



National Park Service
U.S. Department of the Interior
Glen Canyon National Recreation Area
Page, Arizona

Page-LeChee Water Supply Project Environmental Assessment

December 2009



Page-LeChee Water Supply Project

Environmental Assessment

Summary

The City of Page (City), Arizona, proposes to construct and operate a pump station and conveyance pipeline from Lake Powell to a tie-in point on its existing system near US Highway 89 (US 89) between the Glen Canyon rim and the City's water treatment plant. The proposed pump station would be located at Site 3 in the Chains area, as identified in Figure 1 of this EA and in Figure 41 of the *Page-LeChee Water Supply – Part I, Concept Design Study – Report of Findings* prepared by the Bureau of Reclamation (2004). The domestic water supply for the City is currently obtained from Lake Powell through pumping and conveyance facilities that were first constructed at the time Glen Canyon Dam was built between 1957 and 1964. The new pump station would augment the existing system.

The proposal is needed to improve the existing system in a way that provides dependability and redundancy, as well as additional capacity to meet current and future peak demands. While the proposal would allow higher diversions of water from Lake Powell, actual consumptive use would continue to be subject to the City's contract with the Bureau of Reclamation. The proposed new pumping station and intakes would improve the dependability and provide the redundancy needed while also meeting the need for increased capacity during peak demand periods.

This Environmental Assessment evaluates two alternatives; a No Action Alternative and an action alternative. The No Action alternative describes the current condition if no new pumping station is built. The City would continue to use the existing water supply system originating inside Glen Canyon Dam. If the system fails, or if the lake level drops below the intake elevation, the City would be faced with severe water rationing and start bringing water in by truck. This water would be purchased from other sources and/or pumped into trucks from the lake surface nearby, if possible.

This Environmental Assessment has been prepared in compliance with the National Environmental Policy Act (NEPA) to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet objectives of the proposal, 2) evaluates potential issues and impacts to Glen Canyon's resources and values, and 3) identifies mitigation measures to lessen the degree or extent of these impacts. Resource topics included in this document because the resultant impacts may be greater-than-minor include Topography, Geology, and Soils; and Visitor Use and Experience. All other resource topics have been dismissed because the project would result in negligible or no effects to those resources. No major effects are anticipated as a result of this project. Public scoping was conducted to assist with the development of this document and comments were received, mostly in support of the proposed project.

Public Comment

If you wish to comment on the environmental assessment, you may post comments online at <http://parkplanning.nps.gov/glca> or mail comments to Superintendent; Glen Canyon National Recreation Area, P.O. Box 1507, Page, Arizona 86040. This environmental assessment will be on public review for 30 days. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

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Acronyms and Abbreviations

ADOT	Arizona Department of Transportation
afy	acre-feet per year
amsl	above mean sea level
AQCR	Air Quality Control Region
AZG&FD	Arizona Game and Fish Department
BOR	U.S. Bureau of Reclamation
City	City of Page
CFR	Code of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
GCNRA	Glen Canyon National Recreation Area
GMP	General Management Plan
gpm	gallons per minute
GRD	Geologic Resources Division, NPS
LeChee	LeChee Chapter of the Navajo Nation
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NGS	Navajo Generating Station
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
PM2.5	Particulate Matter (2.5 microns)
PM10	Particulate Matter (10 microns)
Reclamation	Bureau of Reclamation
RRU	Recreation and Resource Utilization area
SR 98	State Route 98
SRP	Salt River Project
SWPPP	Stormwater Pollution Prevention Plan
TDS	Total Dissolved Solids
U.S.	United States
US 89	United States Highway 89
USC	United States Code
USF&WS	United States Fish and Wildlife Service
wsel	water surface elevation

PURPOSE AND NEED

Introduction

The City of Page (City), Arizona, in cooperation with the National Park Service (NPS) – Glen Canyon National Recreation Area (GCNRA), prepared this Environmental Assessment (EA) to address the potential environmental effects related to the proposed construction and operation of supplemental water supply facilities that include a new intake from Lake Powell, a pumping plant, and a conveyance pipeline originating in the Chains Recreation Area near the Glen Canyon Dam. These supplemental water supply facilities would provide the City and the LeChee Chapter of the Navajo Nation with a backup system for drawing water from Lake Powell and an increased capability to meet peak water demands during the summer months. Figure 1, below, identifies the proposed approximate location of the pumping facilities.

The water intakes, pumping plant, and the beginning of the conveyance pipeline would be located on land managed by the NPS – GCNRA. The use of federal land for constructing these facilities makes the proposal a “federal action” subject to the provisions of the National Environmental Policy Act (NEPA) of 1969.

This EA was prepared in accordance with NEPA, its implementing regulations published by the Council on Environmental Quality (40 CFR 1500-1508), and the Department of the Interior’s Departmental Manual Part 516. Pursuant to NEPA, federal agencies are required to consider the environmental consequences of major proposed actions in the form of an EA or Environmental Impact Statement (EIS). This NEPA documentation is in the form of an EA, which analyzes the City’s proposed action to construct and operate supplemental water supply facilities from Lake Powell. This EA evaluates existing conditions and potential effects of the proposed action and the no action alternative, including indirect and cumulative effects associated with the proposed action. If the EA determines that the effects of the proposed action would not be significant, a Finding of No Significant Impacts (FONSI) will be prepared. If a FONSI cannot be supported, the City will decide whether to terminate the project or begin preparation of an EIS.

Background

The domestic water supply for the City and neighboring LeChee Chapter of the Navajo Nation is obtained from Lake Powell through pumping and conveyance facilities that were first constructed at the time Glen Canyon Dam was built between 1957 and 1964. Since that time, system improvements to increase capacity have occurred; however, additional intake facilities would be necessary for the City and LeChee to fully use their contractual water allocations from the U.S. Department of the Interior, Bureau of Reclamation (Reclamation). The existing facilities marginally meet the current peak demands of the two communities during summer months.

The City’s current water supply facilities access Lake Powell water via a 12-inch diameter intake pipe located on the upstream face of the Glen Canyon Dam at an elevation of 3,470 feet above mean sea level (amsl). This 12-inch pipe feeds four pumping units, one of which is used as a standby for backup, inside the dam. Each pump discharges into a 12-inch manifold pipe. That pipe discharges into a single 18-inch diameter pipeline that ascends to the canyon rim through a tunnel in the canyon wall, downstream from the dam. Once the pipeline reaches the canyon rim, it turns toward the City’s water treatment plant, which is located at a high point in the City at an elevation of 4,375. The existing system capacity with three pumps operating is estimated to be 3,050 gallons per minute (gpm).

This system is currently vulnerable to interruption by any failure of the pipeline from the Glen Canyon Dam to the water treatment plant in the city. Failure of this pipeline or the pumping equipment inside the dam could take anywhere from several days to weeks to repair depending on where and what kind of failure occurs. The City can only store approximately one day’s supply of water with its current pumping capacity and storage tanks. The pumping and storage capacity of the existing water supply system is barely able to meet peak demands in the summer months each year. The pumps and pipes that transport water through the system from the dam to the water treatment plant often operate 24 hours a day during the peak demand period in order to keep the storage tank from being completely emptied.

Through a contract with the Bureau of Reclamation (Reclamation) and as clarified through subsequent letters of concurrence, the City is allocated an annual delivery of water from storage in Lake Powell to allow for the consumptive use of 2,740 acre-feet per year (afy). As a contractual obligation assigned by Reclamation, the City is required to deliver up to 100,000 gallons of treated water per day to LeChee. The existing water supply facilities would not provide enough capacity to allow the City and LeChee to withdraw their full water allocation, should the demand increase to that level. Additional details regarding the purpose and need for the proposed action can be found in the *Summary Report, Page-LeChee Water Supply Project Alternatives* (TTRMC, 2003), and are incorporated here by reference.

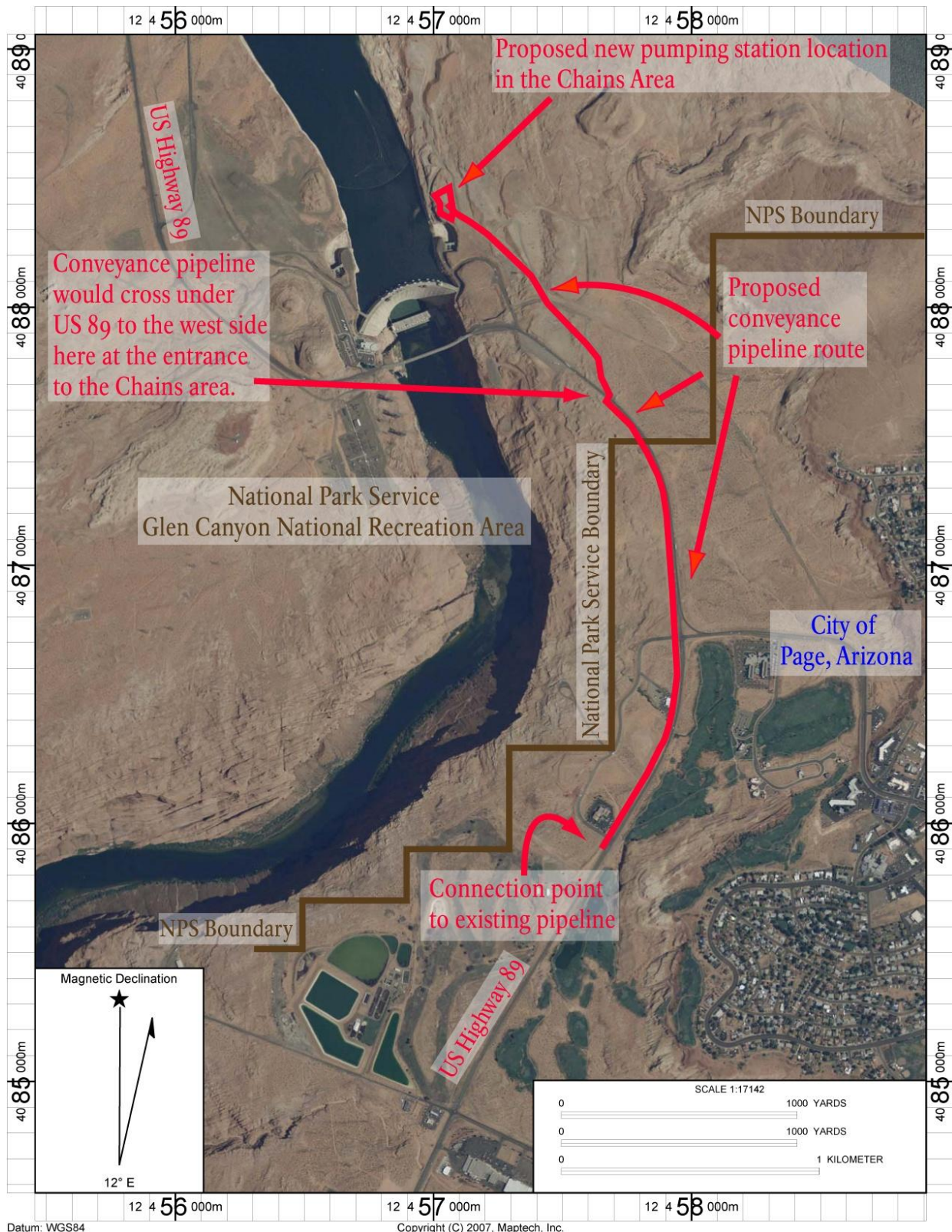


Figure 1 – Proposed project location and conveyance pipeline route

Purpose and Need

The purpose of the action proposed in this EA is to improve the existing system in a way that provides dependability and redundancy, as well as additional capacity to meet current and future peak demands.

While the proposed action would allow higher daily diversions of water from Lake Powell, annual consumptive use would continue to be subject to the City's contract with Reclamation.

The project is needed to accomplish the following objectives:

1. Increase the dependability of the water supply system for the City and the Chapter of LeChee.
2. Provide redundancy so that the system is less susceptible to service interruptions.
3. Add capacity to the system to meet current and future peak demands.

Relationship to Other Plans and Policies

Current plans and policy that pertain to this proposal include the 1979 Glen Canyon National Recreation Area (GCNRA) General Management Plan (GMP) (NPS 1979), the 2001 National Park Service Management Policies (NPS 2001), and Director's Order #53. Following is more information pertaining to how this proposal meets the goals and objectives of these plans and policies:

This project is consistent with the 1979 GCNRA GMP, which designates the proposed project area as a Recreation and Resource Utilization (RRU) Zone. RRU Zones "consist of areas possessing somewhat less scenic value, greater susceptibility to the activities of man, potential or actual mineral resources, or value for utility rights-of-way or development."

The proposal is consistent with the Planning Objectives listed in Table 1 of the 1979 GCNRA GMP.

The proposal is compatible with the goals and objectives of the *2006 National Park Service Management Policies* (NPS 2006).

The proposal is consistent with National Park Service Director's Order #53: Special Park Uses.

Impairment

National Park Service's Management Policies, 2001 require analysis of potential effects to determine whether or not actions would impair park resources (NPS 2000b). 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. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values.

Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute impairment but an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

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
3. identified as a goal in the park's general management plan or other relevant National Park Service planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. A determination on impairment is made in the Conclusion section for each of the resource topics carried forward in this chapter.

Unacceptable Impacts

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the Service will apply a standard that offers greater assurance that impairment will not occur. The Service will do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable.

Virtually every form of human activity that takes place within a park has some degree of effect on park resources or values, but that does not mean the impact is unacceptable or that a particular use must be disallowed. Therefore, for the purposes of these policies, unacceptable impacts are impacts that, individually or cumulatively, would

- be inconsistent with a park's purposes or values, or
- impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process, or
- create an unsafe or unhealthful environment for visitors or employees, or
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with
 - park programs or activities, or
 - an appropriate use, or
 - the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park.
 - NPS concessioner or contractor operations or services.

In accordance with Management Policies, park managers must not allow uses that would cause unacceptable impacts to park resources. To determine if unacceptable impact could occur to the resources and values of Glen Canyon National Recreation Area, the impacts of proposed actions in this environmental assessment were evaluated based on the above criteria. A determination on unacceptable impacts is made in the *Conclusion* section for each of the resource topics carried forward in this chapter.

Appropriate Use

Section 1.5 of Management Policies (2006), *Appropriate Use of the Parks*, directs that the National Park Service must ensure that park uses that are allowed would not cause impairment of, or unacceptable impacts on, park resources and values. A new form of park use may be allowed within a park only after a determination has been made in the professional judgment of the park manager that it will not result in unacceptable impacts.

Section 8.1.2 Of Management Policies (2006), *Process for Determining Appropriate Uses*, provides evaluation factors for determining appropriate uses. All proposals for park uses are evaluated for:

- consistency with applicable laws, executive orders, regulations, and policies;
- consistency with existing plans for public use and resource management;
- actual and potential effects on park resources and values;

- total costs to the Service; and
- whether the public interest will be served.

Park managers must continually monitor all park uses to prevent unanticipated and unacceptable impacts. If unanticipated and unacceptable impacts emerge, the park manager must engage in a thoughtful, deliberate process to further manage or constrain the use, or discontinue it.

A water pumping station and water pipelines are not uncommon structures in national parks. Proper location, sizing, as well as construction materials and methods would ensure that unacceptable impacts to park resources and values would not occur. The proposed project is consistent with the park's general management plan and other related park plans. With this in mind, the NPS finds that the construction and operation of water pumping station and waterline is an acceptable use at Glen Canyon National Recreation Area.

Public Scoping

During the last week of November 2004, a public scoping period and meeting announcement was placed in every Post Office mailbox in Page, AZ. Since there is no mail delivery in Page, this constituted a bulk mailing to everyone in Page and an unknown number of members of the LeChee Chapter of the Navajo Nation. Also during this week, the GCNRA published a news release announcing the same information. Both documents are contained in the appendix to this EA.

The scoping period was open from December 1 through December 31, 2004. During this period, two comments were received via email (see appendix). A public meeting was held in Page on January 6, 2005. A second public meeting was held in LeChee with officials and members of the LeChee Chapter on January 19, 2005.

Impact Topics Retained for Further Analysis

Impact topics for this project have been identified on the basis of federal laws, regulations, and orders; National Park Service *2001 Management Policies*; and National Park Service knowledge of resources at Glen Canyon National Recreation Area. Impact topics that are carried forward for further analysis in this Environmental Assessment are listed below along with the reasons why the impact topic is further analyzed. For each of these topics, the following text also describes the existing setting or baseline conditions (i.e. affected environment) within the project area. This information will be used to analyze impacts against the current conditions of the project area in the *Environmental Consequences* chapter.

Topography, Geology, and Soils

According to the National Park Service's 2001 Management Policies, the National Park Service will preserve and protect geologic resources and features from adverse effects of human activity, while allowing natural processes to continue (NPS 2000). These policies also state that the National Park Service will strive to understand and preserve the soil resources of park units and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources.

The topography of the proposed project site is partially modified by human disturbance during construction of the dam. The proposed location for the pumping plant is on an area that is currently flat and graveled. Toward the canyon rim an area of sandstone rises above the flat, graveled area by approximately 5 to 10 feet before dropping off to a bench about 10 to 15 lower, then dropping off straight down to below the lake surface.

Navajo sandstone forms the canyon walls at the Glen Canyon dam and throughout most of the reservoir basin (Lasson, 1962). At the dam, the Navajo sandstone is over 1,400 feet thick and extends from approximately 1,000 feet above the river level to more than 400 feet below it. The Navajo sandstone is remarkably uniform and similar over wide areas. Nearly identical samples can be obtained from areas separated by many miles. When the canyon walls were being excavated for construction of the dam, two thin shale layers below 3,200 feet amsl in the right abutment (west side) were the only changes in the structure of the rock that were encountered in the entire excavation area. Additional information regarding the geology of the area can be found in the *Concept Design Study* (Reclamation, 2004) and is incorporated here by reference.

The City contracted the U.S. Bureau of Reclamation (BOR) to perform a geologic stability analysis of the proposed project area and in November 2005 drill core samples were collected, boxed, and then stored at a BOR warehouse in Page, Arizona. In December 2005, a Geologist from the BOR logged the borehole cores and prepared a brief summary of field work completed on the site (BOR 2006). GCNRA then requested the assistance of the National Park Service, Geologic Resources Division (GRD) to review the geologic analysis for the site. After reviewing the report, GRD staff concluded in an internal memorandum that the study was inadequate and more details were required to determine whether this site would be suitable to support the facility (NPS 2006, and included in the Appendix).

The May 2006 GRD memo identified 3 recommendations for further study to adequately address concerns about the stability of the site. GRD advised that the spatial relationships between the locations and orientations of the fractures (joints) should be determined. The 2007 Geology Report (BOR 2007) addresses these recommendations and concludes that only one large joint, Joint A projects for a significant length and toward the canyon rim. No other joints intersect Joint A, therefore, it appears that the likelihood of the project inducing a block failure is low. The report indicates there is no evidence that the water intake will compromise the stability of the canyon rim.

By nature, Navajo sandstone can be quite susceptible to localized rock fall. The 2007 Geology Report recommended that an evaluation of impacts on the project from canyon wall rock fall be performed. It goes on to suggest that if a determination is made that rock fall will impact the project, rock bolting of the canyon rim should be performed as needed during construction. These recommendations were confirmed in a memo from Deanna Greco, Geologist, Geoscience and Restoration Branch, GRD, NPS, to Barbara Wilson, Environmental Specialist, GCNRA dated January 22, 2008, and included in the Appendix.

Soils in the area consist of the Needle-Sheppard complex, 2 to 12 percent slopes, rock outcrop, and Sheppard loamy fine sand, 5 to 15 percent slopes. Section 4(f) of the Department of Transportation (DOT) Act of 1966 requires consideration of potential impacts to Prime or Unique Farmlands that may occur as a result of proposed projects on lands administered by the Federal Highway Administration (FHWA). None of these soils are considered Prime or Unique Farmland as defined by the soil survey prepared by the Natural Resource Conservation Service (NRCS) for Coconino Area, North Kaibab Part (NRCS 2005) or as defined by the NPS.

The proposed project would slightly modify the topography of the Chains area within the GCNRA to facilitate the construction of the new pumping station. Some scaling of the cliff face may be necessary. The stability of the geological formations through which the boreholes into the lake would pass must be determined before the potential effects of such drilling can be assessed. Some soils would be disturbed as a result of emplacement of the conveyance pipeline. For these reasons, the topic of topography, geology, and soils has been carried forward for further analysis.

Visitor Use and Experience

According to *2001 Management Policies*, the enjoyment of park resources and values by people is part of the fundamental purpose of all park units (NPS 2000). The National Park Service is committed to providing appropriate, high quality opportunities for visitors to enjoy the parks, and will maintain within the parks an atmosphere that is open, inviting, and accessible to every segment of society. Further, the National Park Service will provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks. The National Park Service *2001 Management Policies* also state that scenic views and visual resources are considered highly valued associated characteristics that the National Park Service should strive to protect (NPS 2000).

GCNRA was established to provide for the management of public outdoor recreation use and the enjoyment of Lake Powell and adjacent lands in Arizona and Utah. In 2003, there were 1.9 million visitors and more than 1.2 million overnight stays (NPS, 2004b). Recreation uses range from those activities that require solitude and an undisturbed setting to those that require mechanical means such as power boating and four-wheel driving. The most popular forms of recreation are water-based activities such as boating, fishing, water skiing, and boat camping. The City of Page provides a significant portion of the infrastructure required to support these recreational activities in the form of lodging, restaurants, and permanent housing for people employed by these businesses and the lake concessionaires.

The Chains area is close to Page and is publicly accessible by way of a gated access road. The area is commonly used by the public for viewing the lake and dam, fishing, swimming, and picnicking. The GCNRA maintains a public restroom in the area. Boaters on the lake can, and do, visit the area while fishing and water skiing, and to view the dam; however, the proposed location for the intakes is behind a barrier on the lake that prevents boaters from coming too close to the dam.

The area is currently used for recreation activities such as swimming and fishing (when the lake level is closer to normal), picnicking, and viewing the dam. In addition to recreation, land use in the surrounding area includes operation of the Glen Canyon dam and its associated facilities. Because the proposed project will functionally and visually reconfigure the Chains area, which is currently used by visitors, the topic of visitor use and experience has been carried forward for further analysis.

Impact Topics Dismissed From Further Analysis

Air Quality

Glen Canyon National Recreation Area is listed as a Class II airshed under the Prevention of Significant Deterioration section of the Clean Air Act (§160), which is defined as an area having moderate to good air quality, with "some deterioration in quality resulting from moderate, well controlled growth" (NPS 2002). The recreation area is located in a remote portion of the Colorado Plateau that has relatively few developments or major sources of air pollutants. Large urban centers are all more than 300 miles away. Localized sources of air pollution include exhaust from recreational and motor vehicles and campfires. There is a Nuclear Fuel Service Plant near Bullfrog, Utah, but it has never been operational. The largest

source of air pollution in the vicinity of the recreation area is the Salt River Navajo Generating Station near Page, Arizona.

The Clean Air Act of 1963 (42 U.S.C. 7401 et seq.) was established to promote the public health and welfare by protecting and enhancing the nation's air quality. The act establishes specific programs that provide special protection for air resources and air quality related values associated with National Park Service units. Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air pollution standards. The Class II designation indicates the maximum allowable increase in concentrations of pollutants over baseline concentrations of sulfur dioxide and particulate matter as specified in Section 163 of the Clean Air Act. Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts (EPA 2000).

The Clean Air Act requires the EPA to establish air quality standards and assist states and localities in establishing ambient air quality monitoring networks and to evaluate local levels of criteria pollutants. Criteria pollutants for which the EPA has established National Ambient Air Quality Standards (NAAQS) include sulfur dioxide, total particulate lead, ozone, nitrogen dioxide, carbon monoxide, and suspended particulate matter with a diameter less than or equal to 10 microns (PM₁₀) and less than or equal to 2.5 microns (PM_{2.5}). Coconino County is located in the Northern Arizona Intrastate Air Quality Control Region (AQCR). EPA data, collected from monitoring stations in the Northern Arizona Intrastate AQCR, indicate that the air quality in Page, Arizona is considered either "better than national standards" or "nonclassifiable/attainment" for the criteria pollutants (eCFR, 2005).

Ambient concentrations of these pollutants are not routinely monitored by the state in or near the recreation area. However, a study conducted in 2001 indicates that the GCNRA is well within the standards for air pollution concentrations (NPS 2002). The expansiveness of the recreation allows for relatively quick dispersion of particles through the air. This leaves little opportunity for the build-up of air pollutants, except for possible short-term concentration of pollutants in narrow side canyons.

There may be some temporary localized effects to air quality from construction-related activities, such as the generation of fugitive dust during installation of the conveyance pipeline and drilling of the intake shafts. The construction contractor would be required to provide water for dust abatement. Also, some emissions would be produced by the construction vehicles and equipment. None of these sources would require an air quality permit. Overall effects to air quality in the project vicinity would be temporary and negligible, and the topic of Air Quality has been dismissed.

Water Resources

National Park Service policies require protection of water quality consistent with the Clean Water Act. The purpose of the Clean Water Act is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters". To enact this goal, the U.S. Army Corps of Engineers has been charged with evaluating federal actions that result in potential degradation of waters of the United States and issuing permits for actions consistent with the Clean Water Act. The U.S. Environmental Protection Agency also has responsibility for oversight and review of permits and actions, which affect waters of the United States.

The only surface water in the proposed project area is Lake Powell. At a normal water surface elevation (wsel) of 3,700 feet amsl, Lake Powell has a water storage capacity of 27,000,000 acre-feet, with an active conservation capacity of 20,876,000 acre-feet above 3,490 feet amsl, the minimum reservoir wsol for power generation (Reclamation, 2004). The Navajo sandstone that underlies the Chains area is porous and absorbed a substantial amount of water from the lake when it was filled (Reclamation, 1969). There are no wetlands, permanent streams, arroyos, or floodplains, above the lake level in the project area. Some jurisdictional "waters of the U.S." in the form of natural drainages are located along the proposed conveyance pipeline route between the pumping plant and the tie-in point on the existing system.

Water quality investigations performed by Reclamation indicate that the quality of the water in Lake Powell near the dam at approximately 3,470 feet amsl is better than it is at approximately 3,374 feet amsl. As described in Section 2.3, the particular factor affecting water quality in the lake is the level of TDS.

The TDS at these two elevations fluctuates seasonally over a range of 200 mg/L. Typically, the TDS levels at the 3,374 feet amsl elevation are about 100 mg/L higher, on average, than at the 3,470 feet amsl elevation. EPA currently recommends a maximum TDS level of 500 mg/L for drinking water. This recommendation is not a standard and is not required by regulation. Water obtained through the existing intake in the dam generally has between 400 and 700 mg/L TDS.

The construction contractor would be required to prepare and submit to NPS for approval a Stormwater Pollution Prevention Plan (SWPPP) prior to the initiation of construction activities. This plan would provide specific details on handling, containment, and disposal of hazardous materials used and wastes generated during construction. Adherence to the plan would be strictly required by GCNRA. The contractor would be required to immediately report to GCNRA any spills of hazardous materials or wastes that cannot be immediately contained and cleaned up in accordance with the plan. There would be no temporary or permanent effects to water quality in the area as a result of the use of any hazardous materials or the generation of any hazardous wastes during construction activities.

There may be some temporary, highly localized, reduction in water quality during construction when the boreholes for the intakes breach the canyon wall below the lake surface during drilling as some small quantities of cuttings and drilling fluids would be introduced into the lake. The overall effect of this would be temporary and negligible. The quality of the water in Lake Powell would not be affected by operation of the pumping plant. The slightly higher level of TDS in the drinking water provided to customers by the City system would probably not be noticeable, because the City would blend the water from the new system with water from the existing system. For these reasons the topic of Water Resources has been dismissed.

Wetlands

For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

Executive Order 11990 *Protection of Wetlands* requires federal agencies to avoid, where possible, adversely impacting wetlands. Further, Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to prohibit or regulate, through a permitting process, discharge or dredged or fill material or excavation within waters of the United States. National Park Service policies for wetlands as stated in *2001 Management Policies* and Director's Order 77-1 *Wetlands Protection*, strive to prevent the loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In accordance with DO 77-1 *Wetlands Protection*, proposed actions that have the potential to adversely impact wetlands must be addressed in a Statement of Findings for wetlands.

No wetlands are located in the project area; therefore, a Statement of Findings for wetlands will not be prepared, and the impact topic of wetlands has been dismissed.

Floodplains

Executive Order 11988 *Floodplain Management* requires all federal agencies to avoid construction within the 100-year floodplain unless no other practicable alternative exists. The National Park Service under *2001 Management Policies* and Director's Order 77-2 *Floodplain Management* will strive to preserve floodplain values and minimize hazardous floodplain conditions. According to Director's Order 77-2 *Floodplain Management*, certain construction within a 100-year floodplain requires preparation of a Statement of Findings for floodplains.

The project area for the new administration building is not located within a 100-year floodplain. Therefore a Statement of Findings for floodplains will not be prepared, and the topic of floodplains has been dismissed.

Vegetation

According to the National Park Service's *2001 Management Policies*, the National Park Service strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural

abundance, diversity, and ecological integrity of plants (NPS 2000). The project area is located on the Colorado Plateau and lies within the Great Basin desertscrub biotic community (Brown 1994). Blackbrush (*Coleogyne ramosissima*) and shadscale (*Atriplex confertifolia*) are the dominant vegetation. Other species include Mormon tea (*Ephedra torreyana*), yucca (*Yucca angustissima*), snakeweed (*Gutierrezia microcephala*), and sand sagebrush (*Artemisia filifolia*). Vegetation is sparsely distributed, with bare ground and sandstone rock common. Previous construction activities in the Chains area during construction of the Glen Canyon dam left the area highly modified. The proposed location for the pumping plant was leveled, cleared, and graveled, and all of the proposed conveyance pipeline alignment was heavily disturbed during these past activities.

This project has been identified as one that may introduce or spread noxious or invasive weedy species in the park. Trenching for the conveyance pipeline during construction would provide a new opportunity for invasive weeds to become established in the area. The construction contractor would be required to implement the Best Management Practices contained in the appendix to this EA to help control the spread of invasive plants. This list would be included in the construction specifications and discussed with the construction contractor at a preconstruction conference. A landscaping plan for site restoration, developed by the City in cooperation with the GCNRA botanist, that uses the native species listed in the appendix to this EA, would be implemented immediately following construction. Adherence to the Best Management Practices and implementation of a landscaping plan following construction would be expected to reduce the potential effects of construction to negligible, and the topic of vegetation has been dismissed.

Wildlife

There are approximately 80 species of mammals, 35 species of reptiles and amphibians, and 200 species of birds in the Lake Powell area (Malespin, 1981). In addition, the lake itself supports up to 20 species of fish, the majority of which are introduced game fish. These include striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), walleye (*Stizostedion vitreum*), bluegill (*Lepomis macrochirus*), and channel catfish (*Ictalurus punctatus*). Threadfin shad (*Dorosoma petenense*) are very abundant and form the food base for larger predatory fish, especially striped bass. Open water habitats in Lake Powell are dominated by these two species.

Common small mammals in the project vicinity include jackrabbit (*Lepus californicus*), Ord kangaroo rat (*Dipodomys ordii*), deer mouse (*Peromyscus maniculatus*), pocket mouse (*Chaetodipus* spp. and *Perognathus* spp.), and woodrats (*Neotoma* spp.). The proximity of the Chains area to the City of Page, the Glen Canyon dam, and other developments probably minimizes the number of large mammals that inhabit the area, although the presence of coyotes (*Canis latrans*) would not be unexpected. Plateau striped whiptail lizard (*Cnemidophorus velox*) are abundant and easily observed on warm summer days. Other common reptiles include gopher snake (*Pituophis catenifer*), Western rattlesnake (*Crotalus viridis*), desert spiny lizard (*Sceloporus magister*), and side-blotched lizard (*Uta stansburiana*).

The common raven (*Corvus corax*) is the most noticeable resident bird; other large birds that are regularly seen include golden eagle (*Aquila chrysaetos*) and red-tailed hawk (*Buteo jamaicensis*). The great-tailed grackle (*Quiscalus mexicanus*) is ubiquitous around the campgrounds and marinas, while the canyon wren (*Catherpes mexicanus*) is frequently seen and heard in the canyon country around the lake. Common waterfowl include mallard (*Anas platyrhynchos*), coot (*Fulica americana*), and Western grebe (*Aechmophorus occidentalis*). Yellow warbler (*Dendroica petechia*), Say's phoebe (*Sayornis saya*), and blue-grey gnatcatcher (*Poliophtila caerulea*) are among the various species of migratory birds found in the Lake Powell area.

During construction, the implementation of a SWPPP, as described in Water Quality, would eliminate the potential for the poisoning of wildlife. During construction of the conveyance pipeline, the trench would be backfilled over the pipe at the end of each day to prevent the accidental trapping of small reptiles and mammals. If the trench must be left open, then a ramp in the form of a short board would be placed in the trench with one end at the bottom of the trench and the other end out of the trench to provide a means for their escape. Screens fitted over the intakes in the lake would prevent the uptake of fish during operation of the pumps. There would be no effects to fish or other common wildlife species from construction or operation of the proposed pumping plant, intakes, or conveyance pipeline, and the topic of wildlife has been dismissed.

Special Status Species

The Endangered Species Act (ESA) of 1969 was enacted to provide a means whereby threatened and endangered species and the ecosystems on which they depend may be conserved. Under section 7(a)(1) and 7(a)(2) of the ESA, the NPS is required to determine whether projects proposed on lands administered by the NPS may affect threatened and endangered species, and/or critical habitat. The United States Fish and Wildlife Service (USF&WS) is the federal agency charged with responsibility for implementing and enforcing the requirements of the ESA.

The GCNRA consulted with the USF&WS and the Arizona Game and Fish Department (AZG&FD) for information about special status species through correspondence. Copies of the correspondence with these agencies are located in the appendix to this EA. Special status species data contained in Table 1 was extracted from the Arizona Ecological Services Field Office website (USF&WS, 2005) and from the AZG&FD (2005) website for Coconino County.

Those species known occur, at least occasionally, in the proposed project vicinity are highlighted in bold text. An asterisk denotes species that are known by AZG&FD to occur within three miles of the project area. The federal and State status for each species are shown in the two right-hand columns. The bald eagle (*Haliaeetus leucocephalus*) and the California condor (*Gymnogyps californianus*) are the only federally protected species on the list that are known to occasionally occur in the proposed project area. There are no known nests for these birds within a half-mile of the proposed project area.

The flannelmouth sucker (*Catostomus latipinnis*) inhabits rocky pools, runs and riffles of medium to large rivers, and is less often found in creeks and small rivers; therefore, no habitat exists for this species in the project area. There is no suitable habitat in the project area for the remaining species in Table 1. There is no critical habitat or proposed critical habitat in the proposed project area.

Table 1 – Current list of federal and State protected species, species proposed for protection, candidates for protection, and species of concern in Coconino County.

Common Name	Scientific Name	Federal	State
Birds			
American peregrine falcon	<i>Falco peregrinus anatum</i>	SC	WSC
Bald eagle	<i>Haliaeetus leucocephalus</i>	T	NL
California brown pelican	<i>Pelecanus occidentalis californicus</i>	E	NL
California condor	<i>Gymnogyps californianus</i>	T	NL
Mexican spotted owl	<i>Strix occidentalis lucida</i>	T	NL
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	E	WSC
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	C	NL
Mammals			
Black-footed ferret	<i>Mustela nigripes</i>	E	NL
Spotted bat	<i>Euderma maculatum</i>	SC	WSC
Big free-tailed bat	<i>Nyctinomops macrotis</i>	SC	NL
Amphibians and Reptiles			
Chiricahua leopard frog	<i>Rana chiricahuensis</i>	T	WSC
Northern leopard frog	<i>Rana pipiens</i>	NL	WSC
Fish			
Apache trout	<i>Oncorhynchus apache</i>	T	NL

Common Name	Scientific Name	Federal	State
Birds			
Flannelmouth sucker*	Catostomus latipinnis	SC	NL
Humpback chub	Gila cypha	E	WSC
Little Colorado spinedace	Lepidomeda vittata	T	NL
Razorback sucker	Xyrauchen texanus	E	WSC
Gila chub	Gila intermedia	PE	NL
Invertebrates			
Kanab ambersnail	Oxyloma haydeni Kanabensis	E	NL
Plants			
Brady pincushion cactus	Pediocactus bradyi	E	NL
Navajo sedge	Carex specuicola	T	HS
San Francisco peaks groundsel	Senecio franciscanus	T	NL
Sentry milkvetch	Astragalus cremnophylax var. cremnophylax	E	NL
Siler pincushion cactus	Pediocactus sileri	T	NL
Welsh's milkweed	Asclepias welshii	T	HS
Fickeisen plains cactus	Pediocactus peeblesianus var. fickeiseniae	C	NL
Arizona bugbane	Cimicifuga arizonica	CA	NL
Paradine (Kaibab) plains cactus	Pediocactus paradinei	CA	NL
<p>bold = occasionally occurs in the project area *known to occur within three miles</p> <p>E = Endangered T= Threatened PE = proposed endangered</p> <p>C = Candidate SC = Species of Concerns CA = Conservation Agreement</p> <p>HS = Highly Safeguarded: no collection allowed WSC = Wildlife of Special Concern</p> <p>NL = NOT LISTED FOR COCONINO COUNTY</p> <p>Sources: Consultation with the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department.</p>			

The bald eagle and the California condor may occasionally pass through the project area. Breeding by these species in the project area or the Lake Powell area has not been observed. The bald eagle would tend to avoid human activities in the project area by flying elsewhere.

California condors are naturally curious scavengers. To reduce the attractiveness of the construction site to these birds, the following measures would be implemented in accordance with the USF&WS recommendations:

- Prior to the start of construction, personnel monitoring California condor locations and movement would be contacted to determine the locations and status of condors in the project vicinity.
- If a condor occurs at the construction site, construction would cease until the condor leaves on its own or until techniques are employed by permitted personnel that result in it leaving the area.
- Construction workers and supervisors will be instructed to avoid interaction with condors and to immediately contact the appropriate GCNRA personnel if or when condors occur at the construction site.

- The construction site would be cleaned up (e.g., trash removed) at the end of each day that work is conducted to minimize the likelihood of condors visiting the area. GCNRA staff would monitor site activities on an as-needed basis during construction to ensure that adequate cleanup measures are taken.
- To prevent water contamination and potential poisoning of condors, an SWPPP, as described in Section 4.4.1, Water Resources, would be developed and implemented. The plan would include provisions for immediate cleanup of any hazardous substance and define how to treat each hazardous substance in case of leakage or spill.

No temporary or permanent effects to special status species would be expected from construction or operations activities, and the topic of special status species has been dismissed.

Cultural Landscapes, Archaeological, Paleontological, and Ethnographic Resources

According to the National Park Service's Director's Order 28 *Cultural Resource Management Guideline*, a cultural landscape is a reflection of human adaptation and use of natural resources, and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. Although a cultural landscape inventory has not been conducted for the GCNRA, the features within the general project area are not likely to contribute to a significant cultural landscape. Therefore, this topic has been dismissed from further consideration.

Section 106 of the National Historic Preservation Act, as amended in 1992 (16 USC 470 et seq.); the National Park Service's Director's Order 28 *Cultural Resource Management Guideline*; and National Park Service *2001 Management Policies* (NPS 2000b) require the consideration of impacts on historic properties that are listed on or eligible to be listed in the National Register of Historic Places. The National Register is the nation's inventory of historic places and the national repository of documentation on property types and their significance. The above-mentioned policies and regulations require federal agencies to coordinate consultation with State Historic Preservation Officers regarding the potential effects to properties listed on or eligible for the National Register of Historic Places.

The National Park Service, as steward of many of America's most important cultural resources, is charged to preserve historic properties for the enjoyment of present and future generations. Management decisions and activities throughout the National Park System must reflect awareness of the irreplaceable nature of these resources. The National Park Service will protect and manage cultural resources in its custody through effective research, planning, and stewardship and in accordance with the policies and principles contained in the *2001 Management Policies* and the appropriate Director's Orders.

According to *2001 Management Policies*, paleontological resources (fossils), including both organic and mineralized remains in body or trace form, will be protected, preserved, and managed for public education, interpretation, and scientific research (NPS 2000). The proposed site for the construction of the new pumping station and conveyance pipeline is located on Navajo sandstone, a geological unit in which dinosaur and reptile tracks have been found within the Glen Canyon National Recreation Area, although none have been found in the project area.

A Class I Archaeological Records Search was conducted by EnviroSystems (2005) for the proposed project area. Arizona Department of Transportation records indicate that a Class III Archaeological survey was conducted along US 89 within the project boundary, but no sites or occurrences were found. The Chains area was originally filled with soil and rock debris from excavations at the Glen Canyon dam and then used as an equipment and materials storage area during construction of the dam (NPS, 2004a). The Chains area's historical use during the construction of the Glen Canyon Dam resulted in total disturbance and the likely destruction of any recoverable cultural, archaeological, or paleontological resources, if any existed.

The NPS Staff Archaeologist has determined that because of previous disturbance in the Chains area, no Class III Archaeological survey in the Chains area would be required. There would be no effects to these resources, and this topic has been dismissed from further analysis.

Historic Structures

The term “historic structures” refers to both historic and prehistoric structures, which are defined as constructions that shelter any form of human habitation or activity. There are no historic structures in the proposed project area; therefore, this topic has been dismissed from further analysis.

Prime and Unique Farmlands

The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in the conversion of these lands to non-agricultural uses. Prime or unique farmland is classified by the U.S. Department of Agriculture's NRCS, and 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. The land that would be affected by the proposed project is not currently, nor has it been recently, used for agricultural purposes. It comprises non-irrigated desert sandstone and soils derived from the breakdown of sandstone. It is neither prime nor unique; therefore, the topic of prime and unique farmlands has been dismissed.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by the Department of Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

There are no Indian trust resources at in the proposed project area. The lands comprising the GCNRA are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, the project would have no effects on Indian trust resources, and this topic was dismissed as an impact topic.

Environmental Justice

Executive Order 128989, *General Actions to Address Environmental Justice in Minority Populations and Low Income Populations* (1994), requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low income populations and communities. The proposed action would not have disproportionate health or environmental effects on minority or low income populations or communities as defined in the Environmental Protection Agency's *Environmental Justice Guidance* (1998). Therefore, environmental justice was dismissed as an impact topic in this EA.

Socioeconomics

The proposed action would neither change local and regional land use nor appreciably impact local businesses or other agencies. Implementation of the proposed action could provide a negligible beneficial impact to the economy of Page, Arizona, as well Coconino County and the Navajo Nation due to minimal increases in employment opportunities for the construction workforce and revenues for local businesses and governments generated from these additional construction activities and workers. Any increase in workforce and revenue, however, would be temporary and negligible, lasting only as long as construction. Because the impacts to the socioeconomic environment would be negligible, this topic has been dismissed.

Soundscape Management

In accordance with *2001 Management Policies* and Director's Order 47 *Sound Preservation and Noise Management*, an important component of the National Park Service's mission is the preservation of natural soundscapes associated with national park units (NPS 2000). Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural

sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among National Park Service units as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas.

The proposed location for the new pumping station and conveyance pipeline and all construction activity would occur in the RRU zone of Glen Canyon National Recreation Area and the US Highway 89 (US 89) right-of-way. Existing sounds in this area are most often generated from vehicular traffic (visitors and employees entering/leaving the Chains area and driving on US 89), people, climate controls on the buildings, some wildlife such as birds, and wind. Sound generated by the long-term operation of the pumping station would include the noise created by the pumps when they are running inside the building and possibly some noise from the electrical transformer that would supply electricity to the pumps. Because the area already contains man-made noises, the long-term operation of the building is not expected to appreciably increase the noise levels in the general area.

During construction, human-caused sounds would likely increase due to construction activities, equipment, vehicular traffic, and construction crews. Any sounds generated from construction would be temporary, lasting only as long as the construction activity is generating the sounds, and would have a negligible to minor adverse impact on visitors and employees. Therefore, the topic of soundscape management was dismissed as an impact topic.

Lightscape Management

In accordance with *2001 Management Policies*, the National Park Service strives to preserve natural ambient landscapes, which are natural resources and values that exist in the absence of human caused light (NPS 2000). Glen Canyon National Recreation Area strives to limit the use of artificial outdoor lighting to that which is necessary for basic safety requirements. The GCNRA also strives to ensure that all outdoor lighting is shielded to the maximum extent possible, to keep light on the intended subject and out of the night sky. The City of Page and the Glen Canyon Dam are the primary sources of light in the proposed project area.

The proposed action may incorporate minimal exterior lighting around the pumping station building, but the lighting would be directed toward the intended subject with appropriate shielding mechanisms, and would be placed in only those areas where lighting is needed for safety reasons. The amount and extent of exterior lighting on the pumping station building would have negligible effects on the existing outside lighting or natural night sky of the area; therefore, this topic has been dismissed.

Park Operations

The primary administrative building and Visitor's Center for the GCNRA is located approximately two miles from the proposed location of the pumping station; however, the connecting conveyance pipeline between the new pumping station and the existing water supply line would cross beneath the main entrance to the parking lot of this building. An additional entrance to the building's parking area approaches from behind the building by way of Scenic View Road, which loops back around to the north and connects to US 89 approximately one half mile away. Techniques for boring beneath the main entrance could be used to avoid closure of this entrance during installation of the conveyance pipeline or the back entrance to the parking area could also be used. Neither construction nor operation of the proposed pumping station and conveyance pipeline would prevent any park operations from being carried out in a manner other than they are normally. For this reason, the topic of Park Operations has been dismissed.

Public Safety and Hazardous Materials/Wastes

The exposure of hazardous materials or wastes during construction would not be expected since it is currently believed that such materials and wastes are restricted to an area well north of where any project-related excavation would take place. An SWPPP, as described in Section 4.4.1, Water Resources, would be expected to eliminate any potential effects of the use of hazardous materials or the generation of hazardous waste during construction.

A few small quantities of hazardous materials such as lubricants for the pumps and possibly some cleaning fluids may be stored on-site during operation of the pumping plant. These materials would be stored in appropriate containers inside the pumping plant building. There would be no effects from storage and use of these materials on-site.

If the Chains area is kept open during construction, than a flagman would be used to control traffic around the construction site. A temporary chain-link security fence around stored materials and equipment during construction would protect the public from any safety hazards. There would be no effects to public safety; therefore, the topic of public safety and hazardous materials/wastes has been dismissed from further discussion.

Museum Collections

According to Director's Order 24 *Museum Collections*, the National Park Service requires the consideration of impacts on museum collections (historic artifacts, natural specimens, and archival and manuscript material), and provides further policy guidance, standards, and requirements for preserving, protecting, documenting, and providing access to, and use of, National Park Service museum collections. No museum collections would be affected by the proposed project; therefore, the topic of museum collections has been dismissed from further consideration.

Permitting Requirements

The NPS would need to issue a grant of right-of-way to the City for the area permanently enclosed by the fence around the pumping plant and that portion of the conveyance pipeline that would be located within the GCNRA. Since the project proposed in this EA would affect more than one acre of land, a National Pollution Discharge Elimination System permit would be required prior to the initiation of construction activities. Also, the Arizona Department of Environmental Quality would require a Stormwater Pollution Prevention Plan with a Notice of Intent submitted to the Arizona Department of Transportation (ADOT). An Encroachment Permit would be required from the ADOT.

The NPS would require verification from the U.S. Army Corps of Engineers (USACE) that the discharge of fill material (less than 10 cubic yards) into Lake Powell during drilling operations meets the criteria of Nationwide Permit No. 18 and thus meets the requirements of Section 404 of the *Clean Water Act* and Section 10 of the *Rivers and Harbors Act*. Verification from the USACE that the placement of the raw water supply conveyance pipeline through "waters of the U.S." (drainages) located between the proposed pumping plant location and the connection point with the existing system would meet the criteria of Nationwide Permit No. 12 would also be required. All necessary permits would be obtained by the City prior to the initiation of construction activities.

ALTERNATIVES CONSIDERED

In June of 2004, the U.S. Bureau of Reclamation (2004) issued a concept design study and report of findings for the City that built on a previous investigation by Tetra Tech RMC (2003). Reclamation's report developed three new lake intake alternatives in greater detail and provided the basis for Alternative B described in this EA. Of these three, two were dismissed from further consideration for various reasons, as described later in this chapter. One action alternative and the No Action Alternative are carried forward for further evaluation in this EA. A summary table comparing alternative components is presented at the end of this chapter.

Alternatives Carried Forward

Alternative A – No Action

Under this alternative, the new pumping station and connecting conveyance pipeline would not be constructed. The City would continue to use the existing water supply system originating inside the Glen Canyon Dam. There would be no system redundancy and no additional pumping capacity during periods of high demand. If the system fails, or if the lake level drops below the intake elevation, the City would be faced with severe water rationing and start bringing water in by truck. This water would be purchased from other sources and/or pumped into trucks from the lake surface nearby, if possible.

Alternative B – Construct and Operate New Water Pumping Station (Preferred Alternative)

The City proposes to construct and operate a pump station and conveyance pipeline from Lake Powell to a tie-in point on its existing system near US 89 between the Glen Canyon rim and the City's water treatment plant. The pump station would be located at Site 3 in the Chains area, as identified in the *Page-LeChee Water Supply – Part I, Concept Design Study – Report of Findings* prepared by Reclamation (2004) and in Figures 2 and 3. The precise placement of the proposed pumping plant within the site would be determined during the development of design data and the detailed engineering plans.

Six 48-inch diameter boreholes would be drilled at an angle from the surface to a point within the lake at an approximate elevation of 3,373.0 feet amsl. The angle of the boreholes, or shafts, would be set at an approximately 2:1 (vertical:horizontal) slope (which means for every two feet down, the borehole angles one foot over toward the canyon wall), which, when combined with the 3,373.0 feet amsl intake elevation, would ultimately determine the exact location of the aboveground pumping facility within the site. A steel casing would be grouted into each shaft with screens placed over the lower ends to prevent the uptake of fish and other materials. The boreholes may all be drilled at the very beginning of construction or they may be drilled in two phases with three drilled at the beginning of construction and the remaining three drilled later when they become necessary. If all six boreholes are drilled at the very beginning of construction, then three would be capped until later when they are needed.

Submersible pumps would be installed in the bottom of the shafts. These pumps would supply water to a common sump in the pumping plant. A turbine booster pump would be installed in the sump for each actively used shaft. These booster pumps discharge into a 12-inch diameter conveyance pipeline that would carry the water to the tie-in point on the existing system. The length of the conveyance pipeline would be approximately 2 miles. All of it would be buried.

For security and the protection of equipment, the booster pumps and electrical and mechanical controls would be enclosed in a small aboveground pumping plant building. The approximately 55 x 90 feet pumping plant would be designed to NPS architectural standards using colored, split-faced concrete blocks and metal roofing similar to the type used for other facilities in the GCNRA. The pumping plant would be surrounded by a 7-foot chain link security fence. The building color and fence coating would be selected to match the surrounding rock. A transformer pad and water flow meter vault would be located outside of the pumping plant, but within the fence. The fenced area would have a total footprint of approximately 175 x 125 feet. A portable outdoor steel hoist frame, stored offsite, would be occasionally used to facilitate installation and removal of the submersible pumps when needed.

The conveyance pipeline from the pumping plant to the tie-in point on the existing system would generally follow the access road to the Chains Recreation Area (Figure 1). From the intersection of the Chains Recreation Area access road and US 89, the conveyance pipeline would cross US 89 to the west side, and then follow it within the right-of-way with the Arizona Department of Transportation, which would require an encroachment permit, to the tie-in point on the existing system. Electricity for the pumping plant would be delivered through a power cable that would be buried in the same trench with the conveyance pipeline up to the Page Electric Utility connection point located just outside the NPS boundary on US 89. When this connection point was constructed, a breaker for the proposed pumping plant was installed in anticipation of the future need (Faulk, pers. comm., 2005). The new alternate water supply system would be managed concurrently with the existing system. The new facilities would be accessed by City staff, as required, for maintenance.

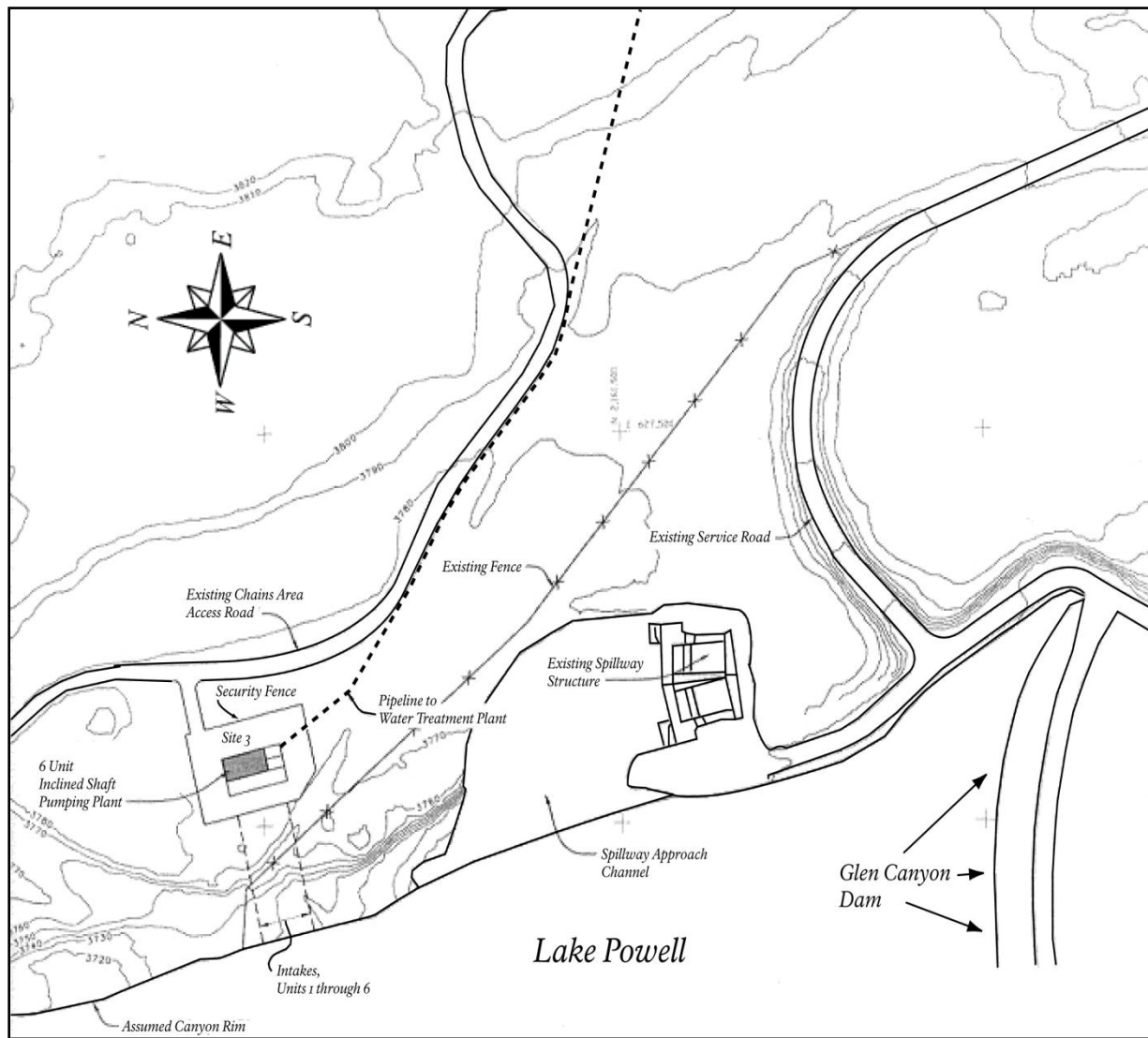


Figure 2 – Proposed location of pumping facility in the Chains Recreation Area.

This alternative is based on preliminary designs and best information available at the time of this writing. Specific distances, areas, and layouts used to describe the alternative are only estimates and could change during final site design. If changes during final site design are not consistent with the intent and effects of the selected alternative, then additional compliance would be completed, as appropriate.

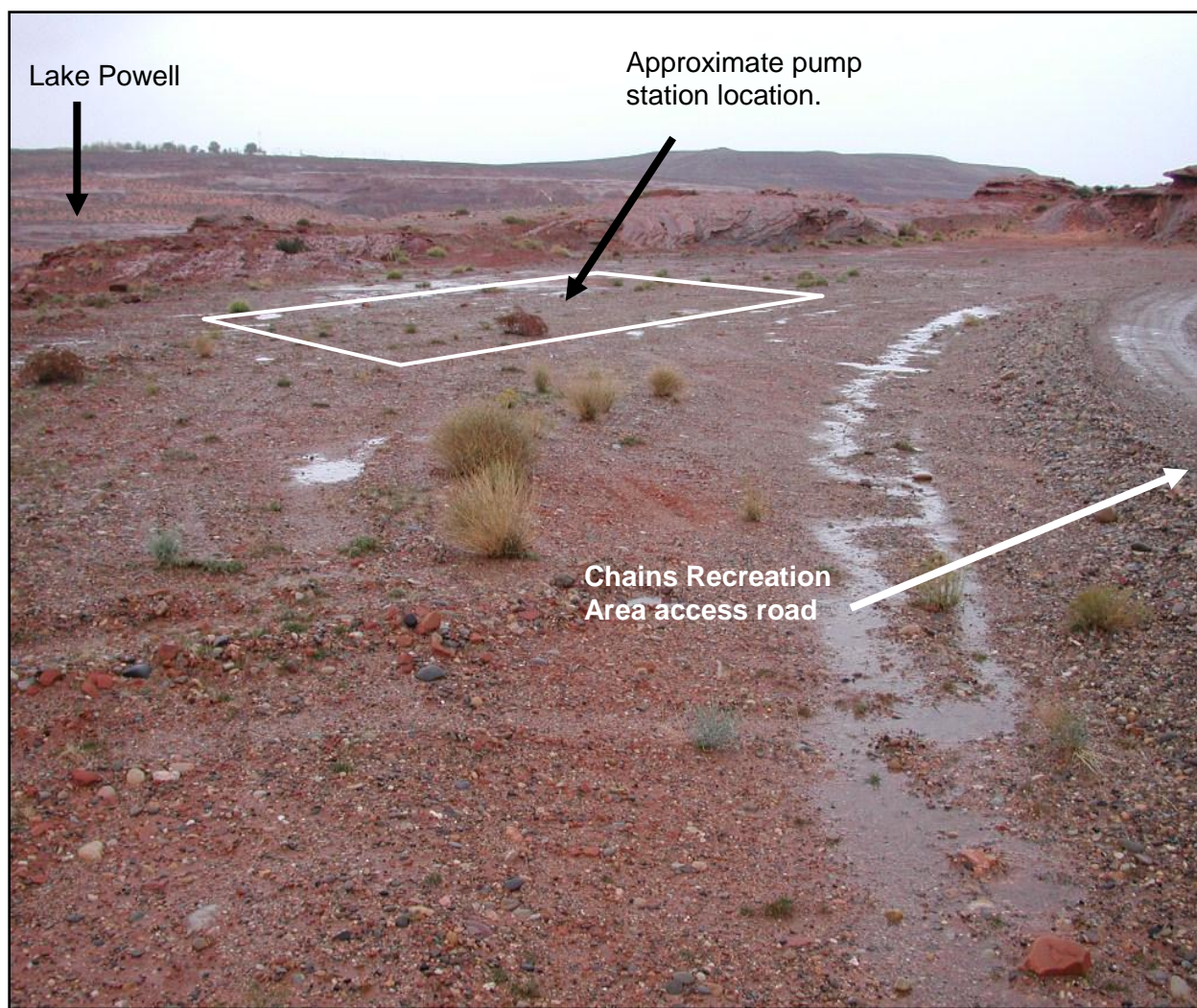


Figure 3 – Photograph of the proposed location for the pumping facility.

Alternatives Considered and Dismissed

Two intake elevations, two borehole configurations, and three site locations, were considered for the proposed action. Also, two entirely separate and independent project possibilities were examined to meet the purpose and need described in Section 1.0 of this EA. These two independent possibilities were the construction and operation of a deep groundwater well-field near Antelope Canyon and the use of excess pumping capacity at the Navajo Generating Station (NGS) operated by Salt River Project (SRP) (TTRMC, 2003). Locating the intake facilities downstream of the Glen Canyon Dam was not considered because of the higher cost of raising the water from a much lower elevation and the lack of a suitable location for a pumping plant.

- Deep Groundwater Well-field Project** – This alternative involved the phased drilling of up to seven, 750 to 800- gpm, deep groundwater wells near Antelope Canyon, approximately 2.0 to 2.5 miles east of the City's water treatment plant. The location identified contains a large underground fracture, called the Wahweap Syncline that intersects with Lake Powell. This connection allows for rapid recharge of the aquifer in this area. Drilling the wells into this fracture would offer the greatest chance of achieving the required pumping capacity. Without this geologic feature, other deep groundwater wells in the area generally only achieve a pumping capacity of 20 to 30 gpm.

A new pipeline would be required between the new well-field and the City's water treatment plant. To minimize the amount of new ground disturbance, this pipeline would follow the access road to

Antelope Point south to State Route 98 (SR 98), then east along SR 98 to the City's water treatment plant. The estimated length of this pipeline would be between five and six miles.

Before the feasibility of this project could be evaluated, a test well would be necessary to gather information regarding well capacity, draw down, horsepower requirements, well spacing, and more accurate pipeline requirements. Even with these data, and assuming that such high-capacity wells are feasible, there is still a risk that individual wells may not provide the required capacity, since it is likely that the aquifer characteristics may not be uniform throughout the well-field. Given the relative similarity between this alternative and the proposed action, this project would be expected to have similar costs, unless additional wells became necessary as a result of some wells not providing the required capacity, which would substantially increase the cost of the project.

The principal reason this project was not carried forward as an alternative is the very high level of risk of failure and the potential for substantially higher costs; whereas the proposed action carries little to no risk at all. Also, from an environmental standpoint, the well-field and connecting pipeline between the wells and the access road to Antelope Point would all be located on previously undisturbed ground, which makes it considerably less desirable than the proposed action, which would be located entirely on previously disturbed ground.

- **Tap into Navajo Generating Station Water System** – This proposal would require a long-term agreement with NGS to use the excess capacity of its existing and future lake intakes, pump stations, and pipelines. Booster stations and a longer, 4.5-mile-long pipeline from the NGS to the City's water treatment plant would need to be constructed to transport the water to the City. Without the planned future expansion of the NGS water supply system, the NGS would not have enough excess capacity to meet the City's needs during peak periods and would not be able to meet the future projected demands of the City and LeChee (TTRMC, 2003).

Once NGS has completed its planned water supply system expansion, there might be enough excess capacity to meet the City's and LeChee's needs; however, several factors make this proposal significantly less attractive than the proposed action. This project would be considerably less reliable than the proposed action because it would depend upon the City's ability to obtain an acceptable agreement with NGS. Also, the NGS is subject to periodic contract issues which could have an effect of the longevity of the plant. Economic, physical, and political conditions relating to the fuel supply could potentially have the same effect. If the NGS ceased operating for any reason, the City would have to cover the full cost of operating the NGS intake system, which would be more expensive than operating the facilities described in the proposed action. Although none of these reasons alone would be enough to dismiss this alternative, taken together they represent a considerable amount of risk, which the proposed action does not have.

Other Intake Elevation, Borehole Configuration, and Siting Possibilities

- **Intake Elevation** – In addition to the selected intake elevation of 3,373.0 feet amsl, an intake depth of 3,473.0 feet amsl was also considered. The existing water supply system intake is set at 3,480.0 feet amsl. Two factors critical in determining which elevation would be the best were the reliability of the supply and water quality. By placing the intake for the proposed new water supply system at the lower elevation, the lake would have to drop another 100 feet to fall below the new system's intake.

Water quality investigations performed by Reclamation indicate that the quality of the water at approximately 3,470 feet amsl is better than it is at approximately 3,374 feet amsl. The bottom of the lake is just below 3,374 feet amsl, which is why deeper intake depths were not considered. The particular factor affecting water quality in the lake is the level of total dissolved solids (TDS). The TDS at these two elevations fluctuates seasonally over a range of 200 milligrams per liter (mg/L). Typically, the TDS levels at the 3,374 feet amsl elevation are about 100 mg/L higher than at the 3,470 feet amsl elevation. The advantage of slightly better water quality was far outweighed by the advantage of having an additional 100 feet of water above the intake, should lake levels decline to an elevation below the existing intake. Also, since the water from the proposed new water supply facilities would be blended with water from the existing system, the overall effect of the higher TDS levels would be minor. For these reasons, the intake depth of 3,473.0 feet amsl was eliminated from further consideration.

- Borehole Configuration** – A vertical borehole configuration was also considered for the water intakes. This configuration would involve drilling or excavating a vertical shaft 362.5 feet deep and 18 feet in diameter from the surface to an elevation of 3,372.5 feet amsl. Then drilling or excavating a horizontal shaft, 8.0 feet wide, through the canyon wall into the lake from a point near the bottom of the vertical shaft. The water level in the vertical shaft would be the same as the lake level. Submersible pumps would be installed in the vertical shaft to bring water to the surface where it would enter a pipeline that connects to the City's existing system as described in the proposed action.

The vertical shaft alternative would cost twice as much to construct as the inclined shaft system described in the proposed action while providing no necessary advantages. This effectively made the alternative financially unfeasible.

- Siting Possibilities** – Two other locations in the Chains Recreation Area were considered as possible sites for the proposed pumping facilities. These two sites, referred to as Site 1 and Site 2 in the *Page-LeChee Water Supply – Part I, Concept Design Study – Report of Findings* (Reclamation, 2004), are located slightly north of the site selected for the proposed action. Figure 4, below, shows the locations of these two sites relative to the selected site. Both sites are closer to the rim of the lake and are consequently more visible from the lake. Both of these sites are barely large enough to accommodate the proposed facilities and could potentially require additional excavation to make room for construction of the new facilities. Also, neither of these sites would accommodate an intake depth of 3,390 feet amsl, unless the vertical shaft borehole configuration was used. These two sites were, therefore, eliminated from further consideration.

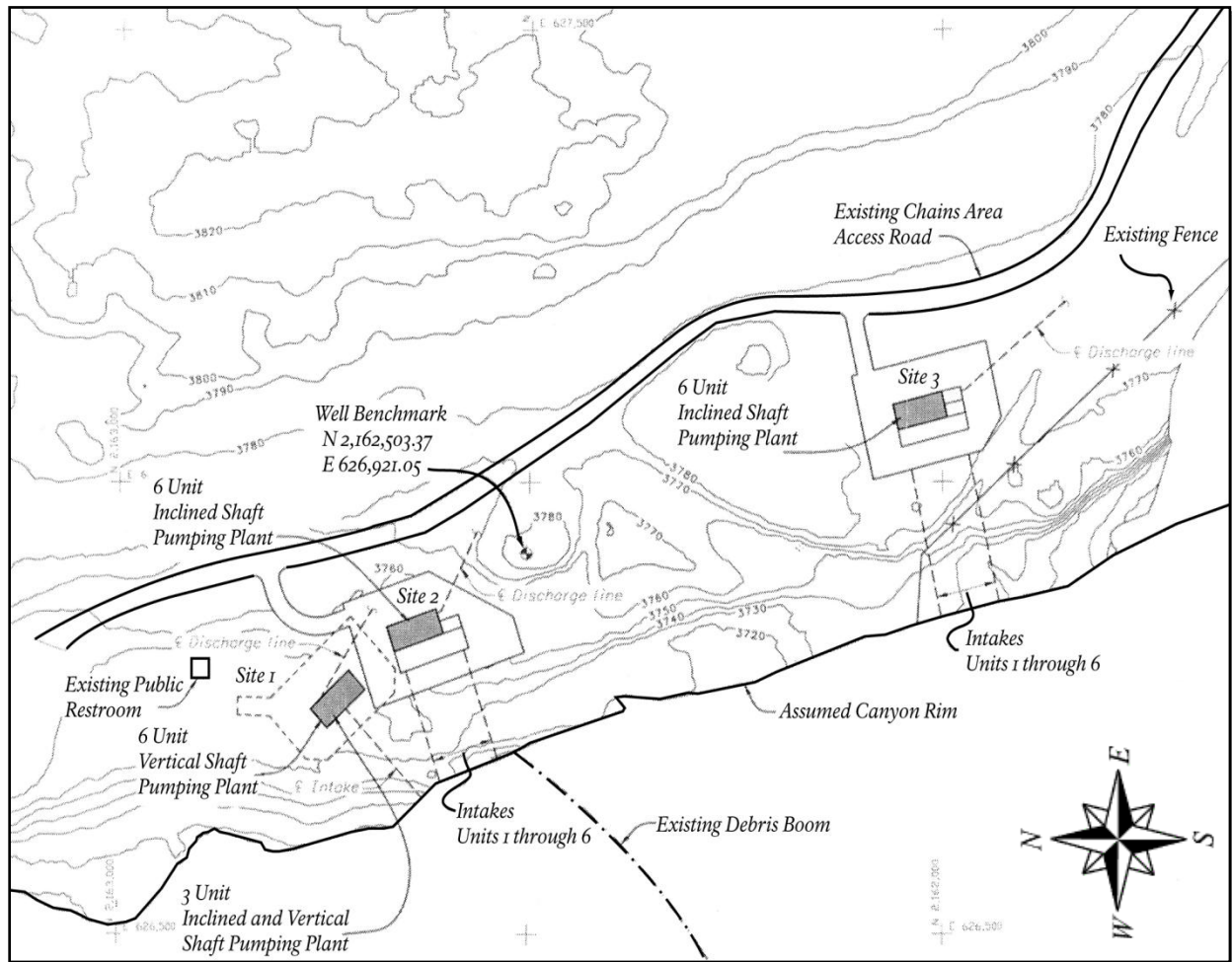


Figure 4 – Relative locations of alternate Sites 1, 2 and 3

Mitigation Measures

These measures would be implemented if the Preferred Alternative is selected. They are not part of the alternative because they are not designed to meet the purpose and need of the project; however, they are necessary to minimize the potential effects to the environment that may result from implementation of the Preferred Alternative.

- A temporary chain-link security fence would be placed around stored materials and equipment during construction for public safety and to protect the materials and equipment from theft and vandalism.
- The construction contractor would be required to provide water for dust abatement.
- The construction contractor would be required to prepare and submit to NPS for approval a Stormwater Pollution Prevention Plan (SWPPP) prior to the initiation of construction activities. This plan would provide specific details on handling, containment, and disposal of hazardous materials used and wastes generated during construction. Adherence to the plan would be strictly required by GCNRA. The contractor would be required to immediately report to GCNRA any spills of hazardous materials or wastes that cannot be immediately contained and cleaned up in accordance with the plan.
- The construction contractor would be required to implement the Best Management Practices contained in the appendix to this EA to help control the spread of invasive plants. This list would be included in the construction specifications and discussed with the construction contractor at a preconstruction conference.
- A landscaping plan for site restoration, developed by the City in cooperation with the GCNRA botanist, that uses the native species listed in the appendix to this EA, would be implemented immediately following construction.
- During construction of the conveyance pipeline, the trench would be backfilled over the pipe at the end of each day to prevent the accidental trapping of small reptiles and mammals. If the trench must be left open, then a ramp in the form of a short board would be placed in the trench with one end at the bottom of the trench and the other end out of the trench to provide a means for their escape.
- To reduce the attractiveness of the construction site to California condors, the following measures would be implemented in accordance with the USF&WS recommendations:
 - Prior to the start of construction, personnel monitoring California condor locations and movement would be contacted to determine the locations and status of condors in the project vicinity.
 - If a condor occurs at the construction site, construction would cease until the condor leaves on its own or until techniques are employed by permitted personnel that result in it leaving the area.
 - Construction workers and supervisors will be instructed to avoid interaction with condors and to immediately contact the appropriate GCNRA personnel if or when condors occur at the construction site.
 - The construction site would be cleaned up (e.g., trash removed) at the end of each day that work is conducted to minimize the likelihood of condors visiting the area. Unannounced random site inspections by GCNRA staff would ensure that adequate cleanup measures are taken.
 - To prevent water contamination and potential poisoning of condors, the SWPPP would include provisions for immediate cleanup of any hazardous substance and define how to treat each hazardous substance in case of leakage or spill.
- The pumping plant would be designed to NPS architectural standards using colored, split-faced concrete blocks and metal roofing similar to the type used for other facilities in the GCNRA. The pumping plant would be surrounded by a 7-foot chain link security fence. The building color and fence coating would be selected to match the surrounding rock.
- Rock bolts would be used to increase the stability of the cliff face if necessary. These bolts would be painted to match the surrounding rock.

- Access to the Chains area would remain open and at least one lane of the access road would be kept open past the pumping plant site unless site remediation activities in the northern portion of the Chains area are carried out concurrently with the construction of the proposed pumping plant. In this case, the NPS may choose close the area to public use until construction and remediation activities have been completed.
- Should construction unearth previously undiscovered cultural resources, work would be stopped in the area of any discovery and Glen Canyon NRA would consult with the State Historic Preservation Officer and the Advisory Council of Historic Preservation, as necessary, according to 36 CFR 800.13, Post Review Discoveries. In the unlikely event that human remains are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (1990) would be followed.
- Where the conveyance pipeline crosses beneath US 89, it would be emplaced using equipment that would bore under the roadway, thus allowing traffic to continue on the road unimpeded.

Alternative Summaries

Table 2 summarizes the major components of Alternatives A and B, and compares the ability of these alternatives to meet the project objectives (the objectives for this project are identified in the *Purpose and Need* chapter). As shown in the following table, Alternative B meets each of the objectives identified for this project, while the No Action Alternative does not address all of the objectives.

Table 2 – Alternatives Summary and Extent to Which Each Alternative Meets Project Objectives

Alternative A – No Action	Alternative B – Preferred Alternative
The new pumping station and conveyance pipeline would not be constructed. The City would continue to use the existing water supply system originating inside the Glen Canyon Dam. There would be no system redundancy and no additional pumping capacity during periods of high demand. Water would be brought in by truck and rationed during water shortages.	A new water pumping station would be constructed in the Chains area near the Glen Canyon Dam. A conveyance pipeline would be constructed to connect the new pumping station to the existing water supply line. After construction, the new system would be operated as a back-up and during maintenance to the existing system. It would also provide additional peak capacity during periods of high water demand.
Meets Project Objectives?	Meets Project Objectives?
No. The existing water supply system would have no back up. There would be no system in place to provide water to the City during maintenance of the existing system. There would be no additional capacity available to meet current and future peak demands for water in Page or in the LeChee Chapter of the Navajo Nation.	Yes. Constructing and operating a new pumping station and conveyance pipeline would provide for system redundancy, higher peak capacity, and the ability to shut down the existing system as necessary for maintenance. This alternative minimizes environmental impacts to the extent possible, and would not result in impairment to any park resources.

Table 3 summarizes the anticipated environmental impacts for Alternatives A and B. Only those impact topics that have been carried forward for further analysis are included in this table. The *Environmental Consequences* chapter provides a more detailed explanation of these impacts.

Table 3 – Environmental Impact Summary by Alternative

Impact Topic	Alternative A – No Action	Alternative B – Preferred Alternative
Topography, Geology, & Soils	No change in existing conditions.	Potential minor adverse effects to topography resulting from the possible need for scaling along the cliff face and site leveling for the boreholes and pumping station. The site would be expected to remain geologically stable and the effects of drilling would be negligible. Minor, temporary adverse effects to soils along the proposed route of the connecting conveyance pipeline would be expected from ground disturbance. Soils along the proposed route have all been previously disturbed.
Visitor Use and Experience	No change in existing conditions.	Minor adverse effects resulting from changes to the viewshed, construction noise/dust, and the potential temporary closure of the Chains Recreation Area during construction.

Identification of the Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which guides the Council on Environmental Quality (CEQ). The CEQ provides direction that “[t]he environmentally preferable alternative is the alternative that would promote the national environmental policy as expressed in NEPA’s Section 101:

- fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
- assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
- attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
- preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
- achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life’s amenities; and
- enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Alternative A, No Action, would leave future generations in Page and LeChee with a distinct lack of a reliable water supply. It would not assure all generations served by the Page water supply system safe, healthful, or productive surroundings because water is essential to life. No Action would limit the beneficial use of the environment to its existing use, namely recreation, which could be further limited by water rationing. It does not balance the need for water with the need for high standards of living or a wide sharing of life’s amenities.

Alternative B is the environmentally preferred alternative because it best addresses these six evaluation factors. Alternative B, *Construct and Operate New Water Pumping Station*, would provide a more reliable water supply to the residents of Page and LeChee. Since water is a critical necessity of life, this, in turn, would fulfill a responsibility of the current generation to future generations to plan ahead and take the steps required to assure its availability. Alternative B would increase the range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences. No important historic, cultural, or natural aspects of our natural heritage would be adversely affected and the environment of diversity and variety of individual choice would be preserved. This alternative would optimize the balance between population and resource use that would permit high standards of living and a wide sharing of life’s amenities.

No new information came forward from public scoping or consultation with other agencies to necessitate the development of any new alternatives, other than those described and evaluated in this document. Because it meets the Purpose and Need for the project, the project objectives, and is the environmentally preferred alternative, Alternative B is also recommended as the National Park Service Preferred Alternative. For the remainder of the document, Alternative B will be referred to as the Preferred Alternative.