the solar power inverter to the camera mount. Installing camera #5 on the visitors platform would require installing a mounting post and routing cable as well. Again, the potential exists for depositing rock and dislodging soil that would enter the cavepool below, potentially impacting water temperature and quality. These impacts would be minimized by drilling into the largest rock sizes feasible and using the minimum size drill bit adequate for the size of the camera mount. Camera #6 is an underwater camera.

No impacts to Devils Hole or other surface water bodies are expected from the operation of the upgraded security system components. Repairs to the cameras in sensitive locations would be done with precautions similar to those taken during normal monitoring operations.

Communications Infrastructure

No impacts to surface water would be expected as a result of the installation of the satellite or microwave dish or laying of buried cables. Installation and burial of cables will be done at such distance from the Hole and with proper BMPs so that the risk of delivering contaminants and sediments into the pool are minimized. Operation of communications infrastructure under Alternative A is expected to have no impact on surface water.

Power Supply

The ground disturbances required to install the power supply under Alternative A are not expected to reach or impact surface water. Operations of the solar array to generate and distribute electricity would also not impact surface water.

Site revegetation

Site revegetation under Alternative A would help restore natural drainage and improve soil retention which can limit the potential for sediment runoff into Devils Hole. Helping to restore natural sediment flow and infiltration rates will ensure that Devils Hole is receiving natural levels of sediment and water. This would help maintain appropriate nutrient levels and water temperatures that could be expected to fluctuate within normal limits for the region. Overall impacts would be beneficial.

Cumulative Impacts

There have been major, direct and indirect adverse cumulative impacts to the water level in Devils Hole from past groundwater pumping activities. Each of the proposed water-related development projects described in the cumulative scenario has the potential to change groundwater levels and flow rates within the regional aquifer that includes Devils Hole. Lower groundwater levels within the regional karst aquifers could lead to changes in water chemistry. These changes may include an increase in the dissolution of calcium carbonate as less water travels through the same aquifer conduits. Water temperature in Devils Hole would likely increase with a decline in water levels. Sunlight would reach further into the Hole and the location of the photic zone would shift as water levels declined over time. General regional groundwater withdraw also would have the potential to impact levels of some of the springs within the vicinity of AMNWR.

Refuge planning projects as they are currently described in the cumulative scenario are not likely to impact surface water in or around Devils Hole. Since the implementation of Alternative A would have only short-term adverse impacts on surface water but long-term beneficial impacts to the overall hydrology of the region, no changes to water levels within Devils Hole are expected to result from the implementation of Alternative A. Because of this, Alternative A is unlikely to contribute to the cumulative effects described above.

In addition, the likelihood of increases in global temperature that have been predicted over the next century could increase the water temperature of the pool (IPCC, 2008). Any increase in water temperature could adversely impact the pupfish, given the evidence that the pupfish may already be existing at the upper edge of the temperature range for sustainable spawning and recruitment (Shrode and Gerkin, 1997).

Conclusion

Overall impacts to surface water from the implementation of Alternative A can be expected to be partly adverse and partly beneficial, minor, short-term, and cover a medium sized area around

the project site. Adverse impacts, such as potential contamination, runoff, and water quality changes due to construction and installation activities will be short-term. Mitigation measures that will be required to offset these impacts include the implementation of BMPs to decrease erosion, as well as habitat restoration techniques. Beneficial impacts can be expected to result from the construction of a secure accessible trail and secure fencing. These components of the project will help to ensure that visitors stay in approved areas and avoid going off-trail which can lead to additional erosion and deposition of materials into the Hole over time. The cumulative effects on surface water from other past, present, and reasonably foreseeable projects in conjunction with Alternative A could be expected to be adverse, moderate, long-term, and project area-wide. The level of impact on surface water resources would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.2.3 Vegetation

Impacts Analysis

Fenceline

Construction of approximately 1200 linear feet of fencing under Alternative A would necessitate removal of plants located along the path of the fence. Repeated disturbance of vegetation by construction vehicles and foot traffic during construction in areas where plants are not cleared would also cause damage to plants. Soil compaction as a result of construction activities is likely to slightly increase the amount of surface runoff in the immediate area, resulting in erosion and subsequent damage to plants. Once construction is complete, plants would reestablish along the fenceline and in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by reducing soil compaction using habitat restoration techniques described below.

The fence would exclude herbivore species such as desert bighorn sheep from approximately six acres. Release from browsing by these herbivores would alter plant species composition and growth.

Exotic plants or seeds could be brought to the site with construction equipment. New introductions could allow for exotic plants to become established and spread, especially in areas where the ground is disturbed by construction activities. Exotic plants currently growing in the area can also become established and spread on newly disturbed substrates. However, mitigation to ensure that imported material does not contain exotic plant material would be implemented.

Visitors Platform, Access, & Interpretation

The existing viewing platform would be retained, however, the fencing and gate beneath the platform would be removed and the trail to the platform, and the platform itself, would be enclosed in a fence tunnel over the existing trail. Additionally, the trail may be shifted to insure that the tunnel would not cast a shadow on the water in the pool. Removing fencing and the gate and enclosing the platform with fencing could result in trampling and destruction of plants in the immediate vicinity of the platform. Shifting the trail and installing the tunnel could necessitate

the permanent removal of plants along the route leading to the visitors platform. Repeated disturbance of vegetation by construction vehicles and foot traffic during construction and deconstruction in areas where plants are not cleared would also cause damage to plants. Once construction is complete, plants would reestablish in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by reducing soil compaction using habitat restoration techniques described below.

Exotic plants or seeds could be brought to the site with construction equipment. New introductions could allow for exotic plants to become established and spread, especially in areas where the ground is disturbed by construction activities. Exotic plants currently growing in the area can also become established and spread on newly disturbed substrates. However, mitigation to ensure that imported material does not contain exotic plant material would be implemented.

Access Stairway

Use of a crane for the installation of a new ships ladder would trample plants in the immediate vicinity of the hole where the stairway is to be located. Repeated disturbance of vegetation by construction vehicles and foot traffic during construction would also cause damage to plants. Once construction is complete, plants would reestablish in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by plantings and soil compaction would be mitigated using habitat restoration techniques described below.

Monitoring Platform & Equipment

The monitoring platform will be built off-site and stored at the foot of the Devils Hole site. No impacts to vegetation are expected from the initial installation or repeated assembly and use of the portable monitoring platform at Devils Hole.

Security System

The security system upgrades would require temporary vegetation disturbance in the area of the existing tower and for the installation of buried cable for two cameras. The two cameras in the crevasse and one suspended in the pool would have a buried cable from the solar power inverter to the camera mount, thus also disturbing vegetation where the cable is buried. The fifth camera would be installed on the hillside or on the visitors platform. If on the hillside, a mounting structure would require removal of vegetation where the structure is placed and the repeated disturbance of vegetation by construction vehicles and foot traffic to and from the site. If on the platform, vegetation would be disturbed with the installation of a mounting post and routing cable. Once installation is complete, plants would reestablish in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by plantings and soil compaction would be mitigated using habitat restoration techniques described below.

Exotic plants or seeds could be brought to the site with construction equipment. New introductions could allow for exotic plants to become established and spread, especially in areas where the ground is disturbed by construction activities. Exotic plants currently growing in the

area can also become established and spread on newly disturbed substrates. However, mitigation to ensure that imported material does not contain exotic plant material would be implemented.

Communications Infrastructure

Installation of an 18" satellite or microwave dish on a 3’ by 3’ concrete pad and 100’ of underground fiber optic cables would require removal of vegetation where the concrete is placed and along the route of the buried cable. Repeated disturbance of vegetation by construction vehicles and foot traffic during construction in areas where plants are not cleared would also cause damage to plants. Once installation is complete, plants would reestablish in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by plantings and soil compaction would be mitigated using habitat restoration techniques described below.

Exotic plants or seeds could be brought to the site with construction equipment. New introductions could allow for exotic plants to become established and spread, especially in areas where the ground is disturbed by construction activities. Exotic plants currently growing in the area can also become established and spread on newly disturbed substrates. However, mitigation to ensure that imported material does not contain exotic plant material would be implemented.

Power Supply

Installation of 300 square feet of solar panels, battery charging system, and power conditioning equipment would require the permanent removal of plants in the immediate area of the panels. Repeated disturbance of vegetation by construction vehicles and foot traffic during construction in areas where plants are not cleared would also cause damage to plants. Once construction is complete, plants would reestablish in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by plantings and soil compaction would be mitigated using habitat restoration techniques described below.

Over time, vegetation would need to be pruned or removed as new growth would shade or interfere with the solar array.

Exotic plants or seeds could be brought to the site on construction equipment. New introductions could allow for exotic plants to become established and spread, especially in areas where the ground is disturbed by construction activities. Exotic plants currently growing in the area can also become established and spread on newly disturbed substrates. However, mitigation to ensure that imported material does not contain exotic plant material would be implemented.

Site revegetation

Overall impacts from Alternative A revegetation are likely to be beneficial. Replanting with native plant species would reduce the probability of erosion and establishment of exotic plants in the treated areas.

Cumulative Impacts

Plants in the project area are subject to damage from natural processes, visitation, and periodic NPS road and trail maintenance. In addition, upgrades to the transportation infrastructure of Ash Meadows NWR are being planned. These plans include the following elements that would impact vegetation in the project area:

- A new wayside interpretive kiosk on the southern edge of Devils Hole, with a minimal primitive parking area. Construction of the wayside would cause impacts through the removal of plants in the area of construction introduction of exotic plants.
- The Desert Refuge complex has undertaken a transportation survey that will provide recommendations for improvements to the existing network of roads and parking lots and address transportation, management, maintenance, and coordination threats and challenges faced by the Refuge (Ash Meadows, 2007). The goal of these improvements is to enhance visitor safety and to support the resource protection mission and policies of the NWR. Transportation improvements could increase visitation to Devils Hole and result in additional impacts to vegetation caused by visitors walking off-trail and introduction of exotic plants.

There would be long-term, minor, direct adverse cumulative effects on vegetation from past, present, and foreseeable future actions. Alternative A would contribute negligible adverse cumulative impacts on vegetation.

Conclusion

Alternative A would result in both adverse and beneficial short and long term, minor, localized impacts on vegetation from construction activities and the installation of new facilities. Short-term adverse impacts would primarily result from damage to plants from construction traffic and activities. Long-term adverse impacts would primarily occur where plants are permanently removed for fencing, visitor access trail, camera mount, satellite or microwave dish, and solar array. Beneficial impacts would result from habitat restoration.

The level of impact on vegetation would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.2.4 Wildlife

Impacts Analysis

Fenceline

Construction activities for installation of approximately 1200 linear feet of fencing and human presence would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Species are expected to return to the area after construction is completed. Some species, such as desert bighorn sheep, may be prevented from using the resources on the project site due to habitat alteration and exclusion by the fence. Approximately

six acres would be enclosed within the fence. However, the area surrounding the project site supports a large area of similar creosotebush scrubland which would provide appropriate habitat for resident wildlife species.

Visitors Platform, Access, & Interpretation

Construction activities for removal of the fencing and gate beneath the visitors platform, installation of a fenced tunnel over the access trail and platform, and human presence would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Species are expected to return to the area after construction is completed. Construction activities should not take place between April and September to avoid disturbance of nesting owls or breeding bats.

Access Stairway

Construction activities for installation of an access stairway into Devils Hole and human presence would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Species are expected to return to the area after construction is completed. Construction activities should not take place between April and September to avoid disturbance of nesting owls or breeding bats.

Monitoring Platform & Equipment

The monitoring platform would be built off-site and stored at the foot of the Devils Hole site and assembled as needed. Monitoring activities under this alternative do not differ from those in the No Action Alternative, thus no additional impacts to wildlife are expected from the repeated assembly and use of the portable monitoring platform at Devils Hole.

Security System

Construction activities for installation of security system upgrades and associated human presence would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Species are expected to return to the area after construction is completed.

Communications Infrastructure

Installation of an 18" satellite or microwave dish on a 3’ by 3’ concrete pad and 100’ of underground fiber optic cables and associated human presence would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Species are expected to return to the area after construction is completed.

Power Supply

Construction activities for installation of the solar array and equipment and associated human presence would cause temporary displacement and disturbance of resident wildlife for the

duration of construction. Species are expected to return to the area after construction is completed.

Site revegetation

Habitat restoration activities would cause temporary displacement and disturbance of resident wildlife. Species are expected to return to the area after restoration is completed.

Cumulative Impacts

Wildlife in the project area is subject to disturbance and damage from natural processes, visitor access, monitoring activities, road maintenance, and traffic. There would be continued adverse effects on wildlife from vehicles using the roadway, visitation, and monitoring of conditions in the cavern. Vehicles passing along the road, visitors to Devils Hole, and monitoring activities cause short- term, local disturbance or displacement of wildlife.

Upgrades to the transportation infrastructure of Ash Meadows NWR are being planned. These plans include the following elements that would impact wildlife in the project area:

- A new wayside interpretive kiosk on the southern edge of Devils Hole, with a minimal primitive parking area. Construction of this wayside would cause temporary displacement of wildlife during the construction period.
- The Desert Refuge complex has undertaken a transportation survey that will provide recommendations for improvements to the existing network of roads and parking lots and address transportation, management, maintenance, and coordination threats and challenges faced by the Refuge (Ash Meadows, 2007). The goal of these improvements is to enhance visitor safety and to support the resource protection mission and policies of the NWR. Transportation improvements could increase visitation to Devils Hole resulting in impacts to wildlife. Effects on wildlife would include mortality, restricted movement, introduction of exotic plants that could affect wildlife habitat, habitat fragmentation and edge effect, and increased human access to wildlife habitats.

There would be long-term, minor, direct adverse cumulative effects on wildlife from past, present, and foreseeable future actions. Alternative A would contribute negligible adverse cumulative impacts on wildlife.

Conclusion

There would be short-term and long-term, negligible, and localized adverse impacts to wildlife as a result of the actions in Alternative A. Short-term impacts are primarily the result of temporary displacement during construction activities. Long-term impacts arise from the permanent exclusion of wildlife species such as desert bighorn sheep from the fenced area.

The level of impact on wildlife would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.2.5 Threatened & Endangered Species, Candidate Species, and Species of Special Concern

Impacts Analysis

Fenceline

Removal of the existing fence and construction of new fencing would correct the altered surface runoff and deposition of gravel into the pool caused by the existing fence. The new fenceline would incorporate a flood gate along the natural drainage pathway to allow substrate composition on the shallow upper shelf, the principle spawning area for pupfish to receive the natural sediment deposition necessary to maintain critical habitat for this species.

The riffle beetle and Amargosa snail would also benefit from the corrected surface runoff similar to the pupfish. Other special status species occurring in the project area are not expected to be affected by construction activities in Alternative A aside from those impacts previously described in the wildlife Section above.

Visitors Platform, Access, & Interpretation

Removal of the fencing and gate beneath the visitors platform and construction of a fence tunnel along the trail and over the platform would have no negative impacts on T&E and special status species beyond those described in the wildlife section above. The platform would cast a shadow over the water as it does currently, thus it would block the same amount of sunlight into the Hole: about 15 minutes a day near the autumnal equinox (September), outside the pupfish spawning season (Weiss, 2005b). The fencing that encloses the visitors platform would cause some small incremental shadows over the hole as compared to the current platform configuration. However, the shadowprint of this fencing would not be opaque, leaving a very high proportion of the actual shadowprint still unshaded. Additionally, the fenced tunnel over the access trail would be constructed along a path that ensures no additional shadows occur over the hole. The small amount of new shadowing would have a small adverse effect on net primary productivity.

The new fenced tunnel over the trail and platform would prevent vandals from harming critical habitat for the pupfish or visitors inadvertently impacting the habitat. This tunnel would have beneficial impacts on pupfish habitat.

Access Stairway

Construction of an access stairway would cause vibration while drilling into rock for the support anchors. Although this vibration would be minimized, there would still be some disturbance due to the proximity of pupfish to the cliff face. Construction activities would not take place during spawning periods, which typically occur between February and May. There would be no additional effects on T&E and special status species beyond those described in the Wildlife above.

Monitoring Platform & Equipment

Installation of the platform (e.g., drilling holes for handrail and steps) and removal of the stilling well and frame structure would potentially elicit stress responses by the pupfish (which would be difficult to quantify). Additionally, given the fragility of the fish population, any rock or stone that is released directly into the pool during construction could result in direct mortality of pupfish. Construction activities would not take place during spawning periods, which typically occur between February and May.

This platform would only be assembled and used temporarily during monitoring activities, thus would not be expected to have any impacts on primary productivity caused by shading of the pool.

Removal of the stilling well would have beneficial effects on the pupfish because the Park would no longer cause disturbance while conducting monitoring by resting a ladder on the existing frame structure.

Other special status species occurring in the project area are not expected to be affected by the monitoring platform aside from those impacts previously described in the wildlife section above.

Security System

The existing security system provides inadequate protection from the possibility that vandals could harm critical habitat for the pupfish or that visitors could inadvertently impact the habitat. The new system would have beneficial effects by providing greater protection to critical habitat and the pupfish population at Devils Hole. Installation of the camera mounts would cause vibration while drilling into rock. Although every effort would be made to minimize duration and magnitude of vibrations, there would still be some disturbance due to the proximity of pupfish to the cliff face. Installation of the new security system would have no additional impacts on special status species beyond those described in the wildlife section above.

Communications Infrastructure

No additional impacts to T&E and special status species are expected from the installation of an 18" satellite or microwave dish on a 3’ by 3’ concrete pad and 100’ of underground fiber optic cables beyond the temporary displacement during active construction described in the wildlife section above.

Power Supply

Installation of the new security system would have no additional impacts on T&E and special status species beyond those described in the wildlife section above.

Site revegetation

No impacts to T&E and special status species are expected from site revegetation activities beyond those described in the wildlife section above.

Cumulative Impacts

Special status species in the project area are subject to disturbance and damage from natural processes, visitor access, monitoring activities, road maintenance, traffic, and declining water levels in Devils Hole. There would be continued adverse effects on wildlife from vehicles using the roadway, visitation, and monitoring of conditions in the cavern. Vehicles passing along the road, visitors to Devils Hole, and monitoring activities cause short- term, local disturbance or displacement to terrestrial wildlife.

Declining water levels resulting from groundwater pumping in the late 1960's and early 1970's dramatically lowered water levels in Devils Hole. Water levels recovered once ground water pumping ceased, but since the late 1980's water levels have again steadily declined. Continued Devils Hole pupfish survival is reliant on the structure of its habitat, of which the critical characteristic is the availability of shallow water on the upper shelf where pupfish spawn and where the bulk of the primary productivity that supports the aquatic community occurs.

On September 11, 2004 eighty pupfish, one third of the population, were accidentally killed in an incident when traps used to monitor the fish were washed into Devils Hole by a flash flood.

A number of water related projects that could impact future habitat conditions (i.e., water levels) for the Devils Hole pupfish are in the planning process (described in Section 4.1).

- The Southern Nevada Water Authority (SNWA) has proposed to develop approximately 8,000 acre-feet of ground water per year from an area north and northwest of Las Vegas. There is no definitive timeline when this currently dormant project may be re-activated.
- The State of Nevada is considering a water rights petition heard in September 2007 involving changes in points of diversion for irrigation pumping in the Amargosa Valley. If those change applications are granted, Devils Hole water levels could be affected.
- The Las Vegas metro and the Amargosa Desert are desirable areas for further development, and many projects are proposed for which the State of Nevada could issue water rights. The Park Service has the right to challenge any award of water rights that it can demonstrate would threaten the federal reserved water right for Devils Hole.
- The Desert National Wildlife Refuge Complex is preparing a Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) that includes four refuges: Desert, ASH MEADOWS, Pahranagat and Moapa. The CCP/EIS describes the resources, public use,

goals, objectives, and strategies for ASH MEADOWS and for the other refuges. It also identifies potential environmental effects of potential actions under consideration. The CCP may have future beneficial or adverse effects on water levels in Devils Hole depending on management decisions made.

Increased travel on area roads could increase concentrations of airborne particulate matter, decreasing solar energy available to fuel primary production in Devils Hole (Wilson and Blinn 2007).

In addition, the likelihood of increases in global temperature that have been predicted over the next century could increase the water temperature of the pool (IPCC, 2008). Any increase in water temperature could adversely impact the pupfish, given the evidence that the pupfish may already be existing at the upper edge of the temperature range for sustainable spawning and recruitment (Shrode and Gerkin, 1997).

There would be long-term, major, direct and indirect adverse cumulative impacts on T&E species from past, present, and foreseeable future actions. Alternative A would contribute moderate beneficial cumulative impacts on T&E species.

Conclusion

There would be long-term, moderate, direct and indirect beneficial impacts and short-term direct negligible or minor adverse impacts to the Devils Hole pupfish as a result of the actions under Alternative A. Adverse impacts would result from installation of structures at or near the hole and some additional shading of the water. The existing fence has been identified as contributing to habitat alterations that would jeopardize the continued existence of these species by adversely modifying the habitat features on which it depends. Under this alternative, the fence would be removed and replaced with one that would allow for more natural sediment flow and renewal of habitat on the upper shelf. Additionally, security upgrades would reduce the possibility of habitat damage from vandalism. However, the actions under this alternative do not address or negate the long-term adverse impacts resulting from declining water levels in Devils Hole.

The level of impact on T&E and special status species would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.2.6 Visitor Experience

Impacts Analysis

Fenceline

Visitor access to the Hole will be limited or prohibited during most, if not all, of the fenceline construction period. The Park will use a variety of communications tools to notify potential visitors of construction. Once the new fence is in place, an ungated opening will provide visitor access to the fenced tunnel that leads to the visitors platform.

The fenced visitors tunnel and platform, as well as the look and feel of the Twinbar fencing around the access trail and platform will create a very different visitor experience than the more open access it will be replacing; it restricts free movement around the site and communicates a forceful security presence, which some visitors may find off-putting. This is discussed under Visitors Platform below.

Visitors Platform, Access Trail & Interpretation

The existing visitors platform will be enclosed in fencing, with two small holes cut out for direct viewing. The trail leading to the platform will be enclosed in fencing as well, creating a "visitors tunnel." In addition, enhanced interpretive panels will provide greater detail and context on the status and ecology of the overall site, and the pupfish itself. The Park believes these changes will help protect the natural environment, although they come at some cost to the human one. Some return visitors may be disappointed and/or frustrated that their access to the overall site is so limited but from the standpoint of the overall experience and interpretation, retaining a direct view and providing more information about the pool and its conditions should be a "net neutral" impact. In addition, the onsite experience will be complemented and enhanced by interpretive exhibits at the Refuge Visitor Center and Death Valley National Park's Furnace Creek Visitor Center which will include live video feeds from the cameras mounted within the crevasse and underwater, and a video of a Tribal elder talking about the importance of Devils Hole/Ash Meadows. It is difficult to predict with certainty what impact these changes will have on the number or frequency of onsite visits. The Park's interpretive display at the Visitors Center may have the simultaneous benefit of increasing awareness of the pupfish while limiting actual onsite visits by emphasizing the fragility of habitat and providing alternative viewing opportunities.

The visitors tunnel to the platform will be conveniently accessible through an ungated opening in the fence at the end of a trail from the visitor parking area along the public road.

The Park anticipates a minor increase in onsite visits, at most, from these improvements to interpretation. The benefit will come in the form of increased awareness of those who see the exhibits at the Visitors Centers.

Access Ladder

The new access ladder will have no direct impact on the visitors experience. It is planned to be invisible to the visitor. But to the limited extent that it is visible from outside the fence or atop the Visitors Platform, it will further communicate to the visitor the importance of monitoring, and the seriousness with which the Park and the Refuge consider the recovery mission for the pupfish.

Monitoring Platform & Equipment

The monitoring platform will have no direct impact on the visitors experience. It will most likely not be visible to visitors, even from the visitors platform. Again, to the limited extent that it may be visible from atop the Visitors Platform, it will further communicate to the visitor the

importance of monitoring, and the seriousness with which the Park and the Refuge consider the recovery mission for the pupfish.

Security System

The security improvements—increased detection capability, stronger fencing, improved communications—could have a negligible negative impact on the visitor experience, that possible impact being the visibility of the increased camera presence. Again, this serves to reinforce the importance of protecting the site. The cameras located in the crevasse and underwater, in addition to sereing a security function (detecting any disturbance within the crevasse), will enhance the visitor experience considerably by providing real-time video of the pool and its surroundings to the interpretive displays at Refuge Visitor Center and Death Valley National Park's Furnace Creek Visitor Center.

Communications Infrastructure

The use of a dedicated satellite link for internet transmission will enable full-motion video to be transmitted through the Internet to the Visitors Center displays. This will be a major enhancement in the visitor experience, because it will permit visitors to the Center to see real-time full-motion video of the pupfish "in action" throughout the year. It will supplement the interpretive panels as only full-motion video can. In addition, having full-motion video of the Hole available through a public "webcam" can increase awareness of the plight of the pupfish to "virtual visitors" from around the world and thereby help build public support.

Power Supply

Enhancing the solar array to meet the increased power requirements of the new security system and cameras will have a no impact on the visitor experience. The array will be located in an appropriate location to avoid interfering with visitors enjoyment of the site.

Site revegetation

Site revegetation will improve the health of the ecosystem and the visual appeal of the site. A healthier ecosystem will ultimately enhance the visitor experience, by improving the sustainability of the pupfish habitat and aiding its recovery.

Cumulative Impacts

Any action taken by governments or private actors that threatens the habitat or survival of the pupfish could have a corresponding cumulative impact on the visitor experience. It is technically true, however, that because actually seeing the fish itself from the platform is such a rare part of the overall Devils Hole experience, any actions that harmed but did not eliminate the fish would by themselves not change the experience. In the extreme, only actions that resulted in the extinction of the species would impact the visitor experience, by removing the justification for the interpretive and security infrastructure in the first place. The Devils Hole pupfish lives a precarious existence as a species, and the Park believes it can successfully enforce its federal

water rights against actions that would endanger it by lowering the water level in the Hole below the mandated level. But if such projects went ahead and ultimately led to loss of the fish population, the Park could well decide that the site need no longer be maintained and there would likely be no visitor experience.

Some of the projects being planned by the Refuge could impact Devils Hole. The interpretive kiosk tentatively planned for south of the Hole would enhance visitor education, providing positive benefit. If any transportation projects served to significantly increase traffic along Devils Hole Road, visitor traffic could increase to a point where additional parking facilities might be needed. The visitors survey planned by USFWS could be used to make improvements elsewhere on the Refuge--at the Visitor Center, for example-- that could ultimately benefit the visitors to Devils Hole. Other specific projects are insufficiently mature to analyze potential impacts, but given the mission to protect natural resources within the Refuge, it is unlikely that any projects that could cause cumulative impacts to the pupfish would move forward without sufficient mitigation.

Conclusion

Overall impacts to the visitor experience from the implementation of Alternative A can be expected to be both adverse and beneficial, minor, and long-term. While visitors might find the new restrictions on access incongruent with the openness of the landscape, the actual experience of the site itself from the viewing platform will be enhanced by the addition of improved interpretive material. The onsite experience will be complemented by offsite exhibits at the Visitor Center and Death Valley National Park's Furnace Creek Visitor Center , which will display video images from within the crevasse and underwater. The additional security provided by the security infrastructure will improve the sustainability of the site, and therefore the visitor experience, over time.

4.2.2.7 Park Operations

Impacts Analysis

Fenceline

The replacement of the compromised cyclone fence with strategically located Twinbar fencing will have a beneficial short- and long-term impact on site security. Twinbar fencing is more difficult to cut, and its double-angled tops will make it much more difficult to scale. The fence could therefore play an important role in the overall strategy of deterring malicious entry into the site.

The fence would have no direct impact on the safety of staff when they conduct monitoring operations at the site. To the extent that improvements in site security further reduce the danger that the area around the cliff would become unstable and further endanger staff access, this could produce a beneficial indirect impact.

Visitors Platform, Access, & Interpretation

The enclosure of the visitors platform and construction of the new enclosed access trail would have no direct or indirect impacts on site security or researcher safety. Monitoring staff would use a separate access trail to reach the ships ladder.

Access Ladder

Installation of a permanent ships ladder down the descent into Devils Hole could by itself have a long-term adverse affect on site security, if potential vandals became aware that it is now easier to access the cavepool. This could encourage them to attempt to force entry into the site, since the stairway into the Hole would now be much safer. However, the improved detection and deterrence systems and the limited (enclosed) access should more than balance this risk.

The ladder and the accompanying handrails would have a major beneficial impact on the safety of researchers accessing the Hole. While the current modes of access are not unsafe per se, the presence of a fixed ladder will reduce the risk of injury, speed the descent, and make it feasible for a single researcher to conduct certain monitoring activities alone.

Monitoring Platform & Equipment

The construction of a sectional, lightweight, portable monitoring platform would have no impact on the security of the site. It would, however, have a beneficial impact on the safety and convenience of monitoring activities. Researchers could store the platform in sections at the edge of the pool and would no longer have to transport their makeshift platform down the descent, removing a substantial safety risk. The easily-assembled platform would also enable a single researcher to conduct monitoring activities when appropriate to the monitoring task. In addition, the built-in measuring system would enable more convenient and accurate sampling techniques and analysis of scientific variables.

Removal of the existing still well and frame, and subsequent reliance on pressure transducers for water level monitoring, will improve the convenience and safety of ongoing monitoring operations for researchers. The monitoring of water level in the pool will be done by connecting a new staff gage to the pressure transducers.

Security System

The security system—more cameras, more (and more effective) motion sensors, improved communications capability, still-image transmission--will provide deterrence, improved detection and response capabilities, and aid in criminal prosecution of violators. These are all beneficial, long-term impacts on site security.

The improved system will reduce the incidence of false alarms, thereby making it more worthwhile for Rangers to respond to first-alarms. Rangers would also be able to view and capture images from the site, thereby making their actions more responsive to the actual situation.

The enhanced security system would have no direct impact on researcher safety. But to the extent that improvements in site security further reduce the danger that the area around the cliff would become unstable due to degradation from vandals and further endanger staff access, this could produce a beneficial indirect impact.

Communications Infrastructure

Under Alternative A, the Park would use a dedicated satellite link to provide Internet transmission for the webcam images, both to the Visitors Center for interpretive use, and to the Ranger station for security monitoring. This is the communications backbone that enables the enhanced security system and visitor experience, so its impacts are beneficial, major, and long-term.

While installing dedicated satellite internet transmission would have no impacts on researcher safety, it could have beneficial, minor, and long-term impacts on the actual conduct of monitoring activities, if researchers can send, store and receive video transmissions to and from colleagues offsite.

Power Supply

The additional power required for the upgrades in cameras and monitors would not itself produce direct impacts on site security or researcher safety. The solar array would be installed in a place and manner which did not interfere with research activities by, for example, shading the Hole and thereby limiting the sunlight needed for the pupfish and their habitat to thrive. Its location has also been chosen to minimize its visibility to visitors, and therefore reduce its likelihood of being a target of malevolence.

Site revegetation

Site revegetation activities will not impact site security or researcher safety. Revegetation will occur before the new fenceline, which will limit access to the revegetated area, is installed.

Cumulative Impacts

The potential water projects in the cumulative scenario will not contribute to cumulative impacts from Alternative A to site security or researcher safety, and thus Park operations. Being so distant from the site, any of those projects, if implemented, would not impinge on the site area directly, and so would not compromise or enhance the security infrastructure of the site. Their remoteness from the site would also preclude any impact on researcher safety.

The Refuge planning activities are also not likely to contribute to cumulative impacts of this project on Park operations, with one possible exception: if either the transportation projects or visitors services projects bring significantly increased traffic to (or past) the site, then this could put increased pressure on the security system, simply by increasing the probability of malicious attempts. This could further degrade the fragile habitat of the pupfish, and therefore its recovery.

Conclusion

Impacts to site security from Alternative A will be beneficial, moderate, and long term, thereby having a positive impact on the efficiency and effectiveness of Ranger enforcement. The improvements to the fence, the camera system, and the motion detection will provide deterrence benefits as well as enhanced detection and enabling increased response efficiency.

Impacts to the safety of scientific research activities from Alternative A will be beneficial, major, and long term, thereby having a positive impact on Park operations. The installation of a permanent ships ladder at Devils Hole will make descent into the site more steady, and enable a single researcher to conduct monitoring activities while being fully equipped. The creation of the segmented portable monitoring platform will also enable a single researcher to conduct monitoring, and provide convenience and consistency to the measurements taken by researchers over the shelf.

4.2.2.8 Cultural Resources

Impacts Analysis

As discussed in Section 3.8, the two primary tangible resource conditions that sustain the cultural use and significance of Devils Hole for the affected tribes are site access and the water level in the cavepool itself. In addition, equipment additions into the Hole impact the intangible spiritual energy of the site. The impact analysis will focus on cultural resource implications of effects on these conditions.

Fenceline

As described in Section 4.2.2.2, the installation of the fenceline under Alternative A is not expected to cause sediment, fuels, or oils to be deposited into Devils Hole because the majority of the fenceline is sufficiently remote from the Hole, and potential contaminants are not likely to be substantial enough to travel far within a given aquifer. No changes in groundwater level are expected to result from the fenceline installation. In addition, BMPs will be utilized throughout construction to minimize sediment or potential fuel leaks or spills from migrating throughout the construction site. For these reasons, fenceline installation would have negligible adverse impact on the contribution that the water level provides to cultural significance.

Once installed, the new fenceline will encompass a larger land area than the existing fence, and in conjunction with the floodgate will allow for an improvement in surface drainage and infiltration rates. The improved natural drainage is likely to help maintain groundwater quality, nutrient levels and temperature. These are beneficial impacts to the cultural resource value of Devils Hole.

The proposed fenceline in Alternative A adds a dogleg to the south and northwest of the Hole. This new fenceline closes off visitor access to a previously accessible area bounded by the new fenceline to the south and west and roughly by an imaginary line extending northwest

approximately 100' from the visitors platform up the hillside. Because the Park has not been given any specific site use locations by the tribes, the Park cannot determine whether denying access to this particular portion of the site will effect the cultural use of the site by affected tribes.

However, the use of double-angled Twinbar fencing along certain portions of the fenceline could be perceived by the tribes as causing a major adverse impact on the cultural integrity of the site, because it adds to the perceived intensity of human intrusion on the site. Its presence as a more visible imposing and defensive structure could detract from, and perhaps overwhelm, the actual beneficial effect of protecting the site's natural resources from further intrusion and degradation. The Twinbar fenceline clearly limits access to the site; that is its purpose. The Park believes the larger risk to the integrity of Devils Hole habitat values requires such a measure, and would work with affected tribes to minimize the visual impact of the enclosed trail to the extent possible.

Visitors Platform, Access, & Interpretation

The impacts on water resources of enclosing the visitors platform, removing the fencegate below it, and constructing and enclosed access trail are described in Section 4.2.2.2. Throughout this process, BMPs would be implemented in order to limit sediment movement and any accidental fuel spills from equipment to the maximum extent possible, at both the platform and trail construction sites. Once installed, the enclosure of the visitors platform and trail are not likely to impact groundwater. As with the fenceline, these facilities are likely to have a beneficial impact on groundwater quality in this area. By limiting visitors to areas within the enclosures, these facilities will protect both Devils Hole and its surrounding groundwater from detrimental impacts. So these activities will ultimately benefit the cultural values of the site.

However, the creation of the enclosed tunnel trail to the visitors platform could be perceived by the tribes as causing a major adverse impact on the cultural integrity of the site, because it adds to the perceived intensity of human intrusion on the site. Its presence as a highly visible enclosed structure could detract from, and perhaps overwhelm, its actual beneficial effect of protecting the site's natural resources from further intrusion and degradation. As with the fenceline overall, the access trail enclosure clearly limits access to the site; that is its purpose. The Park believes the larger risk to the integrity of Devils Hole habitat values requires such a measure, and would work with affected tribes to minimize the visual impact of the enclosed trail to the extent possible.

The improvements to overall visitor education and interpretation from creating video-based display at the Visitors Center will have beneficial impact on the cultural value of the site by enhancing awareness of the special and fragile nature of the site without creating such high increases in actual visitation traffic that site resources, including current roads, are degraded. As mentioned in Section 4.2.2.6, the Park does not expect a major increase in visitation.

Access Ladder

As described in Section 4.2.2.1, the risk of groundwater contamination from the installation of the ladder is low. Once the ladder is constructed and installed, no impacts to groundwater can be expected. The addition of the ladder will aid directly to the protection of natural resources at the Devils Hole site, because allowing researchers safe access to the Hole will prevent the need to drag temporary ladders in and out of the site, which can lead to erosion. Thus, the cultural value associated with sustaining the water resource will be benefited by enhancing the safety of monitoring activities.

Access to culturally important areas of the site will not be affected by constructing a permanent ships ladder into the hole.

Monitoring Platform & Equipment

As described in Section 4.2.2.1, the level of risk of groundwater impacts occurring would be slightly greater than under the installation of the ladder due to the very close proximity of the installation area to Devils Hole. BMPs will be applied to help mitigate against the potential contamination from sediment movement. Once installed, the monitoring platform is not expected to impact groundwater quality or movement. Further, safer and permanent access to research locations would likely prevent the erosion caused by the movement of temporary platforms in and out of the vicinity. Thus, the cultural value associated with sustaining the water resource will be benefited by enhancing the safety and convenience of monitoring activities.

Access to culturally important areas of the site will not be affected by constructing and deploying a segmented removable monitoring platform for use in the Hole.

Security System

As described in Section 4.2.2.2, the minor ground disturbances required to install the security systems under Alternative A, including trenching additional cables and mounting cameras, are not expected to impact groundwater level, quality, movement or temperature. Cable or camera installations would not be expected to be deep enough to reach or impact groundwater. Security system operations would also not impact groundwater directly; to the extent that security improvements deter breaches of the fenceline, which can lead to disturbance or erosion of sediments into the Hole, groundwater features could be enhanced. Thus, the cultural value associated with sustaining the water resource will be benefited by enhancing the intrusion detection and security capabilities at the site.

Access to culturally important areas of the site will not be affected by upgrading the security components that protect the area.

Communications Infrastructure

As described in Section 4.2.2.2, no impacts to groundwater quality or movement would be expected as a result of the installation or operation of communications infrastructure under

Alternative A. Digging and burial will not reach groundwater. Thus, the cultural value associated with sustaining the water resource will be benefited by enhancing the protection afforded by improved communications infrastructure at the site.

The installation of a satellite or microwave dish at the site could contribute to the perception of increased human disturbance of the site, which could lead to perceptions of adverse impact by affected tribes. The Park will attempt to locate the dish to cause minimum visual disruption to the appearance of the site.

Power Supply

Construction equipment and the installation of the 300 square feet of photovoltaic cells are likely to result in minor ground disturbances, which are not expected to reach or impact groundwater. Cable installation would not be expected to be deep enough to reach or impact groundwater. Operations would not impact groundwater quality or movement. Thus, the cultural value associated with sustaining the water resource will be benefited by installing sufficient power to match the security needs of the site.

The installation of a solar array and ancillary equipment at the site could contribute to the perception of increased human disturbance of the site, which could lead to perceptions of adverse impact by affected tribes. The Park will attempt to locate the array to cause minimum visual disruption to the appearance of the site, while still optimizing power performance.

Site revegetation

Site revegetation will take place in the area south of the platform that would be newly fenced off from human traffic. As described in Section 4.2.2.2, site revegetation techniques in Alternative A are not likely to have more than a negligible though beneficial impact on groundwater within the vicinity of Devils Hole. These activities would help restore natural drainage and infiltration rates which could benefit groundwater. Thus, the cultural value associated with sustaining the water resource will be benefited by revegetation at the site.

Revegetation will have no impact on access issues at the site.

Cumulative Impacts

As described in Section 4.2.2.2, since the implementation of Alternative A would have only short-term adverse impacts on groundwater but long-term beneficial impacts to the overall hydrology of the region by allowing more natural drainage, no changes to groundwater levels within Devils Hole are expected to result from the implementation of Alternative A. Because of this, Alternative A is unlikely to contribute to the cumulative water effects described above, and therefore, the cultural value associated with sustaining the water resource would not suffer cumulative cultural resource impacts.

Conclusion

As described in Section 4.2.2.2, overall impacts to water from the implementation of Alternative A can be expected to be partly adverse and minor in the short-term and beneficial and minor in the long-term, and covering a medium-sized area around the project site. The cumulative effects on groundwater from other past, present, and reasonably foreseeable projects, in conjunction with Alternative A, could be expected to be adverse, moderate, long-term, and project area-wide, but virtually none of these impacts would be attributable to Alternative A itself. Thus, the overall impact of Alternative A on the cultural value of a sustainable water resource would be minor, beneficial, and long-term.

The impact on access to Devils Hole is impossible to analyze specifically without further knowledge of affected tribes' actual use of particular areas of the site. The new fenceline closes access to roughly 1/3 of an acre of the site, south and west of the visitors platform.

Several of the project components could increase the perceptions by the affected tribes of too much human interference with the simple power and beauty of the site, which form a part of its cultural value. The Park acknowledges that these impacts could be perceived by the tribes to be major, but believes its proposed actions are necessary to preserve the other resource values on which cultural significance ultimately depends. The Park will work to minimize these impacts to the extent feasible.

The improvements to interpretation are not expected to cause major increases in visitation to the site, but they will have minor beneficial impact on the overall cultural values by increasing public awareness of the unique and fragile nature of the site and the importance of its preservation, which are goals consistent with the tribal concerns.

The level of impact on cultural resources would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park. The Timbisha Shoshone have, with some reservations, selected Alternative A as their preferred alternative.

4.2.3 Alternative B

4.2.3.1 Soils and Geology

Impacts Analysis

Fenceline

Impacts to soils from the installation of fencing under Alternative B can be expected to be similar as those impacts discussed above, under Alternative A. The same heavy equipment will be used, and the same BMPs would be applied. As with Alternative A, displaced soils will be properly disposed of if they contain any potential pollutants, or, if clean, re-introduced during the Habitat Restoration activities (see below) after construction is completed.

Operational impacts to soils from the construction and use of this fenceline will result from the fact that the fenceline will encircle the entire self-contained watershed of Devils Hole. This will require ~2350 linear feet of chainlink fencing and ~175 linear feet of Twinbar High Security fencing, with fence posts placed every 8-9 feet; resulting in approximately 290 fence posts held in the soil with poured cement. This would result in permanent soil displacement at each of these locations. The chainlink nature of this fence, combined with the large, watershed-sized area that would be fenced in would likely allow for most soils and gravel to travel freely through, though small buildups may occur. Soil aeration and revegetation techniques applied are likely to aid in restoring natural sediment flow and stability around the fenced in area.

Visitors Platform, Access, & Interpretation

The installation of the railings surrounding the visitors platform and access trail as described under Alternative B is likely to impact soils within the project area. The existing trail to the visitors platform will remain and a wooden handrail will be installed on both sides of the trail. Construction activities have the potential to cause soil compaction in the areas surrounding the platform, but construction disturbance will be limited to using a posthole drill for railings supports along the trail. Additionally, the presence of construction workers close to the edge of Devils Hole has the potential to dislodge soils and cause them to erode down into the Hole. Any displaced soils will be handled as discussed above.

Access

Alternative B leaves the existing access scenario—a removable ladder—as is, but increases safety and accessibility by adding a permanent handrail down the west side of the cliff. The handrail will be anchored to the cliffside at four locations along its descent. At the bottom, the handrail continues down the remaining 40’ to the water’s edge. The bottom handrail will be secured by posts placed every 8’. The method for securing these posts is described in Section 2.2.2. Either method requires drilling with industrial power hand tools into rock that is close to the cavepool. These anchors are not expected to impact soils, although the drilling could cause some rock pieces to be dislodged and then deposited near or into the Hole. As described above, attempts will be made to minimize vibration by utilizing the largest rock sizes feasible into

which to place bolts, and minimizing the size of drill bit. In addition, rotary hammers can be fitted with a large fan and attachable dust collector to minimize deposition of shavings and small rock materials. As described above, other construction BMPs would be applied to minimize soil contamination, erosion, and disturbance.

Monitoring Platform & Equipment

Construction impacts from the installation of the monitoring platform under Alternative B can be expected to result from the use of construction machinery, including a crane and scaffolding, as well as the presence of workers, near the edge of the Hole. Soil disturbance, in the form of compaction and displacement, as well as erosion into the Hole, may result from construction activities. In addition, drilling the anchor holes could cause some rock pieces to be dislodged and then deposited near or into the Hole. Similar precautions in the selection of rock areas and tool accessories as described for Access above would be implemented.

Security System

The installation of security cameras under this Alternative is the same as under Alternative A. No operational impacts to soils can be expected from the use of the security system.

Communications Infrastructure

No impacts to soils are expected from the use of cellular transmission at this site. No additional infrastructure will be installed.

Power Supply

Impacts to soils from the installation of an 180-square foot solar array under this alternative can be expected to be the same as those discussed under Alternative A.

Site revegetation

Overall impacts from natural re-seeding are likely to be beneficial. Regular watering will speed the process of natural re-seeding after the fence and access trail construction activities. The benefits of restoring a native vegetative community in the area are mentioned in Alternative A. These benefits might not be realized if the slower process of letting the area establish itself naturally were impeded by the intrusion of invasive plants in the area.

Cumulative Impacts

Currently, none of the water-related or Refuge planning projects can be expected to impact soil resources within the vicinity of Devils Hole. Since each of these projects would exist outside of the Devils Hole surface watershed, no soils would be impacted and no changes to sediment movement would occur. Additionally, these activities would not influence any of the soils that supply nutrients to Devils Hole. However, as the Refuge improvement projects are planned in more detail, specific measures would be taken to ensure that they do not jeopardize or adversely

affect critical habitat for the DH pupfish. This would include considering any project components that would alter soil movement in and around Devils Hole. Alternative B would not contribute to cumulative impacts from the scenario described above.

Conclusion

Overall impacts to soils from the implementation of Alternative B can be expected to be partly adverse and partly beneficial, minor, both short- and long-term, and cover a medium sized area around the project site. Some impacts, such as compaction due to construction and installation activities will be short-term, while others, such as the installation of poured concrete for fencing posts, will be long-term. Mitigation measures that will be required to offset these impacts include the implementation of BMPs to decrease erosion and minimize vibration and rock deposition, as well as habitat restoration techniques. Adverse impacts to soils will result from the installation of project components (fencing, railings, the solar array, etc.) that permanently displace soils. Beneficial impacts can be expected to result from the construction of a trail and secure fencing. These components of the project will help to ensure that visitors stay in approved areas and avoid going off-trail which can lead to additional soil compaction and erosion over time. The cumulative effects on soils from other past, present, and reasonably foreseeable projects, in conjunction with Alternative B, would be negligible.

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 the 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 GMP or other relevant NPS planning documents, there would be no impairment of the Park's resources or values with respect to soils.

4.2.3.2 Water

Groundwater

Impacts Analysis

Fenceline

The fenceline in Alternative B is designed to encompass virtually the entire drainage into Devils Hole.

The installation of the fenceline under Alternative B will result in soil compaction, disruption, and potential erosion as discussed under Section 4.2.3.1. As with Alternative A, potential groundwater impacts from the construction of the fenceline as proposed in Alternative B could result from sediment, fuels, and oils eroding or leaking into Devils Hole and traveling through area aquifers. If sediment erodes into Devils Hole, it could cloud the surface of the water, blocking sunlight and effectively increase the temperature as described above. Additionally, fuels and oils could potentially contaminate the water found within Devils Hole. Since the Hole is directly connected to groundwater, these impacts could extend to nearby aquifers as the water

travels. The risk of this occurring during fenceline installation is minimal due to the majority of the fenceline being sufficiently remote from the Hole; and any potential contaminants are not likely to be substantial enough to travel far within a given aquifer. No changes in groundwater level are expected to result from the fenceline installation. BMPs will be utilized throughout construction in order to ensure that limited sediment or potential fuel leaks or spills migrate throughout the construction site. If any potential contaminants reach groundwater, they can be expected to dissipate, especially once construction activities are finished. The depths to which fence posts will be installed are not expected to enough to reach groundwater.

Once the fenceline is fully installed and operated, it would not be expected to influence groundwater quality or movement. It would be sufficiently separated from any groundwater. Further, this new fenceline will encompass a larger land area than the existing fence or Alternative A, allowing for an improvement in surface drainage which could result in a decrease in sediment being washed into Devils Hole that could make its way into area groundwater. This will aid in protecting surface water quality, temperature and overall chemistry by restoring natural sediment fluctuations and infiltration rates.

Visitors Platform, Access, & Interpretation

As described above under the impacts of fenceline installation, erosion and runoff caused by construction of handrails to the visitors platform and removal of the gate below should not impact groundwater quality. However, if significant rock and sediment were deposited into the Hole at an above-normal rate, it could increase water temperature in the cave pool as these materials absorb solar energy. The risk of this occurring during construction of the handrails would be low, due to low intensity of construction and drilling for the handrail supports. If this were to occur, some of the impact would likely dissipate after construction activities end as sediment particles settle onto substrate. Platform removal under this alternative would have the same impacts as in Alternative A. Handrail construction would result in loose sediments but they would be unlikely to reach groundwater. Throughout this process, BMPs would be implemented in order to limit sediment movement and any accidental fuel spills from equipment to the maximum extent possible, at both the platform and trail construction sites. Once installed, the handrails to the visitors platform are not likely to impact groundwater. As with the fenceline, removal of the fencegate below the platform is likely to have a beneficial impact on groundwater quality in this area. By limiting visitors to areas within the enclosures during supervised tours, these facilities will protect both Devils Hole and its surrounding groundwater from detrimental impacts.

Once installed, the handrails along the trail are not likely to impact groundwater. As with the fenceline, these facilities are likely to have a beneficial impact on groundwater quality in this area. By limiting visitors to areas that are sufficiently far enough from Devils Hole, these facilities will protect both Devils Hole and its surrounding groundwater from detrimental impacts.

Access

The impacts to groundwater from the installation of the handrail down the crevasse would come from contamination migrating from sediment and equipment fuel into groundwater at the project site. Construction equipment and activities and their impacts on soil movement and compaction for the stairway are described in Section 4.1. The close proximity of the proposed handrail to the surface of Devils Hole increases the risk of eroded sediments reaching the water from that of other project components, such as the fenceline, that are further away. Additionally, working directly on the steep slopes, chipping rocks and drilling anchors into the cliff would increase the risk of sediments and rocks entering Devils Hole. By adhering to BMP requirements, the appropriate selection of rock segments to receive anchors, selection of the smallest possible drill bits, and the use of dust collectors for rotary hammers, the Park can aid in sediment control and further limit this risk. As discussed above, these impacts would most likely dissipate once construction is complete.

Once the handrail is installed, no impacts to groundwater can be expected. The addition of the handrail, like other project components, will aid in the protection of natural resources at the Devils Hole site. Allowing researchers safe access to the Hole will prevent the need to drag temporary ladders in and out of the site, which can lead to erosion.

Monitoring Platform & Equipment

As with removal of the fencegate below the visitors platform, any potential impacts to groundwater with the installation of monitoring platform would come from the migration of sediment and equipment fuels into Devils Hole. The types of impacts to groundwater quality and temperature would be the same as described above under the other project components. The level of risk and intensity of these impacts would be greater than under the installation of the staircase due to the very close proximity of the proposed platform location along the vertical cliff face to the east of Devils Hole. The platform as designed under Alternative B will consist of a hinged platform bolted into the east wall of the Hole that can be lowered when needed. Scaffolding and a small crane will be required during installation so pieces of the platform can be lowered down the cliff face. Additional scaffolding would be required to span Devils Hole during construction. As discussed in previous analysis sections, construction work this close to Devils Hole raises the risks of sediment, rocks loosened during drilling, fuels and oils to get into the Hole and travel further into area aquifers. These actions could lead to temporary changes in nearby groundwater quality and temperature that would most likely dissipate once construction ends. BMPs will be applied to help mitigate against the potential contamination from sediment movement. Once installed, the monitoring platform is not expected to impact groundwater quality or movement. Further, safer and permanent access to research locations would likely prevent the erosion caused by the movement of temporary platforms in and out of the vicinity.

Security System

The minor ground disturbances required to install the security systems under Alternative B, including trenching additional cables and mounting cameras, are not expected to impact groundwater quality, movement or temperature. Cable or camera installations would not be

expected to be deep enough to reach or impact groundwater. Security system operations would also not impact groundwater directly. To the extent that security improvements deter breaches of the fenceline, which can lead to disturbance or erosion of sediments into the Hole, groundwater features could be enhanced.

Communications Infrastructure

No impacts to surface water would be expected as a result of the installation or operation of communications infrastructure under Alternative B.

Power Supply

The minor ground disturbances required to install the power supply under Alternative B are not expected to impact surface water. Operations would not impact surface water.

Site revegetation

Site revegetation techniques under Alternative B are not likely have more than a minor, beneficial impact on surface within the vicinity of Devils Hole. These activities would help restore natural drainage and improve soil retention which can limit the potential for sediment runoff into Devils Hole. Steady and natural levels of infiltration via healthy soils would help maintain groundwater quality and temperature. Nutrient and dissolved solids levels would most likely fluctuate within normal limits within a healthy ecosystem overtime.

Cumulative Impacts

There have been major, direct and indirect adverse cumulative impacts to the water level in Devils Hole from past groundwater pumping activities. Each of the proposed water-related development projects described in the cumulative scenario has the potential to change groundwater levels and flow rates within the regional aquifer that includes Devils Hole. As discussed in Section 3.2, the underlying hydrogeology of this entire region is heterogeneous and mostly unknown. The specific interaction of proposed groundwater use activities and groundwater level and quality in Devils Hole is difficult to quantify within the scope of this EA. Each of these proposed projects would occur outside of this protected groundwater region; however, given the unknown hydrogeologic connections in this region, changes in water level in Devils Hole could occur.

Refuge planning projects as they are currently described in the cumulative scenario are not likely to impact groundwater in or around Devils Hole; more detailed information and planning would be needed to accurately assess the potential impacts these projects may have.

Since the implementation of Alternative B would have only short-term adverse impacts on groundwater but long-term beneficial impacts to the overall hydrology of the region, no changes to groundwater levels within Devils Hole are expected to result from the implementation of Alternative B. Because of this, Alternative B is unlikely to contribute to the cumulative effects described above.

Conclusion

Overall impacts to groundwater from the implementation of Alternative B can be expected to be adverse and beneficial, minor, short-term, and cover a medium sized area around the project site. Adverse impacts, such as potential contamination and decreased infiltration due to construction and installation activities will be short-term. Mitigation measures that will be required to offset these impacts include the implementation of BMPs to decrease erosion, as well as habitat restoration techniques. Beneficial impacts can be expected to result from the construction of a trail and secure fencing. These components of the project will help to ensure that visitors stay in approved areas and avoid going off-trail which can lead to additional soil compaction and changes in infiltration over time. The cumulative effects on groundwater from other past, present, and reasonably foreseeable projects, in conjunction with Alternative B can be expected to be adverse, moderate, long-term, and project area-wide. The level of impact on groundwater resources would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

Surface Water

Impacts Analysis

Fenceline

Impacts to surface water from the installation of the fenceline under Alternative B can be expected to result from the potential erosion of soils and any fuel spills or leaks from construction equipment. As discussed in Section 4.1 and above in the groundwater impacts analysis, soil compaction, disturbance, the removal of vegetation and the use of heavy machinery that requires fuel and oils all have the potential to impact surface water. As discussed throughout the analysis sections above, the transport of sediments, fuels and oils into Devils Hole has the potential to alter water chemistry, quality and temperature. BMPs will be incorporated into all construction activities and should help to mitigate against this risk. Any impacts to surface water quality and temperature would most likely be temporary and not last beyond the length of construction. Once construction has been completed, this extended fenceline, which will encompass the entire natural drainage area, will allow for the natural migration of sediment as well as surface drainage to resume in the area surrounding Devils Hole. Extending the fenceline out to the natural drainage boundaries will help to ensure that everything that would naturally flow toward or into Devils Hole will be able to. This will aid in protecting surface water quality, temperature and overall chemistry by restoring natural sediment fluctuations and infiltration rates.

Visitors Platform, Access, & Interpretation

Similar impacts to water quality, chemistry and temperature as described above under the fenceline could result from the installation of handrails along the trail and removal of the fencegate below. The removal of vegetation, work on steep slopes, soil compaction and

disturbance, and the use of machinery require fuel and oils can all lead to the potential for contaminated runoff to Devils Hole. Both the removal of the fencegate below the visitors platform and the construction of handrails along the access trail will result in soil compaction, disturbance and therefore minor changes in surface drainage. However, it is likely that any impacts or contamination would only last for the duration of the construction and once the platform is installed it would provide a sturdy and safe location for viewing. The implementation of BMPs throughout the course of handrail installation and fencegate removal as well as habitat restoration efforts once the project is complete will lessen the overall impacts to surface water. No components of construction will occur near any surface water bodies aside from Devils Hole.

Access

The installation of the handrails along the slope of Devils Hole would require several anchors on the slope to hold the staircase in place. The risks of rock deposition and sediment transport from these activities have been described. In the case of Alternative B handrails, there will be anchor drilling at several points down the cliff along the ladder, and the multiple anchor points for the handrail as it descends further to the water. The risk of rock deposition reaching the water is relatively greater than for the ships ladder in Alternative A, though it can be minimized with the rock control techniques described multiple times above. Surface water quality, chemistry, and temperature could be altered as a result of construction activities such as cement pouring, drilling, and lowering handrail components down along the sides of Devils Hole.

Once in place, the handrail is not expected to impact surface water quality or drainage. The addition of this handrail would likely aid in the protection of the water within Devils Hole as it would eliminate the need for researchers to carry an access ladder in and out of the Hole which has the potential to cause erosion each time. Additionally, these anchors have been designed to minimize impact on drainage.

Monitoring Platform & Equipment

As with the access stairway, any potential impacts to surface water from the installation of the monitoring platform under Alternative B would come from the migration of sediment and equipment fuels into Devils Hole, and the dislodging and movement of rock fragments from drilling anchor holes. The types of water quality and temperature-related impacts would be the same as described above under groundwater. Anchor placement this close to Devils Hole raises the risks of sediment, rocks loosened during drilling, fuels and oils to get into the Hole and lead to temporary changes in water quality and temperature that would most likely dissipate once construction ends. BMPs will be applied to help mitigate against the potential contamination from sediment movement. Deposition of rock fragments in the Hole will be minimized by using the smallest adequate drill bit, and employing rotary drilling tools that are equipped with dust-catching bags and internal fan.

Once installed, the monitoring platform is not expected to impact groundwater quality or movement. Further, safer and permanent access to research locations would likely prevent the erosion caused by the movement of temporary platforms in and out of the vicinity.

Security System

As in Alternative A, the construction activities required to install the security system upgrades in the upland areas around Devils Hole are not expected to result in more than minor disturbances to land and soils in the immediate area. Again, the potential exists for depositing rock and dislodging soil that would enter the cavepool below, potentially impacting water temperature and quality. These impacts would be minimized by drilling into the largest rock sizes feasible and using the minimum size drill bit adequate for the size of the camera mount.

Communications Infrastructure

No impacts to surface water would be expected as a result of the installation or operation of communications infrastructure under Alternative B.

Power Supply

The minor ground disturbances required to install the power supply under Alternative B are not expected to impact surface water. Operations would not impact surface water.

Site revegetation

Site revegetation techniques under Alternative B are not likely have more than a minor, beneficial impact on surface within the vicinity of Devils Hole. These activities would help restore natural drainage and improve soil retention which can limit the potential for sediment runoff into Devils Hole. Helping to restore natural sediment flow and infiltration rates will ensure that Devils Hole is receiving natural levels of sediment and water. This would help maintain appropriate nutrient levels and water temperatures that could be expected to fluctuate within normal limits for the region. Overall impacts would be beneficial.

Cumulative Impacts

There have been major, direct and indirect adverse cumulative impacts to the water level in Devils Hole from past groundwater pumping activities. Each of the proposed water-related development projects described in the cumulative scenario has the potential to change groundwater levels and flow rates within the regional aquifer that includes Devils Hole. Lower groundwater levels within the regional karst aquifers could lead to changes in water chemistry. These changes may include an increase in the dissolution of calcium carbonate as less water travels through the same aquifer conduits. Water temperature in Devils Hole would likely increase with a decline in water levels. Sunlight would reach further into the Hole and the location of the photic zone would shift as water levels declined over time. General regional groundwater withdraw also would have the potential to impact levels of some of the springs within the vicinity of AMNWR. Refuge planning projects as they are currently described in the cumulative scenario are not likely to impact surface water in or around Devils Hole. Since the implementation of Alternative B would have only short-term adverse impacts on surface water but long-term beneficial impacts to the overall hydrology of the region, no changes to water

levels within Devils Hole are expected to result from its implementation. Because of this, Alternative B is unlikely to contribute to the cumulative effects described above.

In addition, the likelihood of increases in global temperature that have been predicted over the next century could increase the water temperature of the pool (IPCC, 2008). Any increase in water temperature could adversely impact the pupfish, given the evidence that the pupfish may already be existing at the upper edge of the temperature range for sustainable spawning and recruitment (Shrode and Gerkin, 1997).

Conclusion

Overall impacts to surface water from the implementation of Alternative B can be expected to be both adverse and beneficial, minor and moderate, short-term, and cover a medium sized area around the project site. Adverse minor impacts, such as potential contamination and runoff due to construction and installation activities, will be short-term. Mitigation measures that will be required to offset these impacts include the implementation of BMPs to decrease erosion, as well as habitat restoration techniques. Beneficial moderate impacts can be expected to result from the construction of a visitors trail and a secure fence that encompasses virtually the entire drainage into the Hole. These components of the project will help to ensure that visitors stay in approved areas and avoid going off-trail which can lead to additional soil compaction and runoff over time. Further, this new fenceline will encompass a larger land area than the existing fence, allowing for an improvement in surface drainage and infiltration rates. The improved natural drainage is likely to help maintain groundwater quality, nutrient levels and temperature.

The cumulative effects on surface water from other past, present, and reasonably foreseeable projects, in conjunction with Alternative B can be expected to be adverse, moderate, long-term, and project area-wide. The level of impact on surface water resources would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.3.3 Vegetation

Impacts Analysis

Fenceline

Construction of the fenceline under Alternative B would necessitate removal of plants located along the 2600 linear foot pathway of the fence. Repeated disturbance of vegetation by construction vehicles and foot traffic during construction in areas where plants are not cleared would also cause damage to plants. Soil compaction as a result of construction activities is likely to slightly increase the amount of surface runoff in the immediate area resulting in erosion and subsequent damage to plants. Once construction is complete, plants would reestablish along the fenceline and in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by plantings and soil compaction would be mitigated through habitat restoration techniques described below.

The fence would exclude herbivore species such as desert bighorn sheep from approximately seven acres. Release from browsing by these herbivores would alter plant species composition and growth.

Exotic plants or seeds could be brought to the site with construction equipment. New introductions could allow for exotic plants to become established and spread, especially in areas where the ground is disturbed by construction activities. Exotic plants currently growing in the area can also become established and spread on newly disturbed substrates. However, mitigation to ensure that imported material does not contain exotic plant material would be implemented.

Visitors Platform, Access, & Interpretation

The existing viewing platform would be retained; however, the fencing and gate beneath the platform would be removed. The existing trail to this platform would remain, and a wooden handrail would be installed on both sides of the trail and on the platform. Removing fencing and the gate could result in trampling and destruction of plants in the immediate vicinity of the platform. Installing the handrail would cause minimal site disturbance with few if any plants disturbed along the trail. Repeated disturbance of vegetation by foot traffic during these activities would also cause damage to plants. Once construction is complete, plants would reestablish in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by plantings and soil compaction would be mitigated using habitat restoration techniques described below.

Exotic plants or seeds could be brought to the site with construction equipment. New introductions could allow for exotic plants to become established and spread, especially in areas where the ground is disturbed by construction activities. Exotic plants currently growing in the area can also become established and spread on newly disturbed substrates. However, mitigation to ensure that imported material does not contain exotic plant material would be implemented.

Access Stairway

In this alternative, the existing ladder would remain in place, with the addition of a handrail down the side of the cliff. Installing the handrail would not have any impacts on vegetation beyond some disturbance of vegetation by foot traffic during installation. Once construction is complete, plants would reestablish in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by reducing soil compaction using habitat restoration techniques described below.

Monitoring Platform & Equipment

The monitoring platform would be built off-site and permanently bolted to the east wall of the cavern. Installation of the platform would damage plants in the immediate vicinity as a result of construction worker foot traffic and temporary scaffolding. Following installation, vegetation on the walls of the cavern would be shaded by the platform when in the raised storage position.

Security System

The security system upgrades would require temporary vegetation disturbance in the area of the existing tower and for the installation of the buried cable. Installing the cameras in the crevasse would not have any impacts on vegetation. Installing a camera on the platform would disturb vegetation with the installation of a ground mount and burying cable. Once construction is complete, plants would reestablish in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by reducing soil compaction using habitat restoration techniques described below.

Communications Infrastructure

No impacts to vegetation are expected from the use of cellular transmission at this site as no additional infrastructure will be installed.

Power Supply

Installation of approximately 200 square feet of solar panels, battery charging system, and power conditioning equipment would require the permanent removal of plants in the immediate area of the panels. Repeated disturbance of vegetation by construction vehicles and foot traffic during construction in areas where plants are not cleared would also cause damage to plants. Once construction is complete, plants would reestablish in areas disturbed by construction traffic. Native plant reestablishment would be enhanced by reducing soil compaction using habitat restoration techniques described below.

Over time, vegetation would need to be pruned or removed as new growth would shade or interfere with the solar array.

Exotic plants or seeds could be brought to the site with fill material. New introductions could allow for exotic plants to become established and spread, especially in areas where the ground is disturbed by construction activities. Exotic plants currently growing in the area can also become established and spread on newly disturbed substrates. However, mitigation to ensure that imported material does not contain exotic plant material would be implemented.

Site revegetation

Overall impacts from Alternative B revegetation are likely to be beneficial. It is expected that local plants would seed themselves, although the natural process of establishing native vegetation would compete with the possible establishment of exotic species.

Cumulative Impacts

Plants in the project area are subject to damage from natural processes, visitation, and periodic NPS road and trail maintenance. In addition, upgrades to the transportation infrastructure of Ash Meadows NWR are being planned. These plans include the following elements that would impact vegetation in the project area:

- A new wayside interpretive kiosk on the southern edge of Devils Hole, with a minimal primitive parking area. Construction of the wayside would cause impacts through the removal of plants in the area of construction introduction of exotic plants.
- The Desert Refuge complex has undertaken a transportation survey that will provide recommendations for improvements to the existing network of roads and parking lots and address transportation, management, maintenance, and coordination threats and challenges faced by the Refuge (Ash Meadows, 2007). The goal of these improvements is to enhance visitor safety and to support the resource protection mission and policies of the NWR. Transportation improvements could increase visitation to Devils Hole and result in additional impacts to vegetation caused by visitors walking off-trail and introduction of exotic plants.

There would be long-term, minor, direct adverse cumulative effects on vegetation from past, present, and foreseeable future actions. Alternative B would contribute negligible adverse cumulative impacts on vegetation.

Conclusion

Alternative B would result in both adverse and beneficial short and long term, minor, and localized impacts on vegetation from construction activities and the installation of new facilities. Short-term adverse impacts would primarily result from damage to plants from construction traffic and activities. Long-term adverse impacts would primarily occur where plants are permanently removed for fencing, camera mount, and solar array. Beneficial impacts would result from habitat restoration.

The level of impact on vegetation would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.3.4 Wildlife

Impacts Analysis

Fenceline

Construction activities for installation of 2600 linear feet of fencing and human presence would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Species are expected to return to the area after construction is completed. Some species, such as desert bighorn sheep, may be prevented from using the resources on the project site due to habitat alteration and exclusion by the fence. Approximately seven acres would be enclosed within the fence. However, the area surrounding the project site supports a large area of similar creosotebush scrubland which would provide appropriate habitat for resident wildlife species.

Visitors Platform, Access, & Interpretation

Construction activities for removal of the fencing and gate beneath the visitors platform, installation of a handrail, and human presence would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Species are expected to return to the area after construction is completed. Construction activities should not take place between April and September to avoid disturbance of nesting owls or breeding bats.

Access Stairway

Construction activities for installation of a handrail along the existing access ladder into Devils Hole and down the side of the cliff and human presence would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Species are expected to return to the area after construction is completed. Construction activities should not take place between April and September to avoid disturbance of nesting owls or breeding bats.

Monitoring Platform & Equipment

The monitoring platform would be built off-site. Initial installation of the monitoring platform would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Installation should not take place between April and September to avoid disturbance of nesting owls or breeding bats. Monitoring activities under this alternative do not differ from those in the No Action Alternative, thus no additional impacts to wildlife are expected from the repeated use of the monitoring platform at Devils Hole.

Security System

Construction activities for installation of security system upgrades and associated human presence would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Species are expected to return to the area after construction is completed.

Communications Infrastructure

No impacts to wildlife are expected from the use of cellular transmission at this site as no additional infrastructure would be installed.

Power Supply

Construction activities for installation of the solar array and equipment and associated human presence would cause temporary displacement and disturbance of resident wildlife for the duration of construction. Species are expected to return to the area after construction is completed.

Site Revegetation

Site revegetation activities would cause temporary displacement and disturbance of resident wildlife. Species are expected to return to the area after restoration is completed.

Cumulative Impacts

Wildlife in the project area is subject to disturbance and damage from natural processes, visitor access, monitoring activities, road maintenance, and traffic. There would be continued adverse effects on wildlife from vehicles using the roadway, visitation, and monitoring of conditions in the cavern. Vehicles passing along the road, visitors to Devils Hole, and monitoring activities cause short- term, local disturbance or displacement of wildlife.

Upgrades to the transportation infrastructure of Ash Meadows NWR are being planned. These plans include the following elements that would impact wildlife in the project area:

- A new wayside interpretive kiosk on the southern edge of Devils Hole, with a minimal primitive parking area. Construction of this wayside would cause temporary displacement of wildlife during the construction period.
- The Desert Refuge complex has undertaken a transportation survey that will provide recommendations for improvements to the existing network of roads and parking lots and address transportation, management, maintenance, and coordination threats and challenges faced by the Refuge (Ash Meadows, 2007). The goal of these improvements is to enhance visitor safety and to support the resource protection mission and policies of the NWR. Transportation improvements could increase visitation to Devils Hole resulting in impacts to wildlife. Effects on wildlife would include mortality, restricted movement, introduction of exotic plants that could affect wildlife habitat, habitat fragmentation and edge effect, and increased human access to wildlife habitats.

There would be long-term, minor, direct adverse cumulative effects on wildlife from past, present, and foreseeable future actions. Alternative B would contribute negligible adverse cumulative impacts on wildlife.

Conclusion

There would be short-term and long-term, negligible, adverse, and localized impacts to wildlife as a result of the actions in Alternative B. Short-term impacts are primarily the result of temporary displacement during construction activities. Long-term impacts arise from the permanent exclusion of wildlife species such as desert bighorn sheep from the fenced area.

The level of impact on wildlife would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.3.5 Threatened & Endangered Species, Candidate Species, and Species of Special Concern

Impacts Analysis

Fenceline

Removal of the existing fence and construction of a new fenceline encompassing the entire watershed would correct the altered surface runoff and deposition of gravel into the pool caused by the existing fence. The new fenceline would allow substrate composition on the shallow upper shelf, the principle spawning area for pupfish to receive the natural sediment deposition necessary to maintain critical habitat for these species.

The riffle beetle and Amargosa snail would benefit from correcting surface runoff similar to the pupfish. Other special status species occurring in the project area are not expected to be affected by construction activities in Alternative B aside from those impacts previously described in the wildlife section above.

Visitors Platform, Access, & Interpretation

Removal of the fencing and gate beneath the platform and installation of a handrail along the trail and on the platform would have no negative impacts on T&E and special status species beyond those described in the wildlife section above. The current location along the southeastern cliffside would continue to block the same amount of sunlight: about 15 minutes a day near the autumnal equinox (September), outside the pupfish spawning season (Weiss, 2005b). The railings that surround the platform and the access trail would not cause additional shadows over the hole.

Access Stairway

Construction of an access stairway would cause vibration while drilling into rock for the support anchors. Although this vibration would be minimized, there would still be some disturbance due to the proximity of pupfish to the cliff face. Construction activities would not take place during spawning periods, which typically occur between February and May. There would be no additional effect on T&E and special status species beyond those described in the wildlife section above.

Monitoring Platform & Equipment

Installation of the platform (e.g., drilling holes for wall anchors) would potentially elicit stress responses by the pupfish (which would be difficult to quantify). Additionally, given the fragility of the fish population, any rock or stone that is released directly into the pool during construction could result in direct mortality of pupfish. Construction activities would not take place during spawning periods, which typically occur between February and May.

This platform would only be lowered and used temporarily during monitoring activities, thus would not be expected to have any impacts on primary productivity caused by shading of the pool.

Other special status species occurring in the project area are not expected to be affected by the monitoring platform aside from those impacts previously described in the wildlife section above.

Security System

The existing security system provides inadequate protection from the possibility that vandals could harm critical habitat for the pupfish or that visitors could inadvertently impact the habitat. The new system would have beneficial effects by providing greater protection to critical habitat and the pupfish population at Devils Hole. Installation of the new security system would have no additional impacts on special status species beyond those described in the wildlife section above.

Communications Infrastructure

No impacts to T&E species and special status species are expected from the use of cellular transmission at this site as no additional infrastructure will be installed.

Power Supply

Installation of the new security system would have no additional impacts on T&E and special status species beyond those described in the wildlife section above.

Site revegetation

No impacts to T&E and special status species are expected from site revegetation activities beyond those described in the wildlife section above.

Cumulative Impacts

Special status species in the project area are subject to disturbance and damage from natural processes, visitor access, monitoring activities, road maintenance, traffic, and declining water levels in Devils Hole. There would be continued adverse effects on wildlife from vehicles using the roadway, visitation, and monitoring of conditions in the cavern. Vehicles passing along the road, visitors to Devils Hole, and monitoring activities cause short- term, local disturbance or displacement to terrestrial wildlife.

Declining water levels resulting from groundwater pumping in the late 1960's and early 1970's dramatically lowered water levels in Devils Hole. Water levels recovered once ground water pumping ceased, but since the late 1980's water levels have again steadily declined. Continued Devils Hole pupfish survival is reliant on the structure of its habitat, of which the critical characteristic is the availability of shallow water on the upper shelf where pupfish spawn and where the bulk of the primary productivity that supports the aquatic community occurs.

On September 11, 2004 eighty pupfish, one third of the population, were accidentally killed in an incident when traps used to monitor the fish were washed into Devils Hole by a flash flood.

A number of water related projects that could impact future habitat conditions (i.e., water levels) for the Devils Hole pupfish are in the planning process (described in Section 4.1).

- The Southern Nevada Water Authority (SNWA) has proposed to develop approximately 8,000 acre-feet of ground water per year from an area north and northwest of Las Vegas. There is no definitive timeline when this currently dormant project may be re-activated.
- The State of Nevada is considering a water rights petition heard in September 2007 involving changes in points of diversion for irrigation pumping in the Amargosa Valley. If those change applications are granted, Devils Hole water levels could be affected.
- The Las Vegas metro and the Amargosa Desert are considered desirable areas for further development, and many projects are proposed for which the State of Nevada could issue water rights. The Park Service has the right to challenge any award of water rights that it can demonstrate would threaten the federal reserved water right for Devils Hole.
- The Desert National Wildlife Refuge Complex is preparing a Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) that includes four refuges: Desert, Ash Meadows, Pahranagat and Moapa. The CCP/EIS describes the resources, public use, goals, objectives, and strategies for Ash Meadows and for the other refuges. It also identifies potential environmental effects of potential actions under consideration. The CCP may have future beneficial or adverse effects on water levels in Devils Hole depending on management decisions made.

Increased travel on area roads could increase concentrations of airborne particulate matter, decreasing solar energy available to fuel primary production in Devils Hole (Wilson and Blinn 2007).

In addition, the likelihood of increases in global temperature that have been predicted over the next century could increase the water temperature of the pool (IPCC, 2008). Any increase in water temperature could adversely impact the pupfish, given the evidence that the pupfish may already be existing at the upper edge of the temperature range for sustainable spawning and recruitment (Shrode and Gerkin, 1997).

There would be long-term, major, direct and indirect adverse cumulative impacts on T&E species from past, present, and foreseeable future actions. Alternative B would contribute moderate beneficial cumulative impacts on T&E species.

Conclusion

There would be long-term, moderate, direct and indirect beneficial impacts and short-term direct negligible or minor adverse impacts to the Devils Hole pupfish as a result of the actions under Alternative B. Adverse impacts would result from installation of structures at or near the hole. The existing fence has been identified as contributing to habitat alterations that would jeopardize the continued existence of these species by adversely modifying the habitat features on which it depends. Under this alternative, the fence will be removed and replaced with one that would

almost fully restore natural sediment flow and renewal of critical habitat on the upper shelf. Additionally, security upgrades would reduce the possibility of habitat damage from vandalism. However, the actions under this alternative do not address or negate the long-term adverse impacts resulting from declining water levels in Devils Hole.

The level of impact on special status species would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park.

4.2.3.6 Visitor Experience

Impacts Analysis

Fenceline

Visitor access to the Hole will be limited or prohibited during most, if not all, of the construction period. The Park will use a variety of communications tools to notify potential visitors of construction. Because the visitors platform will only be accessible during Park-supervised tours, it will not be fenced; it will be surrounded by handrails that continue from the access trail.

The Twinbar fence has a different look than the old cyclone fence it will be replacing; it communicates a more forceful security presence, which some visitors may find off-putting. The Park will attempt to soften this feature by choosing a color that integrates with the desert landscape. On the other hand, the lack of interior fencing around the visitors platform may make it an inviting target for vandals. For many visitors the presence of visually daunting Twinbar fencing may reinforce the feeling that Devils Hole is a site in need of, and worthy of, strong protection. But it is certainly possible that visitors will respond negatively to the more forceful presence of the Twinbar.

Visitors Platform, Access, & Interpretation

The existing visitors platform will be used for supervised tours of up to 12 visitors at a time, which can be arranged from the Visitors Center. Tours would be available for a few hours several days a week. Enhanced interpretive panels will also provide greater detail and context on the status and ecology of the overall site, and the pupfish itself. In addition, the Park will create a display at the Visitors Center with multiple video monitors displaying onsite video. The cameras will also feed a web site devoted to Devils Hole interpretation. In addition, the display would likely also include a video of a Tribal elder talking about the importance of Devils Hole/Ash Meadows. Taken together, these features should benefit the overall visitor experience by enabling close-in (remote) viewing of the cavepool itself and reinforcing the cultural significance of the site. It is possible, however, that limiting access to supervised tours will annoy some visitors, especially those who may have visited the site before. This reaction should be addressed by creating material for the interpretive displays that directly addresses the fragility of the ecosystem and the pupfish.

The new access trail to the visitors platform will be convenient and easy to traverse.

The Park anticipates a minor increase in onsite visitors, at most, from these changes to interpretation. The main benefit will come in the form of increased awareness of those who see the exhibits at the Visitors Centers.

Access

The new handrails down the slope will have no direct impact on the visitors experience, as they should be barely visible, if at all. But to the limited extent that it is visible from outside the fence or atop the Visitors Platform, it will further communicate to the visitor the importance of monitoring, and the seriousness with which the Park and the Refuge consider the recovery mission for the pupfish.

Monitoring Platform & Equipment

The monitoring platform will have no direct impact on the visitors experience. It will most likely not be visible to visitors, even from the visitors platform. Again, to the limited extent that it may be visible from atop the Visitors Platform, it will further communicate to the visitor the importance of monitoring, and the seriousness with which the Park and the Refuge consider the recovery mission for the pupfish.

Security System

The security improvements—increased detection capability, stronger fencing, improved communications—will have a negligible impact on the visitor experience, the only possible impact being the visibility of the increased camera presence. Again, this serves to reinforce the importance of protecting the site. The cameras located in the crevasse serve a security function (detecting any disturbance within the crevasse) as well as enhancing the visitor experience by allowing remote views from the display in the Visitor Center, or to those with Internet access.

Communications Infrastructure

The continuing use of cell phone transmission will have no impact on the visitor experience. The cellular transmission tower is already in place, and will not be moved.

Power Supply

Enhancing the solar array to meet the increased power requirements of the new security system and cameras will have a no impact on the visitor experience. The array will be located in an appropriate location to avoid interfering with visitors enjoyment of the site.

Site revegetation

Site revegetation will improve the health of the ecosystem and the visual appeal of the site. A healthier ecosystem will ultimately enhance the visitor experience, by improving the sustainability of the pupfish habitat and aiding its recovery.

Cumulative Impacts

Any action taken by governments or private actors that threatens the habitat or survival of the pupfish could have a corresponding cumulative impact on the visitor experience. It is technically true, however, that because actually seeing the fish itself from the platform is such a rare part of the overall Devils Hole experience, any actions that harmed but did not eliminate the fish would by themselves not change the experience. In the extreme, only actions that resulted in the extinction of the species would impact the visitor experience, by removing the justification for the interpretive and security infrastructure in the first place. The Devils Hole pupfish lives a precarious existence as a species, and the Park believes it can successfully enforce its federal water rights against actions that would endanger it by lowering the water level in the Hole below the mandated level. But if such projects went ahead and ultimately led to loss of the fish population, the Park could well decide that the site need no longer be maintained and there would likely be no visitor experience.

Some of the projects being planned by the Refuge could impact Devils Hole. The interpretive kiosk tentatively planned for south of the Hole would enhance visitor education, providing positive benefit. If any transportation projects served to significantly increase traffic along Devils Hole Road, that could increase visitors to a point where additional parking facilities might be needed. The visitor survey planned by USFWS could be used to make improvements elsewhere on the Refuge--at the Visitor Center, for example-- that could ultimately benefit the visitors to Devils Hole. Other specific projects are insufficiently mature to analyze potential impacts, but given the mission to protect natural resources within the Refuge, it is unlikely that any projects that could cause cumulative impacts to the pupfish would move forward without sufficient mitigation.

Conclusion

Overall impacts to the visitor experience from the implementation of Alternative B can be expected to be beneficial, moderate, and long-term. While some visitors might experience the new, stronger Twinbar fence as visually incongruent with the openness of the landscape (a minor adverse impact) and be disappointed that access is limited to supervised tours, the actual experience of the site itself will be enhanced by the conduct of the tours, as well as by improved interpretive material and improved trail access. The offsite interpretive exhibits at the Refuge Visitors Center, the Death Valley National Park's Furnace Creek Visitor Center, and the interpretive web site, both featuring full-motion video from inside the crevasse, will further enhance the overall visitor experience. The additional security provided by the security infrastructure will improve the sustainability of the visitor experience over time.

4.2.3.7 Park Operations

Impacts Analysis

Fenceline

The replacement of the compromised cyclone fence with the combination of heavier gauge chain link fence around most of the perimeter and Twinbar fencing around gated access area will have a beneficial short- and long-term impact on site security. Twinbar fencing is more difficult to cut, and its angled top will make it more difficult to scale. An all-Twinbar fence would provide more security protection than the combination of chain link with Twinbar, but every possible security solution is a tradeoff between cost—in this case, of circling the entire watershed in Twinbar fencing--and the value of the enhanced natural drainage enabled by the wider fenceline. The Park feels the improved fence could still play an important role in the overall strategy of deterring malicious entry into the site.

The fence would have no direct impact on the safety of staff in conducting monitoring operations at the site. To the extent that improvements in site security further reduce the danger that the area around the cliff would become unstable and further endanger staff access, this could produce a beneficial indirect impact.

Visitors Platform, Access, & Interpretation

Alternative B retains the existing visitors platform but limits access to supervised tours. This alternative also combines improved off-site interpretation at the Refuge Visitors Center and the Death Valley National Park's Furnace Creek Visitor Center (using webcam video) to enhance the overall visitor experience. To the extent that this denial of unsupervised access is perceived negatively by visitors (as "taking something away"), it could spark some negative response; the extreme manifestation of this could be a higher risk of vandalism at the site overall by visitors seeking retaliation or "lashing out." This would not be likely to result in significantly more incidents, but it could put a minor amount of added pressure on the security system.

The visitors platform and interpretive changes would have no impact on researcher safety.

Access

Installation of handrails down the descent into Devils Hole should not have any affect on site security. Access to the hole is not so much easier as to tempt vandals significantly, as might be the case for the ships ladder in Alternative A.

The handrails along the descent and at the bottom would have a major beneficial impact on the safety of researchers accessing the Hole. While the current modes of access are not unsafe per se, the presence of a handrails along the ladder path will reduce the risk of injury, speed the descent, and make it feasible for a single researcher to conduct certain monitoring activities alone. The handrail at the base will also reduce the risk of injury.

Monitoring Platform & Equipment

The installation of a permanent monitoring platform would have no impact on the security of the site. It would, however, have a beneficial impact on the safety and convenience of monitoring activities. Researchers would no longer have to transport their makeshift platform down the descent, removing a substantial safety risk. The fixed platform would also enable a single researcher to conduct monitoring activities by singly operating the fold-down platform mechanism. Introducing a mechanical device such as this platform into the situation, as with any engineered device, does introduce the possibility of mechanical malfunction or failure, which could leave researchers with no platform on any given day. In such a situation, researchers could re-deploy the current platform as a back-up.

Moving the existing still well to the back of the Devils Hole cave will increase the safety and convenience of monitoring activities for researchers, who will no longer be physically obstructed by its presence at its existing location. The monitoring functions of the well will be retained.

Security System

The security system in Alternative B features full-motion video cameras, video recording and transmission capability, improved motion sensors, and wider communications bandwidth. These features will combine to provide improved deterrence, detection and response capabilities, and aid in criminal prosecution of violators. These are all beneficial, long-term impacts on site security.

The system will include compositing software that enables video images from multiple cameras to be displayed on a single monitoring screen. This would provide fully functional remote monitoring capabilities, thereby enhancing the speed and appropriateness of first response. Also, because the improved system will reduce the incidence of false alarms, it will be more worthwhile for Rangers to respond to first-alarms. Rangers would also be able to view and record video from the site, thereby making their actions more responsive to the actual situation, and providing evidence in the case of criminal prosecution.

The enhanced security system would have no direct impact on researcher safety. But to the extent that improvements in site security further reduce the danger that the area around the cliff would become unstable due to degradation from vandals and further endanger staff access, this could produce a beneficial indirect impact.

Communications Infrastructure

The cell phone infrastructure would not be substantially upgraded or changed in Alternative B, although its capability to transmit still images would be utilized, thus providing some security benefits by enabling Rangers to see alternating site images.

Utilizing the same cellular infrastructure as now would have no impact on researcher safety.

Power Supply

The additional power required for the upgrades in cameras and monitors would not itself produce direct impacts on site security or researcher safety. The solar array would be installed in a place and manner which did not interfere with research activities by, for example, shading the Hole and thereby limiting the sunlight needed for the pupfish and their habitat to thrive.

Site revegetation

Site revegetation activities will not impact site security or researcher safety.

Cumulative Impacts

The potential water projects in the cumulative scenario will not contribute to cumulative impacts from Alternative B to site security or researcher safety, and thus Park operations. Being so distant from the site, any of those projects, if implemented, would not impinge on the site area directly, and so would not compromise or enhance the security infrastructure of the site. Their remoteness from the site would also preclude any impact on researcher safety.

The Refuge planning activities are also not likely to contribute to cumulative impacts of this project on Park operations, with one possible exception: if either the transportation projects or visitors services projects bring significantly increased traffic to (or past) the site, then this could put increased pressure on the security system, simply by increasing the probability of malicious attempts.

Conclusion

Impacts to site security from Alternative B will be beneficial, major, and long term, thereby having a positive impact on the efficiency and effectiveness of Ranger enforcement. The improvements to the fence, the camera system, transmission of video, and the motion detection will provide deterrence benefits as well as enhanced detection and increased response efficiency. The visitors experience will be improved by the addition of supervised tours and the use of offsite video displays at the Visitors Centers, although the elimination of unsupervised access to the visitors platform could be viewed negatively by Park and Refuge visitors.

Impacts to the safety of scientific research activities from Alternative B will be beneficial, major, and long term, thereby having a positive impact on Park operations. The installation of handrails will make descent into the site more steady, and enable a single researcher to conduct monitoring activities while being fully equipped. The installation of the mechanical fold-down monitoring platform will also enable a single researcher to conduct monitoring, and provide convenience and consistency to the placement of the monitoring platform over the shelf.

4.2.3.8 Cultural Resources

Impacts Analysis

As discussed in Section 3.8, the two primary tangible resource conditions that sustain the cultural use and significance of Devils Hole for the affected tribes are site access and the water level in the cavepool itself. In addition, equipment additions into the Hole impact the intangible spiritual energy of the site. The impact analysis will focus on cultural resource implications of effects on these conditions.

Fenceline

As described in Section 4.2.3.2, the installation of the fenceline under Alternative B is not expected to cause sediment, fuels, or oils to be deposited into Devils Hole because the majority of the fenceline is sufficiently remote from the Hole, and potential contaminants are not likely to be substantial enough to travel far within a given aquifer. No changes in groundwater level are expected to result from the fenceline installation. In addition, BMPs will be utilized throughout construction to minimize sediment or potential fuel leaks or spills from migrating throughout the construction site. For these reasons, fenceline installation would have negligible adverse impact on the contribution that the water level provides to cultural significance.

Once installed, the new fenceline will encompass a larger land area than the existing fence and will allow for an improvement in surface drainage and infiltration rates. The improved natural drainage is likely to help maintain groundwater quality, nutrient levels and temperature. These are beneficial impacts to the cultural resource value of Devils Hole.

The new fenceline closes off visitor access to a previously accessible area south and west of the platform. Because the Park has not been given any specific site use locations by the tribes, the Park is not aware of whether denying access to this particular portion of the site will affect the cultural use of the site by affected tribes. However, the Timbisha Shoshone have indicated that they would prefer to decrease public visitation at Devils Hole, which could be accomplished by limiting visitor access to the site.

Similarly to Alternative A, the use of double-angled Twinbar fencing along certain portions of the fenceline could be perceived by the tribes as causing a major adverse impact on the cultural integrity of the site, because it adds to the perceived intensity of human intrusion on the site. Its presence as a more visible imposing and defensive structure could detract from, and perhaps overwhelm, the actual beneficial effect of protecting the site's natural resources from further intrusion and degradation. The Twinbar fenceline clearly limits access to the site; that is its purpose. The Park believes the larger risk to the integrity of Devils Hole habitat values requires such a measure, and would work with affected tribes to minimize the visual impact of the enclosed trail to the extent possible

Visitors Platform, Access Trail & Interpretation

Alternative B involves allowing visitor access inside the fenceline and to the platform only during supervised tours, and constructing a simple railing along the north side of the trail from the entrance gate to the visitors platform.

The impacts on water resources of removing the fencegate below the visitors platform and constructing the railed access trail in the Hole are described in Section 4.2.3.2. Throughout this process, BMPs would be implemented in order to limit sediment movement and any accidental fuel spills from equipment to the maximum extent possible, at both the platform and trail construction sites. Once installed, trail is not likely to impact groundwater. By limiting unsupervised access to the interior areas of the site, these facilities will protect both Devils Hole and its surrounding groundwater from detrimental impacts. So these activities will ultimately benefit the cultural value of the site by benefiting the sustainability of the water resource.

Limiting visitor traffic to supervised tours would have both beneficial and adverse impacts on the access condition of the site. Such limited access enhances the perception of the unique and fragile nature of the site and could lead to more respect for the Park's protection mandate, which supports the tribal goal of protection and minimizing disturbance. However, if the access limitations preclude or restrict the tribes' own access to its ceremonial sites, this would be perceived as a major adverse impact for the affected tribes. Without knowledge of the specific locations used by the tribes for ceremonial purposes, the Park cannot know whether this will occur.

The improvements to overall visitor education and interpretation from creating video-based display at the Visitors Centers will have minor beneficial impact on the cultural value of the site, assuming they can successfully enhance awareness of the special and fragile nature of the site without creating such high increases in actual visitation traffic that site resources, including current roads, are degraded. As mentioned in Section 4.2.3.6, the Park does not expect a major increase in onsite visitation.

Access Ladder

As described in Section 4.2.3.2, the risk of groundwater contamination from the installation of a permanent handrail down the cliffside is low. Once the handrail is constructed and installed, no impacts to groundwater can be expected. Thus, the cultural value associated with sustaining the water resource will not be adversely impacted by enhancing the safety of monitoring activities.

Access to culturally important areas of the site will not be affected by constructing a permanent handrail down into the hole.

Monitoring Platform & Equipment

As described in Section 4.2.3.2, construction work along the vertical cliff along the eastern wall of Devils Hole raises the risks of sediment, rocks loosened during drilling, fuels, and oils to get into the Hole and travel further into area aquifers. These actions could lead to temporary

changes in nearby groundwater quality and temperature that would most likely dissipate once construction ends. BMPs will be applied to help mitigate against the potential contamination from sediment movement. Once installed, the monitoring platform is not expected to impact groundwater quality or movement. Further, safer and permanent access to research locations would likely prevent the erosion caused by the movement of temporary platforms in and out of the vicinity. Thus, while the risks of adverse impacts to the water are greater than in Alternative A, the cultural value associated with sustaining the water resource will ultimately be benefited by enhancing the safety and convenience of monitoring activities.

Access to culturally important areas of the site will not be affected by constructing and deploying a segmented removable monitoring platform for use in the Hole.

Security System

As described in Section 4.2.3.2, the minor ground disturbances required to install the security systems under Alternative B, including trenching additional cables and mounting cameras, are not expected to impact groundwater level, quality, movement or temperature. Cable or camera installations would not be expected to be deep enough to reach or impact groundwater. Security system operations would also not impact groundwater directly; to the extent that security improvements deter breaches of the fenceline, which can lead to disturbance or erosion of sediments into the Hole, groundwater features could be enhanced. Thus, the cultural value associated with sustaining the water resource will be benefited by enhancing the intrusion detection and security capabilities at the site.

Access to culturally important areas of the site will not be affected by upgrading the security components that protect the area.

Communications Infrastructure

No additional communications hardware or software will be installed under Alternative B. Thus, the cultural value associated with sustaining the water resource would not be impacted by continuing to use cellular communications infrastructure at the site.

Power Supply

Construction equipment and the installation of the roughly 200 square feet of photovoltaic cells are likely to result in minor ground disturbances, which are not expected to reach or impact groundwater. Cable installation would not be expected to be deep enough to reach or impact groundwater. Operations would not impact groundwater quality or movement. Thus, the cultural value associated with sustaining the water resource will be benefited by installing sufficient power to match the security needs of the site.

The installation of a solar array and ancillary equipment at the site could contribute to the perception of increased human disturbance of the site, which could lead to perceptions of adverse impact by affected tribes. The Park will attempt to locate the array to cause minimum visual disruption to the appearance of the site, while still optimizing power performance.

Site revegetation

Site revegetation will take place in the area south of the platform that would be newly fenced off from human traffic. As described in Section 4.2.3.2, site revegetation techniques in Alternative B are not likely to have more than a negligible though beneficial impact on groundwater within the vicinity of Devils Hole. These activities would help restore natural drainage and infiltration rates which could benefit groundwater. Thus, the cultural value associated with sustaining the water resource will be benefited by revegetation at the site.

Revegetation will have no impact on access issues at the site.

Cumulative Impacts

As described in Section 4.2.3.2, since the implementation of Alternative B would have only short-term adverse impacts on groundwater but long-term beneficial impacts to the overall hydrology of the region by allowing more natural drainage, no changes to groundwater levels within Devils Hole are expected to result from the implementation of Alternative B. Because of this, Alternative B is unlikely to contribute to the cumulative water effects described above, and therefore, the cultural value associated with sustaining the water resource would not suffer cumulative cultural resource impacts.

Conclusion

As described in Section 4.2.3.2, overall impacts to water from the implementation of Alternative B can be expected to be partly adverse and minor in the short-term and beneficial and minor in the long-term, and covering a medium-sized area around the project site. The watershed fenceline will encompass a larger land area than the existing fence, allowing for an improvement in surface drainage and infiltration rates. The improved natural drainage is likely to help maintain groundwater quality, nutrient levels and temperature.

The cumulative effects on groundwater from other past, present, and reasonably foreseeable projects, in conjunction with Alternative B, could be expected to be adverse, moderate, long-term, and project area-wide, but virtually none of these impacts would be attributable to Alternative B itself. Thus, the overall impact of Alternative B on the cultural value of a sustainable water resource would be minor, beneficial, and long-term.

The improvements to interpretation are not expected to cause major increases in visitation to the site, but they will have minor beneficial impact on the overall cultural values by increasing public awareness of the unique and fragile nature of the site and the importance of its preservation.

The impact on access to Devils Hole is impossible to analyze specifically without further knowledge of affected tribes' actual use of particular areas of the site. The new fenceline closes relatively easy access to roughly 1/3 of an acre of the site, south and west of the visitors platform.

Several of the project components could increase the perceptions by the affected tribes of too much human interference with the simple power and beauty of the site, an intangible but real resource condition which form a part of its cultural value. The Park acknowledges that these impacts could be perceived by the tribes to be major, but believes its proposed actions are necessary to preserve the other resource values on which cultural significance ultimately depends. The Park will work to minimize these impacts to the extent feasible.

The level of impact on cultural resources would not result in impairment of park resources that fulfill the specific purposes identified in the enabling legislation or that are essential to the natural or cultural integrity of the park. The Timbisha Shoshone have indicated that they prefer Alternative A over Alternative B.

5.0 CONSULTATION AND COORDINATION

5.1 PUBLIC INVOLVEMENT

The purpose of the scoping process, as outlined in CEQ's regulations for implementing NEPA (40 CFR 1501.7), is to determine the scope of issues to be addressed in the EA and to identify significant issues relating to the Proposed Action. The lead agency is required to invite input from Federal, State, and local agencies, affected Native American tribes, project proponents, and other interested parties (Section 1501.7 (a)(1)). To satisfy scoping requirements for this project, scoping letters were mailed out requesting public and agency input on issues to be addressed in the EA.

The public scoping period for the project began on November 26, 2007 and ended on December 26, 2007. Several comments were received from the public during this period. The NPS has undertaken consultations with State and Federal agencies. These consultation letters are presented in Appendices C & D.

5.2 CONSULTATION

Section 7 of the Endangered Species Act requires that federal agencies, in consultation with the U. S. Fish & Wildlife Service, insure that its actions do not "jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat". In a letter dated April 16, 2009 (Appendix B), the NPS consulted with the U.S. Fish and Wildlife Service, and sought concurrence that the Proposed Action would not adversely affect listed or candidate species or proposed or designated critical habitat. In a letter dated May 18, 2009, USFWS provided its concurrence that "the proposed project is not likely to adversely affect the Devils Hole pupfish" (Appendix B). The project area lies within designated critical habitat of the Devils Hole pupfish, however, the primary purpose of the project is to improve protection of the pupfish and its habitat. Two candidate species, Devils Hole riffle beetle (*Stenelmis calida*) and Armagosa tyronia snail (*Tryonia variegata*) (U.S. Fish and Wildlife Service 1990) also occur in the project area. Protection for these species is likely to be improved as a result of this project as well.

The Nevada Legislature, Nevada Administrative Code Chapter 503 (Nevada Legislature 2008) was reviewed for a list of Nevada state protected species that may occur within the project area. The Nevada Department of Wildlife administers state protected species programs. One state-listed species, Townsend's big-eared bat (*Corynorhinus townsendii*) was identified as potentially occurring within the project area.

The National Historic Preservation Act of 1966 (NHPA) states that "the historical and cultural foundations of the Nation should be preserved as a living part of our community life and development in order to give a sense of orientation to the American people." The Act requires federal agencies to establish programs for evaluating and nominating properties to the National Register of Historic Places and to consider the effects of their undertakings on listed or eligible properties. Section 106 of the NHPA mandates that federal agencies take into account the effects

of their actions on properties listed or eligible for listing in the National Register and give the Advisory Council on Historic Preservation a reasonable opportunity to comment. While it does not require the preservation of such properties, it does require that their historic or prehistoric values be considered in weighing the benefits and costs of federal undertakings to determine what is in the public interest. This evaluation takes place through a process of consultation with affected tribes and the State Historic Preservation Officer ("Section 106 consultation").

Pursuant to federal regulations detailed in 36 CFR 800.8, the Park is planning to coordinate its compliance with NEPA (through this Environmental Assessment) with its Section 106 consultations with the Timbisha Shoshone and Pahrump Paiute tribes. This coordination has or will involve the following steps (36 CFR 800.8) by the Park:

1) Establishing that the proposed action is an undertaking that has the potential to cause effects on NRHP-eligible properties
2) Establishing the parties to be consulted and their roles, possibly including tribes, Tribal Historic Preservation Officers, and State Historic Preservation Officers
3) Ensuring that the preparation of the EA includes appropriate scoping, identification of historic properties, assessment of effects, and consultation leading to resolution of any adverse effects
4) Submitting the EA to the interested consulting parties prior to or when making the document available for public comment
5) Provide procedures for resolving objections by consulting parties to the proposed action, including avoidance, minimization, or mitigation of adverse effects, if any are identified

As such, the environmental findings described in this EA will be used in Section 106 consultations to document the types and severity of impacts to the Traditional cultural property values of Devils Hole.

Appendix B contains the correspondence documenting the consultation with appropriate interested parties.

5.3 PREPARERS AND CONTRIBUTORS

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

Mike Bower, Fish Biologist
Terry Fisk, Hydrologist
Vicki Wolfe, Park Ranger-Interpretation
Ed Forner, Assistant Chief, Resource and Visitor Protection Division
Ed Derobertis, Law Enforcement Ranger
Michele Slaton, Botanist
Linda Manning, Wildlife Biologist
Linda Greene, Chief, Resources Management Division
Daren Fairbanks, Information Technology Specialist
Gerry Wolfe, Safety Officer

David Ek, Assistant Chief, Resources Management Division
John Elks, Buildings and Utilities Supervisor
Leah Bonstead, Archeologist

U.S. Fish & Wildlife Service

Christina Nalen, Visitor Services
Sharon McElvey, Refuge Manager

El Dorado Engineering

Ralph Hayes, President
Nate Glick, P.E.
Morgan Frampton, P.E.

Mangi Environmental Group, Inc.

Jim Mangi, President
Bruce Kaplan, Senior Environmental Professional, Project Manager
Kezia Procita, Environmental Analyst
Karla Hillstrom, GIS Specialist
Mark Blevins, GIS Specialist
Ian Martin, Wildlife Biologist
Priscilla Randall, Registered Landscape Architect

5.4 DISTRIBUTION LIST FOR ENVIRONMENTAL ASSESSMENT

Cooperators and Interested Parties

Last Name	First Name	Title	Office	Agency/ Affiliation	Email Address
All Employees			Death Valley National Park	National Park Service	DEVA All Employees
Arnold	Richard	Tribal Chair		Pahrump Piaute Tribe	rwarnold@hotmail.com
Back	Jennifer		Water Rights Branch	National Park Service	Jennifer_Back@nps.gov
Bair	Janet	Assistant Field Supervisor	Southern Nevada Fish and Wildlife Office	U.S. Fish and Wildlife Service	Janet_Bair@fws.gov
Baldino	Cristi	Wildlife Biologist	Ash Meadows National Wildlife Refuge	U.S. Fish and Wildlife Service	Cristi_Baldino@fws.gov
Barrett	Paul	Recovery Coordinator		U.S. Fish and Wildlife Service	Paul_Barrett@fws.gov
Blacker	David	Executive Director		Death Valley Natural History Association	deathvalleynha@earthlink.net
Deacon	James	Professor Emeritus		University of Nevada, Las Vegas	deaconj@unlv.nevada.edu
Durham	Barbara	THPO		Timbisha Shoshone Tribe	dvdurbarbara@netscape.com

Last Name	First Name	Title	Office	Agency/ Affiliation	Email Address
Fuhrmann	Kelly				Kelly_Fuhrmann@nps.gov
Haskins	Rich	Deputy Director		Nevada Department of Wildlife	rhaskins@ndow.org
Hillyard	Stanley	Professor		University of Nevada, Las Vegas	hillyard@unlv.edu
Lamfrom	David	Field Representative		National Parks Conservation Association	dlamfrom@npca.org
McKelvey	Sharon	Refuge Manager	Ash Meadows National Wildlife Refuge	U.S. Fish and Wildlife Service	Sharon_McKelvey@fws.gov
Parker	Michael	Assistant Professor		Southern Oregon University	parker@sou.edu
Pister	Phil	Executive Secretary		Desert Fishes Council	secretary@desertfishes.org
Scoppettone	Gary			U.S. Geological Survey	Gary_Scoppettone@usgs.gov
Sjoberg	Jon	Supervising Biologist		Nevada Department of Wildlife	sjoberg@ndow.org
Tripp-Massie	Tami	Executive Director		Amargosa Conservancy	info@amargosaconservancy.org
Williams	Bob	Field Supervisor	Nevada Fish and Wildlife Office	U.S. Fish and Wildlife Service	Bob_Williams@fws.gov
Wullschleger	John	Fisheries Program Leader		National Park Service	John_Wullschleger@nps.gov

Media Notifications

Organization	Email Address
Pahrump Valley Times	msmith@pvtimes.com
Pahrump Valley Times	dmcmurdo@pvtimes.com,
Las Vegas television	newsdesk@klastv.com,
Las Vegas television	ktnvnewsdesk@ktnv.com,
Las Vegas television	5newsdesk@kvvu.com,
Las Vegas television	news3@kvbc.com,
Channel 41 Pahrump NV	mikewood41@yahoo.co.uk,
Fox TV - LA	figueroa@fox11la.com,
Las Vegas Review Journal	rogers@reviewjournal.com,
Las Vegas Review Journal	hbrean@reviewjournal.com,
Las Vegas Review Journal	poconnell@reviewjournal.com,
Las Vegas Review Journal	APlanas@reviewjournal.com,
Las Vegas Review Journal	fcurreri@reviewjournal.com,
Las Vegas Review Journal	fgeary@reviewjournal.com,
Las Vegas Review Journal	bhaynes@reviewjournal.com,
Las Vegas Sun	jean@lasvegassun.com,
Las Vegas Sun	manning@lasvegassun.com,
Las Vegas Sun	slovic@lasvegassun.com,

Organization	Email Address
Las Vegas Sun	haney@lasvegassun.com,
Las Vegas Sun	metroeditors@lasvegassun.com,
Las Vegas newspaper	corr@thespectrum.com,
LA Times	julie.cart@latimes.com,
LA Times	elizabeth.shogren@latimes.com,
LA Times	chris.reynolds@latimes.com,
LA Times	louis.sahagun@latimes.com,
LA Times	bettina.boxall@latimes.com,
Las Vegas radio	lasvegas_news@metronetworks.com,
Nevada Magazine	jhollister@nevadamagazine.com,
Nevada Magazine	editor@nevadamagazine.com,
Nevada Magazine	ann@nevadamagazine.com,
Inyo Register/Pahrump Valley Times report.	rkflinchum@earthlink.net,
Death Valley Chamber of Commerce	deathvalleych@earthlink.net,
Owen's Valley newspaper	twoods@sierrawave.net,

Library Distribution

Pahrump Community Library
701 East St.
Pahrump, Nevada 89048

Amargosa Valley Library
829 E. Farm Road
HCR 69 Box 401-T
Amargosa Valley, Nevada 89020

Bishop Branch Library
210 Academy Avenue
Bishop, California 93514

Lone Pine Branch Library
Washington & Bush Streets
Lone Pine, California 93545

Ridgecrest Branch Library
131 East Las Flores Avenue
Ridgecrest, California 93555

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7.0 GLOSSARY

Affected Environment – The existing physical, cultural or socioeconomic environment to be affected by a proposed action and alternatives.

Alluvial – Sediment transported and deposited by flowing water.

Aquifer – A formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to yield significant quantities of water to wells and springs.

Alternative – A reasonable way to fix the identified problem or satisfy the stated need (40 CFR 1500.2).

Ambient – The natural surroundings of a location.

Ambient Air – Any unconfined portion of the atmosphere: open air, surrounding air.

Anthropogenic – Man-made.

Archaeological Resources – Any material remains or physical evidence of past human life or activities, which are of archaeological interest, including the record of the effects of human activities on the environment that is at least 100 years old. Archaeological resources are capable of revealing scientific or humanistic information through archaeological research (NPS DO #28, *Cultural Resources Management Guideline*, 1998).

Artifacts – An object produced by human craft of archaeological or historical interest, including binnacles, compasses, engine order telegraphs, name boards, and builders plates.

Attainment Area – An area designated to have air quality as good as or better than the NAAQS as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a nonattainment area for others.

Best Management Practices (BMP) – Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.

Carbonate rocks – A class of sedimentary rocks composed primarily of carbonate minerals. The two major types are limestone and dolomite, composed of calcite ($CaCO_3$) and the mineral dolomite ($CaMg(CO_3)_2$) respectively.

Cave pool – A small, isolated body of water (usually freshwater) in a chamber beneath the earth.

Compaction – To make soil dense by mechanical manipulation.

Conductivity – The power or quality of transmitting.

Crevasse – a deep fissure, such as that which forms the surface opening to Devils Hole

Critical Habitat – A specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery.

Cultural Landscape – A geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person exhibiting other cultural or aesthetic values. There are four kinds of cultural landscapes, not mutually exclusive: historic site, historic designated landscape, historic vernacular landscape, and ethnographic landscape (NPS DO #28, *Cultural Resources Management Guideline*, 1998).

Cultural Resources – An aspect of a cultural system that is valued by or significantly representative of a culture or that contains significant information about a culture. A cultural resource may be a tangible entity or a cultural practice. Tangible cultural resources are categorized as districts, sites, buildings, structures, and objects for the National Register of Historic Places and as archaeological resources, cultural landscapes, structures, museum objects, and ethnographic resources for National Park Service management purposes (NPS DO #28, *Cultural Resources Management Guideline*, 1998). Types of cultural resources include: historic properties as defined in the National Historic Preservation Act; cultural items as defined in the Native American Graves Protection and Repatriation Act; archeological resources as defined in the Archeological Resources Protection Act; sacred sites as defined in Executive Order 13007, *Protection and Accommodation of Access To "Indian Sacred Sites,"* to which access is provided under the American Indian Religious Freedom Act; and collections.

Cumulative Impacts (or Effects) – Impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (Federal or non-Federal) or person undertakes such other actions; effects resulting from individually minor, but collectively significant, actions taking place over a period of time.

Designated Wilderness Area – An area designated by the United States Congress to be managed as part of the National Wilderness Preservation System.

Dissolved Oxygen (DO) – Amount of free oxygen found in water; most commonly-used measurement of water quality.

Diversity – The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

Disturbance – Significant alteration of habitat structure or composition, may be natural (e.g., fire) or human-caused events (e.g., aircraft overflight).

Drawdown – The vertical distance the water surface elevation of a well, reservoir, etc. is lowered due to the removal of free water.

Environmental Assessment (EA) – A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

Ecosystem – A dynamic and interrelating complex of plant and animal communities and their associated non-living environment.

Endemic – A species, disease, etc. that is only found within a specific geographic region.

Environmental Impact Statement (EIS) – A detailed written statement required by Section 102(2) (C) of the National Environmental Policy Act, analyzing the environmental impacts of a Proposed Action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.11).

Endangered Species – A species that is threatened with extinction throughout all or a significant portion of its range.

Environmental Justice – The confluence of social and environmental movements, which deals with the inequitable environmental burden born by groups such as racial minorities, women, or residents of developing nations.

Ethnographic Resources – Any site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it.

Executive Order (EO) – An official proclamation issued by the President that may set forth policy or direction or establish specific duties in connection with the execution of federal laws and programs.

Exotic – A species not historically present in an area; also known as non-native species.

Extirpation – The elimination of a species or subspecies from a particular area, but not from its entire range.

Forage – (v) search for food or (n) grasses, small shrubs and other plant material that can be used as food sources for grazing animals and livestock.

Geographic Information System (GIS) – A computer system designed to allow users to collect, manage, and analyze large volumes of spatially referenced information and associated attribute data.

Global Positioning System (GPS) – A series of satellites and receivers used to calculate positions on the Earth's surface.

Groundwater – The supply of fresh water found underground, usually in aquifers, which supply wells and springs.

Habitat – Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.

Habitat Restoration – Management emphasis designed to move ecosystems to desired conditions and processes, and/or to healthy ecosystems.

Hazardous Waste/Materials – Any unusable material as defined by applicable law that is liquid, solid or gaseous, which if improperly stored, treated, transported, disposed or otherwise managed, may pose a substantial present or potential hazard to human health or the environment due to its quantity, concentration, physical characteristic, or chemical characteristic. Unlabeled containers are assumed to be hazardous waste until proven to be otherwise.

Historic Structure – A constructed work, usually immovable by nature or design, consciously created to serve some human activity (NPS DO #28, *Cultural Resources Management Guideline*, 1998).

Invasive Species – An alien species (nonnative to the ecosystem) whose introduction does or is likely to cause economic or environmental harm or harm to human health.

Karst – A three-dimensional landscape shaped by the dissolution of a soluble layer or layers of bedrock, typically resulting in the development of caves and cave systems.

Lacustrine – Of or pertaining to a lake.

Migration – The seasonal movement from one area to another and back.

Monitoring – The process of collecting information to track changes of selected parameters over time.

Minority – Individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; African American, not of Hispanic origin; or Hispanic.

Minority Population – Identified where either the affected area's minority population exceeds 50 percent or the affected area's minority population percentage is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

Mitigation – Methods or actions taken to improve site conditions by limiting, reducing or controlling adverse impacts to the environment.

Museum Collections – Assemblage of objects, works of art, historic documents, and/or natural history specimens collected according to a rational scheme and maintained so they can be preserved, studied, and interpreted for public benefit. Museum collections normally are kept in park museums, although they may also be maintained in archaeological and historic preservation centers (NPS DO #28, *Cultural Resources Management Guideline*, 1998).

National Ambient Air Quality Standards (NAAQS) – Standards established by the Environmental Protection Agency (EPA) that apply for outdoor air throughout the country. Primary standards are designed to protect human health, with an adequate margin of safety, including sensitive populations such as children, the elderly, and individuals suffering from respiratory disease. The NAAQS represent maximum air pollutant standards that the EPA set under the Clean Air Act for attainment by each state.

National Register of Historic Places (National Register) – A register of districts, sites, buildings, structures, and objects important in American history, architecture, archaeology, and culture, maintained by the Secretary of the Interior under authority of Section 2(b) of the Historic Sites Act of 1935 and Section 101(a)(1) of the National Historic Preservation Act of 1966, as amended.

National Environmental Policy Act (NEPA) – Requires all agencies, including National Park Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements, and prepare appropriate NEPA documents to facilitate better environmental decision making (40 CFR 1500).

Native – A species that historically occurs in an area or one that was not introduced (brought) from another area.

Nonattainment area – An area that does not meet one or more of the NAAQS for the criteria pollutants designated in the Clean Air Act.

Palustrine – Relating to a system of inland, non-tidal wetlands characterized by the presence of trees, shrubs, and emergent vegetation (vegetation that is rooted below water but grows above the surface).

Permeability – Formations that transmit fluids readily, such as sandstones, are described as permeable and tend to have many large, well-connected pores.

pH – A numerical indicator of the acidity or alkalinity of a substance; ranges from 0.0 (acidic) to 14.0 (basic or alkaline); pure water is neutral, with a pH of 7.0.

Photic zone – The water depth sufficiently exposed to sunlight for photosynthesis to occur

Porosity – a measure of the void spaces in a material.

Runoff – Non-infiltrating water entering a stream or other conveyance channel shortly after a rainfall.

Sediment – Any finely divided organic and/or mineral matter derived from rocks or biological sources that have been transported and deposited by water or air.

Sedimentation – The process of depositing sediment from suspension in water.

Seeding – The establishment of a temporary or permanent vegetative cover on disturbed areas by planting seed.

Silt Fence – A temporary barrier, consisting of a filter fabric stretched between supporting posts with the bottom entrenched in the soil, used to trap sediment.

Soil Erosion – The removal and loss of soil by the action of water, ice, gravity, or wind.

Solvent – A substance (generally liquid) that another substance dissolves into to make a solution.

State Historic Preservation Officer (SHPO) – The official within each state, authorized by the state at the request of the Secretary of the Interior, to act as a liaison for purposes of implementing the National Historic Preservation Act.

Stilling well – A monitoring device used for water level measurements at Devils Hole, in which a chamber is connected to the flow channel by a small inlet. Waves and surges in the main flow stream will not appear in the well due to the small-diameter inlet. The liquid surface in the well will be quiet, but will follow all of the steady fluctuations of the open channel. The liquid level in the well is measured to determine the flow in the main channel.

Stormwater – Water discharges generated by runoff from land and impervious areas such as paved streets, parking lots, and building rooftops during rainfall and snow events. Storm water often contains pollutants in quantities that could adversely affect water quality.

Stretch fault – A reverse fault developed as a result of shear in the middle limb of an overturned fold.

Structure (in terms of cultural resources) – A constructed work, usually immovable by nature or design, consciously created to serve some human activity (e.g., buildings, monuments, dams, roads, railroad tracks, canals, millraces, bridges, tunnels, locomotives, forts and associated earthworks, Indian mounds, ruins, fences, and outdoor sculpture). In the National Register program, "structure" is limited to functional constructions other than buildings (NPS DO #28, *Cultural Resources Management Guideline*, 1998).

Take – In the context of the Endangered Species Act, to"take" is to harass, hunt, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal (MMPA), or to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any listed species (ESA).

Threatened Species – A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Topsoil – The topmost layer of soil, usually containing organic matter.

Traditional Cultural Property – Property affiliated with traditional religious and cultural importance to a Native American Tribe or Native Hawaiian group. These properties are eligible for the National Register of Historic Places.

Turbidity – Measure of the extent to which light passing through water is reduced due to suspended matter. The turbidity is caused by the content and shape of the suspended materials.

Wetlands – Areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil, including swamps, marshes, bogs, and other similar areas.

APPENDIX A: PROJECT COMPONENT DESIGNS

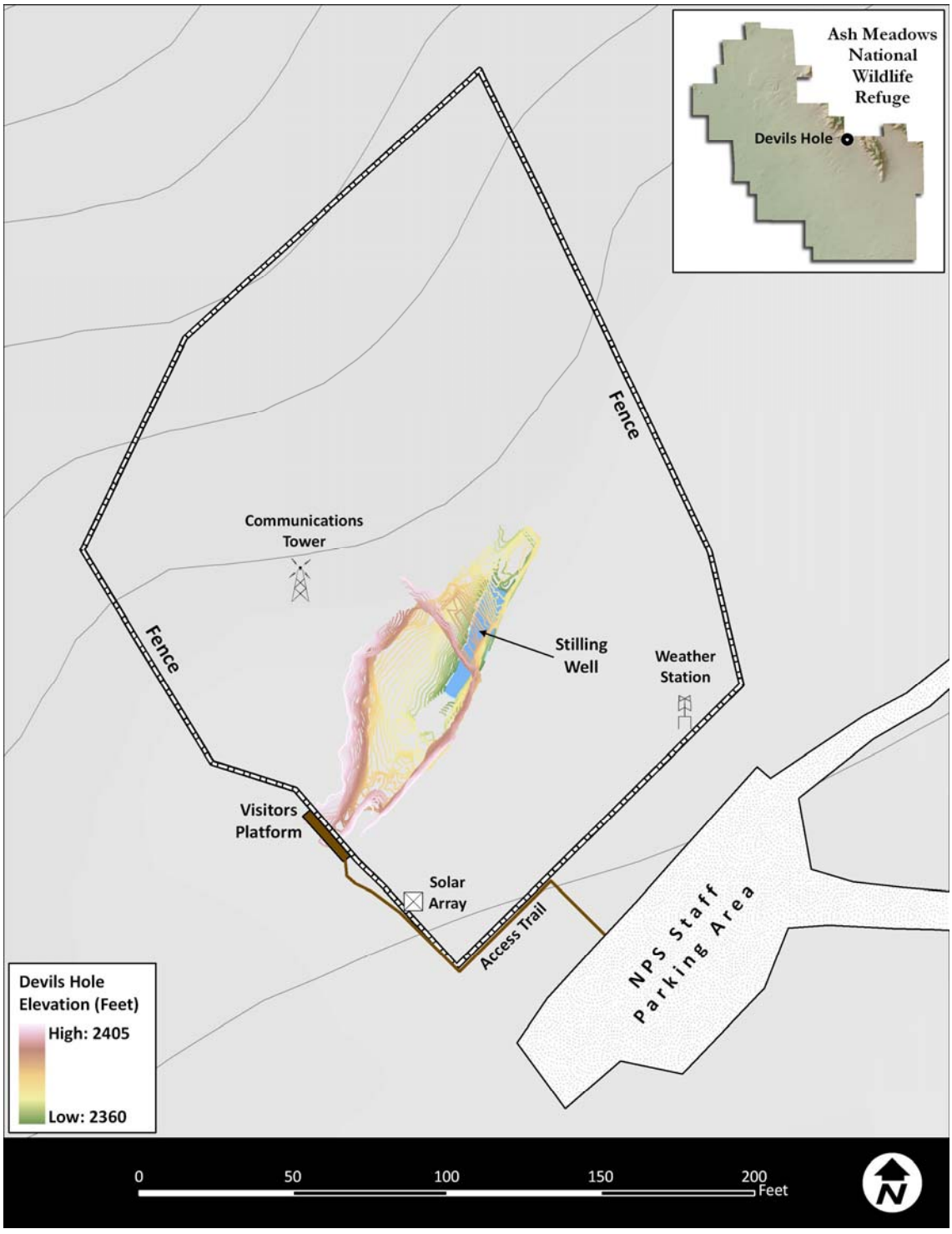

Figure A-1. No Action Alternative (existing site layout)

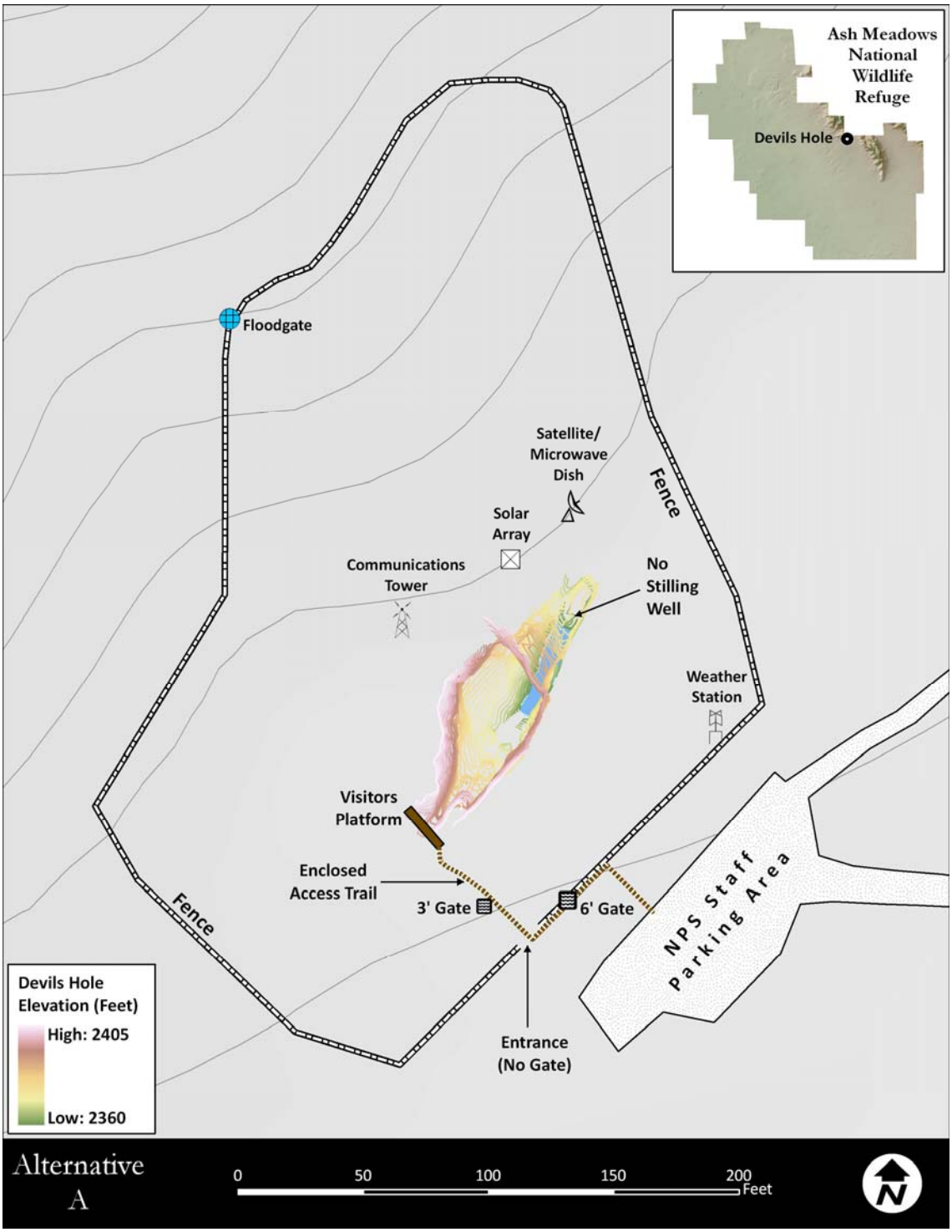

Figure A-2. Alternative A (Preferred Alternative)—Site Schematic

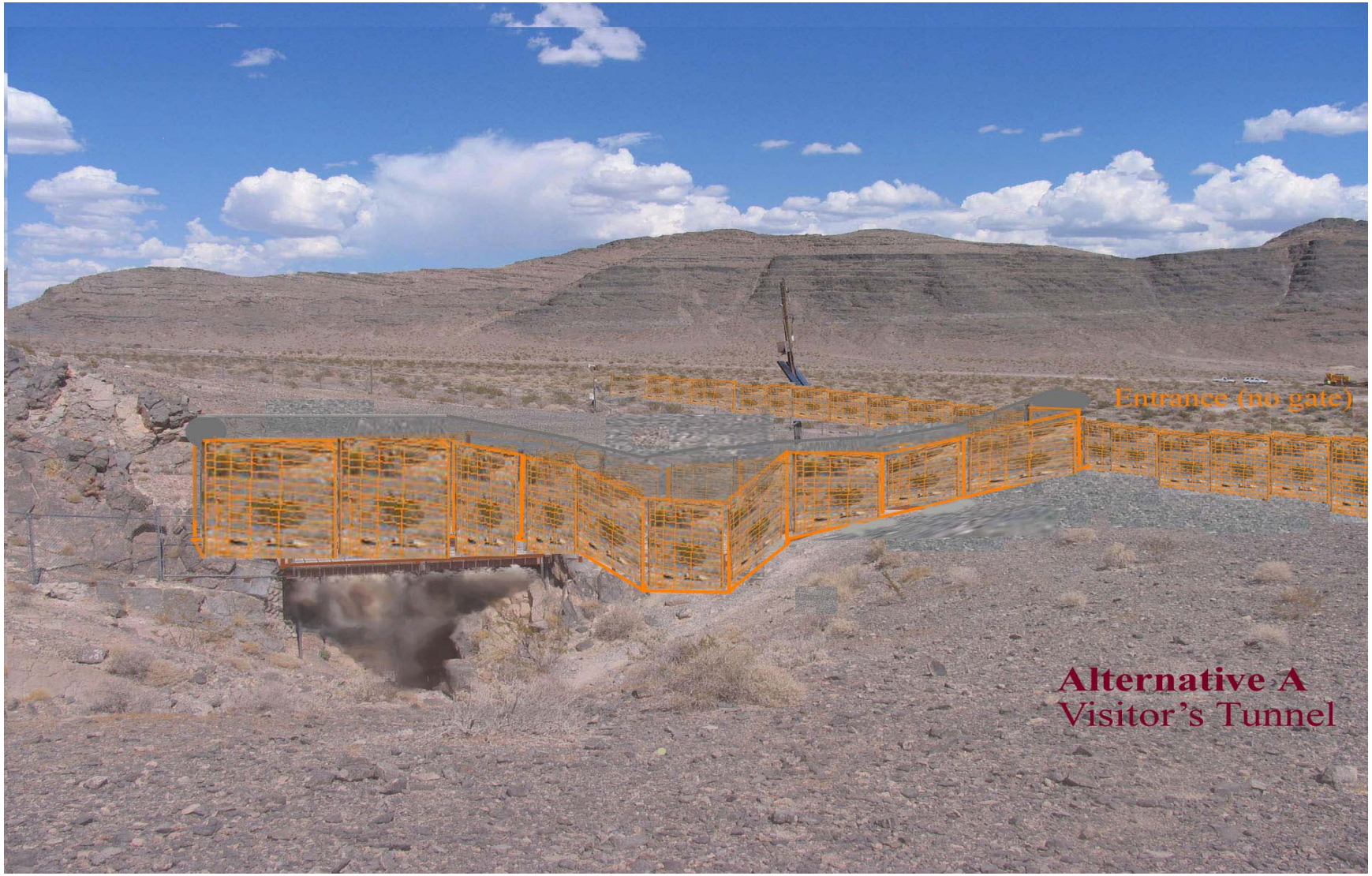

Figure A-3. Alternative A—Fencing, Visitors Tunnel and Platform

Figure A-4. Alternative A—Ships Ladder

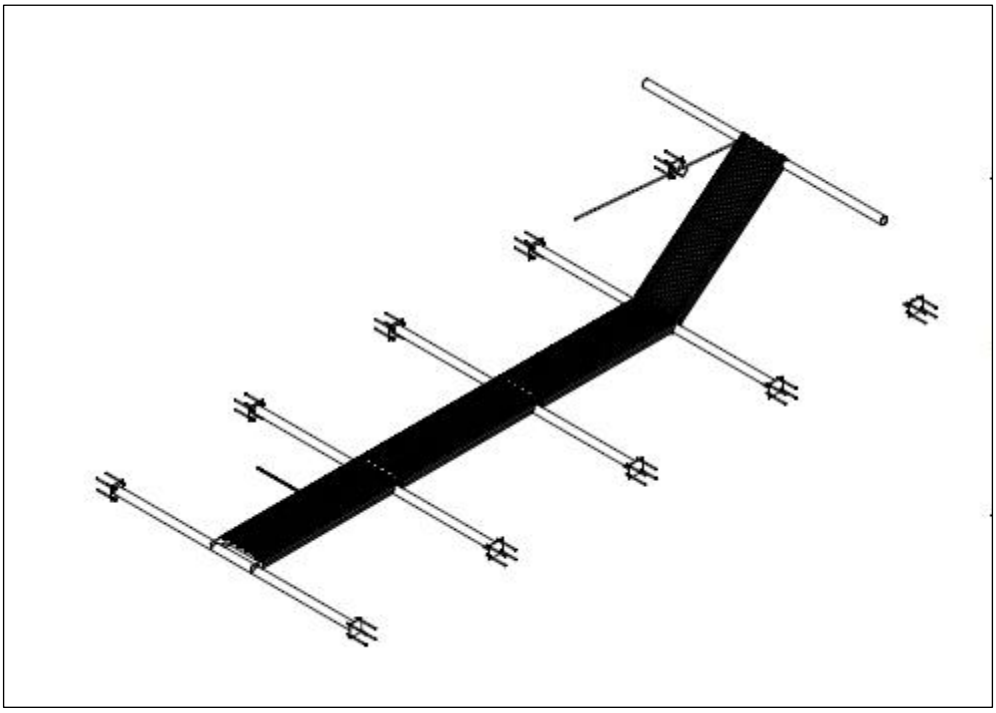

Figure A-5: Platform Assembly—Alternative A

Figure A-6: Individual platform section, 5 ft long, 40 lbs

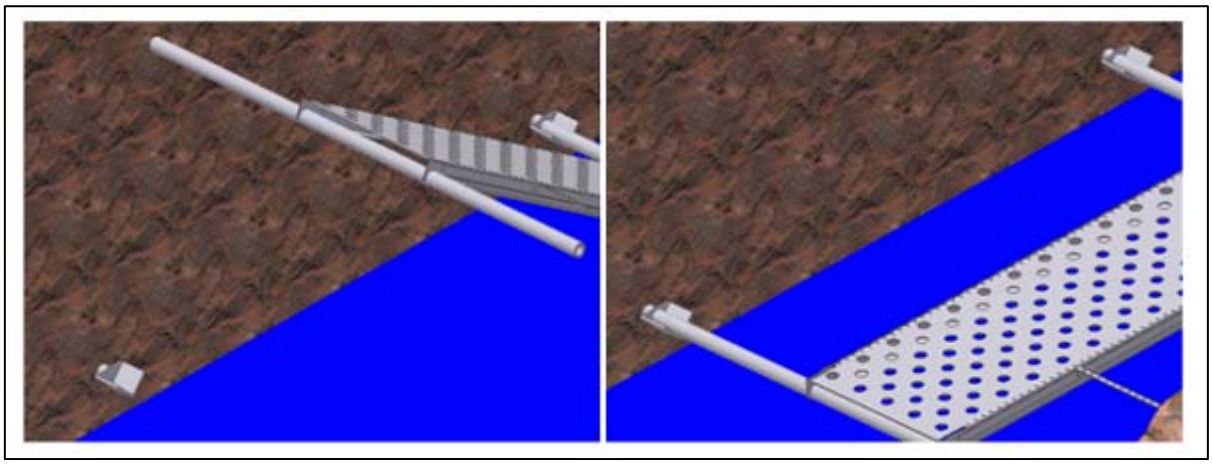

Figure A-7: East wall anchors, (left) the platform section being deployed and (right) the deployed platform—Alternative A

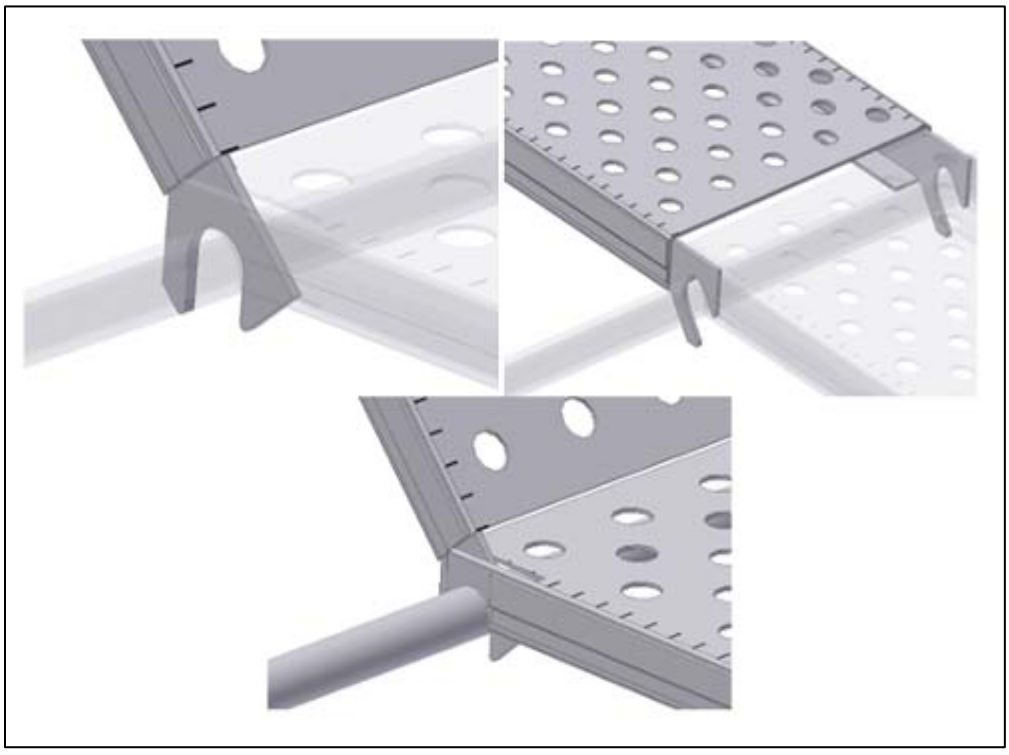

Figure A-8: Connection of platform—Alternative A

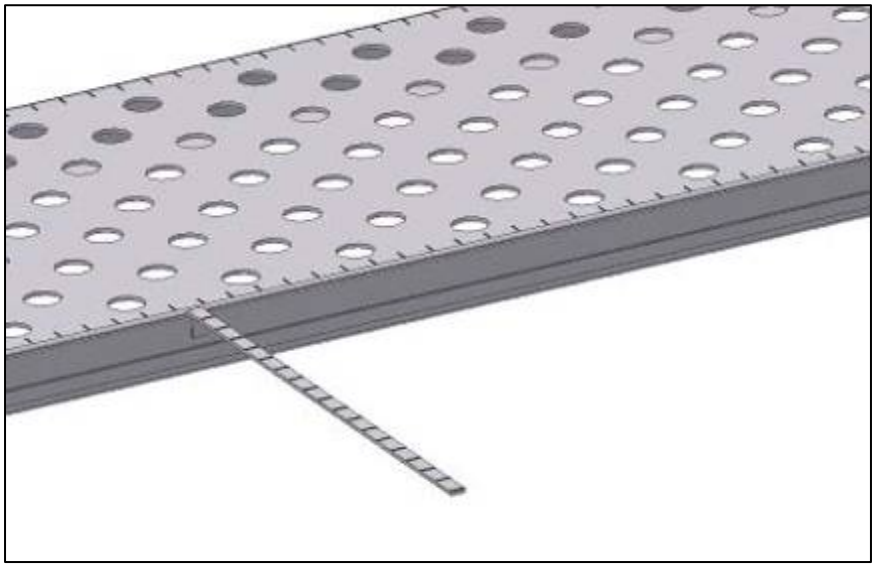

Figure A-9: Location of measuring rods—Alternative A

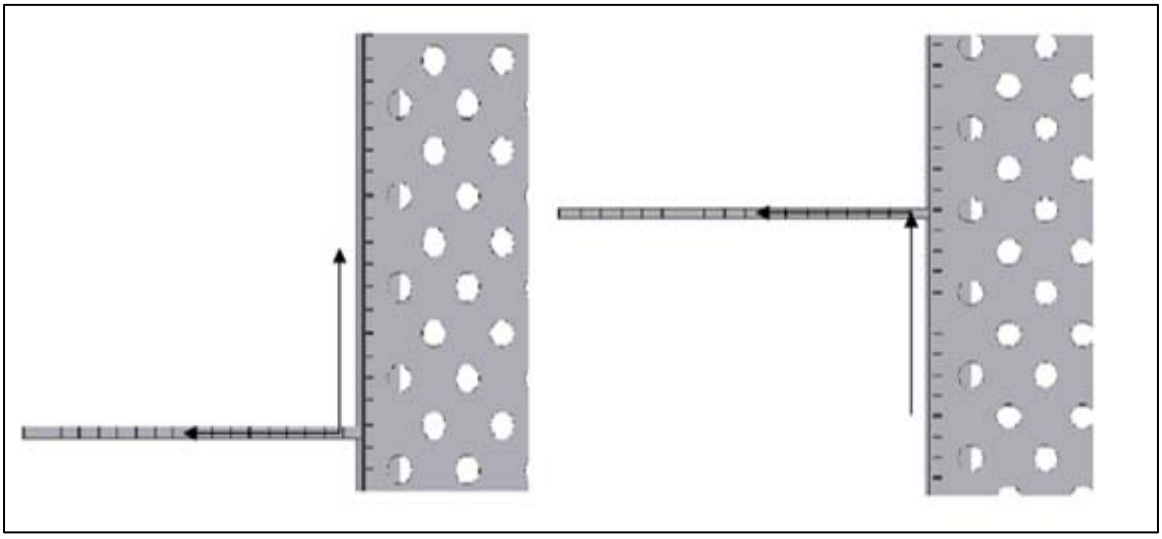

Figure A-10: Diagram showing the built-in measuring system—Alternative A

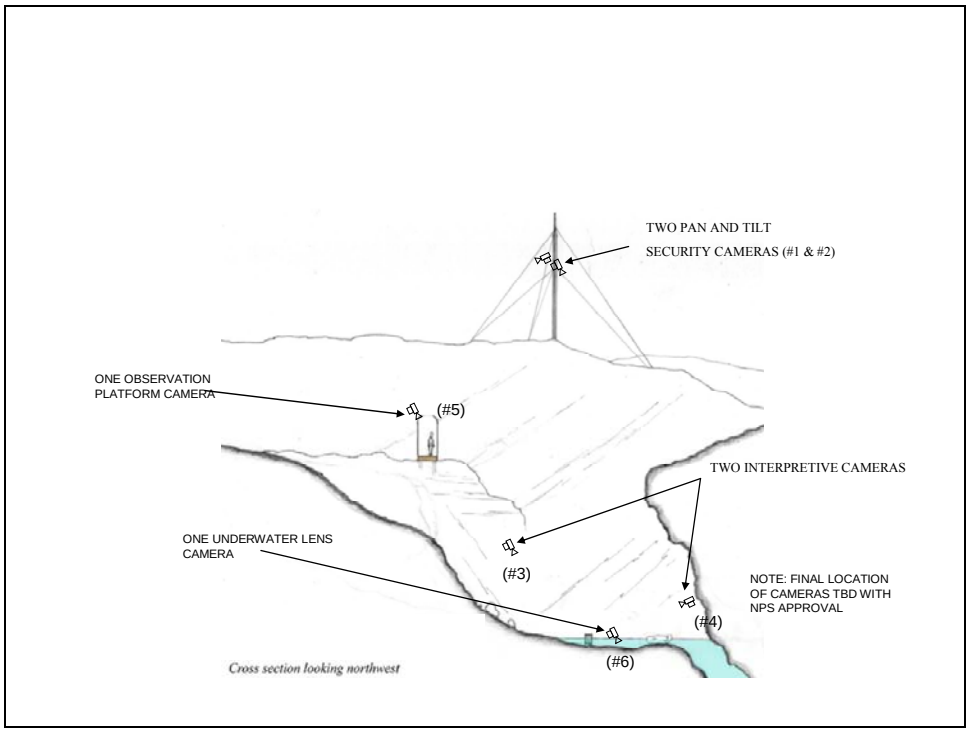

Figure A-11. Camera Configuration—Alternative A

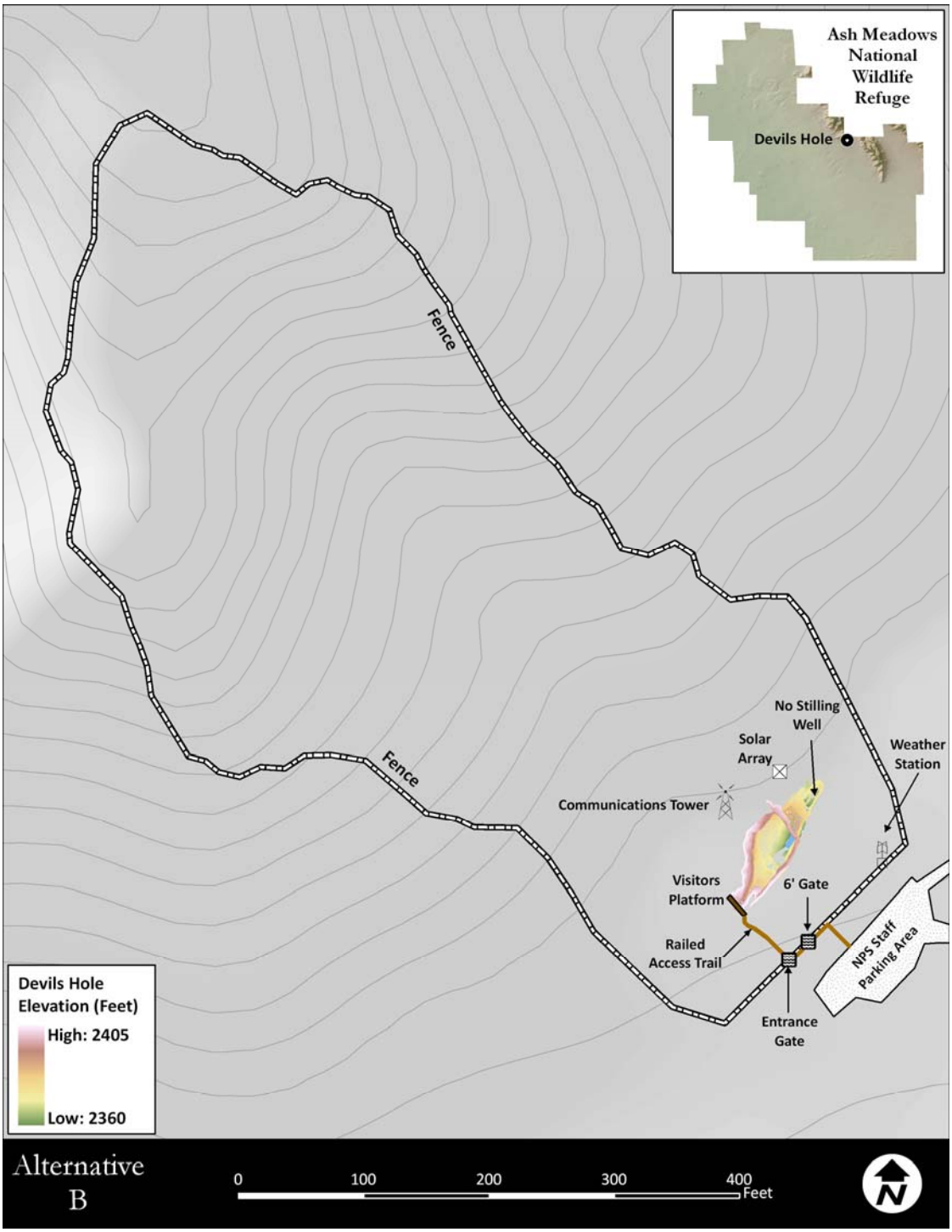

Figure A-12. Alternative B—Site schematic

Figure A-13. Alternative B—Fencing, gate, and Access path to Visitors Platform

Figure A-14. Alternative B—Existing ladder with added handrail

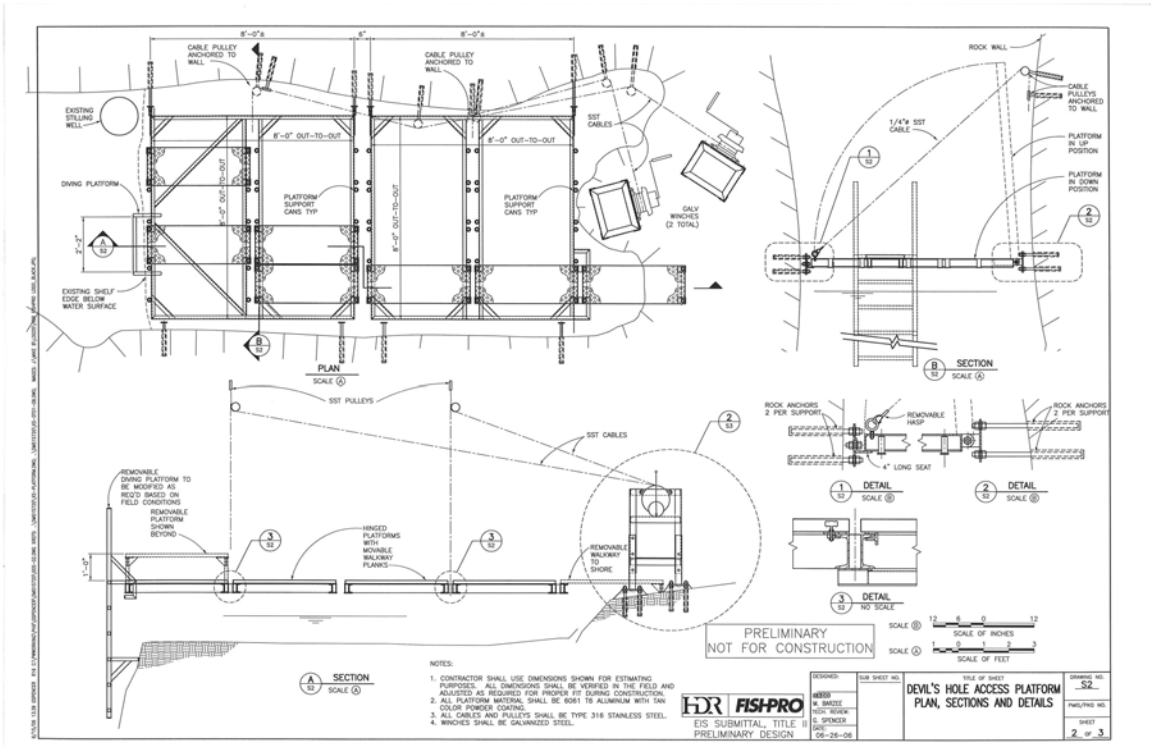

Figure A-15: Hinged monitoring platform, bolted to the east wall—Alternative B

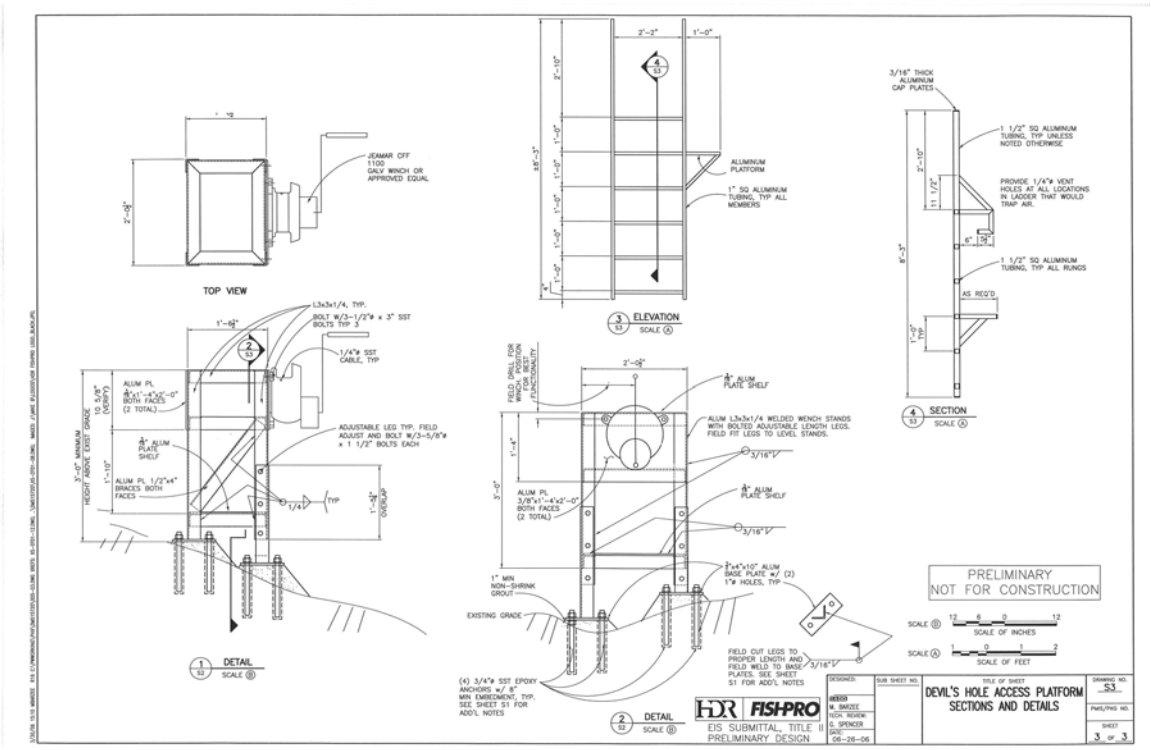

Figure A-16: Hinged monitoring platform, bolted to east wall—Sectional views—Alternative B

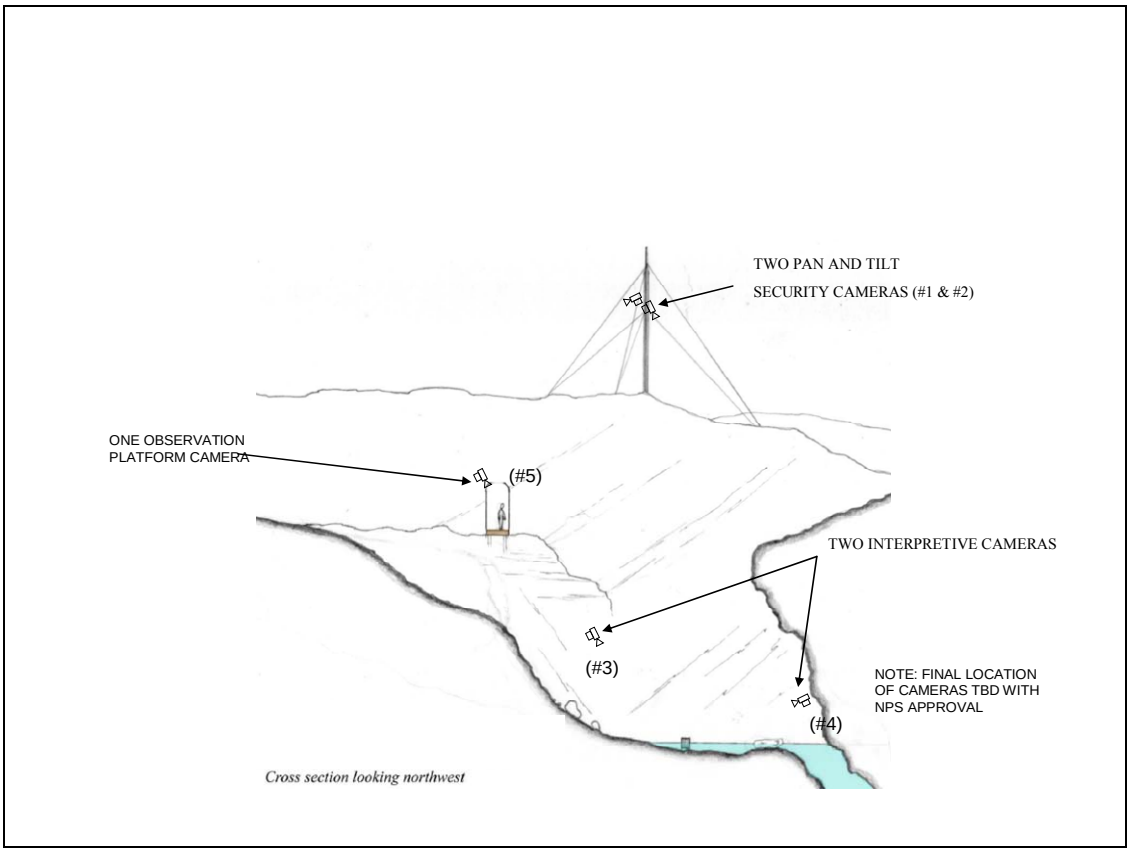

Figure A-17. Camera Locations—Alternative B

APPENDIX B: AGENCY CONSULTATIONS

United States Department of the Interior

NATIONAL PARK SERVICE
Death Valley National Park
PO Box 579
Death Valley, California 92328

IN REPLY REFER TO:
N1423 (8136)

April 16, 2009

Janet Bair, Assistant Field Supervisor
U.S. Fish and Wildlife Service
Southern Nevada Field Office
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130

Dear Ms. Bair:

The National Park Service proposes to implement a comprehensive site plan for Devils Hole, Nevada. The project, titled Devils Hole Site Plan, includes components related to site security, visitor access, interpretive treatments, staff/researcher access, monitoring equipment, site revegetation, and telecommunications infrastructure. Enclosed is a Biological Assessment (BA) to initiate informal consultation under Section 7(a)(2) of the Endangered Species Act (ESA).

As described in the enclosed BA, the proposed action will have no effect on the following ESA-listed species found in Ash Meadows: Ash Meadows blazing star, Amargosa niterwort, Ash Meadows milk-vetch, Ash Meadows sunray, spring-loving centaury, Ash Meadows gumplant, Ash Meadows ivesia, Ash Meadows naucorid, Warm Springs pupfish, Ash Meadows Amargosa pupfish, Ash Meadows speckled dace, desert tortoise, southwestern willow flycatcher, western yellow-billed cuckoo, and Yuma clapper rail.

The proposed action may affect, but is not likely to adversely affect, the following ESA-listed species: Devils Hole pupfish. There is no designated critical habitat in the project area. We request your concurrence with our 'not likely to adversely affect' determination, and hereby request informal consultation under Section 7 of the ESA.

Please contact Mike Bower of my staff at (775) 537-0787, ext 207 regarding this consultation request.

Sincerely yours,

Sarah Craighead
Superintendent

Enclosure

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130
Ph: (702) 515-5230 ~ Fax: (702) 515-5231

MAY 2 ? 2009

May 18, 2009
File No. 84320-2009-I-0285

Memorandum

To: Superintendent, Death Valley National Park, National Park Service, Death Valley, California

From: State Supervisor, Nevada Fish and Wildlife Office, Reno, Nevada

Subject: Informal Consultation for the Devils Hole Comprehensive Site Plan, Nye County, Nevada

On April 21, 2009, we received your letter and supporting information requesting initiation of informal consultation on the subject project. You have requested our concurrence with your determination that the proposed action *may affect, not likely to adversely affect* the Devils Hole pupfish, (*Cyprinodon diabolis*) a species listed as endangered in accordance with section 7(a)(2) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

The National Park Service proposes to implement a comprehensive site plan for Devils Hole, which includes components related to site security, visitor access, interpretive treatments, staff/researcher access, monitoring equipment, site revegetation, and telecommunications infrastructure.

The proposed action would have a relatively small footprint and replace existing facilities in Devils Hole located in southwestern Nye County, Nevada. The location where the proposed activities would occur and equipment would be placed has been disturbed in the past. Actions are proposed to minimize disturbance to Devils Hole pupfish when existing structures such as the ladder, viewing platforms, and stilling well are removed and when appropriate, replaced. Most existing security fencing would remain intact but portions on the south side would be moved to allow more natural flow of allochthonous material into Devils Hole during runoff events. It is unlikely that any of these construction actions will disturb Devils Hole pupfish if minimization measures identified in the biological assessment are followed. Based on this information and the project details provided by your agency, we concur with the determination that the proposed project is not likely to adversely affect the Devils Hole pupfish.

TAKE PRIDE IN AMERICA

Superintendent File No. 84320-2009-I-0285

This concludes informal consultation pursuant to the regulations implementing the Act, promulgated under 50 CFR § 402.13. This informal consultation does not authorize any take of any listed species. Project effects to listed species must be reanalyzed: (1) if new information reveals effects of the action that may affect listed or proposed species or designated or proposed critical habitat in a manner, or to an extent not considered in this consultation; (2) if the action is subsequently modified in a manner that causes an effect to a listed or proposed species, or designated or proposed critical habitat that was not considered in this consultation; and/or, (3) if a new species is listed or critical habitat is designated that may be affected by this project.

If you have any questions or comments regarding this response, please contact Paul Barrett in the Nevada Fish and Wildlife Office in Las Vegas at (702) 515-5230.

Robert D. Williams

cc:
Supervisory Biologist -Fisheries, Nevada Department of Wildlife, Las Vegas, Nevada

2

United States Department of the Interior
NATIONAL PARK SERVICE
Death Valley National Park
PO Box 579
Death Valley, California 92328

April 15, 2008

COPY

Cynthia Lynch
P.O. Box 25
Pahrump, NV 89041

Dear Cynthia,

Barbara Durham, the Timbisha Shoshone THPO suggested that I contact you, and I was provided your contact information by Richard Arnold. I am the new archeologist at Death Valley, and have been here a little over two months. I would like to meet with you in person or talk on the phone in the next few weeks (if possible) to discuss proposed work at Devils Hole. The NPS is in the process of developing a site plan for Devils Hole, and has contracted the report through Mangi Environmental Group. The proposed project as I understand it, calls for some minor modifications to the existing infrastructure at the site. No new buildings are proposed. Some of the scientific equipment in the hole will probably be replaced. The work is not expected to result in major changes to the site, or attract many new visitors.

I would like talk with you to find out if there are any concerns regarding this project, and if possible to learn more about the Paiute's relationship with the Devils Hole area. I surveyed about 30 acres at Devils Hole in February, and did not find any archeological sites in that area. However, I know that the area was used by the Paiute in the past (and present), and would like to make sure that any work that takes place at Devils Hole is discussed with you and any other people that you think should know about the project. I have already met with the Timbisha Shoshone regarding the project. I have contacted Richard Arnold, and am sending a letter like this one to your sister, Clarabelle.

I know that you are probably very busy, and I apologize for contacting you so late in the game. I would like to speak with you before May 1, as the environmental report is scheduled for publication in early May. I have scheduled to meet with Richard Arnold on April 25, 2008 at the Death Valley office in Pahrump. You are welcome to meet with us that day, or if there is another day that would work better for you, please let me know and I will make the arrangements.

You can contact me at the above address, or through e-mail at leah_bonstead@nps.gov, or on my office phone at (760) 786-3232.

Sincerely,

Leah M Bonstead

Leah Bonstead
Park Archeologist
Death Valley National Park

2008.04.15d Bonstead Letter

United States Department of the Interior
NATIONAL PARK SERVICE
Death Valley National Park
PO Box 579
Death Valley, California 92328

April 15, 2008

COPY

Clarabelle Jim
1481 Palm Ave #109
Las Vegas, NV 89104

Dear Clarabelle,

Barbara Durham, the Timbisha Shoshone THPO suggested that I contact you, and I was provided your contact information by Richard Arnold. I am the new archeologist at Death Valley, and have been here a little over two months. I would like to meet with you in person or talk on the phone in the next few weeks (if possible) to discuss proposed work at Devils Hole. The NPS is in the process of developing a site plan for Devils Hole, and has contracted the report through Mangi Environmental Group. The proposed project as I understand it, calls for some minor modifications to the existing infrastructure at the site. No new buildings are proposed. Some of the scientific equipment in the hole will probably be replaced. The work is not expected to result in major changes to the site, or attract many new visitors.

I would like talk with you to find out if there are any concerns regarding this project, and if possible to learn more about the Paiute's relationship with the Devils Hole area. I surveyed about 30 acres at Devils Hole in February, and did not find any archeological sites in that area. However, I know that the area was used by the Paiute in the past (and present), and would like to make sure that any work that takes place at Devils Hole is discussed with you and any other people that you think should know about the project. I have already met with the Timbisha Shoshone regarding the project. I have contacted Richard Arnold, and am sending a letter like this one to your sister, Cynthia.

I know that you are probably very busy, and I apologize for contacting you so late in the game. I would like to speak with you before May 1, as the environmental report is scheduled for publication in early May. I have scheduled to meet with Richard Arnold on April 25, 2008 at the Death Valley office in Pahrump. You are welcome to meet with us that day, or if there is another day that would work better for you, please let me know and I will make the arrangements. I am frequently in the Las Vegas area (usually on the weekends and some Mondays/Tuesdays), and if it would work better for you to meet there, that would be fine too.

You can contact me at the above address, or through e-mail at leah_bonstead@nps.gov, or on my office phone at (760) 786-3232.

Sincerely,

Leah M Bonstd

Leah Bonstead
Park Archeologist
Death Valley National Park

2008-04-15c Bunstead letter

Leah Bonstead/DEVA/NPS
04/14/2008 01:06 PM PDT

To rwarnold@hotmail.com
cc
bcc
Subject NPS Devils Hole Project

Hi Richard -
I received your name and contact information from Barbara Durham, the Timbisha Shoshone THPO. I am the new archeologist at Death Valley, and have been here a little over two months. I would like to meet with you in person or talk on the phone in the next few weeks (if possible) to discuss proposed work at Devils Hole. The NPS is in the process of developing a site plan for Devils Hole, and has contracted the report through Mangi Environmental Group. The NPS would like to find out if there are any concerns about this project going forward, and if possible to learn more about the Paiute's relationship with the Devils Hole area. The proposed project as I understand it, calls for some minor modifications to the existing infrastructure at the site. No new buildings are proposed. Some of the scientific equipment in the hole will probably be replaced. The work is not expected to result in major changes to the site, or attract many new visitors.

I surveyed about 30 acres at Devils Hole in February, and did not find any archeological sites in that area. However, I know that the area was used by the Paiute in the past (and present), and would like to make sure that any work that takes place at Devils Hole is discussed with you and any other people that you think should know about the project. Barbara mentioned that I should also talk with Cynthia Jim and Clarabelle Jim, and thought that you might have contact information for them. Barbara also said that you are very busy, and I am sorry that I am contacting you so late in the game. I would like to speak with you before May 1, as the environmental report is scheduled for publication in early May. I could drive to Pahrump for a meeting, if that works for you. I am available most days except for Monday, April 21, Wednesday April 23, and Monday April 28. Please let me know if there is a particular date that works for you. You can contact me through e-mail at leah_bonstead@nps.gov, or call my office phone at (760) 786-3232.

I am looking forward to hearing from you. Thanks! -Leah

Leah Bonstead
Park Archeologist
Death Valley National Park
Office Number: (760) 786-3232
----- Forwarded by Leah Bonstead/DEVA/NPS on 04/14/2008 12:43 PM -----

"Barbara Durham" <dvdurbarbara@netscape.com>
03/24/2008 01:22 PM MST
Please respond to <dvdurbarbara@netscape.com>

To <Leah_Bonstead@nps.gov>
cc
Subject Re: Devils Hole Project - Paiute Contacts?

Leah,

Their names are Cynthia Jim, Clarabelle Jim and Richard Arnold. I don't have a address for the two ladies but Richard Arnold can be reached at rwarnold@hotmail.com and he can probably make contact with Cynthia and Clarabelle.

Barbara Durham, THPO
Timbisha Shoshone Tribe

04/30/2009 14:17 17607862375 TIMBISHA SHOSHONE PAGE 02

30 April 2009

Joe Kennedy
Chairman

Pauline Esteves
Vice-Chair

Madeline Esteves
Secretary/Treasurer

Angie Boland
Council Member

Erick Mason
Council Member

Mike Bower
Fish Biologist
Death Valley National Park
1321 So. Highway 160, Suite 1
Pahrump, NV. 89048

Re: Comments on the Devils Hole Site Plan draft environmental Assessment

Dear Mr. Bower,

On behalf of the Timbisha Shoshone Tribe of Death Valley, California, I am submitting comments on the draft EA for the Devils Hole Site Plan.

The Timbisha people have inhabited and shared the Ash Meadows area with the southern Paiute people since time immemorial. The Ash Meadows area is within the Timbisha Shoshone's aboriginal territory. The Timbisha Shoshone Tribe have been consulting and advising the National Park Service and the Ash Meadows National Wildlife Refuge when necessary and we encourage this relationship and government-to-government consultation.

Protection of the many cultural sites in the area is most important. I would recommend that the Ash Meadows area be nominated as a Traditional Cultural Property or Traditional Cultural Landscape for further protection. It is our legacy and we need to protect the cultural, aesthetic, inspirational and educational values there. Life in the desert environment is harsh and the Timbisha Shoshone have a duty to protect its natural resources that is reflected in the Timbisha Shoshone cultural values and religion. A energy comes from the water sources, a force or spirit that can reside in water and it is our belief that as Timbisha people, it is our duty to protect and maintain it's purity. The spirits travel through a underground network of springs throughout our tribal ancestral homelands.

Death Valley Timbisha Shoshone Tribe
Post Office Box 206 • Death Valley California • 92328-0206 • PH: (760) 786-2374 • FAX: (760)786-2376

04/30/2009 14:31 17607862376 TIMBISHA SHOSHONE PAGE 03

It is our recommendation that the less damage (insertion of rods, or stabilizers for the monitoring platform in the water) is best for the pupfish.

In selecting the Alternatives presented by the National Park Service, we would prefer No Action. But that choice is not given so we will have to choose the lesser of the two and so Alternative A is our choice.

Should you have any questions, please contact me at (760) 786-2374.

Sincerely,

Barbara Durham

Barbara Durham, THPO
Timbisha Shoshone Tribe

United States Department of the Interior

NATIONAL PARK SERVICE
Death Valley National Park
PO Box 579
Death Valley, California 92328

IN REPLY REFER TO:
H4217 xL7617

March 27, 2009

Ronald M. James
State Historic Preservation Officer
State Historic Preservation Office
100 North Stewart Street
Carson City, Nevada 89701-4285

Re: Death Valley National Park Devils Hole Site Plan Draft Environmental Assessment

Dear Mr. James:

Death Valley National Park is writing an Environmental Assessment for proposed work at Devils Hole. The *Devils Hole Site Plan Draft Environmental Assessment* ("Devils Hole Site Plan"), included with this letter, is being reviewed by Park staff before completion of the final draft (during which time you will have a second opportunity to review and comment). Devils Hole is a cavepool containing the single remaining population of the Devils Hole Pupfish (*Cyprinodon diabolis*), an endangered species (NPS 2008:1). The Park proposes to make a series of improvements to Devils Hole which will provide the species and habitat better protection from intruders and vandalism, improve interpretative and educational opportunities for visitors, enable safe and effective scientific research and ecological monitoring, and restore the natural ecosystem processes upon which the pupfish rely (NPS 2009:ii).

The Pupfish population has been declining in recent years. It is hoped that improvements to the infrastructure at the hole will help to reverse the species decline; the population is currently comprised of 126 individuals, up from 38 in 2006. In order for the fish to survive, it is necessary to maintain their habitat and spawning shelf. Factors influencing the survival of this species may include global warming, airborne dust, research accidents, invasive species, and the presence of existing site infrastructure. This plan aims to address several of those issues. The Devils Hole cavepool is currently surrounded by a chain link fence, with researcher access allowed through a locked gate (NPS 2009:Figure A-1). Researchers access the pool via a ladder down into the hole, and access monitoring equipment installed in the water using a second ladder that is set up on each visit as temporary scaffolding. Several communications and electrical towers are situated above the cavepool, some of which are still in use. Visitors view the site from a wooden platform, situated on a cliff edge overlooking the cavepool.

The Park's preferred alternative, Alternative A (also the environmentally preferred alternative) calls for improvements that the NPS believes will help the pupfish to survive, protect the site from vandalism, and improve safety and convenience for visitors and the public. Changes include expanding the existing fenceline to allow for natural sediment to reach the hole (via a floodgate), and removing the stilling well and frame. While not immediately related to habitat needs, improving interpretative material onsite, enclosing the visitor access tunnel, adding a permanent researcher access ladder and platform, and installing a security system, communications infrastructure, and power supply will help to protect the site from vandalism, improve conditions for researchers, and educational opportunities for visitors. Lastly, disturbed areas around the site will be revegetated in order to provide additional habitat for wildlife (NPS 2009:30-31). The park believes that making these changes will be beneficial to the fish and habitat.

An archeological survey was completed at Devils Hole on February 15, 2008 (Bonstead 2008). A survey of 30.7 acres was completed by Park Archeologist Leah Bonstead and volunteer Jane Rondthaler. Survey transects were spaced approximately 20 m apart. No archeological sites were found, but eleven isolated finds were recorded.

We realize that Devils Hole is extremely important to the Timbisha Shoshone and Pahrump Paiute Tribes. Both groups are culturally affiliated with Devils Hole and still visit the area today. Both groups have been consulted on this project several times. Death Valley Park Archeologist Leah Bonstead, and Fish Biologist Mike Bower, discussed the project with Timbisha elders on February 29, 2008, and also visited Devils Hole with the Timbisha Shoshone Historic Preservation Committee on December 11, 2008. The Timbisha Shoshone reviewed the June 2008 Draft Devils Hole Site Plan and said that at that time they preferred the "no action alternative" (Kennedy 2008:2). The Park addressed several of their concerns in this document, including decreasing the amount of metal and new infrastructure at Devils Hole, changing the proposal from a long staircase to a shorter ladder, retaining the existing visitor platform, and much of the existing fence. The Timbisha have been given the latest draft of the document for review and comment.

The Pahrump Paiute were also consulted on this project. Leah Bonstead and Mike Bower met with Richard Arnold and tribal elders in Pahrump on April 25, 2008. On December 22, 2008, Leah Bonstead met with Richard Arnold at Devils Hole to discuss the most recent version of the Devils Hole Site Plan. We have not received an official letter from the Pahrump Paiute, but overall they seemed interested in the NPS Preferred Alternative, provided that it incorporated better interpretative materials discussing cultural and natural resources. We have sent them the February 2009 document for review and comment.

As this is not the final version of this document, there will be some changes made before the final environmental assessment is sent out for review. If you have any questions or concerns regarding the *Devils Hole Site Plan Draft Environmental Assessment,* please contact Leah Bonstead, Park Archaeologist, at Death Valley National Park, (760) 786-3232.

Sincerely yours,

Sarah Craighead
Superintendent

Enclosures: 1) Devils Hole Site Plan Cultural Resources Section Summary

2) Bonstead, Leah 2008 *Archeological Survey and Consultation for the Devils Hole Site Plan, Death Valley National Park, Nye County Nevada (DEVA 2008A).* National Park Service, Death Valley, California.

3) NPS 2009 *Devils Hole Site Plan Draft Environmental Assessment.* Death Valley National Park, Death Valley, California.

4) Kennedy, Joe 2008 Letter from Joe Kennedy, Tribal Chairperson, Timbisha Shoshone Tribe, to James T. Reynolds, Superintendent, Death Valley National Park, regarding Death Valley National Park Draft Devils Hole Plan Environmental Assessment. June 2008. Ms, Cultural Resources Files, Death Valley, California.

United States Department of the Interior

NATIONAL PARK SERVICE
Death Valley National Park
PO Box 579
Death Valley, California 92328

IN REPLY REFER TO:
H4217 xL7617

March 27 2009

Richard Arnold
Tribal Chair
Pahrump Paiute Tribe
PO Box 3411
Pahrump, NV 89041

Re: Death Valley National Park Devils Hole Site Plan Draft Environmental Assessment

Dear Mr. Arnold:

Death Valley National Park is writing an Environmental Assessment for proposed work at Devils Hole. The *Devils Hole Site Plan Draft Environmental Assessment* ("Devils Hole Site Plan"), included with this letter, is being reviewed by Park staff before completion of the final draft (during which time you will have a second opportunity to review and comment). Devils Hole is a cavepool containing the single remaining population of the Devils Hole Pupfish (*Cyprinodon diabolis*), an endangered species (NPS 2008:1). The Park proposes to make a series of improvements to Devils Hole which will provide the species and habitat better protection from intruders and vandalism, improve interpretative and educational opportunities for visitors, enable safe and effective scientific research and ecological monitoring, and restore the natural ecosystem processes upon which the pupfish rely (NPS 2009:ii).

The Pupfish population has been declining in recent years. It is hoped that improvements to the infrastructure at the hole will help to reverse the species decline; the population is currently comprised of 126 individuals, up from 38 in 2006. In order for the fish to survive, it is necessary to maintain their habitat and spawning shelf. Factors influencing the survival of this species may include global warming, airborne dust, research accidents, invasive species, and the presence of existing site infrastructure. This plan aims to address several of those issues. The Devils Hole cavepool is currently surrounded by a chain link fence, with researcher access allowed through a locked gate (NPS 2009:Figure A-1). Researchers access the pool via a ladder down into the hole, and access monitoring equipment installed in the water via a second ladder that is set up on each visit as temporary scaffolding. Several communications and electrical towers are situated above the cavepool, some of which are still in use. Visitors view the site from a wooden platform, situated on a cliff edge overlooking the cavepool.

The Park's preferred alternative, Alternative A (also the environmentally preferred alternative) calls for improvements that the NPS believes will help the pupfish to survive, protect the site from vandalism, and improve safety and convenience for visitors and the public. Changes include expanding the existing fenceline to allow for natural sediment to reach the hole (via a floodgate), removing the stilling well and frame. While not immediately related to habitat needs, improving interpretative material onsite, enclosing the visitor access tunnel, adding a permanent researcher access ladder and platform, and installing a security system, communications infrastructure, and power supply will help to protect the site from vandalism, improve conditions for researchers, and educational opportunities for visitors. Lastly, disturbed areas around the site will be revegetated in order to provide additional habitat for wildlife (NPS 2009:30-31). The park believes that making these changes will be beneficial to the fish and habitat.

An archeological survey was completed at Devils Hole on February 15, 2008 (Bonstead 2008). A survey of 30.7 acres was completed by Park Archeologist Leah Bonstead and volunteer Jane Rondthaler. Survey transects were spaced approximately 20 m apart. No archeological sites were found, but eleven isolated finds were recorded.

We realize that Devils Hole is extremely important to both the Timbisha Shoshone and Pahrump Paiute Tribes. Both groups are culturally affiliated with Devils Hole and still visit the area today. Both groups have been consulted on this project several times. Death Valley Park Archeologist Leah Bonstead, and Fish Biologist Mike Bower, discussed the project with Timbisha elders on February 29, 2008, and also visited Devils Hole with the Timbisha Shoshone Historic Preservation Committee on December 11, 2008. The Timbisha Shoshone reviewed the June 2008 Draft Devils Hole Site Plan and said that at that time they preferred the "no action alternative" (Kennedy 2008:2). The Park addressed several of their concerns in this document, including decreasing the amount of metal and new infrastructure at Devils Hole, changing the proposal from a long staircase to a shorter ladder, retaining the existing visitor platform, and much of the existing fence. The Timbisha have been given the latest draft of the document for review and comment.

The Park has also consulted with the Pahrump Paiute on this project. Leah Bonstead and Mike Bower met with you, Clarabelle Jim, and Cynthia Lynch in Pahrump on April 25, 2008. On December 22, 2008, Leah Bonstead met with you at Devils Hole to discuss the most recent version of the Devils Hole Site Plan. We have not received an official letter from you discussing your views of the project, but overall walked away from those meetings believing that you agreed with the NPS Preferred Alternative, provided that it incorporated better interpretative materials discussing cultural and natural resources.

As this is not the final version of this document, there will be some changes made before the final environmental assessment is sent out for review. If you have any questions or concerns regarding the *Devils Hole Site Plan Draft Environmental Assessment,* please contact Leah Bonstead, Park Archaeologist, at Death Valley National Park, (760) 786-3232.

Sincerely yours,

Sarah Craighead

Sarah Craighead
Superintendent

Enclosures: 1) Devils Hole Site Plan Cultural Resources Section Summary

2) Bonstead, Leah 2008 *Archeological Survey and Consultation for the Devils Hole Site Plan, Death Valley National Park, Nye County Nevada (DEVA 2008A).* National Park Service, Death Valley, California.

3) NPS 2009 *Devils Hole Site Plan Draft Environmental Assessment.* Death Valley National Park, Death Valley, California.

4) Kennedy, Joe 2008 Letter from Joe Kennedy, Tribal Chairperson, Timbisha Shoshone Tribe, to James T. Reynolds, Superintendent, Death Valley National Park, regarding Death Valley National Park Draft Devils Hole Plan Environmental Assessment, June 2008. Ms, Cultural Resources Files, Death Valley, California.

APPENDIX C: SPECIES OF CONCERN IN ASH MEADOWS NWR

Species of Concern at Ash Meadows NWR

Common Name	Scientific Name	USFWS	BLM	Status	NV Natural Heritage	AMNWR Recovery Plan Species	Ash Meadows Area Endemic
Plants							
Ash Meadows blazing star	*Mentzelia leucophylla*	T	S	CE	at-risk	*	*
Amargosa niterwort	*Nitrophila mohavensis*	E	S	CE	at-risk	*	*
Ash Meadows milk-vetch	*Astragalus phoenix*	T	S	CE	at-risk	*	*
Ash Meadows sunray	*Enceliopsis nudicaulis corrugata*	T	S	CE	at-risk	*	*
Spring-loving centaury	*Centaurium namophilum*	T	S	CE	at-risk	*	*
Ash Meadows gumplant	*Grindelia fraxino-pratensis*	T	S	CE	at-risk	*	*
Ash Meadows ivesia	*Ivesia kingii* var. *eremica*	T	S	CE	at-risk	*	*
Alkali mariposa lily	*Calochortus striatus*		N, C		at-risk	*	
Ash Meadows lady's tresses	*Spiranthes infernalis*				at-risk	*	*
Tecopa birdsbeak	*Cordylanthus tecopensis*		N, C		at-risk	*	*
White bear poppy	*Arctomecon merriamii*		N		at-risk	*	
Darin buckwheat	*Eriogonum concinnum*				at-risk		
Parish's phacelia	*Phacelia parishii*				at-risk		
Death Valley sage	*Salvia funereal*				at-risk		
Death Valley blue-eyed grass	*Sisyrinchium funereum*				at-risk		
St. George blue-eyed grass	*Sisyrinchium radicatum*				at-risk		
Invertebrates							
Amargosa naucorid	*Pelecoris biimpressus biimpressus*					*	
Amargosa naucorid	*Pelocoris shoshone amargosus*				at-risk		
Ash Meadows naucorid	*Ambrysus amargosus*	T	S		at-risk	*	*
Warm Springs naucorid	*Ambrysus relictus*						*

Devil's Hole warm spring riffle beetle	*Stenelmis calida calida*		N		at-risk	*	*
Unnamed riffle beetle	*Microcylloepus similis*				SS		
Death Valley June beetle	*Polyphylla erratica*				SS		
Death Valley agabus diving beetle	*Agabus rumppi*				watch		
Ash Meadows alkali skipper	*Pseudocopaeodes eunus alinea*		N		at-risk		
Ash Meadows pebble snail	*Pyrgulopsis erythropoma*			PS, U	at-risk	*	*
Crystal Springs snail	*Pyrgulopsis crystalis*			PS, U	at-risk	*	*
Distal-gland springsnail	*Pyrgulopsis nanus*			PS, U	at-risk	*	*
Elongate gland springsnail	*Pyrgulopsis isolatus*			PS, U	at-risk	*	*
Fairbanks Spring snail	*Pyrgulopsis fairbanksensis*			PS, U	at-risk	*	*
Median-gland Nevada spring snail	*Pyrgulopsis pisteri*			PS, U	at-risk	*	*
Oasis Valley springsnail	*Pyrgulopsis micrococcus*		N	PS, U	at-risk	*	
Amargosa tryonia	*Tryonia variegata*		N	PS, U	at-risk	*	*
Minute tryonia	*Tryonia ericae*			PS, U	at-risk	*	*
Point of Rocks tryonia	*Tryonia elata*			PS, U	at-risk	*	*
Sportinggoods tryonia	*Tryonia angulata*			PS, U	at-risk	*	*
Virile Amargosa snail	Undescribed					*	*?
Fish							
Devil's Hole pupfish	*Cyprinodon diabolis*	E	S	PS, P, E	at-risk	*	*
Warm Springs pupfish	*Cyprinodon nevadensis pectoralis*	E	S	PS, P, E	at-risk	*	*
Ash Meadows Amargosa pupfish	*Cyprinodon nevadensis mionectes*	E	S	PS, P,T	at-risk	*	*
Ash Meadows speckled dace	*Rhinichthys osculus nevadensis*	E	S	PS, P,E	at-risk	*	*
Reptiles							
Western banded gecko	*Coleonyx variegatus*			PS			
Great Basin collared lizard	*Crotaphytus bicinctores*			PS			
Desert iguana	*Dipsosaurus dorsalis*			PS	watch		
Long-nosed leopard lizard	*Gambelia wislizenii*			PS			

Desert horned lizard	*Phrynosoma platyrhinos*			PS			
Chuckwalla	*Sauromalus ater*		N	PS	watch		
Desert night lizard	*Xantusia vigilis vigilis*			PS			
Desert tortoise	*Gopherus agassizii*	T	S	PS	at-risk		
Birds (^breeding, +prob. breeding)							
American avocet+	*Recurvirostra americana*			PS			
American white pelican	*Pelecanus erythrorhynchos*		P	PS, P	watch		
Arizona Bell's vireo^	*Vireo bellii arizonae*		P	PS, P	watch		
Bald eagle	*Haliaeetus leucocephalus*	Delisted	S	PS, P, E	at-risk		
Black-necked stilt^	*Himantopus mexicanus*			PS			
Black tern	*Chlidonias niger*		N	P	watch		
Black phoebe^	*Sayornis nigricans*			PS			
Blue grosbeak^	*Guiraca caerulea*			ST, P			
Brewer's sparrow^	*Spizella breweri*			PS, P, S			
California black rail	*Laterallus jamaicensis coturniculus*	Species of Concern					
Canvasback	*Aythya valisineria*			PS			
Cinnamon teal^	*Anas cyanoptera*			PS			
Clark's grebe	*Aechmorphorus clarkia*			PS			
Common loon	*Gavia immer*			PS, P	watch		
Cooper's hawk	*Accipiter cooperii*			ST, P			
Costa's hummingbird^	*Calypte costae*			PS			
Crissal thrasher^	*Toxostoma crissale*		N	PS, P	watch		
Eared grebe+	*Podiceps nigricollis*			PS			
Ferruginous hawk	*Buteo regalis*		N	PS, P	at-risk		
Forster's tern	*Sterna forsteri*			PS			
Franklin's gull	*Larus pipixcan*			PS			
Golden eagle+	*Aquila chrysaetos*		N	P	watch		

Gray flycatcher	*Empidonax wrightii*			ST, P			
Least sandpiper	*Calidris minutilla*			PS			
LeConte's thrasher^	*Toxostoma lecontei*		N,C	PS, P	at-risk		
Lewis' woodpecker	*Melanerpes lewis*		N	PS, P	watch		
Loggerhead shrike^	*Lanius ludovicianus*		N	PS, P, S	watch		
Long-billed curlew	*Numenius americanus*		N	PS, P	watch		
Long-billed dowitcher	*Limnodromus scolopaceus*			PS			
Long-eared owl	*Asio otus*		N	P	watch		
Lucy's warbler^	*Vermivora luciae*		N	PS, P	watch		
Northern pintail	*Anas acuta*			PS			
Olive-sided flycatcher	*Contopus borealis*			PS, P	watch		
Osprey	*Pandion haliaetus*			P			
Peregrine falcon	*Falco peregrinus*	Delisted	N	PS, P, E	at-risk		
Phainopepla^	*Phainopepla nitens*		N	PS, P	at-risk		
Pinon jay	*Gymnorhinus cyanocephalus*		N	PS, P	watch		
Prairie falcon+	*Falco mexicanus*		N	P	watch		
Redhead^	*Aythya americana*			PS			
Red-naped sapsucker	*Sphyrapicus nuchalis*		N	ST, P	watch		
Red-necked phalarope	*Phalaropus lobatus*			PS			
Rufous hummingbird	*Selasphorus rufus*			PS			
Sage sparrow^	*Amphispiza bellii*			PS			
Sage thrasher	*Oreoscoptes montanus*			P			
Short-eared owl	*Asio flammeus*		N	PS, P	watch		
Snowy egret	*Egretta thula*			PS			
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	S	PS, P, E	at-risk		
Swainson's hawk	*Buteo swainsoni*		N	PS, P	watch		
Verdin^	*Auriparus flaviceps*			PS			
Virginia's warbler	*Vermivora virginiae*			PS			
Western burrowing owl^	*Athene cunicularia hypugea*		N,C	PS, P	watch		

Western grebe	*Aechmorphorus occidentalis*			PS			
Western least bittern	*Ixobrychus exilis hesperis*		N	PS, P	at-risk		
Western snowy plover	*Charadrius alexandrinus nivosus*		N	PS, P	watch		
Western yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	C	S	P	at-risk		
White-faced ibis	*Plegadis chihi*		P	PS, P	watch	*	
White-throated swift+	*Aeronautes saxatilis*			PS			
Willet	*Catoptrophorus semipalmatus*			PS			
Yellow-breasted chat^	*Icteria virens*		N	P	watch		
Yuma clapper rail	*Rallus longirostris yumanensis*	E	-	PS, P	at-risk		
Mammals		-	-	-	-	-	
Pallid bat	*Antrozous pallidus*		N,C	P	watch		
Silver-haired bat	*Lasionycteris noctivagans*		N		watch		
Hoary bat	*Lasiurus cinereus*		N	PS	watch		
Western red bat	*Lasiurus blossevillii*		N	PS, P	at-risk		
Spotted bat	*Euderma maculatum*		S	PS, P,T	at-risk		
Western small-footed myotis	*Myotis ciliolabrum*		N,C	PS	watch		
Townshend's big eared bat	*Corynorhinus townsendii*		N,C	PS, P, S	at-risk		
Brazilian free-tailed bat	*Tadarida brasiliensis*		N	P	watch		
Ash Meadows montane vole	*Microtus montanus nevadensis*		N	PS, P, S	at-risk	*	*
Desert kangaroo rat	*Dipodomys deserti*			PS	watch		
Desert pocket mouse	*Chaetodipus pencillatus*			PS	at-risk		
Brush mouse	*Peromyscus boylei*			PS			
Kit fox	*Vulpes macrotis*			PS, P	watch		
Ringtail	*Bassariscus astutus*			PS			
Mule deer	*Odocoileus hemionus*			PS			
Desert bighorn sheep	*Ovis canadensis nelsoni*			PS			

Abbreviations: **USFWS: E** = endangered; **T** = threatened. **BLM: S** = Nevada special status species; **N** = Nevada special status species (designated Sensitive by State Office); **P** = proposed Nevada special status species (designated proposed Sensitive by State Office; **C** = California special status species. **State: PS** = priority species; **ST** = stewardship species; **P** = state protected; **E** = state endangered; **CE** = critically endangered plant; **T** = state threatened; **S** = sensitive; **U** = state unprotected. **NV Natural Heritage: SS** - sensitive species; **at-risk** = At-Risk Tracking List (some level of imperilment); **watch** = **Watch List** (taxa could become at-risk in the future)

Source: USFWS, Recovery Plan for the Endangered and Threatened Species of Ash Meadows 1990; Nevada Natural Heritage Program, 2007; NDOW, Nevada Wildlife Action Plan, 2006; Otis Bay, Inc. and Stevens Ecological Consulting, LLC, Ash Meadows Geomorphic and Biological Assessment, 2006.

APPENDIX D: DEVILS HOLE PLANT SPECIES

Devils Hole Plant Species List	
Species Name	**Common Name**
Ambrosia dumosa	white bursage
Amphipappus fremontii var. fremontii	chaff bush
Atriplex confertifolia	shadscale
Atriplex hymenelytra	desert holly
Aristida purpurea	purple threeawn
Brickellia atractyloides	spearleaf brickellbush
Cheilanthes parryi	Parry's lip-fern
Chorizanthe brevicornu var. brevicornu	brittle spineflower
Chorizanthe rigida	devil's spineflower
Cryptantha decipiens	gravelbar cryptantha
Cryptantha racemosa	bushy cryptantha
Descurainia pinnata ssp. glabra,	western tansymustard
Echinocactus polycephalus var. polycephalus	cottontop cactus
Echinocereus engelmannii	Engelmann's hedgehog cactus
Ephedra funereal	Death Valley jointfir
Eriogonum inflatum	desert trumpet
Eriogonum trichopes	little desert buckwheat
Erioneuron pulchellum	fluffgrass
Eucnide urens	rock nettle
Galium stellatum var. eremicum	star-flowered bedstraw
Krameria erecta	littleleaf ratany
Langloisia setosissima ssp. punctata	lilac sunbonnet
Larrea tridentate	creosote bush
Lepidium fremontii var. fremontii	desert pepperweed
Lycium andersonii	Anderson's desert-thorn
Lycium pallidum var. oligospermum	rabbit thorn
Mammillaria tetrancistra	common fishhook cactus
Nicotiana obtusifolia	desert tobacco
Opuntia basilaris var. basilaris	Trelease's beavertail pricklypear
Opuntia echinocarpa	silver cholla
Plantago ovatum	wooly plantain
Pleurocoronis pluriseta	arrow weed
Schismus arabicus	Arabian schismus
Sphaeralcea ambigua var. ambigua	desert mallow
Stephanomeria pauciflora	brownplume wirelettuce
Tidestromia oblongifolia	Arizona honeysweet
Xylorhiza tortifolia	Mojave aster