



— BUREAU OF —
RECLAMATION

Lake Powell Pipeline Project

Appendix C-20: Cultural Resources

Coconino and Mohave Counties, Arizona
Kane and Washington Counties, Utah

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1 Introduction/Affected Environment

“Cultural resources” is a broad term that includes definite locations of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional cultural or religious importance to specific social and/or cultural groups. Cultural resources also include traditional cultural properties (TCPs); TCPs are rooted in a traditional community’s history and are important in maintaining the continuing cultural identity of that community. A TCP may be eligible for inclusion in the National Register of Historic Places (NRHP) based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. For this Draft Environmental Impact Statement, TCPs are analyzed in Section 3.18, Ethnographic Resources.

In most cases, the cultural resources located along the Project Area are finite, unique, fragile, and nonrenewable and have the potential to be adversely impacted by the Proposed Project. Cultural resources that meet the eligibility criteria for listing on the NRHP are formally referred to as historic properties.

1.1 Regulatory Framework

The protection and management of cultural resources are governed by the application of the laws listed below:

The **Antiquities Act of 1906** (34 Stat. 225, 18 United States Code [USC] 1866(b), 54 USC 3203 et seq.) established the protection of antiquities and the formation of national monuments.

The **National Park Service Organic Act of 1916** (39 Stat. 535, 54 USC 1003 et seq.) organized the National Park Service (NPS) “which purpose is to conserve the scenery, natural and historic objects, and wild life in the [National Park] System units and to provide for the enjoyment of scenery, natural and historic objects, and wild life in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (54 USC 100101(a)).

The **Historic Sites Act of 1935** (49 Stat. 666; 54 USC 3201 et seq., 1023 et seq.) established it as a “national policy to preserve for public use historic sites, buildings, and objects of national significance for the inspiration and benefit of the people of the United States” (54 USC 320101). This law also mandated preservation of data concerning “historic and archeological sites, buildings, and objects” (54 USC 320102(b)).

The **Archeological and Historic Preservation Act of 1960** or **Reservoir Salvage Act** (Public Law 86-523, [now] 54 USC 3125 et seq.) established reporting efforts when a federal project “may cause irreparable loss or destruction of significant scientific, prehistorical, historical, or archeological data”

(54 USC 312502). Further, data recovery methods and consultation on “relics” and specimens recovered during investigation were instituted.

The **National Historic Preservation Act of 1966**, as amended (Title 54 of the USC) established most of the archaeological protections currently in place and set up procedures for identifying and consulting on projects that may affect cultural resources. As Section 1(b) notes:

“The Congress finds and declares that—

- (1) the spirit and direction of the Nation are founded upon and reflected in its historic heritage;
- (2) 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;
- (3) historic properties significant to the Nation’s heritage are being lost or substantially altered, often inadvertently, with increasing frequency;
- (4) the preservation of this irreplaceable heritage is in the public interest...”

Section 106 of the Act requires federal agency heads to “prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, shall take into account the effect of the undertaking on any historic property” (54 USC 306108).

“Historic property” means any prehistoric or historic district, site, building, structure, or object included on, or eligible for inclusion on the NRHP, including artifacts, records, and material remains related to the district, site, building, structure, or object (54 USC 300308). Those cultural resources that are determined to be ineligible for inclusion on the NRHP are not a primary concern for the Proposed Project.

The **National Environmental Policy Act** of 1970 (Public Law 91-190, 42 USC 4321 and 4331-4335) in Section 101(b)(4) states that a reason for the act is to: “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” (42 USC 4331(a)).

Executive Order 11593 —Protection and Enhancement of the Cultural Environment (54 USC 300101(Note)). President Richard Nixon affirmed in 1971:

Agencies of the executive branch of the Government (hereinafter referred to as ‘Federal agencies’) shall (1) administer the cultural properties under their control in a spirit of stewardship and trusteeship for future generations, (2) initiate measures necessary to direct their policies, plans and programs in such a way that federally owned sites, structures, and objects of historical, architectural or archaeological significance are preserved, restored and maintained for the inspiration and benefit of the people...

Government-to-Government Relations with Native American Tribal Governments - Executive memorandum of April 29, 1994 (Federal Register Vol. 59, No. 85) dictates that agency heads respect and consult with Tribal governments in considering projects.

(b) Each executive department and agency shall consult, to the greatest extent practicable and to the extent permitted by law, with tribal governments prior to taking actions that affect federally recognized tribal governments. All such consultations are to be open and candid so that all interested parties may evaluate for themselves the potential impact of relevant proposals.

(c) Each executive department and agency shall assess the impact of Federal Government plans, projects, programs, and activities on tribal trust resources and assure that tribal government rights and concerns are considered during the development of such plans, projects, programs, and activities.

The **Archaeological Resources Protection Act** of 1979 (Public Law 96-95; 16 USC 470aa-mm) was enacted to protect archaeological resources from illegal exploitation and to create a permitting process with appropriate consultation with Indian tribes prior to excavation.

The **Native American Graves Protection and Repatriation Act** of 1990 (Public Law 101-601; 25 USC 3001 et seq.) calls for the protection of Native American human remains, associated or unassociated funerary objects, sacred objects, and objects of cultural patrimony. The law also provides procedure for returning human remains and objects, as noted above, to their respective tribe or lineal descendant through the process of consultation.

These laws, statutes, and executive orders make it clear that cultural resources are important to the United States and their avoidance and proper management should be incorporated into planning processes and project design.

1.2 Methodology

1.2.1 Area of Potential Effect

Pursuant to Section 106 of the National Historic Preservation Act, federal agencies must consider whether any historic property within a project's Area of Potential Effect (APE) could be affected by the undertaking. An APE is defined as "the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties" (36 Code of Federal Regulations [CFR] 800.16[d]). The APE used in Section 106 was used to understand potential effects on cultural resources from the Proposed Project.

To understand the cultural resources near and within the Proposed Project, an expansive 2-mile APE (1 mile on either side of the centerline) and literature review was applied to the Proposed Project. The width of this APE was chosen to provide an understanding of the location, type, and density of cultural resources in the general area, along with any previously recorded cultural resources that are within the footprint of any of the construction activities associated with the Proposed Project, which may be directly affected by the undertaking. The 2-mile APE assists in the understanding of the types and densities of cultural resources that would most likely be encountered or negatively affected from an indirect effect from an impact to the setting (e.g., visual) by the Proposed Project.

To determine which cultural resources would be directly affected, a Class III-Intensive Pedestrian Survey (Class III survey) was conducted within a 250-foot-wide survey area for the pipeline and transmission line alignments. A Class III survey of all the proposed ancillary facilities was also conducted. A 100-foot survey area was placed around these facilities, which included facilities such as construction staging areas and access roads. The 250-foot survey area and the 100-foot survey area are referred to in this Draft Environmental Impact Statement as the “Project APE.”

A geoarchaeological study was performed in support of the Class III survey. The results of this study are documented in Appendix H, Utah-Arizona: Geoarchaeology Report (UBWR 2018a). The purpose of this study was to assess the potential of a number of archaeological resources to contain geological deposits suitable to preserved relatively intact and buried cultural zones that would be at risk from pipeline construction. The results of the study provide an aid in the decision-making process for archaeological testing and data recovery as a method for mitigating potential effects on significant or sensitive archaeological resources.

These APEs and their subsequent identification efforts (e.g., literature reviews, Class III surveys, and geoarchaeological studies), were designed to provide an understanding of potential effects of construction operation and maintenance of the Proposed Project. The study reports are listed in this report.

1.2.2 Review of Existing Cultural Resource Information

The state and federal agencies conducted a cultural resource literature review (literature review) at various federal, state, and local repositories to obtain background information relevant to understanding past lifeways, cultural sequences, and historic period developments; to determine the extent of previous studies; and to identify previously recorded cultural resource sites documented within a 2-mile corridor centered (2-mile APE) on the centerline for each alternative. As part of the identification process, state and federal agencies contacted a total of 31 Native American tribes (see Section 6, Consultation and Coordination, below) to inquire about existing information that they might have with regard to known cultural resources.

The literature review was conducted in two phases to address changes in transmission and pipeline corridor routes. Within Arizona, records housed at the Arizona State Historic Preservation Office (Arizona SHPO), the Arizona Strip Field Office, Bureau of Reclamation (Reclamation), the Brigham Young University Library, Arizona State Museum and the Museum of Northern Arizona, Pipe Springs National Monument, Arizona Department of Transportation, and the National Archives were inspected.

Within Utah, records housed at the Utah Division of State History (Antiquities Section); Utah State Historic Preservation Office (Utah SHPO); Bureau of Land Management (BLM) Field Offices in Cedar City, St. George, and Kanab; the Grand Staircase-Escalante National Monument, NPS offices; and the School and Institutional Trust Lands Administration’s headquarters were inspected. This research also included inspecting the Utah Division of State History’s online Historical Data Management System (e.g., PreservationPro).

1.2.2.1 Class III – Intensive Pedestrian Surveys

Following completion of the literature reviews, federal and state agencies conducted Class III surveys of the Proposed Project between 2009 and 2015. These surveys followed the guidance *BLM Manual 8110 – Identifying and Evaluating Cultural Resources* (BLM 2004) and *BLM-Utah Handbook 8110 Guidelines for Identifying Cultural Resources Handbook* (BLM 2002). Information gathered during the literature review was used to identify and relocate previously recorded sites within the APE, and all previous site forms were evaluated to ensure that they contained accurate and current information about each resource. All site records older than five years were updated, and all newly identified sites were recorded to the BLM standards.

In general, the field surveys consisted of a team of five archaeologists or cultural resource specialists walking parallel transects along the proposed corridor. The Project Areas were inventoried in parallel transects spaced no more than 50 feet apart. Each team carried paper copies of the records for the previously recorded sites that were anticipated to be encountered each day.

Recordation on appropriate site forms for each state included taking digital photographs of each site and preparing site sketch maps using Global Positioning System units to record site boundaries and pinpoint site datums, features, and artifacts. For large or dense sites, where the surface number of artifacts was too great to accurately count or record all of them, the survey team would traverse the site in close intervals, and observed artifacts were counted and documented on a tabulation sheet. Surface sample units of 1-to 5-meter squares were then flagged within areas where artifacts were densest; these units were further tabulated as a representative sample of the larger site. Artifacts within these units were not collected.

During recordation, a recommendation was made for the potential NRHP eligibility of each site based on the criteria specified in 36 CFR 800.4 and the guidance provided in NRHP Bulletin 15 (NPS 1997). These criteria are:

Criterion A. Association with events that have made a significant contribution to the broad patterns of our history;

Criterion B. Association with the lives of persons significant in our past;

Criterion C. [Resources] that embody the distinctive characteristics of a type, period, method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;
or

Criterion D. [Resources] that have yielded or may be likely to yield, information important in prehistory or history.

The significance of each site was also assessed based on integrity of location, design, setting, materials, workmanship, feeling, and association. Following recordation, the federal agencies conducted geoarchaeological test excavations of 58 prehistoric archaeological sites within the APE to assess the potential for subsurface deposits. The data gathered assisted in the identification of the kinds of sites that have the best potential for providing data that would address pertinent research

questions. These investigations, and application of the NRHP criteria, led to recommendations of NRHP eligibility for each documented site.

The NPS (1992) sets out guidance on how to recognize, document, and understand TCPs. The excerpts below indicate some of the important background and criteria for evaluating these types of properties.

A traditional cultural property, then, can be defined generally as one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community. ... Properties to which traditional cultural value is ascribed often take on this kind of vital significance, so that any damage to or infringement upon them is perceived to be deeply offensive to, and even destructive of, the group that values them (NPS 1992: 1-2).

Establishing that a property is eligible means that it must be considered in planning federal, federally assisted, and federally licensed undertakings, but it does not mean that such an undertaking cannot be allowed to damage or destroy it. Consultation must occur in accordance with the regulations of the Advisory Council (36 CFR Part 800) to identify and, if feasible, adopt measures to protect it, but if in the final analysis the public interest demands that the property be sacrificed to the needs of the project, there is nothing in the National Historic Preservation Act that prohibits this (NPS 1992: 4).

In order to be eligible for inclusion in the NRHP, a property must have "integrity of location, design, setting, materials, workmanship, feeling, and association" (36 CFR Part 60). In the case of a TCP, there are two fundamental questions to ask about integrity. First, does the property have an integral relationship to traditional cultural practices or beliefs; and second, is the condition of the property such that the relevant relationships survive? (NPS 1992: 10).

Assuming the entity to be evaluated is a property, and that it retains integrity, it is next necessary to evaluate it against the four basic NRHP criteria set forth in the NRHP regulations (36 CFR Part 60). If the property meets one or more of the criteria, it may be eligible; if it does not, it is not eligible (NPS 1992: 11).

Properties that have achieved significance only within the 50 years preceding their evaluation are not eligible for inclusion in the NRHP unless "sufficient historical perspective exists to determine that the property is exceptionally important and will continue to retain that distinction in the future." This is an extremely important criteria consideration with respect to traditional cultural values. A significance ascribed to a property only in the last 50 years cannot be considered traditional (NPS 1992: 15).

1.3 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the LPP Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts (UDWRe 2020; provided in Appendix E, Plan of Development). EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

Construction, operation, and maintenance of the Proposed Project would affect cultural resources that are listed in or eligible for inclusion in the NRHP. To protect historic properties, the Utah Board of Water Resources (UBWR) proposes to implement the EPMs that would be contained within the final Plan of Development. These measures would summarize the procedures contained within a pending multiple-agency programmatic agreement document to manage the effects of the Proposed Project on historic properties and ensure compliance with Section 106 (*Programmatic Agreement Among the Bureau of Land Management; Kaibab Band of Paiute Indians; Arizona State Historic Preservation Officer; Utah State Historic Preservation Officer; and Advisory Council on Historic Preservation; Regarding the Lake Powell Pipeline Project in Southern Utah and Northern Arizona*). When finalized, this agreement would call for the implementation of Historic Property Treatment Plans (HPTPs) for each state. The purpose of the HPTPs is to resolve (i.e., reduce, avoid, or mitigate) existing or potential project-related adverse effects on historic properties within the APEs throughout construction, operation, and maintenance of the Proposed Project. Measures that would be outlined in the HPTP include, but are not limited to procedures for: avoidance measures, cultural resource monitoring, unanticipated discoveries, mitigation, reporting, and public outreach.

1.4 Existing Conditions

1.4.1 Cultural History Overview

The cultural history of southern Utah and the Arizona Strip (northern Arizona) can be divided into five major periods: the Paleoindian Period, Archaic Period, Puebloan Period, Late Prehistoric Period (650 to 174 B.P.), and the Historic Period (174 B.P. to present). This information is very general in nature, however, and it may differ in some ways from information provided in the ethnographic studies completed for the project.

1.4.2 Prehistory

The earliest human occupation of North America occurred during the Paleoindian Period (11,450 to 8450 B.P. [9500 to 6500 B.C.]). At this time, dramatic climatic changes coincided with the extinction of large Pleistocene animals. People of southern Utah and northern Arizona specialized in hunting these animals with large, lanceolate projectile points including Clovis and Folsom points. Two sites dating to this period have been previously documented in Arizona in the vicinity of, but outside of boundaries of the Proposed Project.

generalist hunter-gatherers and subsisted on a wide variety of plants and animals. This is reflected in a change in material culture. Grinding slabs, roasting pits, and a greater assemblage of food-processing implements have been identified at a number of archaeological sites dating to this time period. In southwestern Utah and the Arizona Strip, the Archaic Period is generally divided into three sub-periods: Early Archaic, Middle Archaic, and Late Archaic. While evidence of Early Archaic occupations in the vicinity of the Proposed Project is scant, recovered projectile points from this period suggest that Early Archaic people were present in the Arizona Strip between 6000 B.C. and 4000 B.C. Excavations undertaken at North Creek rockshelter, which is near Escalante, Utah, provide evidence of Early Archaic occupation about 1,000 years after the Paleoindian occupation. Stone tools recovered from this site are notched (primarily Pinto projectile points) forms and not the earlier stemmed points. Early Archaic period manos and metates were also recovered here indicating that the processing of plant materials was important. Some evidence also indicates that lands near the Proposed Project were used throughout the Middle Archaic Period. The Middle Archaic is characterized by a shift to smaller projectile points with more pronounced notches. Although hunting and gathering remained the primary subsistence strategy, this difference in point style may reflect a change in hunting technology and practices. During the Late Archaic, populations in the area became larger and more sedentary and subsistence practices included horticultural endeavors, including the cultivation of beans, corn, and maize.

The Puebloan Era (A.D. 500 to 1300) is characterized by reliance on domesticated crops, pottery manufacture, and sedentary life in villages. Although pithouses were the initial household structures, aboveground masonry dwellings were constructed by approximately A.D. 900. It is not known if Puebloan people were descended from Archaic Period populations or if they instead immigrated to the area. Two Puebloan Period archaeological traditions developed in southwestern Utah and the Arizona Strip: the Virgin tradition and the Kayenta tradition. The Virgin tradition developed at the confluence of the Virgin and Muddy rivers in Overton, southern Nevada, and extended east across much of the Arizona Strip. The Kayenta tradition developed in the region north and east of the Little Colorado River, west of the Chuska Mountains on the Arizona–New Mexico border, and south of the San Juan River.

Puebloan Era populations in the vicinity of the Proposed Project practiced farming from at least as early as 200 B.C. During the Basketmaker II period (A.D. 50 to 400), maize horticulture was practiced. Ceramic vessels were not yet used, and food was stored in slab-lined pits. During this time, occupational sites typically consisted of several pithouses, or a natural cave or rockshelter. Basketmaker II sites are common in southwestern Utah and the Arizona Strip. The Basketmaker III period in the region (A.D. 400 to approximately A.D. 600) is characterized by a change from atlatl hunting technology to the use of the bow and arrow. Food preparation implements, including trough metates and early ceramics, are often found in archaeological deposits dating to this time., which may indicate a shift from hunting and gathering to an emphasis on agriculture and the storage of food.

Changes in material culture mark a change from Basketmaker III to Pueblo I between approximately A.D. 700 and A.D. 800. During the Pueblo I period, habitation structures consisted of a pit structure with an arc-shaped, multi-room surface structure constructed behind it. The surface rooms were primarily used for storage and workspace. Pueblo I transitioned into Pueblo II during the tenth century. Although there are regional variations, during the Pueblo II period, habitation structures were typically constructed of aboveground masonry rooms with a subterranean kiva in front. Most Pueblo II settlements in southwestern Utah and the Arizona Strip were dispersed hamlets and

farmsteads. Pottery at this time was corrugated utility ware and black-on-white painted pottery. In the Virgin River area, the black-on-white pottery style of this period is identified as St. George Black-on-gray.

Puebloan culture transitioned to Pueblo III between A.D. 1150 and A.D. 1200. At this time, large, pueblos with a dominant plaza were constructed over much of the area, and pottery was corrugated, black-on-white, black-on-red, and polychrome. During the Pueblo III period, the Virgin River cultural area was depopulated by approximately A.D. 1160, and most of the rest of the region was depopulated by A.D. 1175. Although some areas may have been reoccupied between A.D. 1200 and A.D. 1275, evidence of permanent Puebloan habitation is not found in the Virgin River area during the Pueblo IV and Pueblo V periods. During this time, many Puebloan peoples moved and settled with large pueblos to the east (e.g., Hopi, Zuni, and Acoma), disbanded into smaller groups and incorporated into the Ancestral Numic populations in the region, and/or moved and incorporated with the existing Fremont populations to the north in the Great Basin region of Utah and Nevada.

In the vicinity of the Proposed Project, the Ancestral Numic (e.g., Southern Paiute) settled around natural springs and cultivated corn, squash, sunflowers, and other domesticated plants. Observations of Ancestral Numic farming practices were seen by early explorers along the Hesperus River in Colorado and across western Colorado and southern Utah into northern Arizona to the farming village of led by Chief Toquer on the Virgin River (now called Toquerville, Utah). While maintaining a residential base, small groups of several families practiced seasonal rounds of cooperative hunting, gathering, and fishing activities. Because these groups were often mobile, encounters with other groups occurred and allowed for the trade of goods obtained from locations near residential bases. Each group traded products from their base regions to those with products from distant locations. While all Paiute bands in the vicinity of the Proposed Project traded buckskins, the Kaibab Paiute traded mescal items, salt, and pipe stone, and the Panguitch Paiute traded dogs, buckskin clothing, and access to fisheries. The Kaiparowits Paiute were renowned for their bows manufactured from bighorn sheep horns. Indigenous peoples with ties to the Proposed Project area, including non-Paiute groups, generally gathered the same plant resources, including agave and pinõn, hunted bighorn sheep, pronghorn, and deer, and traded with each other for other resources and goods.

The Southern Paiutes of the Proposed Project region were first encountered by Europeans in 1765 when Spanish explorer Juan Rivera entered present-day southwestern Colorado and southeastern Utah. Rivera documented Southern Paiute farms along the Animas River near Durango, Colorado, in the Moab Valley, and at Aneth on the San Juan River. In the following decade, Francisco Antanasio Dominguez and Sylvestre Velez de Escalante encountered the Southern Paiute in 1776. These early Spanish travelers noted Paiute cultivation and irrigation practices along the Virgin River, and, in 1826, Jedidiah Smith also wrote of established corn and squash farming in the region. Mormon Latter-day Saint colonists in the middle 1850s were also impressed with the crops grown by Southern Paiute communities in the Santa Clara River area, and corn was sometimes shared. Although cultivation of domesticated plants was an important endeavor, irrigation systems associated with these fields also resulted in the irrigation of wild plant species such as greens and berries.

The Highway Alternative crosses the Kaibab Indian Reservation (KIR); the Southern Alternative lies adjacent to, but outside of the KIR.

In addition to the Southern Paiutes, several other tribes also retain Ancestral ties to lands in the vicinity of the Proposed Project. The Hualapai Reservation is located along the Colorado River near the western Grand Canyon. The Pai peoples (including Havasupai and Hualapai) maintained relationships with the Paiute across the river for many generations, and several river crossings and shared trails have been reported. Pai and Paiute intermarried, and some Paiute took refuge with the Pai during conflicts with Euro-Americans. The Hopi Tribe currently resides along the Black Mesa in Coconino and Navajo Counties in northeastern Arizona, but they also inhabited other adjacent areas. The Hopi identify ancestral ties to many archaeological sites and trails on the Colorado Plateau; these sites, which are located within the Proposed Project area, remain important in maintaining current Hopi culture and traditions. The Pueblo of Zuni also retains important ties to lands in the vicinity of the Proposed Project. The Zuni view the Project Area as a cultural landscape that contains interconnected locations of importance to the tribe; the entire Grand Canyon and lands to the north of it constitute migration areas that are important in Zuni culture.

1.4.2.1 History

Exploration of the Proposed Project region began in 1776 when Dominguez and Escalante searched for a route between the Spanish colony at Santa Fe, New Mexico, to the Spanish settlement at Monterey, California. Upon arrival in an area near current Cedar City, Utah, the Dominguez-Escalante party decided to return to Santa Fe to avoid winter weather. Within the Proposed Project area, the team followed the west side of the Hurricane Cliffs, crossed Kanab Creek, and passed north of the area that was to become the town of Fredonia, where they turned southeast toward the Colorado River. Little evidence of their trail remains today, but, in subsequent years, other explorers, trappers, and traders established other trails that included portions of the original Dominguez-Escalante Trail.

Between 1826 and 1827, Jedidiah Smith led a party of trappers from northern Utah into southern California. The group traveled the length of Utah from Cache Valley, through Salt Lake and Utah valleys, and eventually followed the path of present-day Interstate 15 to St. George and on to California. Smith returned to the Great Salt Lake in the spring of 1827 and traveled south again that same summer. Between 1829 and 1830, a route between Santa Fe, New Mexico, and Monterey, California, was finally documented. This trail is known as “the Old Spanish Historic Trail” and encompasses a portion of the trail established earlier by Jedidiah Smith. This became a major trade route until approximately 1848. Trade ventures along the trail included opportunities to trap and trade with Native American groups of the region. The Old Spanish Historic Trail was also used by prominent traders such as Antonio Armijo, William Wolfskill, George Yount, and John Charles Fremont.

The arrival of the Church of Jesus Christ of Latter-day Saints between 1848 and 1849 resulted in changes to the Old Spanish Historic Trail to accommodate wheeled carts and wagons. Portions of the trail became known later as the Arrowhead Trail, Highway 91, and Highway 15. The trail used by members of the Church of Jesus Christ of Latter-day Saints became known as the “Mormon Wagon Road.” Another prominent trail established by members of the Church of Jesus Christ of Latter-day Saints was the “Honeymoon Trail,” which passes through the APE. Between 1877 and 1893, this trail was used by members of the Church of Jesus Christ of Latter-day Saints who had settled in the vicinity of the Colorado River to travel to the church’s temple in St. George, Utah, to be married.

In 1855, the town of Fredonia was established and, in 1858, attempts were made to establish a town near present-day Kanab. However, conflicts with indigenous populations continued through the

1860s, and several attempts failed. In 1870, a fourth attempt was successful and was aided by the presence of Captain George M. Wheeler of the U.S. Geological Survey, whose team of men mapped much of Kane County, the lower Virgin River Valley, and the Arizona Strip. The geographical name description of the “Vermillion Cliffs” is attributed to Wheeler’s report. Survey and mapping of the Colorado Plateau was also conducted in 1871 and 1872 when John Wesley Powell created a base map near present-day Kanab. Following a visit to Kanab by Brigham Young, farming and ranching endeavors developed in Kanab, and three grist mills were established in 1881, 1890, and 1915. Wool production was also a very important endeavor in Kane County.

In 1896, the town of Hurricane was established. All land within the town originally belonged to the Hurricane Canal Company, which sought to establish a water canal system between the Virgin River to the Hurricane Bench. In 1906, the canal was completed, and, by 1917, the town was an important agricultural center focused on the cultivation of sugar beets, grains, fruit, and alfalfa. Large-scale sheep and cattle ranching operations were also established. One important operation was “Gould’s Sheep Shearing Mill,” which produced over a million pounds of wool each year. However, the mill was the target of arson fires in 1913 and 1931. The Sons of Utah Pioneers erected a monument to the mill in 2004. This monument, and the remains of a Gould’s sheep-shearing camp, are located within the APE of the Proposed Project.

During the Great Depression, programs implemented by the Church of Jesus Christ of Latter-day Saints, Civilian Conservation Corps, and Works Progress Administration alleviated some hardship, but many inhabitants of the region moved to other areas in search of work. The remains of Civilian Conservation Corps camps and work projects are found in the area. Following World War II, however, the populations of communities in southern Utah have grown significantly, attributable to mild climates and tourism. Primary recreation and tourist locations in the vicinity of the Proposed Project include Glen Canyon National Recreation Area; Grand Staircase-Escalante National Monument; and Pipe Spring National Monument, which is located within the KIR.

1.4.3 Review of Existing Cultural Resource Information

The previously recorded cultural resources found within the literature review for the Proposed Project are presented in Appendix G, Utah-Arizona: Literature Search & Maps, of Lake Powell Pipeline (LPP) Final Study Report 3 – Archaeological and Historic Era Resources (UBWR 2018b). The literature review encompassed a 1-mile corridor on either side of the pipeline route and proposed transmission lines, known as the 2-mile APE.

For the Proposed Project, most of the previously recorded prehistoric sites within the 2-mile APE are associated with ancestral Puebloan Basketmaker II, Basketmaker III through Pueblo II periods, although some Archaic and Late Prehistoric sites were documented. Some site types found within the 2-mile or Project APE, such as pueblos and pit houses, contain more subsurface artifacts, features, and deposits than sites types that are mostly present on the ground surface (e.g., lithic scatters). The potential for subsurface archaeological remains and, at times, human remains at pueblos or pit houses, increases their archaeological complexity and may increase the concerns an Indian tribe or the public in any damage that may occur to these site types. Historic sites primarily consist of linear resources (roads, trails, utility corridors, waterways). Other historic sites include refuse scatters, farm and homesteads, ranches, campsites, waterworks, mining sites, lime kilns, historic inscriptions, standing structures, and cemeteries and graveyards. Most of these sites are

associated with mid-19th to late 20th century Euro-American populations. A listing of these site types is presented in Table 1.4-1.

Specifically, in Utah, 442 cultural resource surveys, 1,084 previously recorded archaeological sites (897 prehistoric, 138 historic, and 49 multi-component sites), 44 historic standing structures, and 100 historic features identified on General Land Office (GLO) plat maps are located within the 2-mile APE. Additionally, 10 historic properties are listed on the NRHP (Table 1.4-1).

In Arizona, a total of 160 cultural resource surveys, 412 previously recorded archaeological sites (343 prehistoric, 35 historic, and 12 multi-component), 22 historic standing structures, 57 GLO historic features, and two NRHP-listed historic properties are within the 2-mile APE (Table 1.4-1).

Within the boundaries of the KIR, the literature review found in Appendix G, Utah-Arizona: Literature Search & Maps, of LPP Final Study Report 3 – Archaeological and Historic Era Resources (UBWR 2018b), indicated that 40 cultural resource investigations have been previously conducted within the 2-mile APE. These previous studies resulted in the documentation of 37 archaeological sites within the 2-mile APE. These include 19 prehistoric sites, four sites dating to the historic period, seven multi-component sites, and seven sites of unknown composition/age (Table 1.4-1).

Table 1.4-1 The Results from the 2-mile APE Literature Review along the Highway and Southern Alternatives (combined)

Site Type	Utah	Arizona	Kaibab Indian Reservation	Total in 2-mile APE
Previously Conducted Class III Surveys	442	160	40	642
Prehistoric Sites	897	343	19	1,259
Historic Sites	138	35	4	177
Multi-component Sites	49	12	7	68
Historic Standing Structures	44	22	0	66
Historic General Land Office Features	100	57	0	157
Unknown Composition and Age	0	0	7	7
NRHP Listed Historic Property	10	2	0	12

Key:

APE = Area of Potential Effect

NRHP = National Register of Historic Places

1.4.3.1 Class III Surveys

The results of the Class III surveys were prepared and distributed to agencies and participating tribes in December 2010, July 2013, and May 2014. These results are documented in Appendix G, Utah-Arizona: Literature Search & Maps; Volume 1: Utah Survey Report; and Volume 2: Arizona Survey Report of the LPP Final Study Report 3 – Archaeological and Historic Era Resources (UBWR 2018b). The BLM (as lead federal agency for Section 106) provided another draft of these reports to the Utah SHPO and Arizona SHPO for review in January 2015. The BLM, Utah SHPO, and Arizona SHPO provided comments to the UBWR’s cultural resource contractor for revisions in April 2015. A subsequent Class III survey report was submitted to the BLM for review in January 2017. Following BLM review and subsequent revisions, the reports were submitted for review to the Arizona SHPO and Utah SHPO as well as the required agencies, tribes, and consulting parties for review and comment. In October 2017, the revised draft report was sent to tribes and in April 2018,

tribes were sent the final report. The final reports were each sent to their respective SHPOs. Both SHPOs concurred with the BLM's National Historic Preservation Act - Section 106 "finding of adverse effect" for this undertaking.

Class III Survey Results Within Arizona

The Class III survey resulted in the identification of 102 archaeological sites and 294 isolated finds within the Project APE within Arizona but outside of the KIR. An additional 14 previously recorded sites could not be relocated during fieldwork. Of the 102 documented sites, 58 sites were updates of previously recorded sites and 44 sites are new discoveries. A total of 84 of the 102 identified sites are eligible or recommended as eligible for listing in the NRHP under the NRHP criteria, and 18 sites have been recommended as ineligible for listing. Of the 18 ineligible sites, 12 sites contain prehistoric materials. Of the 84 eligible or recommended eligible sites in the Proposed Project APE in Arizona, 60 are prehistoric sites, 14 are historic-period sites, and 10 are multi-component sites. Table 1.4-2 contains a summary of all 84 eligible or recommended eligible site types within the Project APE in Arizona.

Table 1.4-2 State of Arizona: Cultural Resources within the Project APE outside of the Kaibab Indian Reservation

Site Type	Total
Prehistoric Sites	
Lithic and Ceramic Scatter	17
Lithic Procurement	3
Lithic Scatter	12
Pithouse/Habitation	2
Prehistoric Campsite/Habitation	14
Prehistoric Habitation	5
Pueblo/Habitation	5
Rock Shelter	2
Subtotal	60
Historic Sites	
Construction and/or Maintenance Camp	2
Historic Campsite	1
Livestock Activity	2
Roads and Highways	7
Trash Scatter	2
Subtotal	14
Multi-Component Sites	
Prehistoric Campsite/Habitation/Historic Trash Scatter	3
Prehistoric Habitation/Historic Trash Scatter	1
Prehistoric Lithic and Ceramic Scatter/Historic Campsite	1
Prehistoric Lithic and Ceramic Scatter/Historic Land Claim Marker	1
Prehistoric Lithic and Ceramic Scatter/Historic Trash Scatter	1
Prehistoric Lithic Scatter/Historic Trash Scatter	3
Subtotal	10
Total	84

Within Arizona, most of the eligible prehistoric sites documented within the Project APE are habitation sites including pithouse, pueblo, campsite, and other habitation sites (26 sites). Pueblo sites may contain evidence of masonry and may be manifested as field houses, U-shaped structures

with one or more rooms, and pueblos with four walls and two or more rooms. General habitation sites contain evidence of potential habitation (e.g., rubble mound, rock shelter). Prehistoric campsites exhibit cultural materials and features that reflect short-term human activity. Cultural materials at these sites can include a variety of artifacts such as lithic flakes (debitage); stone tools, such as projectile points, scrapers, and knives; ground stone implements; and ceramics. They also typically include features such as milling surfaces, hearths, or storage features. Prehistoric lithic and ceramic scatters (17 sites) are classified as separate site types because they may be associated with resource procurement sites, habitation sites, or structures. These sites are also common, followed by standard lithic scatters (12 sites) that contain similar artifact assemblages but lack the cultural features present at campsites or habitation sites. The remaining prehistoric site types identified within the Project APE (lithic procurement and rock shelter sites) are minimally represented.

Roads and highways comprise most of historic site types within the Project APE within Arizona (seven sites). These features include the historic timber/lumber haul road between the Mt. Trumbull saw mills and St. George Road (number by the Arizona State Museum [ASM] as AZ B:1:76 [ASM]); segments of the route between Pipe Spring and Fredonia (segments of AZ B:2:55 [ASM]); an early alignment of the Toroweap Road (segments of AZ B:2:114 [ASM]); various segments of a 1924-1933 road connecting Short Creek (Hildale, Utah) with Pipe Springs and Fredonia (segments of AZ B:2:116 [ASM]); segments of Glen Canyon Dam construction road (AZ C:2:67 [ASM]); a system of historic wagon roads between St. George, Utah, with early pioneer settlements in eastern Arizona, via Lee's Ferry (AZ C:6:6 [ASM] [also known as the Old Arizona Wagon Road, the Mormon Wagon Road and the Honeymoon Trail]); and a segment of the "Fredonia to the Grand Canyon" road shown on the 1919 GLO plat map (AZ I:3:10 [ASM]). All these roads are eligible or recommended eligible for listing on the NRHP under Criterion A because of their association with events that have contributed to the broad pattern of history. Some of these roads are also eligible under Criterion C because they may contain significant information regarding early construction methods and associated features (three roads), and/or under Criterion D for their information potential (four roads). The remaining seven historic sites within Arizona represent historic construction and/or maintenance camps, campsites, sites associated with livestock activity, and trash scatters. All of these sites are recommended as eligible for listing on the NRHP under Criterion D for their information potential, except for two livestock activity areas that are potentially eligible under Criterion A. The two construction and/or maintenance camps are also potentially under Criterion A, and one is also eligible under Criterion C. Four of the roads pass into the KIR and are also included in KIR historic site counts provided in Table 1.4-3, below.

The 10 multi-component sites within the 2-mile-wide APE in Arizona that are eligible or recommended eligible for listing on the NRHP consist primarily of prehistoric lithic scatters and campsites associated with historic trash scatters (six sites). Other sites are prehistoric habitation, lithic and ceramic scatters, lithic scatters, and pithouse and pueblo sites associated with historic campsites, trash scatters, and livestock areas. One prehistoric site also contains a historic land claim marker. All of these multi-component sites in Arizona are potentially eligible for listing on the NRHP under Criterion D for their information potential; one of these sites (AZ B:2:97[ASM]) contains historic cairns that may be associated with marking trails and land claims/ownership, which may reflect important events or activities. This site was, therefore, also recommended as eligible for listing on the NRHP under Criterion A. A second site (AZ B:2:107 [ASM]) consisting of a large pueblo habitation site containing numerous features and an historic earthen dam with a collapsed stone gate is also recommended as eligible for listing under Criterion A.

Property ownership/management of the 84 eligible or recommended-eligible sites documented in Arizona is varied with 33 sites located on lands administered by the BLM, 23 sites on Arizona State Lands Department (ASLD) lands, 14 sites on private lands, three sites on BLM/private lands, six sites on NPS-managed lands, and one site on ASLD/private lands. Four additional sites are road/highways located on ASLD, BLM, NPS, and/or private lands that also pass within the boundaries of the KIR.

Class III Survey Results Within the Kaibab Indian Reservation

The Class III survey report for lands located within the boundaries of the KIR describes 24 archaeological sites and 57 isolated finds within the portion of the Project APE (including the surveys for the ancillary facilities) within the boundaries of the KIR. A total of 22 of these sites were recommended as eligible for listing in the NRHP and two were recommended as ineligible. Of the 22 eligible sites, four are located within the eliminated Southeast Corner Alternative and are, therefore, no longer under consideration as they would not be affected by the Proposed Project. Of the remaining 18 eligible sites, 10 are prehistoric-period sites, five are historic-period sites, and three are multi-component sites. A sixth historic road/highway (AZ B:2:115) was also identified on KIR lands but was not included in the KIR Class III survey report bringing the total site count to 19 sites. Table 1.4-3 summarizes all 19 sites documented within the boundaries of the KIR.

Table 1.4-3 Kaibab Indian Reservation: Cultural Resources within the Project APE

Site Type	Total
Prehistoric Sites	
Lithic and Ceramic Scatter	3
Lithic Scatter	1
Prehistoric Campsite/Habitation	3
Prehistoric Habitation	3
Subtotal	10
Historic Sites	
Roads and Highways	6
Subtotal	6
Multi-Component Sites	
Prehistoric Pithouse/Habitation/Historic Trash Scatter	1
Prehistoric Pueblo/Habitation/Historic Campsite	1
Prehistoric Pueblo/Habitation/Historic Livestock Campsite	1
Subtotal	3
Total	19

Slightly more prehistoric habitation sites (six sites) were documented within the boundaries of the KIR than lithic scatters (four sites) with or without ceramic artifacts, and all are eligible under Criterion D for their information potential. Historic road or highway sites accounted for all six of the historic-era resources. Five of the historic roads are recommended as eligible for listing on the NRHP under Criteria A, C, and D and one is only eligible under Criteria A and D. One of these roads/highways also extends outside of the boundary of the KIR. Multi-component sites were all prehistoric habitation sites with historic campsite activity or historic trash scatters (three sites). All three of these sites are eligible for listing on the NRHP under Criterion D, but one is also eligible under Criterion A.

Results of the Class III Survey Within Utah

The Class III survey conducted for Utah resulted in the documentation of 230 archaeological sites and 129 isolated finds within the Project APE. A total of 162 of these sites are eligible or recommended as eligible for listing in the NRHP, and 68 sites have been recommended as ineligible for listing. Of the eligible or potentially eligible resources, 123 are prehistoric sites, 20 are historic-period sites, and 19 are multi-component sites.

An additional four previously documented prehistoric sites (listed by the Utah SHPO as 42KA6870, 42KA6871, 42KA6875, 42KA6876) were not re-surveyed and were not addressed in the 2018 Class III survey report. However, the site location maps filed with the Class III Survey report indicate that these four previously recorded sites are eligible for listing on the NRHP. Inclusion of these four sites in the site count brings the total number of known eligible sites within the Project APE in Utah to 166 sites. All 166 sites are summarized in Table 1.4-4, below.

Within Utah, the majority of the eligible or recommended eligible prehistoric sites documented within the Project APE are lithic scatters (43 sites) followed by prehistoric campsites (41 sites). Lithic scatters that also contain ceramic artifacts (23 sites) are also common. Pueblo sites are moderately represented within the Project APE (11 sites). The remaining prehistoric site types identified within the Project APE are minimally represented, including general prehistoric habitation sites. Most of the prehistoric sites are recommended as eligible for listing on the NRHP under NRHP Criterion D for their potential to provide important information regarding the prehistory of the region.

Roads and highways comprise most of the historic site types within the Project APE (eight sites). These features include historic U.S. Highway 89, originally constructed between 1922 and 1925 (42KA4226); an historic road alignment running north-south down the west side of the Cockscomb (42KA6769; labeled “Pahreah (Paria) to Lees Ferry” on GLO; also known as House Rock Valley Road); the Honeymoon Trail (42KA7015; also known as the Old Arizona Road); a historic road to Virgin City (42WS4397/2679); the Arizona Strip Road (42WS5212; road from Fort Pierce to Hurricane); two roads identified on GLO as the “Road to St. George to Kanab” (42WS5357); and “Road in Dry Wash from Toquerville to Arizona” (42WS6188). Four of the eight roads are recommended eligible for listing on the NRHP under Criterion A because of their association with events that have contributed to the broad pattern of history and also under Criterion D for their information potential, three roads are recommended eligible under Criterion A, and one road is recommended eligible under Criteria A, B, C, and D. This road, the road running down the west side of the Cockscomb (42KA6769) represents a portion of the “Pahreah (Paria) to Lees Ferry” road as shown on 1877 and 1918 GLO maps. It is associated with Jacob Hamlin and John D. Lee and the Mormon communities of eastern Arizona. The road has been recommended as eligible for listing in the NRHP under Criteria A and D because it may contain significant information regarding early construction methods and under Criterion B for its association with important persons and under Criterion C because it is characteristic of an early wagon road associated with transportation and settlement within the region. The remaining 11 historic sites represent historic farmsteads/ranches, campsites, inscriptions, linear features, trash scatters, and sites associated with livestock activity. Most of these sites are recommended eligible for listing under Criterion D for their information potential (nine sites) although others are recommended eligible under Criterion A (five sites) or Criterion C (one site).

Table 1.4-4 State of Utah: Cultural Resources within the Project APE

Site Type	Total
Prehistoric Sites	
General Habitation	2
Lithic and Ceramic Scatter	23
Lithic Procurement	2
Lithic Scatter	43
Pithouse/Habitation	3
Campsite/Habitation	41
Pueblo/Habitation	11
Petroglyph/Pictograph	2
Subtotal	127
Historic Sites	
Farmsteads/Ranching	1
Historic Campsite	1
Historic Inscriptions	1
Linear Feature	1
Livestock Activity	3
Roads and Highways	8
Trash Scatter	1
Water Retention Structure	4
Subtotal	20
Multi-Component Sites	
Prehistoric Pueblo/Habitation/Historic Habitation	1
Prehistoric Campsite/Habitation/Historic Campsite	1
Prehistoric Campsite/Habitation/Historic Livestock Activity	4
Prehistoric Campsite/Habitation/Historic Trash Scatter	6
Prehistoric Habitation/Historic Livestock Activity	1
Prehistoric Lithic Scatter/Historic Inscriptions	1
Prehistoric Lithic Scatter/Historic Trash Scatter	2
Prehistoric Pueblo/Habitation/Historic Trash Scatter	1
Prehistoric Rock Art/Historic Inscriptions	1
Prehistoric Rock Shelter/Historic Inscriptions	1
Subtotal	19
Total	166

Multi-component sites within the Project APE in the state of Utah that are eligible or recommended eligible for listing on the NRHP consist primarily of prehistoric campsites associated with historic features or trash scatters (six sites). Other sites are prehistoric lithic scatters with trash scatters or historic inscriptions, and habitation, pueblo, rock writings, and rock shelter sites that also contain evidence of historic livestock activity, trash scatters, or historic inscriptions (12 sites). All of these multi-component sites in Utah are potentially eligible for listing on the NRHP under Criterion D for their information potential. One site (42KA1526) contains both prehistoric rock art and historic inscriptions. This site is also eligible for listing under Criteria A and C because the rock art represents the distinctive characteristics of a type or period, display distinctive artistic values, and may graphically represent important tribal events.

Of the 166 eligible or recommended-eligible sites, 72 are located on lands administered by the BLM, 39 on state lands, 28 on private lands, 18 on BLM/private lands, four on BLM/state/private lands, two on state/private lands, two on lands administered by the NPS, and one encompassing BLM/NPS/state/private lands.

2 Results/Environmental Consequences

2.1 No Action Alternative

The No Action Alternative would have no additional negative effects on cultural resources. If the LPP were not built, there would be no additional negative effects on cultural resources. However, the Proposed Project is responsible for an increased awareness of cultural resources in the area, which has been a beneficial effect. Archaeologists, tribes, and the public are now more aware of the types and density of cultural resources within the 2-mile APE. Under the No Action Alternative, no amendment to the Arizona Strip Field Office Resource Management Plan (RMP) would occur, so current management of the resources for which the Kanab Creek Area of Critical Environmental Concern (ACEC) was designated (including cultural resources) as prescribed in the RMP would continue. This alternative would, therefore, not result in effects on cultural resources.

A discussion of cumulative effects is provided in Appendix C-25, Cumulative Effects.

2.2 Southern Alternative

The Southern Alternative would have negative effects on cultural resources including historic properties. These historic properties would be impacted by the Proposed Project in diverse ways. All cultural resources located within the Project APE have the potential to be adversely affected by construction and operation of the Proposed Project. A discussion of cumulative effects is provided in Appendix C-25, Cumulative Effects.

The prehistoric, historic, and multi-component sites identified and documented within the Project APE would be affected in different ways and to different degrees by construction requirements for the various facilities. For example, the pipeline route would not be able to be shifted enough to avoid sites; however, the position of buildings and some facilities could be moved to avoid sites. While avoidance is always the preferred option, sites that cannot be avoided would need some form of mitigation for negative effects on historic properties. This mitigation would be outlined in the HPTP. This document would also address protection and management needs for cultural resources prior to, during, and after construction of the pipeline and other associated effects.

Because the Project APE for the pipeline is only 250 feet wide, there may not be room within the Project APE to avoid many cultural resources within or adjacent to the Project APE. Large sites that span the Project APE or lie across the Project APE would be affected by construction; measures outlined in the HPTP would be implemented to mitigate the effects on these cultural resources.

Many of the cultural resources within the transmission Project APEs may be avoided by spanning the sites and relocating some towers. However, some tower locations may directly affect a limited number of sites. Access roads for these towers may also create effects on the cultural resources that may require mitigation and/or monitoring. While some of the sites lie adjacent to other access roads, several of the access roads are, themselves, historic roads or have associated features that may not be avoided.

From the Class III survey of the Southern Alternative, a total of 272 cultural resources sites are within or partially within the “footprint” of the right-of-way (ROW) for construction of the pipeline, access roads, and other project-related facilities. Two hundred fourteen of these cultural resources are eligible for the NRHP. Fifty-eight of these cultural resources are not eligible. Effects may include, but are not limited to, complete destruction, partial destruction, artifact breakage, visual effects, auditory effects, and atmospheric effects. Table 2.2-1, below, lists these resources.

Table 2.2-1 Cultural Resources within the Right-of-Way of the Southern Alternative (Including Shared Areas with Highway Alternative)

National Register Status	Number of Sites
Non-eligible	58
Eligible	214
Total	272

Appendix G, Utah-Arizona: Literature Search & Maps; Volume 1: Utah Survey Report; and Volume 2: Arizona Survey Report of the LPP Final Study Report 3 – Archaeological and Historic Era Resources detailed the visual effects that the LPP Project could have on the various resources located within or near the 2-mile APE (UBWR 2018b). These reports identify the following resources and the visual effects on historic properties: Dominguez-Escalante Trail, Old Spanish National Historic Trail, Honeymoon Trail, Pipe Spring National Monument, Historic Highway U.S. Highway 89A, Temple Historic Trail (Antelope Valley - County Road 109), and the ACEC. These reports note that both the Dominguez-Escalante and Old Spanish Trail were single-use trails with no visible evidence of their specific location. The report indicates that the short-term and long-term effects to these resources ranges from low to very low, with some moderate negative effects in the foreground of the resources. In addition to archaeological resources, these reports also detail the potential visual effects on various resources located within or near the 2-mile APE. This report states that several historic trails/roads/highways, Pipe Spring National Monument, and the ACEC may see visual effects because of the Proposed Project.

2.2.1 Resource Management Plan Amendment

Designation of an area of critical environmental concern highlights areas where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, and scenic values, fish, or wildlife resources, or other natural systems or processes. The area of critical environmental concern designation indicates to the public that the BLM recognizes that an area has significant values and has established special management measures to protect those values. In addition, designation also serves as a reminder that significant values or resources exist that must be accommodated when future management actions and land use proposals are considered near or within an area of critical environmental concern. Designation of an area of critical environmental concern is achieved only through the planning process, either in the resource management plan itself or through a plan amendment.

Kanab Creek is a culturally special place to the Paiute people. Kanab Creek is defined by its contribution to the aboriginal adaptation of Southern Paiute people to their survival during the historic period. Riverine and spring oasis farming were central to Paiute adaptation in the area, and the permanent waters of Kanab Creek were key to this farming. The Kaibab Paiute people farmed the length of Kanab Creek; plants were gathered, and animals of all kinds were hunted. Kanab Creek also defined one of the major north-south access trails from the mountains of southern Utah to the Colorado River. Along this trail was a two-way flow of goods and materials drawn from neighboring Indian tribes to the south, as well as the seasonal movement of plants and animals found in various ecological zones (Stoffle et al. 1997). The ACEC area incorporates the BLM-administered portion of Kanab Creek in Arizona. The ACEC was designated in part for its relevant and important cultural values; it is considered to have significant regionally important cultural resources vulnerable to vandalism and effects.

Accordingly, in 2011 the Kaibab Band of Paiute Indians Tribal Council resolved to designate the area as a TCP and sacred site (Resolution of the Governing Body of the Kaibab Band of Paiute Indians, No. K-07-11 [March 17, 2011]), and in 2019 the Tribal Council designated it as an integral component of a larger Traditional Cultural District (Resolution of the Governing Body of the Kaibab Band of Paiute Indians, No. K-27-19 [May 16, 2019]).

Designation of the ACEC provides additional protection to archaeological and historical resources. One example is Decision No. MA-AC-10, which limits motorized use in an area of critical environmental concern to the footprint of a designated road (versus Decision No. MA-TM-05 that allows vehicles to pull off designated routes up to 100 feet either side of centerline of the route). This would minimize inadvertent damage to cultural resources along routes in the area of critical environmental concern. Other management prescriptions in the RMP provide additional protection to cultural resources as well.

2.2.1.1 Sub-alternative 1

Under Sub-alternative 1, RMP Decision No. MA-LR-06 would be amended so that new land use authorizations could be allowed in the ACEC. However, the proposed amendment to Decision No. MA-LR-06 would still require routing new utilities away from cultural resources and mitigation for effects from new land use authorizations (determined during site-specific planning). These effects would be evaluated during project-specific environmental review and analysis, which would include mitigation of effects to the extent possible. The proposed amendment to Decision No. LA-VR-01 would clarify that where a designated utility corridor overlaps an area of critical environmental concern, the VRM class is Class IV rather than Class II as it is elsewhere in the ACEC, potentially allowing substantial changes in landscape characteristics. This change would affect the visual character in that portion of the ACEC by potentially allowing new land use authorizations to be more obtrusive and visible on the landscape.

2.2.1.2 Sub-alternative 2

Under Sub-alternative 2, potential effects on cultural resources could occur because the size of the ACEC would be reduced by 905 acres with no specific provision for mitigation from new land use authorizations in the area that has been excluded from the ACEC. In addition, other area of critical environmental concern management prescriptions in the RMP that provide additional protection to cultural resources would no longer be applicable to the lands excluded from the ACEC. Construction and operation and maintenance of new ROWs (and other land use authorizations), as well as the use and maintenance of designated routes, construction of new range facilities, and

management of salable or leasable minerals could result in direct effects on cultural resources, and indirect effects on sites from erosion as vegetation is removed. However, existing federal laws (including the National Historic Preservation Act [NHPA]) would still apply; therefore, potential effects on cultural resources would be evaluated during project-specific environmental review and analysis and mitigated to the extent possible.

2.2.1.3 Sub-alternative 3

Under Sub-alternative 3, effects on cultural resources would be similar to those described under Sub-alternative 1. In addition, the utility corridor would no longer be an avoidance area for new land use authorizations, potentially increasing the likelihood of adverse effects to cultural resources. However, the Arizona Strip Field Office Resource Management Plan Amendment Sub-alternative 3 would result in a decrease of 175.5 acres of overlap between the utility corridor and the ACEC, thus decreasing the likelihood of new land use authorization that may disturb cultural resources in this area. The proposed amendment would still require mitigation for effects from new land use authorizations that would be determined during site-specific project planning. In addition, other area of critical environmental concern management prescriptions in the RMP that provide additional protection to cultural resources would still be applicable since the size of the ACEC would not be reduced.

2.2.2 Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of cultural resources. Mitigation measures for historic properties within the APE would be developed in consultation with appropriate agencies, tribes, consulting parties and may include data recovery, additional historic research, or other measures to be detailed in the HPTPs.

2.3 Highway Alternative

The Proposed Project would have adverse effects on cultural resources including historic properties. Fewer cultural resources and historic properties have the potential to be affected by the Highway Alternative (n=259) than the Southern Alternative (n=272). The Southern Alternative contains fewer (n=14) complex sites with the potential for human remains than the Highway Alternative (n=21). The Highway Alternative begins at Lake Powell and ends at Sand Hollow. Along the path are numerous cultural resources that are culturally sensitive, sacred, and/or are historic properties (sites determined to be eligible for inclusion on the NRHP). These places would be affected by the Proposed Project in diverse ways. All cultural resources located along the Project APE have the potential to be adversely affected by construction and operation of the Proposed Project. A discussion of cumulative effects is provided in Appendix C-25, Cumulative Effects.

The prehistoric, historic, and multi-component sites identified and documented within the Project APE would be affected in different ways and to different degrees by construction requirements for the various facilities. For example, the pipeline route would not be able to be shifted enough to avoid sites; however, the position of buildings and some facilities could be moved to avoid sites. While avoidance is always the preferred option, sites that cannot be avoided would need some form of mitigation for adverse effects. This mitigation would be outlined in the HPTPs. This document would also need to address protection and management needs for cultural resources prior to, during, and after construction of the pipeline and other associated effects.

Because the Project APE for the pipeline is only 250 feet wide, there may not be room within the Project APE to avoid cultural resources within or adjacent to the Project APE. Large sites that span the Project APE or lie across the Project APE would be affected by construction; measures outlined in the HPTPs would be implemented to mitigate the effects on these cultural resources. Many of the cultural resources within the transmission corridors may be avoided by spanning the sites and relocating some towers. However, some tower locations may directly impact a limited number of sites. Access roads for these towers may also create effects on cultural resources that may require mitigation and/or monitoring. While some of the sites lie adjacent to other access roads, several of the access roads are, themselves, historic roads or have associated features that may not be avoided.

From the Class III survey of the Highway Alternative, a total of 259 cultural resources sites are within or partially within the “footprint” of the ROWs for construction of the pipeline, access roads, and other project-related facilities. Two hundred six of these cultural resources are eligible for the NRHP. Fifty-three of these cultural resources are not eligible. Effects may include but are not limited to complete destruction, partial destruction, artifact breakage, visual effects, auditory effects, and atmospheric effects. Table 2.3-1, below, lists these resources.

Table 2.3-1 Eligibility of Cultural Resources within the Right-of-Way of the Highway Alternative (including Shared Areas with Southern Alternative)

National Register Status	Number of Sites
Non-eligible	53
Eligible	206
Total	259

Appendix G, Utah-Arizona: Literature Search & Maps; Volume 1: Utah Survey Report; and Volume 2: Arizona Survey Report of the LPP Final Study Report 3 – Archaeological and Historic Era Resources (UBWR 2018b) detailed the visual effects that the LPP Project could have on the various resources located within or near the 2-mile APE. These reports identify the following resources and the visual effects on historic properties: Dominguez-Escalante Trail, Old Spanish National Historic Trail, Honeymoon Trail, Pipe Spring National Monument, Historic Highway U.S. Highway 89A, Temple Historic Trail (Antelope Valley - County Road 109), and the ACEC. These reports note that both the Dominguez-Escalante and Old Spanish Trail were single-use trails with no visible evidence of their specific location. The report indicates that the short-term and long-term effects to these resources ranges from low to very low, with some moderate negative effects in the foreground of the resources. In addition to archaeological resources, these reports also detail the potential visual effects on various resources located within or near the 2-mile APE. This report states that several historic trails/roads/highways, Pipe Spring National Monument, and the ACEC may see visual effects because of the Proposed Project.

2.3.1 Mitigation Measures

Mitigation measures for historic properties within the APE would be developed in consultation with appropriate agencies, tribes, and consulting parties, and may include data recovery, additional historic research, or other measures to be detailed in the HPTPs.

2.4 Comparative Analysis of Alternatives

The Proposed Project would have effects on cultural resources including historic properties. More cultural resources would be impacted by the Southern Alternative than the Highway Alternative; however, the Southern Alternative would affect fewer (n=14) complex sites with the potential for human remains than the Highway Alternative (n=21). With one major deviation, the Southern Alternative and Highway Alternatives are similar in that they begin at Lake Powell and end at Sand Hollow. Along these alternative routes are numerous cultural resources that are culturally sensitive, sacred, and/or declared historic properties eligible for inclusion on the NRHP. These places would be affected by the Proposed Project in diverse ways.

From the Class III survey of the Southern Alternative, a total of 272 cultural resources sites are within or partially within the “footprint” of the ROW, construction ROW, access roads, and other project-related facilities. Two hundred fourteen of these cultural resources are eligible for the NRHP. Fifty-eight of these cultural resources are not eligible. Effects may include but are not limited to complete destruction, partial destruction, artifact breakage, visual effects, auditory effects, and atmospheric effects. Table 2.4-1 below lists these resources.

From the Class III surveys of the Highway Alternative, a total of 259 cultural resources sites are within or partially within the “footprint” of the ROWs, construction ROWs, access roads, and other project-related facilities. Two hundred six of these cultural resources are eligible for the NRHP. Fifty-three of these cultural resources are not eligible. Effects may include, but are not limited to complete destruction, partial destruction, artifact breakage, visual effects, auditory effects, and atmospheric effects. Table 2.4-1 below lists these resources.

Table 2.4-1 Cultural Resources Identified by the Class III Survey within the Proposed Projects Rights-of-Way for the Southern and Highway Alternatives That May be Directly or Indirectly Affected

National Register Status	Southern Alternative	Highway Alternative
Non-eligible	58	53
Eligible	214	206
Total	272	259

The Class III surveys identified a variety of prehistoric site types. Some of these site types, such as pueblos and pit houses, usually contain subsurface artifacts, features, and deposits. Subsurface deposits may include, but are not limited to, room blocks, ceremonial rooms, storage features, hearths, artifacts, and middens. In some instances, human remains have been found near or within pueblos and pit houses. With the abundance of archaeological information at these site types and their potential to contain human remains, their importance and sensitivity is recognized. Other prehistoric site types, such as camp sites and lithic scatters, may also contain subsurface deposits and may provide important information about the prehistory of the area; however, their archaeological complexity and potential for human remains is usually less than a pueblo or pit house. The number of pueblos and pit houses recorded within the Project APE are listed in Table 2.4-2.

Table 2.4-2 Pueblo and Pit House Sites Identified in the Project APE for the Southern and Highway Alternatives That May be Directly or Indirectly Impacted

Site Type	Southern Alternative	Highway Alternative
Pueblo	10	19
Pit house	4	3
Total	14	21

Historic site types that are known to usually contain important information (e.g., subsurface deposits and substantial artifact assemblages) or are sometimes associated with important events, important people or vernacular architectural/engineering design are farmsteads and camps/habitation sites. Each alternative has a similar amount of historic camp/habitation sites and farmsteads. For example, the Southern Alternative has six historic camp/habitation sites and two farmsteads and the Highway Alternative has seven historic camp/habitation sites and two farmsteads.

Sites that are of particular concern, that may be directly or indirectly affected within the Project APE, include rock art, historic inscriptions, and rock shelters. Potential negative effects on these cultural resources within the Project APE are listed in Table 2.4-3, below.

Table 2.4-3 Site Types of Concern Identified in the Project APE for the Southern and Highway Alternatives That May be Directly or Indirectly Impacted

Site type	Southern Alternative	Highway Alternative
Rock art	2	2
Historic inscriptions	2	3
Rock shelters	4	4
Rock shelter with historic inscriptions	1	1
Total	9	10

Table 2.4-3 shows a similar number of sites of concern that may be effected by either the Highway or the Southern Alternative. It should be noted that even if a pueblo or pit house, historic camp, farmstead, rock art, historic inscription, or rock shelter listed in the above tables are located within the Project APE, any alteration, damage, or destruction to these historic properties may be avoided through project design. If damage or destruction to these historic properties may occur, minimization and mitigation measures would be outlined in the HPTP to lessen these effects.

Sites that are similar to those listed in Tables 2.4-2 and 2.4-3, above, are present within the 2-mile APE. Because cultural resources may be located farther away from the Proposed Project in the 2-mile APE, effects from either the Highway or the Southern Alternative would be fewer than potential effects within the Project APE. Since both alternatives share the same route for large distance, indirect effects (e.g., visual) would be similar in magnitude for both alternatives. However, effects to historic properties within the ACEC area south of the KIR are more likely to occur if the Southern Alternative is selected. Conversely if the Highway Alternative is selected, indirect effects on cultural resources near and within the KIR are more likely to occur.

Table 2.4-4, below, shows a greater number of cultural resources located on BLM-managed land, followed by NPS-, Tribe- and Reclamation-managed lands.

Table 2.4-4 Federal Ownership of Cultural Resources Identified by the Class III Survey within the Project APE for the Southern and Highway Alternatives

Alternative	Agency			
	BLM	Tribe	NPS	Reclamation
Southern Alternative	164	7	10	3
Highway Alternative	113	26	10	3

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indian

3 References

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Utah Division of Water Resources (UDWR). 2020. Lake Powell Pipeline Plan of Development. February 2020.

4 Glossary

Area of Potential Effects. Area of potential effects means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

Cultural resources. Cultural resources are definite locations of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional cultural or religious importance to specified social and/or cultural groups.

Eligible. The term eligible for inclusion in the NRHP includes both properties formally determined as such in accordance with regulations of the Secretary of the Interior and all other properties that meet the NRHP criteria.

Historic property. Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the NRHP criteria. Cultural resources that meet the eligibility criteria for listing in the NRHP are formally referred to as historic properties.

5 Acronyms

ACEC	Kanab Creek Area of Critical Environmental Concern
APE	Area of Potential Effect
Arizona SHPO	Arizona State Historic Preservation Office
ASLD	Arizona State Lands Department
ASM	Arizona State Museum
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
GLO	General Land Office
HPTP	Historic Property Treatment Plans
KIR	Kaibab Indian Reservation
LPP	Lake Powell Pipeline
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
Reclamation	Bureau of Reclamation
RMP	Arizona Strip Field Office Resource Management Plan

ROW	right-of-way
TCP	traditional cultural property
UBWR	Utah Board of Water Resources
USC	United States Code
Utah SHPO	Utah State Historic Preservation Office

6 Consultation and Coordination

The federal agencies, including Reclamation designated BLM as the lead federal agency as described in 36 CFR Part 800. As the lead federal agency, the BLM consults with federally recognized tribes, State Historic Preservation Offices, local governments, and consulting parties, pursuant to Section 106 of the NHPA as part of the process to identify historic properties. Federal agencies must demonstrate compliance with the NHPA (54 USC 300101). Section 106 of the NHPA requires a federal agency with jurisdiction over a project to evaluate the effect of the proposed project on properties included on, or eligible for, the NRHP. Any adverse effects that the Project or alternatives may have on historic properties would be resolved through compliance with the terms of a programmatic agreement under Section 106 of the NHPA (54 USC § 306108).

A draft programmatic agreement that establishes procedures for Section 106 review and the methods of identification, evaluation, and treatment of historic properties is being prepared for the LPP Project by the BLM. The preparation of this Programmatic Agreement has included participation of federal agencies, such as the Advisory Council on Historic Preservation, BIA, Kaibab Band of Paiute Indians, Reclamation, the Fort Mohave Indian Tribe, Havasupai Indian Tribe, Hopi Tribe, Hualapai Tribe, Las Vegas Paiute Tribe, Moapa Band of Paiutes Indians, Navajo Nation, Paiute Indian Tribe of Utah, Pueblo of Zuni, and San Juan Southern Paiute Tribe. State organizations include the Arizona Department of Transportation, Arizona SHPO, Arizona State Land Department, Arizona State Museum, Utah Department of Transportation, Utah Public Lands Policy Coordinating Office, Utah School and Institutional Trust Lands Administration, and Utah SHPO. Other organizations invited to participate in the development of this Programmatic Agreement include, the Citizens for Dixie's Future; Coconino County, Arizona; Colorado Plateau Archaeological Alliance; Five County Association of Governments, Utah; Kane County, Utah; Mohave County, Arizona; National Trust for Historic Preservation; Washington County, Utah; Utah Statewide Archaeological Society; Utah Rock Art Research Association; and Utah Professional Archaeological Council. Additional parties that have been invited to participate are the UBWR and the Washington County Water Conservancy District.

Throughout the life of the Proposed Project, federal agencies have conducted Section 106 consultation. Consultation has consisted of in-person meetings, conference calls, review periods, letters, and emails. In 2008, the Havasupai Indian Tribe, Hopi Tribe, Hualapai Indian Tribe, Las Vegas Paiute Tribe, Kaibab Band of Paiute Indians, Navajo Nation, Paiute Indian Tribe of Utah, Pueblo of Zuni, Moapa Band of Paiutes, San Juan Southern Paiute, Southern Ute Indian Tribe, Ute Indian Tribe of the Uintah and Ouray Reservation, Ute Mountain Ute Indian Tribe, and the Yavapai-Apache Nation, were contacted in 2008 were invited to engage in government-to-government consultation for this project.

In 2009, the Chemehuevi Indian Tribe, Colorado River Indian Tribes, White Mountain Apache Tribe, and the Yavapai-Prescott Indian Tribe invited to engage in government-to-government consultation.

In 2010, the Cocopah Indian Tribe, Confederated Tribes of the Goshute Reservation, Fort McDowell Yavapai Nation, Fort Mojave Indian Tribe, Northwestern Band of the Shoshone Nation, Quechan Tribe, San Carlos Apache Tribe, and the Skull Valley Band of Goshute Indians, were invited to engage in government-to-government consultation.

The Fort Mohave Indian Tribe, Havasupai Indian Tribe, Hopi Tribe, Hualapai Indian Tribe, Las Vegas Paiute Tribe, Moapa Band of Paiutes, Navajo Nation, Paiute Indian Tribe of Utah, Pueblo of Zuni, and San Juan Southern Paiute, agreed to help identify cultural resources and areas to which they ascribe traditional religious and cultural significance and participate in consultations regarding the potential effects of the Proposed Project on those cultural resources.

In 2018, BLM finalized the consultation for the APE, the findings of the Class III – Intensive Pedestrian Survey (Class III survey) and the potential for the Proposed Project to have an “adverse effect” to historic properties as defined in 36 CFR Part 800. When the Programmatic Agreement is finalized and executed, the Section 106 consultation process will be technically finalized. However, consultation would continue to occur with all parties on the development and execution of all treatment measures (e.g., monitoring, archaeological excavation, reporting, public outreach) outlined in the HPTPs for Arizona and Utah. Consultation would occur for project variances.

Reclamation sent letters to the Ak-Chin Indian Community; Apache Tribe of Oklahoma; Chemehuevi Indian Tribe; Cocopah Indian Tribe; Colorado River Indian Tribes; Fort Belknap Indian Community of the Fort Belknap Reservation of Montana; Fort McDowell Yavapai Nation; Fort Mojave Indian Tribe; Gila River Indian Community; Havasupai Tribe; Hopi Tribe; Hualapai Indian Tribe; Kaibab Band of Paiute Indians; Las Vegas Tribe of Paiute Indians; Moapa Band of Paiute Indians; Navajo Nation; Northwestern Band of the Shoshone Nation; Paiute Indian Tribe of Utah; Pascua Yaqui Tribe; Pueblo of Laguna, New Mexico; Pueblo of Nambe, New Mexico; Pueblo of Zia, New Mexico; Pueblo of Zuni; Salt River Pima-Maricopa Indian Community; San Carlos Apache Tribe; San Juan Southern Paiute Tribe; Shoshone Tribe of the Wind River Reservation, Wyoming; Shoshone-Bannock Tribes of the Fort Hall Reservation, Idaho; Southern Ute Indian Tribe; Tohono O'odham Nation; Tonto Apache Tribe; Ute Indian Tribe of the Uintah and Ouray Reservation (Northern Ute), Utah; Ute Mountain Ute Tribe; White Mountain Apache Tribe; and Yavapai-Apache Nation in early February 2020. The letter was followed up with three webinars for tribal consultation and an email summarizing the webinar (February to March 2020).



— BUREAU OF —
RECLAMATION

Lake Powell Pipeline Project Appendix C-21: Ethnographic Resources

**Coconino and Mohave Counties, Arizona
Kane and Washington Counties, Utah**

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1 Introduction/Affected Environment

This section defines the ethnographic resources present in the Project Area, regulations governing their protection, an evaluation of the effects of the Lake Powell Pipeline Project (LPP or Proposed Project) on these resources, and recommendations for these resources. A discussion of cumulative effects is provided in Appendix C-25, Cumulative Effects.

Ethnographic resources are resources that are considered important to living communities. The tribes' perspective informs this appendix and may not align with the perspectives of the federal agencies. In general, these resources may include buildings, locations, sacred locations, viewsheds, archaeological sites, plant habitats, shrines, or other places where individual modern communities have a deep connection to their past. In contrast, Section 3.17, Cultural Resources of the Draft Environmental Impact Statement focuses solely on archaeological resources (prehistoric and historic sites). This division was made to give greater emphasis on modern community concerns, particularly those of Native American Tribes.

Please note that this section uses extensive quotations from previous reports in order to preserve the viewpoint and language of the tribes and legal documents. They are indicated by indenting the entire paragraph. Further, references in these quotations are omitted in this document to keep the discussion simpler. Please see the original work for any outside references or concerns.

1.1 Regulatory Framework

The regulatory framework for ethnographic resources occurs together with those regulations protecting antiquities, in part because ethnographic resources may include prehistoric sites that are venerated by living communities (NPS 2018).

The **Antiquities Act of 1906** (34 Stat. 225, 18 United States Code [USC] 1866(b), 54 USC 3203 et. seq.) established the protection of antiquities and the formation of national monuments.

The **National Park Service Organic Act of 1916** (39 Stat. 535, 54 USC 1003 et. seq.) organized the National Park Service (NPS) “which purpose is to conserve the scenery, natural and historic objects, and wild life in the [National Park] System units and to provide for the enjoyment of scenery, natural and historic objects, and wild life in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (54 USC 100101(a)).

The **Historic Sites Act of 1935** (49 Stat. 666; 54 USC 3201 et. seq., 1023 et. seq.) established that it is “national policy to preserve for public use historic sites, buildings, and objects of national significance for the inspiration and benefit of the people of the United States” (54 USC 320101). This law also mandated preservation of data concerning “historic and archeologic sites, buildings, and objects” (54 USC 320102(b)).

The **Archeological and Historic Preservation Act of 1960** or **Reservoir Salvage Act** (Public Law 86-523, [now] 54 USC 3125 et. seq.) established reporting efforts when a federal project “may cause irreparable loss or destruction of significant scientific, prehistorical, historical, or archeological data” (54 USC 312502). Further, data recovery methods and consultation on “relics” and specimens recovered during investigation were instituted.

The **National Historic Preservation Act of 1966 (NHPA)**, as amended (Title 54 of the USC) established most of the archaeological and ethnographic protections currently in place and set up procedures for identifying and consulting on projects that may affect cultural resources (archaeological and ethnographic resources together). As Section 1(b) notes:

The Congress finds and declares that—

- (1) the spirit and direction of the Nation are founded upon and reflected in its historic heritage;
- (2) 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;
- (3) historic properties significant to the Nation’s heritage are being lost or substantially altered, often inadvertently, with increasing frequency;
- (4) the preservation of this irreplaceable heritage is in the public interest.

Later in this act, ethnographic resources are explicitly mentioned:

(6)(A) In General.— Property of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined to be eligible for inclusion on the National Register.-

(B) Consultation.— In carrying out its responsibilities under section 306108 [of Title 54] [Section 106 of this Act], a Federal agency shall consult with any Indian tribe or Native Hawaiian organization that attaches religious and cultural significance to property described in [subsection 302706 of Title 54] [subparagraph 101(d)(c)(A) of the Act] (a).- (54 USC 302706).

Section 106 of the Act requires that federal agencies “prior to the approval of the expenditure of any federal funds on the undertaking or prior to the issuance of any license, shall take into account the effect of the undertaking on any historic property” (54 USC 306108).

“Historic property” means any prehistoric or historic district, site, building, structure, or object included on, or eligible for inclusion on the National Register, including artifacts, records, and material remains related to the district, site, building, structure, or object. (54 USC 300308)

The **Department of Transportation Act** of 1966 under Section 4F (49 USC 303(a)) states that:

It is the policy of the United States Government that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. (49 USC 303(a))

The **National Environmental Policy Act** of 1970 (Public Law 91-190, 42 USC 4321 and 4331-4335) in Section 101(b)(4) states that a reason for the act is to: “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” (42 USC 4331(a)).

Executive Order (E.O.) 11593 – Protection and Enhancement of the Cultural Environment (54 USC 300101(Note)) states that:

Agencies of the executive branch of the Government (hereinafter referred to as “Federal agencies”) shall (1) administer the cultural properties under their control in a spirit of stewardship and trusteeship for future generations, (2) initiate measures necessary to direct their policies, plans and programs in such a way that federally owned sites, structures, and objects of historical, architectural or archaeological significance are preserved, restored and maintained for the inspiration and benefit of the people.

The **American Indian Religious Freedom Act** of 1978 (Public Law 95-341, 42 USC 1996) states that:

It shall be the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites. (Section 1)

The **Archaeological Resources Protection Act** of 1979 (Public Law 96-95; 16 USC 470aa-mm) was enacted to protect archaeological resources from illegal exploitation and to create a permitting process with appropriate consultation with Indian tribes prior to excavation.

The **Native American Graves Protection and Repatriation Act** of 1990 (Public Law 101-601; 25 USC 3001 et seq.) calls for the protection of Native American human remains, objects associated with those remains, and/or the protection of specific sacred and culturally significant objects, as defined in this law. This law also provides procedure for returning human remains and associated objects and sacred and culturally significant objects to their respective tribe or lineal descendent through the process of tribal consultation.

Government-to-Government Relations with Native American Tribal Governments – Executive memorandum of April 29, 1994 (Federal Register Vol. 59, No. 85) dictates that federal agencies respect and consult with Tribal governments in considering projects:

(b) Each executive department and agency shall consult, to the greatest extent practicable and to the extent permitted by law, with tribal governments prior to taking actions that affect federally recognized tribal governments. All such consultations are to be open and candid so that all interested parties may evaluate for themselves the potential impact of relevant proposals.

(c) Each executive department and agency shall assess the impact of Federal Government plans, projects, programs, and activities on tribal trust resources and assure that tribal government rights and concerns are considered during the development of such plans, projects, programs, and activities.

Indian Sacred Sites – E.O. 13007 of May 24, 1996 (42 USC 1996 note) declares that agencies shall: ...“to the extent practicable, permitted by law”...

(1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites.

Where appropriate, agencies shall maintain the confidentiality of sacred sites ...

(iii) “Sacred site” means any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site.

Consultation and Coordination with Indian Tribal Governments – E.O. 13175 of November 6, 2000. This executive order mandates meaningful consultation with Indian tribes and respect for their autonomy.

Federal agencies strive to avoid harming important sites, i.e., those eligible for or considered eligible for inclusion on the National Register of Historic Places (NRHP). When a project cannot avoid harming eligible sites, there is a regulatory process in place to mitigate the adverse effects of the project on important sites built into the NHPA. This process requires the development of a mitigation plan, embodied in either a Memorandum of Agreement (MOA) for simple projects or programmatic agreement for complex ones. These documents are developed in cooperation with federal agencies, tribes, and other concerned parties. The MOA or programmatic agreement may require site-specific mitigation plans for complex projects, such as this one.

1.2 Methodology

Pursuant to Section 106 of the National Historic Preservation Act (hereafter, Section 106 or NHPA depending on context), federal agencies must consider whether any historic property within a project’s area of potential effects (APE) could be affected by the undertaking by making a “reasonable and good faith effort” to identify historic properties (NHPA Section 800.4(b)(1)). This sentence requires defining several terms to better understand what it means.

Historic property is a legal term with eligibility requirements attached to it. Ethnographic resources that meet the eligibility criteria for listing in the NRHP are formally referred to as historic properties and/or traditional cultural properties (TCPs) depending on context and have protection under law.

An APE is defined as “the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties” (36 CFR 800.16(d)). To understand the cultural resources near and within the Project Area, an expansive 2-mile APE (1 mile on either side of the centerline) and literature review was applied to the Proposed Project.

The Advisory Council on Historic Preservation (ACHP) has created the following guidance on what constitutes a “reasonable and good faith effort”:

Prior to beginning the identification stage in the Section 106 process, the regulations (at 36 CFR § 800.4) require the federal agency to do the following:

- Determine and document the APE in order to define where the agency will look for historic properties that may be directly or indirectly affected by the undertaking;
- Review existing information on known and potential historic properties within the APE, so the agency will have current data on what can be expected, or may be encountered, within the APE;
- Seek information from others who may have knowledge of historic properties in the area. This includes the State Historic Preservation Officer/Tribal Historic Preservation Officer and, as appropriate, Indian tribes or Native Hawaiian organizations who may have concerns about historic properties of religious and cultural significance to them within the APE.

Following these initial steps, the regulations (36 CFR § 800.4(b)(1)) set out several factors the agency must consider in determining what is a “reasonable and good faith effort” to identify historic properties. They call for the agency official to “take into account past planning, research and studies; the magnitude and nature of the undertaking and the degree of federal involvement; the nature and extent of potential effects on historic properties; and the likely nature and location of historic properties within the APE. The Secretary of the Interior's standards and guidelines for identification provide guidance on this subject. The agency official should also consider other applicable professional, state, tribal, and local laws, standards, and guidelines. The regulations note that a reasonable and good faith effort may consist of or include “background research, consultation, oral history interviews, sample field investigation, and field survey.”

When asked to provide its advisory opinion (pursuant to 36 CFR § 800.2(b)(2)) on the adequacy of a specific identification effort, the ACHP will evaluate the agency’s efforts in light of these factors and the following criteria.

1. The identification effort is reasonable when it is logically designed to identify eligible properties that may be affected by the undertaking, without being excessive or inadequate in light of the factors cited above. While it may be appropriate in some circumstances to identify all historic properties in the APE, it is important to note that the regulations *do not require* identification of all properties. . .
2. The identification effort is carried out in good faith when it is fully implemented by or on behalf of the federal agency. (ACHP 2011, emphasis in original)

During initial tribal consultation for the Proposed Project, conducted from 2008 to 2011, several tribes expressed interest in completing ethnographic research for traditional cultural use along the Project Area, while others decided that their participation would be minimal or not required. Additional information is available in LPP Final Study Report 23 –Ethnographic Resources, Chapter 3, Tribal Consultation (UBWR 2016). The purposes of the ethnographic research include (1) identifying and documenting potential TCPs and other ethnographic resources within or near the Project Area; (2) documenting potential effects on these resources; (3) evaluation of potential TCPs for inclusion on the NRHP; and (4) documenting other potential concerns for the tribes. Together, the ethnographic reports provide a baseline of information about the Project Area and insight into tribal concerns.

Ethnographic reports were prepared by the Hopi, Hualapai, Southern Paiute Advisory Committee (SPAC) (consisting of the Kaibab Band of Paiute Indians [referred to herein as the “Tribe”], Paiute Indian Tribe of Utah, and San Juan Southern Paiute Tribe), and the Zuni. Much of the material in the reports is considered by the tribes as too sensitive for public disclosure.

The general methodology used in the ethnographic reports was to visit the Project Area with tribal elders and other knowledgeable tribal members. Locations were picked out in advance as probable areas of concern. Additional locations were chosen during the field trips as needed. At each location, comments made by the tribal members were recorded and later compiled. The draft ethnographic report was then submitted to the tribe for verification.

For example, a SPAC report states:

During the Southern Paiute ethnographic studies in 2011, 2012, and 2017, the SPAC visited 52 sites that the committee members identified as areas of critical cultural concern. Subsequently, eleven of these sites were declared sacred sites under Executive Order 13007 by the Kaibab Band of Paiute Indians and the Paiute Indian Tribe of Utah, and seven were determined to be eligible to be listed in the National Register of Historic Places as TCPs, defined by National Register Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties of Historic Places. The remaining sites continue to be of cultural concern to the Paiute people.

It is important to understand the 52 sites, places, and landscapes visited during the three ethnographic studies represent a small number of culturally sensitive places and landscapes found throughout the LPP corridors. The SPAC therefore stipulates that there are culturally sensitive places located throughout the entire length of the proposed Lake Powell Pipeline corridor. These culturally sensitive places vary in terms of their size, ranging from small local archaeology sites, to large lineal pilgrimage trails, to even larger cultural districts. (SPAC 2020, 2)

The scope for this ethnographic review is approximately 1 mile on either side of the Proposed Project (or a 2-mile-wide indirect APE). However, because some sites have integrated viewsheds, there may be visual effects caused by the Proposed Project beyond this limit. In the Project Area, viewsheds can extend for quite a distance and may be integral to the resource.

Despite the timeframe from the Proposed Project’s initial studies, 2008 through 2019, the SPAC affirms that:

When viewed from an official tribal position, the current LPP ethnographic study should only be viewed as an initial step in the process of conducting a complete American Indian cultural impact assessment.

Some places along the LPP routes visited were not studied due to the time required to conduct a site analysis. Many other portions of the LPP APE were not visited at all by the SPAC due to access issues and time needed to conduct a full assessment. Some resources were understudied due to the seasons in which site visits occurred, thus natural resources like plants and animals were either missing or difficult to identify. While the findings in this

report represent a selective sample of Southern Paiute places, natural resources, and ancestral locations along the proposed LPP routes, the SPAC stipulates that Southern Paiute cultural resources [sic], places, and landscapes are found along the entire LPP corridor. (SPAC 2020: 44-45)

Types of ethnographic resources fall into broad categories. The following discussion comes from the SPAC, Supplement Number 5 (2020):

Sensitive Areas

All identified sites are considered culturally sensitive areas. Southern Paiute people, their culture, and their traditional bio-physical environment are intimately intertwined. Paiute cultural identity, spirituality, laws, traditions, and ceremonies are connected to and often arise from their long-term and complex relationships with this traditional bio-physical environment. A loss of traditional lands thus equates to a loss of identity and culture. Areas of cultural importance, therefore, require protection.

Sacred Sites

Sacred Sites are special Federal designations that can be assigned to special places located on federal or tribal lands by a tribe declaring a location a sacred site. When such an action occurs, the tribe is affirming the cultural and religious importance of the site to their community.

Traditional Cultural Properties

The National Register of Historic Places Bulletin 38 defines a Traditional Cultural Property (TCP) as an area “that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community’s history; and (b) are important in maintaining the continuing cultural identity of the community.” For Native American groups, a location must be associated with origin narratives, cultural history, or ceremonial activity to be considered for a TCP nomination. One of the four following criteria must be met for inclusion of an area into the National Register of Historic Places:

1. Association with events that have made a significant contribution to the broad patterns of our history.
2. Association with the lives of persons significant in our past.
3. Embodiment of the distinctive characteristics of a type, period, or method of construction.
4. History of yielding, or potential to yield, information important in prehistory or history.

The SPAC stipulates that TCPs are a kind of cultural resource. This stipulation is based on previous environmental impact assessments and cultural resource studies with Southern Paiute and other Numic-speaking people, which clearly define Native American cultural resources.

Traditional Cultural District

A Traditional Cultural District (TCD), a type of TCP, is defined as a collection of properties comprising a culturally significant entity. It is the rarest type of cultural resource found in the

LPP study area. A district is a unified entity that usually consists of historically, functionally, or archaeologically related properties. Examples of districts include groups of habitation sites, rural villages, and transportation networks. Thus, there are historic districts, archaeology districts, and TCDs, with the latter being the focus of this section. A TCD normally contains areas of critical cultural importance, sacred sites, and TCPs. Together these each contribute to the importance of each TCD component and the TCD itself. (SPAC 2020, 3–4)

There are based on our research five major types of cultural landscapes we have found to be perceived by many American Indian peoples. In terms of both size and function, these are (1) holy landscapes, (2) storyscapes, (3) regional landscapes, (4) ecoscapes, and (5) landmarks. (SPAC 2020, 43)

The key point to this discussion is that American Indian people have lived since the beginning of time and have co-evolved with their physically and socially constructed environment. This complex inter-relationship generally is discussed as Sacred Ecology. Deriving from sacred ecological relationships is a view of traditional resources that traditional people organize with terms that tend not to match those used by national cultural resource management agencies. This does not imply that there is no way to find commonly agreed upon definitions for cultural resources, but instead it implies that careful discussion must be conducted in specific situations in order to be certain that accurate communication is occurring. This applies to the identification, management, use, and protection of these cultural resources. (SPAC 2020, 43)

It is important to note that from an agency perspective, not all ethnographic sites are of equal importance. Similar to prehistoric and historic sites, ethnographic sites need to be evaluated for their importance in the same way as other sites and determined to be eligible by the federal agency. The Tribe's sacred sites have been declared as TCPs and/or included in the TCD and hence are presumed to be eligible under the NHPA. The NPS developed Bulletin 38 to help decision-makers understand how to evaluate ethnographic properties:

Bulletin 38 – Guidelines for Evaluating and Documenting Traditional Cultural Properties of the NPS (1992) sets out guidance for how to recognize, document, and understand TCPs and TCDs. The excerpts below indicate some of the important background and criteria for evaluating these types of properties.

A traditional cultural property, then, can be defined generally as one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community... Properties to which traditional cultural value is ascribed often take on this kind of vital significance, so that any damage to or infringement upon them is perceived to be deeply offensive to, and even destructive of, the group that values them. (NPS 1992, 1–2)

Establishing that a property is eligible means that it must be considered in planning Federal, federally assisted, and federally licensed undertakings, but it does not mean that such an undertaking cannot be allowed to damage or destroy it. Consultation must occur in accordance with the regulations of the Advisory Council (36 CFR Part 800) to identify, and

if feasible adopt, measures to protect it, but if in the final analysis the public interest demands that the property be sacrificed to the needs of the project, there is nothing in the National Historic Preservation Act that prohibits this. (NPS 1992, 4)

In order to be eligible for inclusion in the Register, a property must have “integrity of location, design, setting, materials, workmanship, feeling, and association.” (36 CFR Part 60) In the case of a traditional cultural property, there are two fundamental questions to ask about integrity. First, does the property have an integral relationship to traditional cultural practices or beliefs; and second, is the condition of the property such that the relevant relationships survive? (NPS 1992, 10)

Assuming the entity to be evaluated is a property, and that it retains integrity, it is next necessary to evaluate it against the four basic National Register Criteria set forth in the National Register regulations (36 CFR Part 60). If the property meets one or more of the criteria, it may be eligible; if it does not, it is not eligible. (NPS 1992, 11)

Properties that have achieved significance only within the 50 years preceding their evaluation are not eligible for inclusion in the Register unless “sufficient historical perspective exists to determine that the property is exceptionally important and will continue to retain that distinction in the future.” This is an extremely important criteria consideration with respect to traditional cultural values. A significance ascribed to a property only in the last 50 years cannot be considered traditional. (NPS 1992, 15)

Guidance on boundaries:

For example, where a property is used as, the Helkau District is used, for contemplative purposes, viewsheds are important and must be considered in boundary definition... The fact that the boundaries of a traditional cultural property may be drawn more narrowly than they would be if they included all significant viewsheds or lands on which noise might be intrusive on the practices that make the property significant does not mean that visual or auditory intrusions occurring outside the boundaries can be ignored. In the context of eligibility determination or nomination, such intrusions if severe enough may compromise the property’s integrity. (NPS 1992, 19)

Thus, ethnographic resources (with the exception of sacred sites) need to be determined eligible for inclusion on the NRHP for them to be important enough to modify the project around them. Sacred sites should be avoided, in conformity with E.O. 13007. Ethnographic resources not eligible for the NRHP can be treated like other non-eligible sites: avoided if possible, but not a concern for the Proposed Project.

1.3 Environmental Protection Measures

The proposed pipeline would incorporate environmental protection measures (EPMs) into the design of the pipeline by first, avoiding areas of cultural concern. Avoidance is achieved by moving the pipe and its associated construction activities to the side of sites, but within the 250-foot corridor surveyed for cultural resources. The next design feature is to reduce the footprint of the

pipeline construction, where possible, within identified viewsheds to minimize impacts. The Proposed Project would incorporate visual deflectors, such as placement of trees and boulders to minimize viewshed concerns. Once the pipeline is in the ground, disturbed areas would be revegetated with seed mixtures appropriate to the plant community as described in the LPP Plan of Development (UDWR 2020; provided in Appendix E, Plan of Development) and Appendices C-13, Vegetation Communities; C-14, Wetland and Riparian; and C-15, Special Status Plants.

1.4 Existing Conditions

This section describes the ethnographic environment of the Project Area through the lens of ethnographic research. The discussion is broken into sections dealing with human-landscape interactions, ethnographic categories, and ethnographic findings.

1.4.1 Human-Landscape Interactions

The Project Area lies in an area with long-term human-landscape interactions. The SPAC explains why the Proposed Pipeline poses a risk to this area:

The Creator placed Southern Paiute people in their homelands at least 12,000 years ago. According to Southern Paiute origin narratives, the Creator made Southern Paiute people the sole owners and caretakers of these lands. Southern Paiute oral histories describe how Southern Paiute people attest to how they have always resided in these lands. These histories categorically rejecting the notion that their people emerged elsewhere, only to arrive in their lands at some later point in time. Southern Paiutes are also the federally recognized aboriginal inhabitants of these lands per the ruling of the Indian Claims Commission...

Because these lands are part of traditional Southern Paiute territory, all Native American sites located within Southern Paiute territory, unless identified and agreed upon by all Southern Paiute tribes as belonging to others should be defined as Ancestral Numic. The SPAC requests that all Native American sites located within traditional Southern Paiute territory be referred to as *Enugwuhype* or Ancestral Numic. The *Enugwuhype* period refers to the time period from Creation to 100 years ago.

From a heritage and Southern Paiute perspective, the proposed pipeline puts important cultural places and resources at extreme risk. Some places have special resources, such as particular kinds of medicine plants that need to be gathered at that location. Other places are linked to world balancing ceremonies, time keeping, and traditional healing. If these places were impacted by pipeline construction, the cultural value and useful benefits would be lost forever. These places could never be rebuilt or relocated to other places in traditional Southern Paiute territory.

Even though the legal ownership of much of traditional Southern Paiute lands has shifted to the United States government, the moral, spiritual, and cultural stewardship responsibilities for these lands remain in the hands of Southern Paiute peoples, as well as other Numic people such as the Ute tribes. In this report, Paiute people share portions of their knowledge so they can remain in a stewardship capacity in order to advise on moral, spiritual, and cultural matters that affect their traditional lands.

Southern Paiute places and resources of cultural significance are found throughout the LPP study area. These Paiute cultural elements include but are not limited to archaeological resources, ethnobotanical resources, ethnozoological resources, ethnogeological resources, visual resources, acoustic/tonal resources, astronomical resources, and supernatural/metaphysical resources. These types of resources can be found at specific locations and landscapes and contribute to the overall cultural importance of the traditional homeland. (SPAC 2020, 1–2)

The Hopi have a slightly different view of prehistory:

The Hopi emerged into this, the Fourth World, from the *Sipapuni* in the Grand Canyon. Upon emerging, they encountered *Ma'sam*, the guardian of the Fourth World. A spiritual pact was made with *Ma'sam*, wherein the Hopi would act as the stewards of the earth. As part of this pact, the Hopi vowed to place their footprints throughout the lands of the Fourth World as they migrated in a spiritual quest to find their destiny at the center of the universe. Hopi clans embarked on a long series of migrations that led them throughout the Southwest and beyond, settling for a time in various places. Following divine instructions, the Hopi continued their migrations until after many generations they arrived at their rightful place on the Hopi Mesas. (Molenaar and Greaves 2013, 12)

The Hopi Tribe is a combination of many clans (extended families) that have migrated to this region from several areas of the Colorado Plateau physiographic area. The Hopi have lived in this specific area for several hundred years and are believed to have inhabited other adjacent regions for over 1,000 years. Although their current primary areas of settlement are the three Hopi Mesas in the center of the present-day reservation, the Hopi have a rich oral tradition recounting clan migrations throughout much of the American Southwest, including parts of southern Utah and northern Arizona. The LPP Project affects lands that contain archaeological evidence the Hopi identify as part of their ancestral settlements and clan migration routes to their current villages. (Molenaar and Greaves 2013, 9)

Archaeological sites that have been identified by archaeologists as “Anasazi” or Ancestral Pueblo are considered by the Hopi people to be evidence of the pre-coalition, dispersed populations that represent the ancestors of current and extinct clans that form the Hopi Tribe. The modern Hopi reservation is a part of *Hopitutskeva* (traditional Hopi land) that has been subject to several reductions in the traditional land base of the tribe. The project area is to the north of the Hopi reservation; however, as with many parts of the northern Southwest, the project area contains archaeological evidence of Hopi ancestral occupation that is important to living Hopi cultural practices and history. (Molenaar and Greaves 2013, 9)

Archaeological evidence and Hopi traditions place Hopi ancestry within the San Juan River region of the American Southwest. The Hopi Tribe believes that the Hopi people have inhabited the Four Corners region of the modern states of Arizona, New Mexico, Colorado, and Utah for approximately the last 10-12,000 years. The earliest portion of this time period (approximately 8,000-10,000 years ago) is identified with the term *Motisinom* (“first people”), which includes temporal periods archaeologists call Paleoindian and Archaic. The more recent 2,000-2,500 years prior to the historic period are identified with the *Hisatsinom*

(“people of long ago”), time periods formerly referred to by archaeologists as “Anasazi” and now termed Puebloan. (Molenaar and Greaves 2013, 9)

The Zuni also have an origin story that ties them to the landscape:

From a Zuni traditional perspective all of the archaeological sites in the project area are conceptually grouped together and identified as *enote bes'abdowe*- literally, old homes. All of these archaeological sites, from the initial Pueblo period through the last Pueblo occupation, are ancestral monuments that commemorate the lives of the ancestors. From the Zuni viewpoint, all of these sites are the remnants left by Pueblo ancestors as they sought out the Middle Place. (Colwell-Chanthaphonh et al. 2011: 26)

As Allison Wallace told us in an interview, humans emerged onto this, the Fourth World, in a very different form. These ancestors came out of the underworld, but did not look like us human beings. They had webbed hands and feet and appendages on their heads. They were covered in slime. Octavius Seowtewa explained, “our ancestors go back to *ab 'wi delin kyabin:na* [lit. raw world], which means not baked yet, before time was thought of as time. Most of the Zuni songs go back to when the earth was not cooked yet-our ancestors go back to that time.” After emergence, these most ancient ancestors were told to search out *Idiwan'a*, the Middle Place, a certain destination with an untold location. The people began their search, splitting into different groups as they migrated from place to place in search of their destiny at the Middle Place. (Colwell-Chanthaphonh et al. 2011, 24)

It is common for different tribes to have different perspectives on the past. A common belief that unites these perspectives is that prehistoric remains are important to each tribe and should be protected.

Section 4.2 of LPP Final Study Report 23 – Ethnographic Resources summarizes the Hualapai ethnographic perspective:

Hualapai researchers conducted a review of ethnographic and historical literature, consulting a database of records containing references reaching 200 years into the past. The resulting report titled *Hualapai Ethnohistoric Associations Relating to the Lake Powell Pipeline Project* documents a longstanding relationship between Pai peoples residing south of the Colorado River and the Paiutes residing north of that river. The interactions described in those documents are multifaceted, including economic, ceremonial, and kin relations. The report establishes that, although Pai people regularly interacted with the Paiutes who used to occupy land along the Lake Powell Pipeline route, ownership of sites and their resources are unlikely.

The Hualapai report did not identify sites defined as their tribal traditional cultural properties within the LPP APE. The modern Hualapai Reservation borders 108 miles of the Colorado River, which serves as the northern boundary of their range. While the Hualapai once controlled a larger territory, evidence outlined in the report indicates that the Pai peoples regarded the Colorado River as their boundary. The historic records show only one place name in the Pai language for a site north of the Colorado River, indicating the transient nature of Pai peoples who visited the north. However, the record of river crossings of Pai peoples north to Paiute land and of Paiutes south into Pai territory is substantial. Cross-

boundary visits for trade, for hunting and for ceremonial events occurred between communities from Shivwits territory in the west to the Colorado Strip in the east. Ancestors of the modern Tribe participated in Ghost Dance and other ceremonies at sites north of the Colorado River, but the location of these sites are not linked to the LPP APE. While fewer references point to a connection between the Hualapai and sites in the Colorado [Arizona] Strip, there are numerous recorded interactions between their Tribe and the Shivwits Paiutes. There are accounts of regular interaction between the Pai and the Paiutes facilitated by well-documented trails. The oral accounts collected by Hualapai researchers provide evidence that Pai and Paiutes intermarried and thereby cemented relationships between the tribes. (UBWR 2016)

1.4.2 Ethnographic Categories

These three ethnographic reports (Hopi, SPAC, and Zuni) expressed interest in four main categories of physical resources, realizing that each has a supernatural overlay: spiritual landscapes, prehistoric sites, plants/animals, and the natural world. A fifth category, viewsheds, is intertwined with the other categories.

1.4.2.1 Spiritual Landscapes

A difficult concept for many non-native people is commonplace for Native American tribes: the world is alive and interconnected. Many Native Americans believe that everything has a spirit. This includes animals, plants, rocks, canyons, rivers, and even air. The Creator gave each an individual, sentient spirit (with its own voice, desires, and life) as each element was placed into the world. What appears to a non-Indian as just a pebble is a wondrous act of creation, connected to the whole earth, with a unique spirit that can listen, speak, and interact with those of suitable spiritual temperament.

This idea of a spiritual landscape filled with individual spiritual elements is central to Native American objections to construction projects. People are disrupting the work of Creation by moving what belongs (integrated into this particular space) and replacing it with what does not belong (matter from a different integrated landscape).

Further, that which does not belong, like a steel pipe, has elements from many different places that have been removed from their home, baked with other elements, and moved to a foreign place. Essentially, these are lost souls without a connection to their new environment.

In this particular case, the Creator's work is being disrupted over a large distance (the proposed pipeline), and there is co-mingling of sentient beings: Colorado River spirit(s) with that of different river spirit(s) at the terminus.

1.4.2.2 Prehistoric Sites

Prehistoric sites are important to all the tribes. Their importance relates to their evidence of ancestral use of an area and also as part of the spiritual landscape of the region. For example, the Hopi explain this significance as follows:

The migration stories in Hopi oral histories serve a number of purposes associated with Hopi religion, ritual activities, and their integration into other aspects of everyday life. During migrations, Hopi established "footprints" as directed by *Ma'saw* through the

establishment of pilgrimage trails, shrines, and ritual springs, and the creation of petroglyphs and pictographs at several of these and other locations. Additionally, their migrations are associated with a physical record of their habitation site uses through the presence of ruins, the graves of their ancestors, and a range of artifacts such as potsherds, grinding stones, stone tools, and their manufacturing debris, as well as other remains. The Hopi value this archaeological record as evidence of fulfillment of their pact with *Ma'sam* for spiritual stewardship of those lands and as payment to Mother Earth for the use of those areas. Archaeological sites provide the Hopi footprints that are connected to clan migration histories, religious beliefs, and documentation of the tribe's caring for the earth during their use of this vast region. (Molenaar and Greaves 2013, 12)

Many Native American groups claim affiliation with prehistoric archaeological sites such as rock art locations, habitations sites, or burials. The Hopi Tribe has often made the case that the exact location of some of these places, such as ancestral archaeological sites and burials, are unknown to the tribe until such locations are identified by Hopi cultural experts during ethnographic or ethnohistoric investigations, or by archaeological discovery during survey or subsurface evaluation in a given study area. (Molenaar and Greaves 2013, 19–20)

This determination by Hopi religious practitioners does not distinguish between archaeological sites but appears to be fully inclusive. Every prehistoric site is a TCP under this view. The Zuni also agree with this type of blanket determination:

Based on the sample of sites visited and Zuni traditional knowledge of ancestral migrations, as well as the cultural and religious meanings imbued in ancestral sites, all the archaeological sites associated with the Paleoindian to Pueblo periods are deemed to be Zuni traditional cultural properties. (Colwell-Chanthaphonh et al. 2011, 57)

1.4.2.3 Plants and Animals

Plants and animals are very important to traditional customs and practices. Plants have spiritual power that help in healing, bringing spiritual power, and inviting supernatural forces. Likewise, animals also have spirits and ancestors that can guide and empower those with correct understanding. For example, a member of the SPAC team noted:

This entire place has many plants and rock art. It was also a place of living. It has many Paiute traditional plants, pottery, flint, sacred plants, and an old house made out of clay and rocks. (SPAC 2011)

From the Zuni:

Animals are a central focus of Zuni culture and religion. They are considered ancestral spirits. A diverse array of cultural practices requires the use of animals, such as raptor feathers for religious paraphernalia. Animals are a vital part of the Zuni cultural environment.

Plants have sustained the Zuni people for generations, and serve as a source of food items, religious material, and spiritual and physical health. Plants are a vital part of the Zuni cultural environment. (Colwell-Chanthaphonh et al. 2011, 65)

And the Hopi:

Informants agreed that this rock art site had links with Hopi migration oral literature and was therefore a significant location to them. The presence of a patch of one very sacred plant and another with craft and ceremonial uses, was also of great interest to informants' inventory and stewardship concerns about lands that have been used by Hopi ancestors. (Molenaar and Greaves 2013, 49)

1.4.2.4 Natural World

The fourth general theme is that of the natural world. This broad category may include rock formations, springs, water ways, and mountains. Each of these is considered a living being, with particular strengths, abilities, and sentience. The following examples are presented to show the general concern for these types of resources.

For the Zuni:

Eight Zuni named places are known in the general project area, in the “zone of emergence” south of Lake Powell, and two intersect the project directly, the Grand Canyon and the Colorado River. These named places are Zuni historic properties and a vital part of the Zuni cultural environment. (Colwell-Chanthaphonh et al. 2011, 65)

The Proposed Project would begin at the Colorado River, upstream and outside of the Grand Canyon National Park. However, the Zuni define the Grand Canyon broadly, as including all of its tributary canyons. Thus, the Project Area intersects the Zuni's definition of the Grand Canyon and the Colorado River (more on this below). However, the Zuni “zone of emergence” is located outside of the Project Area.

The SPAC report states:

On Charleston Peak, Wolf used his greater power to create the Southern Paiutes - the ingredients accounting for their dark skin color. So Charleston Peak and the Spring Mountain Range are, in comparative perspective, holier to Southern Paiutes than is Mount Ararat to Christians. (SPAC 2011, 5–6)

Charleston Peak and the Spring Mountain Range are near the border of Nevada and California. They are not part of this project.

The Hopi declare:

Water in all of its forms (rivers, lakes, rain, aquifers, snow, etc.) is a central concern of Hopi culture and religion. All water is powerfully revered and is a central to Hopi life. Hopi respect for water is critical to their religious practices and conception of who they are as a people. This concern is obviously rooted in practical empirical knowledge that is reflected in scientific ecological understanding of the central role water plays in enabling all life on earth to flourish and in maintaining the delicate balances of plant and animal communities in arid areas such as the American Southwest. Archaeology and historical records document that the Hopi have a long record of water use in the region and claim ancestral rights to the Little

Colorado River. Because the LPP Project is focused on the movement of water from Lake Powell, the Hopi express concern that NEPA considerations accurately assess potential impacts to the delicate water balance in this area. (Molenaar and Greaves 2013, 28)

1.4.3 Ethnographic Findings

The Hopi, SPAC, and Zuni have identified cultural resources present in the Project Area through ethnographic research. Each tribe had an opportunity to visit the area and participate in the creation of ethnographic accounts between 2008 and 2012. In the intervening years since consultation began, some of the reports were revised with the inclusion of additional resources. These changes were incorporated into this ethnographic review and reflect a continuous involvement in the Proposed Project.

Because federal law is concerned with particular site types and their eligibility for the NRHP, each tribe was asked to identify TCPs and sacred sites, so that they could be incorporated into the planning process for the Proposed Project. The ethnographic reports were submitted to the Proponent prior to 2015, thereby allowing for several years of project planning. One recent and substantial change was the addition of the Kanab Creek TCD by the Tribe in 2019 (see below).

The federal agency makes a determination of eligibility for historic properties under the NHPA, which includes TCPs and TCDs. The general process is that tribes identify TCPs; the federal agency determines if they are eligible for inclusion on the NRHP; the State Historic Preservation Office (SHPO) or Tribal Historic Preservation Office (if the TCP is on a reservation) concurs (or invites further discussion) with the determination of eligibility; and the property is formally nominated. In practice, most TCPs are not formally nominated, but are considered eligible for project purposes. Historic properties considered eligible have the same protections as those formally listed on the NRHP.

1.4.3.1 Hopi Traditional Cultural Properties

All of the prehistoric archaeological sites within the Project Area are considered TCPs for the Hopi under criteria A through D. No specific TCPs were identified in the ethnographic report.

The Hopi position is that all prehistoric sites are TCPs eligible under the following criteria:

Criterion A because they are associated with the Hopi clan migrations, which have made a significant contribution to the broad pattern of Hopi history.

Criterion B because they are “associated directly with *Ma’saw* and the Hopi’s covenant to leave their footprints across the land.”

Criterion C because “ancestral archaeological sites, that may be individually anonymous, are identified as part of the great clan migrations that are central to all that is Hopi.”

Criterion D because they have yielded or have the potential to yield information important to Hopi prehistory. (Molenaar and Greaves 2013, 19–20)

While the Hopi had concerns about plant and animal life within the Project Area, no TCPs were identified based solely on these concerns.

1.4.3.2 Southern Paiute Advisory Committee Traditional Cultural Properties

The following discussion generically describes sacred sites, TCPs, and a TCD that have been identified by SPAC and made known to the Bureau of Reclamation (Reclamation) during the course of this project.

Sacred Sites

The Resolution of the Governing Body of the Kaibab Band of Paiute Indians, No. K-07-11 (March 17, 2011) states that:

[T]he Kaibab Tribal Council is requesting the following places and landscapes be declared as sacred sites under Executive Order 13007; Kanab Creek, Elephant Foot, Yellowstone Mesa, Moonshine Ridge, Indian Knoll, Milk Mountain, Pilgrimage Trail, Eagle Mountain and Ancestral Village; ... the Kanab Creek corridor and tributaries are accepted as sacred by the spiritual leaders of the Tribe, Tribal Elders, and the Tribal Council;

Many of these locations are included in the Kanab Creek TCD.

Milk Mountain Pilgrimage Trail

The Milk Mountain Pilgrimage Trail, also known as “*Kavaicuwac Puha Po*,” is a pilgrimage trail from the Paria River to Milk Mountain (“*Kavaicuwac*”) which destination is located in southeastern Utah, and well outside of the Project Area. It is thought that this trail might have been used by shamans, as tribal representatives, to acquire spiritual energy. It was declared a sacred site in 2011.

The pilgrimage trail, as presently understood, begins at the Paria River, moves to Catstair Canyon, then to Five Mile Spring, to Trail Map Rock, to *Kavaicuwac Paayuxwitse*, and finally to *Kavaicuwac*. The shamans would walk the trail and place offerings at important locations along the route, seek spiritual assistance, and receive it.

Pioneer Gap

This area has also been denoted as the “Puha’gant Kanihype (Pioneer Gap) Cultural Landscape.”

This cultural landscape contains three main components - (1) Ipa (Navajo Well), (2) Puha’gant Kanihype, and (3) Cliff Rim Panels ... This landscape must be avoided. If the Southern alignment is selected, the alignment must be moved to the east of the Puha’gant Kanihype cultural landscape, east of the powerline corridor.

This area has been proposed as a TCP by the Southern Paiute Advisory Committee and declared in a resolution as a Sacred Site by the Tribal Council of the Kaibab Band of Paiute Indians on March 17, 2011. (SPAC 2012, 7)

The Proposed Project location was moved away from this location as requested by the tribe.

Kanab Creek TCD (Which Includes Sacred Sites and TCPs)

In the SPAC 2020 – Supplement Number 5 Report, the following information on the TCD was provided:

For Native American groups, a location must be associated with origin narratives, cultural history, or ceremonial activity to be considered for a TCP nomination. One of the four following criteria must be met for inclusion of an area into the National Register of Historic Places:

1. Association with events that have made a significant contribution to the broad patterns of our history.
2. Association with the lives of persons significant in our past.
3. Embodiment of the distinctive characteristics of a type, period, or method of construction.
4. History of yielding, or potential to yield, information important in prehistory or history.

A TCD, a type of TCP, is defined as a collection of properties comprising a culturally significant entity. It is the rarest type of cultural resource found in the LPP study area. A district is a unified entity that usually consists of historically, functionally, or archaeologically related properties. Examples of districts include groups of habitation sites, rural villages, and transportation networks. Thus, there are historic districts, archaeology districts, and TCDs, with the latter being the focus of this section. A TCD normally contains areas of critical cultural importance, sacred sites, and TCPs. Together these each contribute to the importance of each TCD component and the TCD itself.

The SPAC in coordination with the Kaibab Band of Paiute Indians prepared an eligibility determination for a TCD which encompasses a cultural region located along and including the southern portion of the Kaibab Paiute Reservation. This effort began when the Kaibab Paiute Tribe sent an official letter to John Eddins of the Advisory Council on Historic Preservation (ACHP) requesting help with the TCD nomination. The letter was sent December 15, 2015. ...

The Kaibab TCD extends from Jacob Canyon in the east, Yellowstone Mesa in the west, to Hack Canyon to the south, and at the start of Kanab Creek Canyon in the north. The Kaibab Band of Paiute Indians passed a tribal council resolution (K-27-19) on May 16, 2019 in support of the TCD nomination and declared it potentially eligible.

The Kaibab Paiute TCD is a multi-layered cultural landscape that does include places associated with time keeping ceremonies, portals to other spiritual dimensions, vision questing, and large-scale balancing ceremonies such as the Ghost Dance. This TCD also contains an area that was historically used as a region of refuge by the Kaibab Paiute people during the late 1800s. This region of refuge is tied to a contemporary Southern Paiute prophecy as a place they must return to during a period of extreme hardship. Many of the TCD places can be seen from elevated points in the immediate area. Such high points have been, and continue to be, used for vision questing, the coordination of ceremonial activities, and spiritual renewal, thus making the viewsapes from these locations, critical components of this cultural landscape. Puha, a Paiute term for spiritual energy, is associated with all of these areas and natural resources. A number of special rock shelters are understood as portals to spiritual dimensions and some are used for space travel. The TCD contains ceremonial areas used by Southern Paiute religious leaders whose activities resulted in ritual deposits, known burials, and rock pecking and painting panels. The TCD contains petrified wood used in medicine and ceremonial white mineral deposits used for rock and body

painting. In addition to the ceremonial components, there are a number of natural resource use areas that contain traditional Southern Paiute home sites and agricultural fields.

All of the places in the TCD are interconnected, thus creating a cultural landscape that has Puha and cultural significance. Pilgrimage trails that cross the proposed TCD traverse large swaths of traditional territory and thus help create a cohesive culturally significant entity. It is a high priority to maintain the cultural integrity of these spiritual and physical trails. The places and resources found within the TCD boundary continue to hold meaning and cultural importance to contemporary Southern Paiute people today. The Kaibab Paiute Tribe has declared this bounded cultural area as eligible as a TCD for the National Register of Historic Places. (SPAC 2020, 3–5)

Traditional Cultural Properties

Identified TCPs are generically discussed below in the order that they are encountered along the Proposed Project route, beginning at the Lake Powell intake and ending at Sand Hollow Reservoir.

Take Out Point/ Colorado River

This location was identified as a TCP, but no details were provided to Reclamation as of this writing, March 27, 2020, by the Tribe or its representatives.

Kanab Creek (also part of the TCD and a sacred site)

The Kanab River is fed by watershed that is more than 60 miles north to south and 40 miles east to west. Kanab Canyon (*Kanav'uipi*) begins on the Kaibab Indian Reservation (KIR) and extends continuously until the Kanab River joins the Colorado River in the Grand Canyon. All of the Kanab Canyon is a culturally sacred ecological landscape within the larger Grand Canyon regional landscape. Culturally, the Kanab River Canyon is defined by its contribution to the spiritual and cultural life of all the Southern Paiute people, especially the Kaibab Paiute people. Kanab River Canyon contains special ceremonial places essential to the practice of Paiute religion. The canyon is also like a Zion (as this term was originally used in the Holy Lands of the Near East) or Region of Refuge (as this term is understood in anthropology) in that it served and serves as a permanent place to which the Paiute people can go and be safe from threat. During the late 1800s, Paiute people went into the canyon led by a medicine woman to seek both the shelter and spiritual renewal provided by the canyon. Contemporary prophecy carried down through time by Paiute elders predicts a time when the canyon will be needed and used again as a Zion by the Kaibab Paiute people. On March 17, 2011, the Tribal Council of the Kaibab Band of Paiute Indians passed a resolution declaring Kanab River Canyon a TCP. (SPAC 2012, 6–7)

Elephant Foot/ Indian Knoll/ Moonshine Ridge (also part of the TCD and a sacred site)

This area has also been denoted as the “PuhaTuvip Cultural Landscape (Yellowstone Mesa area).”

This landscape includes four features- (1) Indian Knoll, (2) Moonshine Ridge, (3) Elephant Foot, and (4) Moonshine Spring - that contain ... and critical viewscapes. These areas must be avoided as any impact would irreparably damage Puha [spiritual energy], resulting in great harm to the sites' spiritual integrity. If the southern alignment is elected, then the pipeline would need relocated so that it bypasses this landscape to the south and goes around Yellowstone Mesa... (SPAC 2012, 4).

Mouth of Ash Creek Canyon/Toquerville

The mouth of Ash Creek Canyon near Toquerville is considered a TCP for the SPAC. This area is now outside of the Proposed Project, but is included here due to their concerns.

Ash Creek Canyon is located in southern Utah, approximately 21 miles south of Cedar City. This canyon follows a southeastern trajectory that parallels the Horse Ranch Mountains that lie to the east of Interstate-15. The proposed LPP is slated to be built through an 11.5 mile stretch of the canyon near the town of Toquerville. As the LPP route comes through the Toquerville area, it crosses the mouth of Ash Creek Canyon. The Southern Paiute Advisory Committee viewed both the upper and lower parts of the canyon and they believe that this place should be considered an area of cultural concern.

The committee explained that the canyon was an important trade and travel trail for Southern Paiute people prior to contact and well into the contemporary period. Southern Paiute people living in the Virgin River area would use the canyon trail to reach places in the north and, in the early part of the 20th Century, Southern Paiute ranchers used the trail to move cattle.

In addition to traditional and contemporary Southern Paiute uses of the canyon, this area has historical importance. In October 1776, Fathers Dominguez and Escalante entered the upper Virgin River watershed by traveling southward in Ash Creek Canyon and encountered Southern Paiute people for the first time. The padres were greeted by Paiute people holding ears of corn to signal non-aggression and peace. (SPAC 2011, 278–279)

Ash Creek Canyon

Ash Creek Canyon is considered a TCP for the SPAC. This area is now outside of the Proposed Project, but is included here due to their concerns.

Numerous volcanic magma flows created an almost impassible landscape, but erosion cut a deep canyon that has become the path of animals and humans alike. (SPAC 2011, 333)

Somewhere along here, fathers Escalante and Dominquez met the Paiute people for the first time—a historical event. At one time there were fields and fields of corn and squash. This was the site that greeted their eyes. There are Indian camps all along Ash Creek. (SPAC 2011, 283)

Other Areas of Cultural Concern

The SPAC identified other areas of cultural concern, which do not rise to the level of sacred sites and TCPs or TCDs. Consequently, these locations do not have the same level of federal protection. However, if the Proposed Project could accommodate their avoidance, it would create good will to the local community.

The proposed alignment includes areas of native plant gathering that should be avoided if possible. Many native plant species are important to the tribes, and some places have a greater variety or better quality of important species. These locations, when identified, could be taken into account, if possible, as a goodwill gesture to the local community. The SPAC have identified several areas of plant resources along both alternatives.

The following locations are described in the SPAC's Lake Powell Pipeline EIS Avoidance [sic] vs. Mitigation Report (referred to hereafter as the "SPAC Avoidance and Mitigation Report"), in the same order that they are presented here. The intent of this section is to draw attention to the locales that the SPAC has identified along the Project Area as being sensitive, but are not included as either sacred sites or TCPs.

Southern Alternative Areas of Cultural Concern

Sandy Canyon Aboriginal Agricultural Communities and Fields

This aboriginal agricultural community includes the Aqueduct Village and farms and the Two Story Community and farms located along lower Sandy Canyon Wash (south of State Route 389). Access to this site is currently limited which has helped to preserve its integrity and to protect the significant cultural resources in this area. Use of the existing primitive road by construction traffic (equipment and personnel) servicing the Southern alignment would irreparably harm this culturally significant site. (SPAC 2012, 5)

The area known as the Sandy Canyon Aboriginal Agricultural Communities and Fields, as identified in the SPAC Avoidance and Mitigation report, would be avoided by the Proposed Project. The proposed access road that bisected this community would not be used.

Enughwuhype (Ancient Ones) Sites (also part of the TCD)

This landscape includes two prehistoric sites. . . These sites are known to have been used for thousands of years based on the kinds of artifacts identified and thus this landscape is a marker of Paiute history. The whole area likely contains buried cultural deposits. The Southern alignment will affect the viewscape and expose the area to intrusion, irreparably harming its cultural and spiritual significance. If the Southern alignment is selected, the pipeline must be kept at least 100 feet north of its suggested alignment as it crosses the ... area. In addition:

- Protective signage must be provided to prevent accidental intrusion of construction workers and activities. (SPAC 2012, 6)

Highway Alternative Locations of Concern

Pioneer Gap to the Turn-Off to Highway 89A

This segment is approximately 11.2 miles long and consists of twelve documented cultural sites with numerous traditionally important resources. The sites include...evidence of Southern Paiute aboriginal farming....

Implementation of the measures outlined in section 4 of this report [SPAC mitigation measures] should afford adequate protection to this segment. Although we expect significant disturbances, the cultural properties disinterred can be repatriated through traditional practices and the long-term benefits provided by the mitigation measures will help to preserve this site over time. (SPAC 2012, 9)

Highway 89A to the Reservation Boundary

This 2.5-mile segment begins along Highway 89A about 1.15 miles north of the town of Fredonia, Arizona, and continues southwest to the eastern boundary of the Reservation. It contains large tracts of private land, precluding detailed assessment for most of the segment. However, the SPAC was able to assess three areas along this segment – Lost Spring Wash, Kanab River Crossing, and the Sand Dune. Although all three sites have significant culturally important resources, appropriate mitigation would minimize impacts and provide long-term site protection. (SPAC 2012, 9)

Lost Spring Wash

Lost Spring Wash runs from Highway 89 to Highway 89A approximately one mile north of Fredonia, Arizona, just south of Cowboy Butte. Much of this segment is on private property so neither the Class III archaeologists nor the SPAC were allowed access. Current APE maps appear to simply go around private property suggesting that an actual APE has not been determined. Although cultural resources were identified on those portions of the segment available for inspection, the overall significance of these areas is currently unclear and should be further assessed prior to construction. (SPAC 2012, 9)

Kanab Creek Crossing

This segment begins at Highway 89A just south of Cowboy Butte, heads west until it crosses Kanab River then turns south, paralleling the riverbank and a series of low cliffs. The Kanab River Crossing segment contains a large number, and continuous series, of Southern Paiute aboriginal agricultural communities which are located along both sides of the Kanab River Hydrological System. These communities are traditionally associated with similar communities that occur along Kanab River all the way to Quickwater Spring in the south. These farming communities contained many homes, farm structures, and artifacts. At least one community has a documented burial. Burials were found during the State Route 389 construction project. These burials and associated grave items were excavated and removed during construction.

Although the site contains many culturally important places and artifacts, the SPAC is compelled to prioritize avoidance for those areas containing religious and ceremonial sites that remain undisturbed and comparatively inaccessible. Given this area's history of disturbance and relative accessibility to the general public, mitigation is considered acceptable if done consistent with SPAC recommendations. (SPAC 2012, 10)

Sand Dune

A portion of the Sand Dune is on located on State land and a portion is in the State Route 389 highway right-of-way. However, the SPAC is aware of many cultural resources located here, including evidence of at least one burial unearthed during construction of State Route 389. Additional disturbance associated with pipeline construction may irreparably harm the remaining undisturbed portions of this site altogether. Therefore, the pipeline should be relocated 150 feet north of the Sand Dune in addition to implementing all measures outlined in section 4 [SPAC mitigation measures]. (SPAC 2012, 10)

Cottonwood Creek Aboriginal Southern Paiute Agricultural Community

The Cottonwood Creek Aboriginal Southern Paiute Agricultural Community is a continuous agricultural community located along the Cottonwood hydrological system. The community contains many homes, farm structures, artifacts, and burials and is divided by State Route 389 approximately 2.5 miles west of Fredonia, Arizona. During highway construction, burials and grave goods were found and removed from this area. Given this area's history of disturbance and relative accessibility, mitigation is considered acceptable if done consistent with SPAC recommendations. (SPAC 2012, 11)

Sandy Canyon Aboriginal Southern Paiute Agricultural Community

Sandy Canyon Aboriginal Southern Paiute Agricultural Community is a very large farming community consisting of many agricultural homes and associated farming materials. It is located approximately 3.5 miles west of the Cottonwood hydrological system and is divided by State Route 389, approximately 5.5 miles west of Fredonia, Arizona. Measures identified in section 4 [SPAC mitigation measures] should be implemented to mitigate impacts to this site. (SPAC 2012, 11)

Sand Wash Aboriginal Southern Paiute Agricultural Community

The Sand Wash Aboriginal Southern Paiute Agricultural Community is a small farming community located on Sand Wash where it is crossed by State Route 389. Sand Wash has its headwaters to the north in the Shinarump Cliffs and subsequently flows through the southeast portion of the reservation, where it joins the Moccasin-Twomile Hydrological system at Bitter Seeps. The Sand Wash community is smaller than those found along other hydrological systems in the area. Given this site's history of disturbance and relative accessibility, mitigation is considered acceptable if done consistent with SPAC recommendations. (SPAC 2012, 12)

Moccasin-Twomile Aboriginal Southern Paiute Agricultural Community

The South Moccasin and Twomile Communities meet 0.5 miles north of State Route 389. This hydrological system is approximately 5.5 miles west of the Sandy Canyon Community and is located 2.5 miles east of the Kaibab Tribal Office. ... Given this area's history of disturbance and relative accessibility, mitigation is considered acceptable if done consistent with SPAC recommendations. (SPAC 2012, 12)

Moccasin-Twomile: Pipe Spring Aboriginal Southern Paiute Agricultural Community

The Pipe Spring Community is located 2.5 miles west of the Moccasin-Twomile Hydrological System, just west of Pipe Spring Road. . .

The Pipe Spring Community is in the culturally important viewscape of Pipe Spring National Monument, the Kaibab Paiute Tribal Building, and the tribal community located on the hill to the north. Viewscapes are a critical dimension of cultural assessments. The proposed pipeline alignment would cause extensive cultural damage to this large aboriginal community

and should be moved at least 500 feet south of State Route 389 from just west of the Moccasin-Twomile Hydrological System to approximately half a mile west of the Pipe Spring Community. The 500-foot realignment should be confirmed by a viewscape specialist in consultation with the SPAC. In addition, all mitigation measures identified in section 4 [SPAC mitigation measures] should be implemented. (SPAC 2012, 12–13)

Pipe Valley Aboriginal Southern Paiute Agricultural Community

The Pipe Valley Aboriginal Southern Paiute Agricultural Community is located near and within the western boundary of the Kaibab Paiute Indian Reservation. . . Given this area's history of disturbance and relative accessibility, mitigation is considered acceptable if done consistent with SPAC recommendations. (SPAC 2012, 13)

1.4.3.3 Zuni Traditional Cultural Properties

The Zuni ethnographic report identifies two specific sacred sites/TCPs and a general category.

The Zuni declare the Grand Canyon as a sacred site and TCP-eligible under criteria A through D:

The rivers and all the tributaries that connect to the Grand Canyon are TCPs. They are the canyon's spiritual veins.

Although it is difficult to pinpoint its beginning and end, this place name [*Kuminab Alakwe:a'*] describes the Grand Canyon's whole river and canyon system, starting in southern Utah and continuing through northwestern Arizona and southern Nevada, and goes from rim-to-rim and includes tributary canyons.

Kuminab Alakwe:a' is a traditional cultural property, a tangible property that is important in the recognition and retention of Zuni culture. It is eligible for the National Register of Historic Places under several criteria, including:

Criterion A because of its associations with events that have made a significant contribution to the broad patterns of Zuni history;

Criterion B because of its association with the lives of the first people to emerge on this earth who are significant persons in the Zuni past;

Criterion C because it is representative of a significant and distinguishable entity whose components may lack individual distinction- that is, individual components to *Kuminab Alakwe:a'* such as willow and hematite gathering areas may lack distinction in themselves, but taken all the tangible and intangible components together as *Kuminab Alakwe:a'* are of prime importance to Zuni history;

Criterion D because it has already yielded and has the potential to yield still more information important in Zuni prehistory and history.

Kuninah Alakwe:a', as a traditional cultural property, does not have any criteria considerations that would make it ineligible for the National Register, and retains its integrity of location, design, setting, materials, workmanship, feeling, and association and is more than 50 years old. We therefore recommend *Kuninah Alakwe:a'* as a historic property eligible for the National Register of Historic Places. (Colwell-Chanthaphonh et al. 2011, 51–52)

The Zuni declare the Colorado River [*K'yawan' A:bonanne*] to be a sacred site and TCP under Criteria A through D:

The river is associated with the Zuni people's emergence and first migrations; it is home to aquatic life that is important to Zuni traditions; the water from the river is used in ceremonies; and the waterway is a literal trail and a metaphorical umbilical cord that is linked directly to the Zuni home area via the Little Colorado River.

K'yawan' A:bonanne is a tangible property that is important in the retention and transmission of traditional Zuni culture. As a traditional cultural property, it is eligible for the National Register of Historic Places under several criteria, including:

Criterion A because of its associations with events that have made a significant contribution to the broad patterns of Zuni history;

Criterion B because of its association with the lives of the first people to emerge on this earth, who are significant persons in the Zuni past;

Criterion C because it is representative of a significant and distinguishable entity whose components may lack individual distinction- that is, individual components to *K'yawan' A:bonanne* such as aquatic life may lack distinction in itself, but taken all the tangible and intangible components together as *K'yawan' A:bonanne* are of prime importance to Zuni history;

Criterion D because it has already yielded and has the potential to yield still more information important in Zuni prehistory and history.

As a traditional cultural property, *K'yawan' A:bonanne* does not exhibit any the criteria considerations that would make it ineligible for the National Register, and retains its integrity of location, design, setting, materials, workmanship, feeling, and association and is more than 50 years old. We therefore recommend *K'yawan' A:bonanne* as a historic property eligible for the National Register of Historic Places. (Colwell-Chanthaphonh et al. 2011, 53–55)

The Zuni identify all prehistoric archaeological sites within the Project Area as TCPs:

Enote Hes'abdowe, ancestral sites, are located throughout the project area. These include both previously identified sites and sites yet to be identified.

The Zuni team categorically considers all archaeological sites from the Paleoindian period through the Pueblo periods to be Zuni traditional cultural properties. These sites are monuments and memorials to the Zuni past, provide specific information about Zuni history and culture, are sources for religious instruments (such as arrowheads), are

referenced in Zuni religious songs and prayers, and are living abodes for ancestral spirits. As such, ancestral archaeological sites are used in the retention and transmission of traditional Zuni culture and thus are considered to be traditional cultural properties.

Based on the sample of sites visited and Zuni traditional knowledge of ancestral migrations, as well as the cultural and religious meanings imbued in ancestral sites, all the archaeological sites associated with the Paleoindian to Pueblo periods are deemed to be Zuni traditional cultural properties. These archaeological sites are eligible for the National Register of Historic Places under two criteria:

Criterion A, for their association with events that have made a significant contribution to the broad patterns of our history; and

Criterion D, for their potential to yield information important in prehistory and history. All of these ancient sites are older than 50 years and, based on their present archaeological documentation, they retain the integrity of location, design, setting, materials, workmanship, feeling, and association that make them culturally significant to the Zuni people. We therefore recommend *Enote Hes'abdome* as historic properties eligible for the National Register of Historic Places. (Colwell-Chanthaphonh et al. 2011, 55–58)

While the Zuni had concerns about plant and animal life within the Project Area, no TCPs were identified based solely on these concerns.

2 Results/Environmental Consequences

2.1 No Action Alternative

The No Action Alternative would have no additional effects on ethnographic resources. If the LPP were not built, the Proposed Project would have no additional effects on ethnographic resources. However, under this alternative, projects already planned by the Proponent would continue to occur. Disturbance, due to these projects, would vary in space and time. Most impacts would likely be long-term in nature. Mitigation measures and standard industry practices would be implemented on future planned projects to minimize impacts.

2.2 Southern Alternative

The Southern Alternative would have long-term, adverse effects on ethnographic resources including sacred sites, TCPs, and a TCD. The Southern Alternative begins at Lake Powell and ends at Sand Hollow Reservoir. Along the path are numerous ethnographic resources that are culturally sensitive, sacred, and/or declared historic properties eligible for inclusion on the NRHP. These places would be affected by the Proposed Project in diverse ways.

2.2.1 Sacred Sites

2.2.1.1 Colorado River and Canyon as Sacred Sites

The Zuni declare the Colorado River and its tributaries and canyons as sacred sites and as TCPs. This creates a sacred site more than 1,450 miles long, not including its tributaries. Due to the areas' sacred site status, the Proposed Project would follow E.O. 13007 in accommodating access to and avoiding adversely affecting the physical integrity of the sites "to the extent practical, permitted by law, and not clearly inconsistent with essential agency functions" (E.O. 13007). For a discussion of these areas as TCPs, see below.

2.2.1.2 Kanab Creek Canyon and Tributaries (Included in the TCD, and a TCP)

The Kanab Creek Canyon and its tributaries have been identified as a sacred site. This sacred site would be crossed by both proposed alignments because it extends more than 65 miles north-south. Due to the area's sacred site status, the Proposed Project would follow E.O. 13007 in accommodating access to and avoiding adversely affecting the physical integrity of the site "to the extent practical, permitted by law, and not clearly inconsistent with essential agency functions" (E.O. 13007). This discussion also ties into the Kanab Creek TCD below.

2.2.1.3 Elephant Foot/Indian Knoll/Moonshine Ridge/Yellowstone Mesa (a Sacred Site, Included in the Traditional Cultural District)

This area has also been denoted as the "*PuhaTuwip* Cultural Landscape (Yellowstone Mesa area)." This landscape measures approximately 7 miles long by 6 miles wide and comprises over 23,000 acres. It is made up of spiritually important high places and the views between them. Due to the areas' sacred site status, the Proposed Project would follow E.O. 13007 in accommodating access to and avoiding adversely affecting the physical integrity of the sites "to the extent practical, permitted by law, and not clearly inconsistent with essential agency functions" (E.O. 13007). This discussion also ties into the Kanab Creek TCD below.

2.2.1.4 Milk Mountain Pilgrimage Trail

The Milk Mountain Pilgrimage Trail, also known as "*Kavaicuwac Puha Po*," lies along both alternatives. It is a sacred site and considered a TCP for the Tribe. The trail depends on viewsheds for direction and spiritual power. Consequently, effects to viewsheds are considered particularly egregious. As presently understood, the first three stops along the pilgrimage trail parallel U.S. Highway 89, a modern highway.

U.S. Highway 89 is a multilane highway that has already caused widespread changes in the viewshed of the trail. The Proposed Project, regardless of alternative, parallels U.S. Highway 89 from the Paria River to Catstair Canyon to Five Mile Spring (and a substantial distance beyond). This is essentially the same route as the trail for this portion of the trail. Due to the presence of an already disturbed landscape/viewshed, there would be temporary effects on the trail for this stretch of the Proposed Project due to construction activities. The short-term effect of construction would temporarily impinge on the viewshed of the trail, but the underground pipeline's presence would be masked by revegetation. Once the underground pipeline is built, and revegetated, there may be a visual effect, but much less than the existing highway.

The pilgrimage trail represents a shaman's journey into spiritual power. Consequently, it is used infrequently, and years could pass before a shaman makes the journey. The presence of the Proposed Project would not impinge on Indian religious practice.

2.2.1.5 Puha'gant Kanihype (Pioneer Gap) Cultural Landscape

This cultural landscape contains three main components - (1) Ipa (Navajo Well), (2) Puha'gant Kanihype, and (3) Cliff Rim Panels ... This landscape must be avoided. If the Southern alignment is selected, the alignment must be moved to the east of the Puha'gant Kanihype cultural landscape, east of the powerline corridor.

This area has been proposed as a TCP by the Southern Paiute Advisory Committee and declared in a resolution as a Sacred Site by the Tribal Council of the Kaibab Band of Paiute Indians on March 17, 2011. (SPAC 2012, 6)

The Southern Alignment was re-aligned to the south of this area. The cultural landscape would not be affected by the proposed construction.

As of this writing, May 21, 2020, no other sacred sites were identified to Reclamation from any tribe or their representative along this route.

2.2.2 Traditional Cultural Properties and Traditional Cultural District

2.2.2.1 Prehistoric Sites as Traditional Cultural Properties

The Hopi and the Zuni have categorically defined every prehistoric site along the Proposed Project as TCPs. Once they are formally included on the NRHP as an ethnographic resource, they can be individually mitigated. There are 202 prehistoric sites along the Southern Alternative that would be directly affected. The individual physical effects to these sites would range from with some sites minimally affected by the Proposed Project construction and others entirely impacted.

2.2.2.2 Colorado River as a Traditional Cultural Property

The Zuni assert that the Colorado River [*K'yaman' A:bonanne*] is a TCP. Because the intake structure is located physically above the Colorado River and the Proposed Project would remove water from the Colorado River to a different water basin, there may be a negative effect on the river and spiritual resources of the Colorado River for the duration of the project. The Zuni and other tribes expressed strong negative emotions about moving the water in this unnatural way (pipeline to a different basin). A SPAC member called this aspect of the Proposed Project an abomination and expressed deep concern for the water babies (spirits) that live in the river and help it thrive.

There is an ethnographic concern with the Proposed Project's effect on the Colorado River, both as a physical place and, more especially, as a spiritual place upon which the tribes depend. The physical dimension of the Proposed Project's impact is negligible on a resource over 1,450 miles long. In terms of the river corridor, the area of impact is tiny. As a quantity of water, the project water is already allocated to the State of Utah for use. The damage to the spiritual dimension is harder to quantify and constitutes an adverse effect.

2.2.2.3 Grand Canyon as a Traditional Cultural Property

The Zuni and Hualapai, in particular, expressed deep ethnographic use and reverence for the Grand Canyon. In particular, the Zuni defined the Grand Canyon and all of its tributary canyons as a TCP. Thus, the intake location is included with the Grand Canyon TCP. However, due to the width and breadth of this TCP, encompassing hundreds of square miles, the comparatively small area of the intake system, together with the existing infrastructure in place there, makes it doubtful that the Proposed Project would have any effect, including aesthetic, on this TCP. The Proposed Project would not affect the Grand Canyon as a TCP.

2.2.2.4 Take Out Point/Colorado River

This location was identified as a TCP, but no details were provided to Reclamation as of this writing, May 21, 2020, by the Tribe or its representatives.

2.2.2.5 Kanab Creek Traditional Cultural District

The TCD lies at the southern edge of the KIR. It measures about 18 miles long and 18 miles wide and extends south of the reservation for about 15 miles. The TCD includes over 90,000 acres of land. For comparative purposes, the TCD comprises an area larger than Washington DC, which has about 65,000 acres. The physical disturbance of the pipeline corridor would disrupt 403.50 acres (direct impact) and would be visible from many sites of cultural importance to the Tribe as it parallels the existing towers of the Navajo-McCulloch Transmission Line through the TCD along the already designated energy corridor.

The Kaibab Paiute TCD is a multi-layered cultural landscape that does include places associated with time keeping ceremonies, portals to other spiritual dimensions, vision questing, and large-scale balancing ceremonies such as the Ghost Dance. This TCD also contains an area that was historically used as a region of refuge by the Kaibab Paiute people during the late 1800s. ... Many of the TCD places can be seen from elevated points in the immediate area. Such high points have been, and continue to be, used for vision questing, the coordination of ceremonial activities, and spiritual renewal, thus making the viewscapes from these locations, critical components of this cultural landscape. Puha, a Paiute term for spiritual energy, is associated with all of these areas and natural resources. A number of special rock shelters are understood as portals to spiritual dimensions and some are used for space travel. The TCD contains ceremonial areas used by Southern Paiute religious leaders whose activities resulted in ritual deposits, known burials, and rock pecking and painting panels. The TCD contains petrified wood used in medicine and ceremonial white mineral deposits used for rock and body painting. In addition to the ceremonial components, there are a number of natural resource use areas that contain traditional Southern Paiute home sites and agricultural fields.

All of the places in the TCD are interconnected, thus creating a cultural landscape that has Puha and cultural significance. Pilgrimage trails that cross the proposed TCD traverse large swaths of traditional territory and thus help create a cohesive culturally significant entity. It is a high priority to maintain the cultural integrity of these spiritual and physical trails. The places and resources found within the TCD boundary continue to hold meaning and cultural importance to contemporary Southern Paiute people today. (SPAC 2020, 3–5)

The Proposed Project would have long-term, adverse effects on this TCD, particularly its spiritual dimension. The crossing would impair locations of *Puba* (spiritual energy) that are sacred to the Kaibab Paiute and potentially open very sensitive prehistoric sites to vandalism. Historic sites that are sacred to the Tribe are located within the Kanab canyon, including the Ghost Dance TCP. These are unique and cannot be replaced or moved. Additional cultural sites are present that are prehistoric and sacred to the tribe. The viewscape itself is part of the spiritual dimensions of the TCD.

2.2.2.6 Kanab Creek (a Sacred Site, Included in the Traditional Cultural District)

Culturally, the Kanab River Canyon is defined by its contribution to the spiritual and cultural life of all the Southern Paiute people, especially the Kaibab Paiute people. Kanab River Canyon contains special ceremonial places essential to the practice of Paiute religion. (SPAC 2012, 6–7)

Essentially, the Southern Alternative would affect Kanab Creek in the same ways as the “Kanab Creek Traditional Cultural District” described above because it is a part of it.

2.2.2.7 Elephant Foot/Indian Knoll/Moonshine Ridge/Yellowstone Mesa (a Sacred Site, Included in the Traditional Cultural District)

This area has also been denoted as the “*PubaTuwip* Cultural Landscape (Yellowstone Mesa area).” This landscape measures approximately 7 miles long by 6 miles wide and comprises over 23,000 acres. It is made up of spiritually important high places and the views between them. The Southern Alternative would directly impact about 145 acres as it parallels the existing towers of the Navajo-McCulloch transmission line through the TCD along the already designated energy corridor. The *PubaTuwip* Cultural Landscape would be bisected by the proposed Southern Alternative. The underground pipeline would disrupt the views (spiritual dimension) north of Wutiviungkunt Camp and south of Indian Knoll, especially during construction. The large-scale contamination of the area by a foreign object would harm the spiritual power of the area. The SPAC recommends that the proposed pipeline pass south of this area, which has important sacred elements.

The SPAC Avoidance and Mitigation Report (2012) indicates that:

In addition to relocating the pipeline, the following additional long-term cultural preservation measures should also be a requirement of the Project proponent:

- Nominate the landscape as a Traditional Cultural Property to the National Register of Historic Places;
- Acquire Bureau of Land Management lands within this landscape on behalf of the [Tribe] and implement long-term protection measures;
- Acquire the parcels of private and Arizona state trust lands within this landscape on behalf of the Tribe and implement long-term protection measures;
- Assist the Tribe in developing a cultural and spiritual management plan including support for renaming Moonshine Ridge, Moonshine Spring, and Elephant Foot through the USGS Place Name Committee and restricting access to the area, only allowing access for ceremonial purposes. (SPAC 2012, 4–5)

2.2.3 Areas of Cultural Concern

Some ethnographic resources do not rise to the level of TCPs or sacred sites, but are still important to local community members. While there is no federal protection for such sites, if reasonable accommodations can be made to avoid them, it makes local communities grateful and demonstrates a sensitivity to local issues.

The proposed alignment includes areas of native plant gathering that should be avoided if possible. Many native plant species are important to the tribes, and some places have a greater variety or better quality of important species. These locations, when identified, could be taken into account, if possible, as a goodwill gesture to the local community. The SPAC has identified several areas of plant resources along both alternatives, including a “critical plant habitat” area near the Hurricane Cliffs.

Enoughwuhype (Ancient Ones) Sites (included in Traditional Cultural District)

The SPAC singled out this location. The two prehistoric sites sit on either side of a canyon. The sites are already considered as TCPs by the Hopi and Zuni as part of their blanket TCP determination and lies within the TCD.

This landscape includes two prehistoric sites. . . the Southern alignment will affect the viewscape and expose the area to intrusion, irreparably harming its cultural and spiritual significance. If the Southern alignment is selected, the pipeline must be kept at least 100 feet north of its suggested alignment as it crosses the . . . area. In addition:

- Protective signage must be provided to prevent accidental intrusion of construction workers and activities. (SPAC 2012, 6)

2.2.3.2 Gould Creek Wash Crossing

There is a tribal concern with the Gould Creek Wash crossing with the transmission line. This area is one of spiritual power, due to the presence of lava. The transmission line would likely disrupt the spiritual power of this area.

2.2.4 Resource Management Plan Amendment

The Kanab Creek Area of Critical Environmental Concern (ACEC) was designated as part of the Arizona Strip Field Office Resource Management Plan (RMP). The Southern Alternative would cross through the ACEC under one of three possible amendments. Regardless of which Arizona Strip Field Office Resource Management Plan Amendment (RMPA) sub-alternative is chosen, this crossing would have long-term, adverse effects on the Kanab Creek Sacred Site and TCP because all of the proposed RMPA sub-alternatives would allow construction of the Proposed Project through the ACEC.

The proposed Kanab Creek crossing would impair locations of *Puha* (spiritual energy) that are sacred to the Tribe and could open very sensitive prehistoric sites to potential vandalism. Historic sites that are sacred to the Tribe are located within the canyon. These are unique and cannot be replaced or moved. Additional cultural sites are present that are prehistoric and sacred to the Tribe. The viewscape itself is part of the spiritual dimensions of the sacred site and TCP.

The Proposed Project could open these currently remote areas up due to construction activities and access routes. This would provide additional opportunities for these areas to be visited by people who may not understand the sacredness of this canyon. As additional access is provided, it is difficult to preserve sacred sites in their original condition.

Under RMPA Sub-alternative 1, the portion of the ACEC overlapped by the utility corridor would no longer be an avoidance area for new land use authorizations. However, the proposed amendment to Decision No. MA-LR-06 would still require routing new utilities away from ethnographic sites, and mitigation for impacts from new land use authorizations (determined during site-specific project planning).

RMPA Sub-alternative 1 would allow for the construction of the Proposed Project through the Kanab Creek TCD, which is a sacred site. Construction through this sacred area would result in long-term, adverse effects to the spiritual, historic, cultural, and aesthetic values of this area, per the discussion above.

Under RMPA Sub-alternative 2, the size of the ACEC would be reduced by 905 acres with no specific provision for mitigation from new land use authorizations in the area that has been excluded from the ACEC. In addition, other ACEC management prescriptions in the RMP that provide additional protection to sensitive resources would no longer be applicable to the lands excluded from the ACEC. Construction, operation, and maintenance of new rights-of-way (and other land use authorizations), as well as the use and maintenance of designated routes, construction of new range facilities, and management of salable or leasable minerals could result in direct and indirect effects on ethnographic resources as projects are implemented. However, existing federal laws would still apply so potential effects on ethnographic resources on public lands would be evaluated during project-specific environmental review and analysis, and mitigated to the extent possible, which could reduce effects on specific ethnographic resources.

RMPA Sub-alternative 2 would allow for the construction of the Proposed Project through the Kanab Creek, which is a sacred site. Construction through this sacred area would result in long-term, adverse effects to the spiritual, historic, cultural, and aesthetic values of this area, per the discussion above.

Under RMPA Sub-alternative 3, effects on ethnographic resources would be similar to those described under RMPA Sub-alternative 1. RMPA Sub-alternative 3 would result in a decrease of 175.5 acres in the overlap area of the utility corridor and the ACEC as compared to RMPA Sub-alternative 1. However, RMPA Sub-alternative 3 would also include the amendment of Decision No. MA-LR-06 as outlined for RMPA Sub-alternative 1, so while the portion of the ACEC overlapped by the utility corridor would no longer be an avoidance area for new land use authorizations, the proposed amendment would still require mitigation for impacts from new land use authorizations that would be determined during site-specific project planning. In addition, other ACEC management prescriptions in the RMP that provide additional protection to resources would still be applicable since the size of the ACEC would not be reduced.

RMPA Sub-alternative 3 would allow for the construction of the proposed pipeline through the Kanab Creek Canyon, which is a sacred site and a TCP. Construction through this sacred area would result in long-term, adverse effects to the spiritual, historic, cultural, and aesthetic values of this area, per the discussion above.

2.2.5 Mitigation Measures

Under federal regulations for historic properties, a programmatic agreement and other derivative mitigation documents would be created to mitigate adverse effects to historic properties caused by the Proposed Project.

These mitigation measures would be developed in accordance to federal law with the tribes, SHPOs, consulting parties and interested public.

Site specific mitigation, monitoring, and project-level survey plans would be developed as part of this process to mitigate the adverse effects of this Proposed Project. The Tribe developed proposed mitigation and avoidance recommendations for both alignments (SPAC 2012).

2.3 Highway Alternative

The Highway Alternative would have long-term, negative effects on ethnographic resources, including sacred sites and TCPs. The Highway Alternative begins at Lake Powell and ends at Sand Hollow. Along the path are numerous ethnographic resources that are culturally sensitive, sacred, and/or declared historic properties eligible for inclusion on the NRHP. These places would be affected by the Highway Alternative in diverse ways.

2.3.1 Sacred Sites

2.3.1.1 Colorado River and Canyon as Sacred Sites

The Zuni declare the Colorado River and its tributaries and canyons as sacred sites and as TCPs. This creates a sacred site more than 1,450 miles long, not including its tributaries. Due to the areas' sacred site status, the Proposed Project would follow E.O. 13007 in accommodating access to and avoiding adversely affecting the physical integrity of the sites "to the extent practical, permitted by law, and not clearly inconsistent with essential agency functions" (E.O. 13007). For a discussion of these areas as TCPs, see below.

2.3.1.2 Kanab Creek Canyon and Tributaries (Included in the TCD, and a TCP)

The Kanab Creek Canyon and its tributaries have been identified as a sacred site. This sacred site would be crossed by both proposed alignments because it extends more than 65 miles north-south. Due to the area's sacred site status, the Proposed Project would follow E.O. 13007 in accommodating access to and avoiding adversely affecting the physical integrity of the site "to the extent practical, permitted by law, and not clearly inconsistent with essential agency functions" (E.O. 13007). This discussion also ties into the Kanab Creek Traditional Cultural District below.

2.3.1.3 Milk Mountain Pilgrimage Trail

The Milk Mountain Pilgrimage Trail, also known as "*Kavaicuwac Puha Po*," lies along both alternatives. It is a sacred site and considered a TCP for the Tribe. The trail depends on viewsheds for direction and spiritual power. Consequently, effects to viewsheds are considered particularly egregious. As presently understood, the first three stops along the pilgrimage trail parallel U.S. 89, a modern highway.

U.S. 89 is a multilane highway that has already caused widespread changes in the viewshed of the trail. The Proposed Project, regardless of alternative, parallels U.S. 89 from the Paria River to Catstair Canyon to Five Mile Spring (and a substantial distance beyond). This is essentially the same route as the trail for this portion of the trail. Due to the presence of an already disturbed landscape/viewshed, there would be temporary effects on the trail for this stretch of the Proposed Project due to construction activities. The short-term effect of construction would temporarily impinge on the viewshed of the trail, but the underground pipeline's presence would be masked by revegetation. Once the underground pipeline is built and revegetated, there may be a visual effect, but much less than the existing highway.

The pilgrimage trail represents a shaman's journey into spiritual power. Consequently, it is used infrequently, and years could pass before a shaman makes the journey. The presence of the proposed underground pipeline would not impinge on Indian religious practice.

2.3.2 Traditional Cultural Properties

2.3.2.1 Prehistoric Sites as Traditional Cultural Properties

The Hopi and the Zuni have categorically defined every prehistoric site along the proposed pipeline as TCPs. Once they are formally included on the NRHP as an ethnographic resource, they can be individually mitigated. This means that there are 190 prehistoric sites along the Highway Alternative that would be directly affected by the Proposed Project. The individual physical effects on these sites would range from some sites minimally affected by the Proposed Project construction and others entirely impacted.

2.3.2.2 Colorado River as Traditional Cultural Property

The Zuni assert that the Colorado River [*K'yawan' A:bonanne*] is a TCP. Because the intake structure is located physically above the Colorado River and the Proposed Project would remove water from the Colorado River to a different water basin, there may be a negative effect on the river and spiritual resources of the Colorado River for the duration of the project. The Zuni and other tribes expressed strong negative emotions about moving the water in this unnatural way (pipeline to a different basin). A SPAC member called this aspect of the Proposed Project an "abomination" and expressed deep concern for the water babies (spirits) that live in the river and help it thrive.

There is an ethnographic concern with the Proposed Project's effect on the Colorado River, both as a physical place and, more especially, as a spiritual place upon whom the tribes depend. The physical dimension of the Proposed Project's impact is negligible. In terms of the river corridor, the area of impact is tiny. As a quantity of water, the project water is already allocated to the State of Utah for use. The damage to the spiritual dimension is harder to quantify and constitutes an adverse effect.

2.3.2.3 Grand Canyon as a Traditional Cultural Property

The Zuni and Hualapai, in particular, expressed deep ethnographic use and reverence for the Grand Canyon. In particular, the Zuni defined the Grand Canyon and all of its tributary canyons as a TCP. Thus, the intake location is included with the Grand Canyon TCP. However, due to the width and breadth of this TCP, encompassing many square miles, the comparatively small area of the intake system, together with the existing infrastructure in place there, make it doubtful that the Proposed Project would have any effect, including aesthetic, on this TCP. The Proposed Project would not affect the Grand Canyon as a TCP.

2.3.2.4 Take Out Point/Colorado River

This location was identified as a TCP, but no details were provided to Reclamation as of this writing, March 27, 2020, by the Tribe or its representatives.

2.3.2.5 Kanab Creek Traditional Cultural District

The TCD lies at the southern edge of the KIR but will be visible from the proposed Highway Alternative. It measures about 18 miles long and 18 miles wide and extends south of the reservation for about 15 miles. The TCD includes over 90,000 acres of land. For comparative purposes, the TCD comprises an area larger than Washington DC, which has about 65,000 acres.

The Kaibab Paiute TCD is a multi-layered cultural landscape that does include places associated with time keeping ceremonies, portals to other spiritual dimensions, vision questing, and large-scale balancing ceremonies such as the Ghost Dance. This TCD also contains an area that was historically used as a region of refuge by the Kaibab Paiute people during the late 1800s. ... Many of the TCD places can be seen from elevated points in the immediate area. Such high points have been, and continue to be, used for vision questing, the coordination of ceremonial activities, and spiritual renewal, thus making the viewscapes from these locations, critical components of this cultural landscape. Puha, a Paiute term for spiritual energy, is associated with all of these areas and natural resources. A number of special rock shelters are understood as portals to spiritual dimensions and some are used for space travel. The TCD contains ceremonial areas used by Southern Paiute religious leaders whose activities resulted in ritual deposits, known burials, and rock pecking and painting panels. The TCD contains petrified wood used in medicine and ceremonial white mineral deposits used for rock and body painting. In addition to the ceremonial components, there are a number of natural resource use areas that contain traditional Southern Paiute home sites and agricultural fields.

All of the places in the TCD are interconnected, thus creating a cultural landscape that has Puha and cultural significance. Pilgrimage trails that cross the proposed TCD traverse large swaths of traditional territory and thus help create a cohesive culturally significant entity. It is a high priority to maintain the cultural integrity of these spiritual and physical trails. The places and resources found within the TCD boundary continue to hold meaning and cultural importance to contemporary Southern Paiute people today. (SPAC 2020, 3–5)

The Proposed Highway Alternative would be visible from the TCD during construction. Once the Proposed Project is built, the existing highway would be more visible than the project alignment from the TCD.

2.3.3 Areas of Cultural Concern

Some ethnographic resources do not rise to the level of TCP or sacred sites, but are still important to local community members. While there is no federal protection for such sites, if reasonable accommodations can be made to avoid them, it makes local communities grateful and demonstrates a sensitivity to local issues.

The proposed alignment includes areas of native plant gathering that should be avoided if possible. Many native plant species are important to the tribes, and some places have a greater variety or better quality of important species. These locations, when identified, could be taken into account, if

possible, as a goodwill gesture to the local community. The SPAC have identified several areas of plant resources along both alternatives, including a “critical plant habitat” area near the Hurricane Cliffs.

2.3.3.1 Pioneer Gap to the Turn-off to Highway 89A

This segment is approximately 11.2 miles long and consists of twelve documented cultural sites with numerous traditionally important resources... The spiritual and ceremonial area around Pioneer Gap and the aboriginal Southern Paiute farming community at the mouth of Johnson Canyon are two highly sensitive areas.

Implementation of the measures outlined in section 4 of this report [SPAC mitigation measures] should afford adequate protection to this segment. Although we expect significant disturbances, the cultural properties disinterred can be repatriated through traditional practices and the long-term benefits provided by the mitigation measures will help to preserve this site over time. (SPAC 2012, 9)

2.3.3.2 Highway 89A to the Reservation Boundary

[T]he SPAC was able to assess three areas along this segment – Lost Spring Wash, Kanab River Crossing, and the Sand Dune. Although all three sites have significant culturally important resources, appropriate mitigation would minimize impacts and provide long-term site protection. (SPAC 2012, 9)

2.3.3.3 Lost Spring Wash

Although cultural resources were identified on those portions of the segment available for inspection, the overall significance of these areas is currently unclear and should be further assessed prior to construction. (SPAC 2012, 9)

2.3.3.4 Kanab Creek Crossing (AZ B:2:92 and AZ B:2:93)

The Kanab River Crossing segment contains a large number, and continuous series, of Southern Paiute aboriginal agricultural communities which are located along both sides of the Kanab River Hydrological System... These farming communities contained many homes, farm structures, and artifacts. At least one community has a documented burial. Burials were found during the State Route 389 construction project. These burials and associated grave items were excavated and removed during construction.

Although the site contains many culturally important places and artifacts, the SPAC is compelled to prioritize avoidance for those areas containing religious and ceremonial sites that remain undisturbed and comparatively inaccessible. Given this area’s history of disturbance and relative accessibility to the general public, mitigation is considered acceptable if done consistent with SPAC recommendations. (SPAC 2012, 10)

2.3.3.5 Sand Dune (AZ B:2:1/NA8960)

A portion of the Sand Dune is on located on State land and a portion is in the State Route 389 highway right-of-way. However, the SPAC is aware of many cultural resources located here, including evidence of at least one burial unearthed during construction of State Route 389. Additional disturbance associated with pipeline construction may irreparably harm the remaining undisturbed portions of this site altogether. Therefore, the pipeline should be

relocated 150 feet north of the Sand Dune in addition to implementing all measures outlined in section 4 [SPAC mitigation measures]. (SPAC 2012, 10)

2.3.3.6 Cottonwood Creek Aboriginal Southern Paiute Agricultural Community

The Cottonwood Creek Aboriginal Southern Paiute Agricultural Community is a continuous agricultural community located along the Cottonwood hydrological system. The community contains many homes, farm structures, artifacts, and burials and is divided by State Route 389 approximately 2.5 miles west of Fredonia, Arizona. During highway construction, burials and grave goods were found and removed from this area. Given this area's history of disturbance and relative accessibility, mitigation is considered acceptable if done consistent with SPAC recommendations. (SPAC 2012, 11)

2.3.3.7 Sandy Canyon Aboriginal Southern Paiute Agricultural Community

Sandy Canyon Aboriginal Southern Paiute Agricultural Community is a very large farming community consisting of many agricultural homes and associated farming materials. ... Measures identified in section 4 [SPAC mitigation measures] should be implemented to mitigate impacts to this site. (SPAC 2012, 11)

2.3.3.8 Sand Wash Aboriginal Southern Paiute Agricultural Community

The Sand Wash Aboriginal Southern Paiute Agricultural Community is a small farming community located on Sand Wash where it is crossed by State Route 389... Given this site's history of disturbance and relative accessibility, mitigation is considered acceptable if done consistent with SPAC recommendations. (SPAC 2012, 12)

2.3.3.9 Moccasin-Twomile Aboriginal Southern Paiute Agricultural Community

This agricultural community contains a high density of structures and cultural materials on both sides of State Route 389 where the proposed pipeline crosses the hydrological system. Given this area's history of disturbance and relative accessibility, mitigation is considered acceptable if done consistent with SPAC recommendations. (SPAC 2012, 12)

2.3.3.10 Moccasin-Twomile: Pipe Spring Aboriginal Southern Paiute Agricultural Community

The Pipe Spring Community is a massive aboriginal community...

The Pipe Spring Community is in the culturally important viewscape of Pipe Spring National Monument, the Kaibab Paiute Tribal Building, and the tribal community located on the hill to the north. Viewscapes are a critical dimension of cultural assessments. The proposed pipeline alignment would cause extensive cultural damage to this large aboriginal community and should be moved at least 500 feet south of State Route 389 from just west of the Moccasin-Twomile Hydrological System to approximately half a mile west of the Pipe Spring Community. The 500-foot realignment should be confirmed by a viewscape specialist in consultation with the SPAC. In addition, all mitigation measures identified in section 4 [SPAC mitigation measures] should be implemented. (SPAC 2012, 12–13)

2.3.3.11 Pipe Valley Aboriginal Southern Paiute Agricultural Community

This community consists of numerous sites containing cultural and burial materials on the north and south side of the proposed alignment. Given this area's history of disturbance and relative accessibility, mitigation is considered acceptable if done consistent with SPAC recommendations. (SPAC 2012, 13)

2.3.3.12 Gould Creek Wash Crossing

Tribes have expressed concern regarding the Gould Creek Wash Crossing. This area is one of spiritual power, due to the presence of lava. The transmission line would likely disrupt the spiritual power of this area.

2.3.4 Mitigation Measures

Under federal regulations for historic properties, a programmatic agreement and other derivative mitigation documents would be created to mitigate adverse effects to historic properties caused by the Proposed Project.

These mitigation measures would be developed in accordance with federal law with the tribes, SHPOs, consulting parties, and interested public.

Site-specific mitigation, monitoring, and project-level survey plans would be developed as part of this process to mitigate the adverse effects of this Proposed Project. The Tribe developed proposed mitigation and avoidance recommendations for both alignments (SPAC 2012).

2.4 Comparative Analysis of Alternatives

There are three alternatives to consider for the Proposed Project. The least damaging to ethnographic resources is the No Action Alternative. However, this alternative does not fit the purpose and need for the Proposed Project.

The *Southern Alternative* would affect the following resources:

Sacred Sites = 5

Colorado River as sacred site

Colorado River Canyon as sacred site

Kanab Creek as sacred site

Elephant Foot/Indian Knoll/Moonshine Ridge/Yellowstone Mesa as integrated sacred site

Milk Mountain Pilgrimage Trail

Prehistoric Sites as TCPs = 202

202 Prehistoric Sites

Traditional Cultural District = 1

Kanab Creek TCD (includes Kanab Creek as sacred site and TCP; Elephant Foot/Indian Knoll/Moonshine Ridge [PuhaTuvip Cultural Landscape TCP]; Enoughwuhype [Ancient Ones Sites])

Traditional Cultural Properties = 2 (outside of TCD)

Colorado River as TCP
Take Out Point/Colorado River

Areas of Cultural Concern = 2

Critical plant habitat
Gould Creek Wash Crossing

The Highway Alternative would affect the following resources:

Sacred Sites = 4

Colorado River as sacred site
Colorado River Canyon as sacred site
Kanab Creek as sacred site
Milk Mountain Pilgrimage Trail

Prehistoric Sites as TCPs = 190

190 Prehistoric Sites

Traditional Cultural District = 1

Kanab Creek TCD (includes Kanab Creek as sacred site and TCP; Elephant Foot/Indian Knoll/Moonshine Ridge [PuhaTuvip Cultural Landscape TCP]; Enoughwuhype [Ancient Ones Sites])

Traditional Cultural Properties = 2

Colorado River as TCP
Take Out Point/Colorado River

Areas of Cultural Concern = 13

Critical plant habitat
Pioneer Gap to the Turn-Off to Highway 89A
Highway 89A to the Reservation Boundary
Lost Spring Wash
Kanab Creek Crossing
Sand Dune
Cottonwood Creek Aboriginal Southern Paiute Agricultural Community
Sandy Canyon Aboriginal Southern Paiute Agricultural Community
Sand Wash Aboriginal Southern Paiute Agricultural Community
Moccasin-Twomile Aboriginal Southern Paiute Agricultural Community
Moccasin-Twomile: Pipe Spring Aboriginal Southern Paiute Agricultural Community
Pipe Valley Aboriginal Southern Paiute Agricultural Community
Gould Creek Wash Crossing

A simple list of ethnographic resources affected does not adequately describe the effects of the Proposed Project. Each resource is valued differently in evaluating what part of tribal identity would be lost. For example, the TCD comprises multiple individual elements described as a unit. In particular, the spiritual dimensions of harm to a TCP or TCD is difficult to quantify.

Because the arbiter of tribal identity and culture is really the individual tribe, the following quotes from the SPAC Avoidance and Mitigation Report sums up the SPAC perspective on their proposed losses due to the Proposed Project:

The Southern Paiute Advisory Committee (SPAC) was tasked by the Kaibab Paiute Tribal Council to compare and contrast potential cultural resource impacts along the Southern and Reservation-Highway alignment alternatives for the proposed Lake Powell Pipeline (LPP) Project (Project). The alternatives were evaluated based on 13 specific criteria identified by the SPAC with the understanding that all Southern Paiute aboriginal territory is sacred. Specifically, the SPAC assessed each alternative alignment for the following:

1. Number of culturally essential components (both places and larger areas) such as ceremonial places, medicine places, living places, resource use areas, and spiritual places;
2. Culturally sensitive places that would suffer irreversible, lasting effects if exposed to pipeline construction;
3. Traditional medicine and food plants;
4. Critical viewsapes necessary for prayer and ceremony;
5. Food resources, medicinal animals, and Spirit Helpers (spiritual beings who assist in ceremony);
6. High concentrations of Puha (associated with vision questing areas, medicine areas, doctoring areas, time keeping areas, rites of passage areas, portals to spiritual dimensions, and places used for space travel);
7. Primarily sacred ceremonial areas used by Southern Paiute religious leaders;
8. Ceremonial deposits;
9. Known burials;
10. Region of Refuge (“Zion”)/Prophecy areas;
11. Presence of Tumpituxwinap (rock pecking and painting panels);
12. Current condition and access to cultural sites;
13. Presence of ceremonial minerals and rocks (e.g., petrified wood and ceremonial white paint).

In general, both alignments are likely to impact culturally important resources and while neither is ideal, the cultural significance and irreparable damage that would occur to places and landscapes along the Southern alignment are comparatively more concerning. The Southern alignment has high concentrations of Puha associated with the many sacred ceremonial and prophecy areas unique to that landscape. Tumpituxwinap are also prevalent throughout the Southern alignment. Difficult access to these areas has aided in their preservation. There are more known burials along the Reservation-Highway alignment that will have to be carefully monitored during construction and certain measures will have to be implemented to repatriate remains consistent with traditional practices. However, provided

that all ground-disturbing activities will be addressed through the measures described in this report, the Reservation-Highway alignment is the preferred alternative. (SPAC 2012, 2).

Although this summary was written in 2012, prior to the Proposed Project in its current iteration, the preference of the SPAC for the Highway Alternative, if the LPP is built, has not diminished.

The Hopi, Hualapai, and Zuni ethnographies did not indicate a preference for alternatives but reiterated their concern for the spiritual and physical resources that may be impacted by the Proposed Project, should it be constructed.

Should the Southern Alternative be chosen, the BLM would comply with E.O. 13007 with regard to three sacred sites, including the Kanab Creek, Elephant Foot/Indian Knoll/Moonshine Ridge/Yellowstone Mesa as integrated sacred site, and the Milk Mountain Pilgrimage Trail. There would also be 125 individual direct effects to prehistoric sites. There are also two areas of cultural concern (critical plant habitat and Gould Creek Wash Crossing) that the tribes prefer would be avoided. Two prehistoric sites, on NPS-managed land, would be mitigated. The Bureau of Indian Affairs (BIA) would comply with E.O. 13007 with regard to Kanab Creek as sacred site. Additionally, Reclamation would comply with E.O. 13007 with regard to the sacred sites that are along the proposed route such as the Colorado River as sacred site and the Colorado River Canyon as sacred site. In addition, Reclamation would mitigate adverse effects to the Colorado River as a TCP and the Take Out Point/Colorado River as a TCP. Reclamation would mitigate one prehistoric site. See Table 2.4-1 for a summary of effects from each alternative by agency.

Should the Highway Alternative be chosen, the BLM would comply with E.O. 13007 with regard to the Kanab Creek (and tributaries) as a sacred site, and the Milk Mountain Pilgrimage Trail as a sacred site. There are 80 prehistoric sites that would be mitigated for direct effects. The TCD would be mitigated. There are also two areas of cultural concern (critical plant habitat and Gould Creek Wash Crossing) that it would be useful to avoid. The BIA would comply with E.O. 13007 with regard to the Kanab Creek as sacred site. The BIA would mitigate 11 prehistoric sites (direct effects). There are also 11 areas of cultural concern that it would be useful to avoid. The NPS would mitigate two prehistoric sites. Additionally, Reclamation would comply with E.O. 13007 with regard to the sacred sites that are along the proposed route such as the Colorado River as sacred site and the Colorado River Canyon as sacred site. In addition, Reclamation would mitigate adverse effects to the Colorado River as a TCP and the Take Out Point/Colorado River as a TCP. Reclamation would mitigate one prehistoric site. See Table 2.4-1 for a summary of effects from each alternative by agency.

Table 2.4-1 Summary of Direct Adverse Effects from Each Alternative by Agency

Alternative	Agency				Private
	BLM	Tribe	NPS	Reclamation	
No Action	None	None	None	None	None
Southern Alt. ^(a)	Sacred Sites = 3 Prehistoric Sites = 125 TCD = 1 Area of Cultural Concern = 2	Sacred Site = 1	Prehistoric Sites = 2	Sacred Sites = 2 TCP = 2 Prehistoric Site = 1	Prehistoric Sites = 74
Highway Alternative	Sacred Sites = 2 Prehistoric Sites = 80 TCD = 1 Area of Cultural Concern = 2	Sacred Site = 1 Prehistoric Sites = 11 Area of Cultural Concern = 11	Prehistoric Sites = 2	Sacred Sites = 2 TCP = 2 Prehistoric Site = 1	Prehistoric Sites = 96

Notes:

(a) There were no differences between the RMPA Sub-alternatives.

Key:

BLM = Bureau of Land management

NPS = National Park Services

Reclamation = Department of Reclamation

RMPA = Arizona Strip Field Office Resource Management Plan Amendment

Tribe = Kaibab Band of Paiute Indians

3 References

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4 Glossary

Ethnographic resources. Resources that are considered important to living communities.

Ma’saw. The guardian of the Fourth World. [Hopi]

Puha. Spiritual power. [Paiute]

Sipapuni. The place where humans emerged from a previous world. [Hopi]

5 Acronyms

ACEC	Area of Critical Environmental Concern
APE	area of potential effect
BIA	Bureau of Indian Affairs
KIR	Kaibab Indian Reservation
MOA	Memorandum of Agreement
NPS	National Park Service
NHPA	National Historic Preservation Act of 1966
NRHP	National Register of Historic Places
Reclamation	Bureau of Reclamation
RMP	Arizona Strip Field Office Resource Management Plan
RMPA	Arizona Strip Field Office Resource Management Plan Amendment
SHPO	State Historic Preservation Office
SPAC	Southern Paiute Advisory Committee (consisting of the Kaibab Band of Paiute Indians, Paiute Indian Tribe of Utah, and San Juan Southern Paiute Tribe)

TCD	Traditional Cultural District
TCP	traditional cultural property
Tribe	Kaibab Band of Paiute Indians
USC	United States Code

6 Consultation and Coordination

Complex projects have complex consultation and coordination histories. Per federal law, consultation with tribes occurs government-to-government. The Federal Energy Regulatory Commission, as the lead agency when the Proposed Project was under their jurisdiction, initiated consultation with the tribes in 2008. However, they also delegated to the Proponent and the BLM some of those duties. The Proponent hired a consultant to also communicate with the tribes and do ethnographic fieldwork. Their consultation record is included in the LPP Final Study Report 23 – Ethnographic Resources, particularly in Chapter 3 and Appendix A. Therein, consultation letters, faxes, and other communication are chronicled. The BLM also consulted with the tribes during this same time period.

On May 8, 2008, the Federal Energy Regulatory Commission sent letters to the Kaibab Tribe, Navajo Nation, Paiute Indian Tribe of Utah, Cedar Band of Paiute Indians, Koosharem Band of Paiutes, Ute Indian Tribe, Pueblo of Zuni, Kanosh Band of Paiute, Indian Peaks Band of Paiutes, and Shivwits Band of Paiutes. The UBWR and BLM sent letters to additional tribes in 2009 and 2010.

These tribes expressed general interest in the project: Chemehuevi Indian Tribe; Cocopah Indian Tribe; Colorado River Indian Tribe; Confederated Tribes of the Goshute Reservation; Fort McDowell Yavapai Nation; Fort Mojave Indian Tribe; Havasupai Tribe; Las Vegas Paiute Tribe; Moapa Band of Paiute Indians; Northwestern Band of the Shoshone Nation; Quechan Tribe; San Carlos Apache Tribe; San Juan Southern Paiute Tribe; Skull Valley Band of Goshute Indians; Southern Ute Indian Tribe; Ute Indian Tribe; Ute Mountain Ute Tribe; White Mountain Apache Tribe; Yavapai-Apache Nation; and Yavapai-Prescott Indian Tribe.

These tribes actively participated in consultation meetings and cultural resources studies between 2008 and 2013: Hopi Tribe; Hualapai Tribe; Kaibab Paiute Band; Navajo Nation; Paiute Indian Tribe of Utah; Pueblo of Zuni Tribe; and the San Juan Southern Paiute Tribe.

Tribal consultation on the proposed RMP was initiated on November 16, 2017. On that date, the BLM's Arizona Strip District Manager and Field Office Manager made a presentation to the Kaibab Paiute Tribal Council at the tribal office in Pipe Spring, Arizona, discussing the proposed RMP amendment. On June 21, 2018, the District Manager, Assistant Field Manager, and District Planning and Environmental Coordinator met with the Kaibab Paiute Tribal Council and discussed the RMP amendment in more detail, as well as reiterating the invitation for the Tribe to become a cooperating agency on the project.

In addition to the formal tribal consultation, on July 19, 2018, the BLM held an Economic Strategies Workshop on the Kaibab Paiute Reservation, directly engaging with tribal members and tribal representatives who had concerns about the social and economic impacts of the proposed RMP amendment. The Economic Strategies Workshop was advertised and open to the public. The BLM District Manager and Field Manager were present at the July meeting, as were a number of BLM staff.

Reclamation sent its first letter to the tribes about the project in two batches by certified mail, ending on February 4, 2020. This letter re-initiated consultation with the tribes and asked them to participate in a web conference on either March 10 or 11, 2020, for a project update. In addition, information on cultural, ethnographic resources, and other concerns was sought.

The letter was sent to the following tribes: Ak-Chin Indian Community; Apache Tribe of Oklahoma; Chemehuevi Indian Tribe; Cocopah Indian Tribe; Colorado River Indian Tribes; Fort Belknap Indian Community of the Fort Belknap Reservation of Montana; Fort McDowell Yavapai Nation; Fort Mojave Indian Tribe; Gila River Indian Community; Havasupai Tribe; Hopi Tribe; Hualapai Indian Tribe; Kaibab Band of Paiute Indians; Las Vegas Tribe of Paiute Indians; Moapa Band of Paiute Indians; Navajo Nation; Northwestern Band of the Shoshone Nation; Paiute Indian Tribe of Utah; Pascua Yaqui Tribe; Pueblo of Laguna, New Mexico; Pueblo of Nambe, New Mexico; Pueblo of Zia, New Mexico; Pueblo of Zuni; Salt River Pima-Maricopa Indian Community; San Carlos Apache Tribe; San Juan Southern Paiute Tribe; Shoshone Tribe of the Wind River Reservation, Wyoming; Shoshone-Bannock Tribes of the Fort Hall Reservation, Idaho; Southern Ute Indian Tribe; Tohono O'odham Nation; Tonto Apache Tribe; Ute Indian Tribe of the Uintah and Ouray Reservation, Utah; Ute Mountain Ute Tribe; White Mountain Apache Tribe; and the Yavapai-Apache Nation.

This was followed up by email invitations to the webinar and a post-webinar email (on March 19, 2020) summarizing the concerns and questions that came up during the webinars.



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Lake Powell Pipeline Project

Appendix C-22: Indian Trust Assets

Coconino and Mohave Counties, Arizona
Kane and Washington Counties, Utah

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1 Introduction/Affected Environment

1.1 Regulatory Framework

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States for federally recognized Indian tribes or individual Indians (e.g., Reclamation 2009: Section 4.19-1 and Reclamation 2017: Section 19). An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. An ITA may include land, minerals, federally reserved hunting and fishing rights, federally reserved water rights, and instream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally recognized Indian tribes with trust land; the United States is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the United States. The characterization and application of the United States trust relationship has been defined by case law that interprets Congressional acts, executive orders, and historic treaty provisions.

The federal government, through treaty, statute, or regulation, may take on specific, enforceable fiduciary (trust) obligations that give rise to a trust responsibility to federally recognized tribes and individual Indians possessing trust assets. Courts have recognized an enforceable federal fiduciary duty with respect to federal supervision of Indian money or natural resources, held in trust by the federal government, where specific treaties, statutes, or regulations create such a fiduciary duty. Specific guidance is provided in Executive Order 13751, Consultation and Coordination with Indian Tribal Governments, 63 Federal Register (FR) 96; and Government-to-Government Relations with Native American Tribal Governments FR, Vol. 59, No. 85. In addition, there are agency-specific guidelines.

The agencies are required to actively engage federally recognized tribal governments and consult with such tribes on government-to-government level when their action may affect an ITA (FR Vol. 59, No. 85, May 4, 1994, 22951–2). The Department of the Interior (Interior) is required to “protect and preserve Indian trust assets from loss, damage, unlawful alienation, waste, and depletion” (Interior 2000, Secretarial Order 3215). It is the general policy of the Interior to perform its activities and programs in such a way as to protect any ITA and avoid adverse effects whenever possible.

1.2 Methodology

As part of the initial Proposed Project under the Federal Energy Regulatory Commission (FERC), efforts to identify ITAs included letters sent to the Havasupai Tribe, Hopi Tribe, Hualapai Tribe, Kaibab Band of Paiute Indians (referred to herein as “the Tribe”), Moapa Business Council, Navajo Nation, Northwestern Band of Shoshone Nation, Paiute Indian Tribe of Utah, Pueblo of Zuni, San Juan Southern Paiute Tribe, Ute Indian Tribe, Ute Mountain Ute, Bureau of Indian Affairs (Western Region Office), and the Bureau of Reclamation (Reclamation) asking for identification of any ITA

within or near the Project Area in 2008 to 2010. However, there was no response (see LPP Final Study Report 23 – Ethnographic Resources [UBWR 2016, 2–1]).

The lack of response led the authors of the Ethnographic Resources report to conclude that “Current information indicates that there are no known Indian Trust Assets that exist along the LPP project corridor” (LPP Final Study Report 23 – Ethnographic Resources [UBWR 2016, 2–1]). However, the Interior team working on FERC licensing issues was aware that the Kaibab Indian Reservation (KIR) is an ITA and existed in the Lake Powell Pipeline Project (LPP) corridor. The Interior Team (led by the Bureau of Land Management [BLM]) held monthly conference calls during the FERC process with the Tribe to discuss common issues of concern.

This discussion of ITAs is broken into smaller sections: Lands and Minerals, Hunting/Fishing Rights, and Water Rights. A discussion of cumulative effects is provided in Appendix C-25, Cumulative Effects.

1.2.1 Lands and Minerals

The KIR is an ITA. A review of the American Indian/Alaska Native/Native Hawaiian Areas National Shapefile indicated that the KIR is the only tribal trust land that intersects the Project Area. The Navajo Nation has tribal land near the inflow at Lake Powell; however, the reservation boundary is 2.7 miles away from the Proposed Project at its nearest point.

President Woodrow Wilson’s Executive Order 2667 established the present boundaries of the KIR:

It is hereby ordered that the tract of land in Arizona within the following boundaries, approximately 125,000 acres, be, and is hereby, reserved from entry, sale, or other disposal and set aside for use of the Kaibab and other Indians now residing thereon, and for such other Indians as the Secretary of the Interior may locate thereon:

Beginning at the northwest corner of section 6, township 41 north, range 2 west; thence east to the northeast corner of said section 6; thence north 47.12 chains to the boundary line between Arizona and Utah; thence west along said boundary line to the northwest corner of section 34, township 42 north, range 5 west; thence south to the southeast corner of section 33, township 41 north, range 5 west; thence east along the northern boundary of section 4, township 40 north, range 5 west, to the northeast corner thereof; thence south to the southwest corner of section 27, township 40 north, range 5 west; thence east to the southeast corner of section 28, township 40 north, range 2 west; thence north to the northeast corner of section 4, township 40 north, range 2 west; thence west to the southwest corner of section 31, township 41 north, range 2 west; thence north to the place of beginning.

This order supersedes and takes the place of the order of October 16, 1907, promulgated by the Department of the Interior, which order is hereby revoked: *Provided*, That this order shall not affect any existing legal rights of any person to any of the lands described therein.

Woodrow Wilson

The White House, 17 July 1917.

The executive order does not grant the Tribe rights outside of the reservation boundary; consequently, the ITA is defined as the reservation. Mineral extraction is not a component of the Proposed Project.

1.2.2 Hunting/Fishing Rights

Treaties establishing reservations sometimes included language that allowed hunting and fishing off the reservation. For example, the “Treaty with the Navaho, 1868,” Article 9 states:

“In consideration of the of the advantages and benefits conferred by this treaty, and the many pledges of friendship by the United States, the tribes who are parties to this agreement hereby stipulate that they will relinquish all right to occupy any territory outside their reservation, as herein defined, but retain the right to hunt on any unoccupied lands contiguous to their reservation, so long as the large game may range thereon in such numbers as to justify the chase.” (Kappler 1904, p. 1018)

There are no Navajo hunting rights ITAs involved with or affected by this Proposed Project. For example, Navajo hunting outside of their reservation is in coordination with the State of Utah.

The Tribe does not have hunting rights associated with their treaty.

1.2.3 Water Rights

Water lies at the heart of this Proposed Project. While there are no water rights explicitly stated in the treaty creating the KIR, Tribal water rights are assumed under the Supreme Court’s 1908 *Winters v. United States* decision, with a 1917 priority date.

The good faith identification efforts for establishing the existence of ITAs resulted in a single finding: the KIR is the only ITA for the Proposed Project.

It is the policy of the federal government to protect ITAs per the laws, statutes, and executive orders cited above. This concept of protection yields the following criteria for assessing potential effects (e.g., Reclamation 2017: Section 19.4):

Effects on existing ITAs would be considered adverse if the action:

1. Interferes with the use, value, occupancy, character, or enjoyment of an ITA, including effects on general fish and wildlife where fishing and hunting rights exist.
2. Fails to protect ITAs from loss, damage, waste, depletion, or other negative effects including from disturbances such as noise or changes to visual resources.
3. Fails to protect treaty-based fishing, hunting, gathering, and similar rights of access and resource use on traditional tribal lands.

1.3 Environmental Protection Measures

There are no specific environmental protection measures for ITAs for this project.

1.4 Existing Conditions

This section quotes Gerke (2020), with minor modifications.

The Kaibab Paiute Indian Reservation is located along the Arizona-Utah border in a high valley on the Arizona Strip, about 50 miles to the north of the Grand Canyon. The reservation contains five tribal villages, as well as the non-Indian community of Moccasin and Pipe Springs National Monument.

The Kaibab Paiute tribe is part of the Southern Paiute Nation. The tribe is relatively small, with about 240 members. The Southern Paiute claim a vast swath of traditional lands, bounded on the south by about 600 miles of the Colorado River. The Grand Canyon and Colorado River lay within the sacred land of *Puxant Twip*, where the Southern Paiute people believe they were created.

The Paiute were attracted to this area by Pipe Spring, which provided them with reliable water. In the arid climate of the region, such water sources were necessary for plants, animals, and humans to live. However, in the 1860s Mormon settlers arrived in the area and quickly built forts and towns around the springs, diverting the waters for their use. With the spring water taken by these newcomers, Kaibab Paiute farms dried up, wildlife became scarce, and the tribe starved. To support themselves, many took jobs with local ranches or mining operations. ...

[The KIR] covers less than 200 square miles, a small portion of their historic territory. The wide diversity in elevation across the reservation means that the climate ranges from semi-arid to alpine. The Kaibab Band of Paiute Indians was formed under the Indian Reorganization Act of 1934. They organized a tribal government in the 1950s, and in 1970 the Bureau of Indian Affairs provided them with a building to use as their tribal headquarters directly across from Pipe Spring National Monument.

The tribe owns and operates most businesses on the reservation. They manage a communal tree orchard, and many families are involved in the livestock industry. The tribe has its own Fisheries and Parks Department to manage hunting and fishing on the reservation. However, the primary income for the reservation comes from tourism to their scenic homeland, due to the fact that Arizona Highway 389, the main route between Las Vegas and Lake Powell, crosses the reservation. The tribe and NPS jointly built and operate the visitor center and museum at Pipe Springs National Monument, and the tribe owns a recreational vehicle and camping site nearby. (Gerke 2020)

2 Results/Environmental Consequences

2.1 No Action Alternative

The No Action Alternative would have no effect on ITAs. Should the Proposed Project not be built, then existing conditions would continue and projects planned by the Project Proponent would go through future review and analysis under the National Environmental Policy Act. As currently constituted, there would be no effect on the KIR ITA.

2.2 Southern Alternative

The Southern Alternative would have a temporary effect on the ITA.

Based on the criteria developed above in Section 1.2, effects on existing ITAs would be considered adverse if the action:

1. Interferes with the use, value, occupancy, character, or enjoyment of an ITA, including effects on general fish and wildlife where fishing and hunting rights exist.

The Southern Alternative would not interfere with the KIR, but the Tribe would not benefit from its use. Because this route goes around the reservation boundary, it would not change the current land or governmental activities on the reservation. However, the construction area outside of the KIR would be visible from the ITA. The visual impact would occur until the area is revegetated.

2. Fails to protect ITAs from loss, damage, waste, depletion, or other negative effects, including from disturbances such as noise or changes to visual resources.

The Southern Alternative would result in a buried pipeline placed outside and parallel to the KIR's southern boundary. It would have a temporary effect on the KIR ITA due to the visual change, until the area is revegetated.

3. Fails to protect treaty-based fishing, hunting, gathering, and similar rights of access and resource use on traditional Tribal lands.

The Southern Alternative would have no effect on these types of activities because the executive order establishing the KIR does not contain off-reservation hunting, fishing, gathering, or similar rights. The Southern Alternative would not affect the assumed water right of the Tribe because it uses Utah's allocated water and not that of any tribe, and because Utah's LPP allocation would be diverted in priority.

2.2.1 Mitigation Measures

Mitigation measures proposed to minimize effects to visual resources (see Appendix C-19, Visual Resources), and addressed in that section of this Draft Environmental Impact Statement, would also apply to the ITA.

2.3 Highway Alternative

The Highway Alternative would have short- and long-term effects on the ITA.

Based upon the criteria developed above in Section 1.2, effects on existing ITAs would be considered adverse if the action:

1. Interferes with the use, value, occupancy, character, or enjoyment of an ITA, including effects on general fish and wildlife where fishing and hunting rights exist.

The Highway Alternative would allow the Tribe to use its land for the betterment of its people.

2. Fails to protect ITAs from loss, damage, waste, depletion, or other negative effects including from disturbances such as noise or changes to visual resources.

The Highway Alternative would have short-term visual effects to the reservation. The pipeline construction would create a visual corridor devoid of vegetation during construction. Once construction is completed, however, the pipeline corridor would be reclaimed and revegetated, so visual contrasts would disappear over time. In addition, the LPP corridor would become substantially unnoticeable over time because it would be parallel to an existing paved highway where disturbance has already occurred. The placement of the pipeline through the reservation would encumber 239 acres (0.2 percent) of the KIR ITA for decades along the proposed LPP route similar to the effects of the existing Arizona State Highway 389.

3. Fails to protect treaty-based fishing, hunting, gathering, and similar rights of access and resource use on traditional tribal lands.

The Highway Alternative would impair resource use on the reservation (i.e., within the right-of-way [ROW] corridor) during construction. Traditional plant resources within the construction corridor would be disturbed, and revegetation efforts could take years to achieve full growth. The Highway Alternative would not affect the assumed water right of the Tribe because it uses Utah's allocated water and not that of any tribe and because Utah's LPP allocation would be diverted in priority.

2.3.1 Mitigation Measures

Mitigation for the Highway Alternative would be addressed in the BIA grant of ROW, including regulatory conditions on the use of the land, as well as any terms and conditions negotiated between the Tribe and the Project Proponent as part of the Tribe giving its consent to the ROW. Such mitigation may include those measures already provided for other visual effects, the timing of construction, access to locations with sensitive cultural resources, revegetation, and traffic control.

2.4 Comparative Analysis of Alternatives

There are three alternatives to compare: the No Action Alternative, the Highway Alternative, and the Southern Alternative. The No Action Alternative would have no effect to the ITA.

The Highway Alternative would affect the ITA more than the Southern Alternative, but these effects would be mitigated through the conditions on the BIA ROW grant, including those negotiated between the Project Proponent and the Tribe. The effects include an encumbrance on the reservation in the form of a permanent ROW pipeline; visual effects; noise effects; and short-term impediments to resource use and collection. In addition, the Tribe's negotiation would include the payment of just compensation for the ROW encumbrance, which the Tribe would use for the betterment of its people.

In contrast, the Southern Alternative avoids the ITA completely, therefore not allowing the Tribe to benefit from the use of its resource, but there would be a slight short-term visual effect during construction. That effect would not be mitigated.

3 References

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4 Glossary

Indian Trust Assets. This is a legal term. It refers to legally defined assets that the U. S. Government holds in trust for individual Indian Tribes.

Mormon. In general, members of the Christian churches derived from the actions of Joseph Smith, Jr. These members hold the Book of Mormon as scripture, from which this nickname occurs.

Puxant Tuvip. A sacred land, wherein the Southern Paiute people believe they were created.

Shapefile. A geographic information system file that contains geographic data.

5 Acronyms

FERC	Federal Energy Regulatory Commission
Interior	Department of the Interior
ITA	Indian Trust Asset
KIR	Kaibab Indian Reservation
Reclamation	Bureau of Reclamation
RMP	Arizona Strip Resource Management Plan
RMPA	Arizona Strip Resource Management Plan Amendment
ROW	right-of-way
Tribe	Kaibab Band of Paiute Indians

6 Consultation and Coordination

Consultation about Indian Tribal Assets began early in the Proposed Project history. In 2008 to 2010, the Utah Board of Water Resources, BLM, and Sagebrush Consultants reached out to numerous tribes about the Proposed Project including ITAs. Specifically, letters were sent to the Havasupai Tribe, Hopi Tribe, Hualapai Tribe, Kaibab Band of Paiute Indians, Moapa Business Council, Navajo Nation, Northwestern Band of Shoshone Nation, Paiute Indian Tribe of Utah, Pueblo of Zuni, San Juan Southern Paiute Tribe, Ute Indian Tribe, Ute Mountain Ute, Bureau of Indian Affairs (Western Region Office), and Reclamation asking for identification of any ITAs within or near the Project Area. However, there was no response (UBWR 2016, 2-1).

Reclamation asked the BIA to help identify any ITAs in the Project Area.

Reclamation sent letters to the Ak-Chin Indian Community; Apache Tribe of Oklahoma; Chemehuevi Indian Tribe; Cocopah Indian Tribe; Colorado River Indian Tribes; Fort Belknap Indian Community of the Fort Belknap Reservation of Montana; Fort McDowell Yavapai Nation; Fort Mojave Indian Tribe; Gila River Indian Community; Havasupai Tribe; Hopi Tribe; Hualapai

Indian Tribe; Kaibab Band of Paiute Indians; Las Vegas Tribe of Paiute Indians; Moapa Band of Paiute Indians; Navajo Nation; Northwestern Band of the Shoshone Nation; Paiute Indian Tribe of Utah; Pascua Yaqui Tribe; Pueblo of Laguna, New Mexico; Pueblo of Nambe, New Mexico; Pueblo of Zia, New Mexico; Pueblo of Zuni; Salt River Pima-Maricopa Indian Community; San Carlos Apache Tribe; San Juan Southern Paiute Tribe; Shoshone Tribe of the Wind River Reservation, Wyoming ; Shoshone-Bannock Tribes of the Fort Hall Reservation, Idaho; Southern Ute Indian Tribe; Tohono O'odham Nation; Tonto Apache Tribe; Ute Indian Tribe of the Uintah and Ouray Reservation (Northern Ute), Utah; Ute Mountain Ute Tribe; White Mountain Apache Tribe; and Yavapai-Apache Nation in early February of 2020. This was followed up by three webinars for tribal consultation and an email summarizing the webinar (February to March 2020).



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Lake Powell Pipeline Project

Appendix C-23: Socioeconomics

Coconino and Mohave Counties, Arizona
Kane and Washington Counties, Utah

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1 Introduction/Affected Environment

The economic effects evaluated as a part of the Lake Powell Pipeline Project (LPP or Proposed Project) Draft Environmental Impact Statement include water supply reliability benefits, project costs, the ability to pay (ATP) for Lake Powell Pipeline water supply beneficiaries to pay the costs of the LPP alternatives, and the effects of project construction and operation, maintenance, and replacement costs (OM&R) on employment, income, and value of output produced. Finally, the values of resources that could potentially be affected by the LPP, but where the extent of effects are unquantified, are presented. A discussion of the affected economic region is also included. The Proposed Project is a non-federal water project. The ATP and cost-benefit ratios are presented here exclusively for informational purposes and are not required for the project to proceed.

1.1 Regulatory Framework

This analysis was conducted based on the financing and cost recovery provisions of Chapter 28, Part 4 of the Lake Powell Pipeline Development Act (U.C.A. 73-28-101). Details of financing and cost recovery are subject to the contracts that would be developed under that act.

1.2 Methodology

1.2.1 Geographic Scope

For the purposes of this analysis, the local economic region includes four counties: Kane County, Utah; Washington County, Utah; Coconino County, Arizona; and Mohave County, Arizona. Economic data are also presented for communities and the Kaibab Indian Reservation (KIR) within the local economic region to evaluate economic benefits and project affordability.

1.2.2 Socioeconomic Effect Categories

Each categories of effects listed in the introduction represent economic and financial affects from different perspectives. These perspectives can be broadly categorized as national level economic effects, financial effects, and regional economic effects. Each of these categories of effects are considered in this evaluation of the LPP, as well as a discussion of the affected economic region. The different analysis perspectives are discussed in more detail below.

1.2.3 Economic Analysis

A project alternative is considered economically feasible when the direct and indirect benefits generated by the action are greater than the resource costs of the action. Economic feasibility implies that society is better off when an action is taken than not. An example of a direct benefit from increased water supplies is an increase in water supply reliability, which reduces hardship and costs to households and businesses during periods of shortage that would occur without a project. An example of an indirect benefit is the value of diversified types of landscaping and recreational activities with a more reliable supply.

Economic analyses have traditionally focused on quantifiable, monetized benefits and costs. These traditional analyses typically present benefits and costs in terms of net benefits (total benefits minus total costs), where positive net benefits indicate a project is economically justified. In some situations, there may be no reliable data available or applicable method for estimating and monetizing benefits. In these cases, benefits may be described qualitatively.

An economic analysis is from a broad national perspective. Benefits and costs are considered regardless of whether they accrue to those inside or outside the Project Area. Interest during construction (IDC) is added to construction costs to represent the full economic cost of a project. In private project financing, IDC represents the interest that would accumulate on funds borrowed to finance construction of a facility. IDC accrues until a project generates benefits and can support project payments. In public financing, IDC represents the difference between funds appropriated for construction and the economic cost of capital invested in the project when the project is brought into service at the end of construction. This difference represents an economic cost that must be included in economic justification and can be thought of as an opportunity cost for funds that could be invested elsewhere if they were not tied up in project construction. Due to the relatively short period of construction, IDC is typically a relatively small portion of total economic costs.

1.2.4 Financial Analysis

A financial analysis is an evaluation of cash flows and affordability of a project or action from the perspective of individual businesses, households, and agencies. A financial analysis generally includes information on project costs, revenues and/or services generated by the project, and the financial resources available to pay for the project compared to project costs. A project is considered financially feasible if the financial resources of the project beneficiaries are sufficient to pay the capital and annual operation and maintenance costs associated with the project. A financial analysis would be an appropriate analysis to use for making a business case for a project and is frequently evaluated through an ATP analysis.

1.2.5 Regional Effect Analysis

The primary purpose of a regional effect analysis is to evaluate the effect of an alternative on income, employment, and the value of output produced in the region where the proposed action is located. Regional effects can include the following:

- Short-term effects from construction expenditures;
- Long-term effects from operation, maintenance, and replacement expenditures;
- Long-term effects from changes in production and income/revenue associated with an alternative; and
- Long-term effects from changes in expenditures associated with any changes in other activities associated with an alternative.

The total regional effects associated with the location of an industry in a region are the sum of direct, indirect, and induced effects. Direct effects represent effects on the industry that is immediately affected. Indirect effects account for inter-industry transactions. Induced effects measure the effects of the changes in household income on demand for goods and services such as housing, restaurants, and retail sales. Regional effects are generally measured in terms of employment, income, and the value of output produced.

Regional economic effects are generally not equivalent to economic benefits. Economic benefit is a measure of well-being from the perspective of all of society while regional economic effects are a measure of changes in income and other factors from the perspective of a local community or region. Any project or program that results in increased spending in a region will increase economic activity and generate some level of positive regional effects but will not necessarily generate economic benefits. Therefore, in most cases regional effects cannot be added to economic benefits as a measure of total benefit.

Increased employment can be considered an economic benefit if a region has “substantial and persistent unemployment” and its labor resources will be “employed or more effectively employed” with a project in place, then the net additional income to the unemployed and underemployed can be defined as a benefit. Substantial and persistent unemployment is defined in terms of a rate 50 percent to 100 percent above the national average over a two- to four-year period.

1.2.6 Additional Economic Values Considered

In addition to the municipal and industrial water supply reliability values discussed previously, there are additional potential effects associated with the Proposed Project that cannot be quantified but should be recognized. These include ecosystem values and recreation values. An example of the relevance of ecosystem values are short-term and long-term disturbed acreage associated with the project alternatives. Disturbance of these acres can lead to lost ecosystem service benefits, especially if any disturbance occurs in critical habitat areas. If recreation access or recreation areas are affected, then recreation values are relevant.

1.2.7 Cumulative Effects

A discussion of cumulative effects is provided in Appendix C-25, Cumulative Effects.

1.3 Environmental Protection Measures

There are no environmental protection measures for socioeconomics for this project.

1.4 Existing Conditions

This section describes the socioeconomic conditions in the area of analysis. Data are provided for each county in the analysis area as well as for Utah, Arizona, and the United States, as appropriate for context. Sources of data are the U.S. Census Bureau and U.S. Bureau of Economic Analysis (BEA). The economic region includes counties that are directly affected as well as counties that have economic ties through trade and commuting patterns with the counties that are directly affected. Therefore, the economic region typically extends beyond the area of direct effect.

1.4.1 Demographics

Population growth is an indicator of urbanization in a region and can affect the level of demand for public services. From 2000 to 2019, population growth was highest in Washington County and lowest in Kane County. Overall, the four-county region experienced positive population change between 2000 and 2018 as shown in Table 1.4-1 below. Population growth for the study area has been slightly higher but of a similar magnitude than for Arizona and Utah as a whole.

Table 1.4-1 Socioeconomic Area of Analysis Population Totals (2000–2018)

Area	2000	2010	Change from 2000 to 2010	2018	Change from 2010 to 2018	Change from 2000 to 2018
Kane County	6,046	7,125	17.85%	7,350	3.16%	21.56%
Washington County	90,354	138,115	52.86%	171,700	24.32%	90.03%
Coconino County	116,320	134,421	15.56%	142,854	6.27%	22.81%
Mohave County	155,032	200,186	29.13%	209,550	4.68%	35.16%
4-County Region	367,752	479,847	30.48%	531,454	10.75%	44.51%
Utah	2,233,169	2,763,885	23.77%	3,161,105	14.37%	41.55%
Arizona	5,130,632	6,392,017	24.59%	7,171,646	12.20%	39.78%
United States	281,421,906	308,745,538	9.71%	327,167,439	5.97%	16.25%

Source: U.S. Census Bureau n.d.

1.4.2 Population Projections

Historic growth trends would not necessarily be expected to continue into the future. Therefore, population projections were obtained for the study area counties. Population projections for the socioeconomic area of analysis vary considerably. The Arizona Department of Administration, Office of Employment & Population Statistics estimates projections for both low, median, and high growth scenarios (ADOA n.d.). The University of Utah, Kem C. Gardner Policy Institute (2017) estimates projections from 2025 to 2055. Coconino County, Arizona is predicted to experience the least growth, while Washington County, Utah is predicted to experience the largest growth in the socioeconomic area. Table 1.4-2 and Table 1.4-3 below describe the projections for the socioeconomic area from 2025 to 2055. The population projections indicate the study area will continue to grow substantially into the future.

Table 1.4-2 Arizona Population Projections (2025–2055)

Year	Level	Coconino County	Mohave County	Arizona
2025	Low	148,800	222,200	7,604,200
	Medium	154,400	230,500	7,791,800
	High	160,100	237,400	7,959,500
2035	Low	146,000	233,100	8,251,800
	Medium	160,200	255,400	8,777,600
	High	175,500	274,300	9,272,700
2045	Low	139,600	242,600	8,773,100
	Medium	162,600	280,500	9,682,300
	High	188,400	313,500	10,589,700
2055	Low	131,200	251,600	9,178,900
	Medium	163,100	306,000	10,504,500
	High	200,600	355,600	11,915,400

Source: Arizona Department of Administration n.d.

Table 1.4-3 Utah Population Projections (2025–2055)

Year	Kane County	Washington County	Utah
2025	8,684	219,019	3,615,036
2035	9,611	286,768	4,178,317
2045	10,179	355,549	4,745,057
2055	10,736	429,295	5,285,767

Source: University of Utah Kem C. Gardner Policy Institute 2017

1.4.3 Housing and Development

Housing and Development Housing availability is an indicator of the ability of a region to support temporary and full-time workers and their families, as an influx of labor could occur during construction of large infrastructure projects.

From 2014 to 2018, all four counties experienced growth in their housing stock; Washington County experienced the largest growth, while Kane County experienced the lowest level of growth in socioeconomic area of analysis. Renter-occupied versus owner-occupied rates varied across the socioeconomic area of analysis. The median monthly owner cost was highest in Coconino County and lowest in Mohave County. From 2014 to 2018, median monthly owner cost increased Kane, Coconino, and Mohave Counties. Washington County was the only county to have a decline in median monthly owner costs. The source of housing data is the U.S. Census Bureau, American Community Survey (ACS) one-year estimates and ACS five-year estimates.

Residential home values varied across the socioeconomic area of analysis. In 2018, Mohave County had the lowest median residential home value, while Coconino County had the highest. From 2014 to 2018, all four counties experienced an increase in median home values. Table 1.4-4 below shows median home values in the socioeconomic analysis area.

Table 1.4-4 Median Residential Home Values

Year	Kane County ^(a)	Washington County ^(a)	Coconino County	Mohave County	Utah	Arizona	U.S.
2018	\$190,000	\$262,200	\$293,800	\$189,300	\$303,300	\$241,100	\$229,700
2017	\$190,200	\$240,300	\$277,400	\$157,100	\$275,100	\$223,400	\$217,600
2016	\$187,300	\$221,700	\$272,000	\$148,700	\$250,300	\$205,900	\$205,000
2015	\$175,300	\$212,600	\$228,600	\$139,400	\$234,600	\$194,300	\$194,500
2014	\$168,200	\$209,500	\$227,500	\$120,200	\$223,200	\$176,700	\$181,200

Source: U.S. Census Bureau n.d. (ACS 2014–2018)

Notes:

ACS 1-year estimates.

(a) ACS 5-year estimates.

The availability of temporary housing is a significant factor in a region’s ability to support temporary workers who need to relocate for project work. In 2014 and 2018, Coconino County had the highest median contract rental rate, while Mohave County had the lowest. In 2014 and 2018, Kane County had the highest vacancy rates while Washington County had the lowest. Table 1.4-5 and Table 1.4-6 show median contract rental and vacancy rates for the socioeconomic analysis area.

Table 1.4-5 Median Contract Rental Rates in the Socioeconomic Analysis Area

Year	Kane County	Washington County	Coconino County	Mohave County	Utah	Arizona	United States
2018	\$787	\$860	\$1,000	\$646	\$862	\$843	\$862
2017	\$795	\$833	\$951	\$629	\$822	\$810	\$827
2016	\$781	\$803	\$904	\$629	\$791	\$782	\$798
2015	\$735	\$783	\$884	\$623	\$768	\$760	\$776
2014	\$712	\$776	\$866	\$632	\$755	\$753	\$767

Source: U.S. Census Bureau n.d. (ACS 2014-2018)

Note: ACS 5-year estimates.

Table 1.4-6 Vacancy Rates in the Socioeconomic Analysis Area

Year	Kane County ^(a)	Washington County ^(a)	Coconino County	Mohave County	Utah	Arizona	United States
2018	56.02%	17.87%	29.27%	21.69%	9.91%	13.89%	12.29%
2017	57.78%	18.79%	27.37%	23.52%	10.07%	14.88%	12.62%
2016	55.82%	19.45%	27.38%	25.43%	10.54%	14.93%	12.41%
2015	52.36%	19.84%	28.75%	25.74%	10.32%	15.91%	12.30%
2014	49.94%	19.89%	26.93%	27.62%	10.19%	16.52%	12.47%

Source: U.S. Census Bureau n.d. (ACS 2014-2018)

Notes:

ACS 1-year estimates.

(a) ACS 5-year estimates

1.4.4 Employment, Income, and Poverty

The economic sectors employing the largest portion of the population across the socioeconomic area of analysis were accommodation and food services, health care and social assistance, construction, retail trade, and real estate (BEA 2020).

Unemployment rates in 2019 ranged from 2.4 percent in Washington County to 5.5 percent in Coconino County. All counties in the socioeconomic area of analysis had unemployment rates higher than their respective state's rate. Over the past 10 years, all four counties have consistently had higher rates of unemployment than their respective state's rate. However, unemployment in the study area has steadily decreased over the last 10 years and is currently at a very low level. Table 1.4-7 describes unemployment rates in the socioeconomic analysis area.

Table 1.4-7 Unemployment Rates for 2010 to 2019

Year	Unemployment Rate (percentage)					
	Utah	Arizona	Kane County	Washington County	Coconino County	Mohave County
2010	7.30	9.90	9.70	10.10	9.50	12.40
2011	5.60	8.80	8.50	7.70	9.20	11.60
2012	4.80	7.90	7.70	6.20	8.50	10.50
2013	3.80	7.40	5.30	4.50	7.90	9.50
2014	3.30	6.50	5.70	4.00	7.00	8.10
2015	3.30	5.70	5.40	3.80	6.60	7.40
2016	3.10	5.20	4.10	3.40	6.30	6.00
2017	2.90	4.80	3.90	3.20	5.40	5.80
2018	2.70	4.80	4.00	3.30	6.20	6.10
2019	2.20	4.50	2.80	2.40	5.50	5.40

Source: U.S. Bureau of Labor Statistics n.d.

In 2018, Coconino County had per capita personal incomes higher than the reference areas of Utah and Arizona. Mohave County had the lowest per capita personal incomes in 2018. From 2009 to 2018 all four counties in the socioeconomic analysis area experienced growth in per capita personal incomes. Kane County experienced the most growth, while Mohave County experienced the least growth in per capita personal income. Table 1.4-8 describes per capita personal income for the socioeconomic analysis area. Washington, Kane, and Mohave Counties all have relatively low incomes compared to Utah and Arizona as a whole, indicating limited available disposable income.

Table 1.4-8 Per Capita Personal Income for Study Region Counties, Utah, and Arizona

Year	Per Capita Personal Income					
	Utah	Arizona	Washington County	Kane County	Coconino County	Mohave County
2009	\$31,833	\$33,418	\$29,574	\$25,452	\$33,924	\$25,384
2010	\$32,156	\$33,635	\$29,455	\$26,028	\$34,406	\$25,582
2011	\$34,200	\$34,968	\$31,221	\$26,823	\$37,094	\$25,501
2012	\$36,139	\$36,123	\$32,449	\$27,991	\$36,814	\$26,011
2013	\$36,725	\$36,602	\$32,514	\$29,292	\$38,336	\$26,768
2014	\$38,517	\$38,226	\$34,670	\$31,163	\$40,639	\$28,450
2015	\$40,867	\$39,676	\$37,427	\$33,039	\$42,726	\$29,366
2016	\$42,375	\$40,671	\$37,837	\$34,775	\$44,279	\$30,286
2017	\$44,002	\$42,505	\$39,099	\$36,809	\$46,662	\$31,742
2018	\$46,320	\$44,329	\$40,257	\$38,847	\$48,129	\$33,148
Low	\$31,833	\$33,418	\$29,455	\$25,452	\$33,924	\$25,384
High	\$46,320	\$44,329	\$40,257	\$38,847	\$48,129	\$33,148

Source: BEA n.d.

Additional data were obtained for median household income and poverty rate for all people in the local economic region and for the KIR. Table 1.4-9 shows median household income and poverty rates for Utah, Arizona, the four-county region, and the KIR.

Table 1.4-9 Median Household Income and Percentage of Population in Poverty for Study Region Counties, Utah, Arizona, and the KIR

Area	Median Household Income	Persons in Poverty
Utah	\$68,374	9.0%
Arizona	\$56,213	14.0%
Washington County	\$56,877	9.7%
Kane County	\$48,269	10.5%
Coconino County	\$57,616	15.9%
Mohave County	\$43,266	16.8%
KIR	\$33,438	20.9%

Source: U.S. Census Bureau n.d. (2014–2018 ACS estimates)

Key:

KIR = Kaibab Indian Reservation

Table 1.4-9 shows that the KIR is experiencing economic hardship relative to the four-county region and the states. The KIR median household income is nearly \$10,000 less than the lowest income county in the region. In addition, the poverty rate is 4.1 percent higher than the highest poverty rate county.

County Level Fiscal Conditions

County levels of revenues, expenditures, debt, assets, and liabilities are all indicators of the economic health of the affected region. The better the fiscal condition of the region, the greater the ability of the region to finance expansion of infrastructure to support growth and development. The fiscal conditions of each county in the analyses area are described below.

1.4.4.1 Washington County, Utah

Long-term Debt

At year-end 2018, the county had \$37.32 million in governmental type debt. The debt is a liability of the government and amounts to approximately \$233.26 per capita. During the current fiscal year, the county's total debt had a net decrease of \$8,079,357.

Financial Statement Analysis

Washington County, Utah, Annual Financial Reports were analyzed for the years ended December 31, 2018 and 2017. These are the most recent years of comprehensive financial statements that are available. These financial reports are independently audited by Hinton Burdick, PLLC. The opinion of the independent auditor is that the financial statements in the report present fairly, in all material respects, the financial position of the county.

The Comprehensive Annual Financial Report for the Fiscal Year ended December 31, 2018 includes a statement of revenues, expenses, and changes in net position. The financial statements indicate that from 2017 to 2018 governmental activities revenue increased from \$79,020,704 to \$82,507,483, a 4.41 percent increase. Overall governmental program revenues, including intergovernmental aid

and fees for services were \$29.79 million. General taxes, investment earnings, and other general revenues totaled \$52.7 million. Taxes accounted for 61.86 percent of Washington County's total governmental revenue for 2018.

Financial statements indicate that from 2017 to 2018 governmental expenses decreased from \$69,067,795 to \$72,885,490, a 5.24 percent decrease. The cost of all governmental activities this year was \$69.06 million. Of this cost, \$18.50 million was paid for by those who directly benefited from the programs; \$11.29 million was subsidized by grants received from other governmental organizations for both capital and operating activities.

Financial statements indicate that from 2017 to 2018 net revenue increased from \$6,135,345 to \$13,439,688, a 119 percent increase. A breakdown of revenues and expenses for the last two fiscal years is shown in Table 1.4-10.

Table 1.4-10 Washington County, Utah, Revenues and Expenses

Revenues	2018		2017	
	Governmental Activities	Component-Unit Activities	Governmental Activities	Component-Unit Activities
Program Revenues				
Charges for Services	\$18,508,160	\$23,847,639	\$17,985,710	\$19,864,447
Operating Grants and Contributions	\$9,164,125	\$7,062,416	\$7,933,723	\$7,115,036
Capital Grants and Contributions	\$2,134,886	\$2,189,612	\$3,945,011	\$2,584,028
General Revenues:				
Taxes	\$51,035,820	\$3,338,904	\$48,141,019	\$3,135,856
Other	\$1,664,492	\$1,591,133	\$1,015,372	\$630,323
Total Revenue	\$82,507,483	\$38,029,704	\$79,020,835	\$33,329,690
Expenses				
General Government	\$13,265,313	-	\$13,752,716	-
Judicial	\$2,204,465	-	\$2,162,231	-
Public Safety	\$23,631,193	\$6,721,841	\$23,260,712	\$4,916,005
Public Works	\$6,648,043	\$17,572,972	\$8,564,121	\$15,707,307
Health and sanitation	\$3,341,895	\$7,552,437	\$3,024,159	\$8,177,076
Conservation	\$639,280	-	\$783,491	\$73,623
Culture, Tourism, and Recreation	\$18,411,528	-	\$20,240,131	-
Interest on Long Term Debt	\$926,078	-	\$1,097,929	-
Total Expenses	\$69,067,795	\$31,847,250	\$72,885,490	\$28,874,011
Net Revenue	\$13,439,688	\$6,182,454	\$6,135,345	\$4,455,679

Source: Washington County 2019

Assets represent financial obligations such as cash, receivables, and capital assets such as equipment. Liabilities represent financial obligations such as current accounts payable and long-term bonds payable. Governmental activities are generally financed through taxes and intergovernmental revenues while business-type activities are financed in whole or in part by fees charged to external parties. Component units are legally separate entities for which the government is financially accountable. As December 31, 2018, Washington County, Utah, had total governmental assets of \$148,947,571 and total liabilities of \$41,312,923. The asset liability ratio for governmental activities is 3.61. Asset and liability information for years 2017 and 2018 can be found in Table 1.4-11 below.

Table 1.4-11 Washington County, Utah, Asset Liability Ratio

Measure	Type of Activity	2017	2018
Total Assets	Governmental Activities	\$138,733,946	\$148,947,571
	Component-Unit Activities	\$90,996,082	\$99,907,151
Total Liabilities	Governmental Activities	\$49,261,713	\$41,312,923
	Component-Unit Activities	\$14,359,870	\$15,174,973
Asset/Liability Ratio	Governmental Activities	2.82	3.61
	Component-Unit Activities	6.34	6.58

Source: Washington County 2019

1.4.4.2 Kane County, Utah

Long-term Debt

Total bonded debt outstanding at December 31, 2018 was \$10.0 million of lease revenue bonds payable from tax and other revenues of the County. Long-term debt decreased by \$0.5 million in 2018.

Financial Statement Analysis

Kane County, Utah, Annual Financial Reports were analyzed for the years ended December 31, 2018 and 2017. These are the most recent years of comprehensive financial statements that are available. These financial reports are independently audited by Squire and Company, PC. The opinion of the independent auditor is that the financial statements in the report present fairly, in all material respects, the financial position of the county.

The Comprehensive Annual Financial Report for the Fiscal Year ended December 31, 2018, includes a statement of revenues, expenses, and changes in net position. The financial statements indicate that from 2017 to 2018 governmental activities revenue decreased from \$22,800,000 to \$20,900,000, an 8.33 percent decrease. Taxes comprise a major source of revenue for the county; \$10.4 million was recognized from all tax sources, which is 50.0 percent of total revenues for governmental activities. Overall tax revenues increased by \$0.3 million as compared to the prior year. A continuing improvement in the economy resulted in an increase in sales tax and transient room tax collections.

Financial statements indicate that from 2017 to 2018 governmental expenses increased from \$17,000,000 to \$20,200,000, an 18.82 percent increase. The increase of \$3.2 million in expenses is attributed primarily to an increase in general government of \$1.2 million (from general cost increases), an increase in public safety of \$0.7 million public safety (from an increase in salaries and benefits), and an increase in public health of \$0.6 million (from a change in contract terms with health provider).

Financial statements indicate that from 2017 to 2018 net revenue decreased from \$5,800,000 to \$700,000, an 87.93 percent decrease. A breakdown of revenues and expenses for the last two fiscal years is shown in Table 1.4-12.

Table 1.4-12 Kane County, Utah, Revenues and Expenses for Governmental Activities

Revenue and Expense Categories	Governmental Activities	
	2018	2017
Program Revenues		
Charges for Services	\$5,700,000	\$5,300,000
Operating Grants and Contributions	\$4,300,000	\$7,200,000
General Revenues:		
Property Tax	\$6,200,000	\$6,300,000
Sales Tax	\$1,300,000	\$1,200,000
Transient Room Tax	\$2,900,000	\$2,600,000
Investment Earnings	\$500,000	\$200,000
Total Revenue	\$20,900,000	\$22,800,000
Expenses		
General Government	\$9,000,000	\$7,800,000
Public Safety	\$6,300,000	\$5,600,000
Public Health	\$600,000	-
Highways and Public Improvement	\$1,700,000	\$1,300,000
Parks and Recreation	\$100,000	\$100,000
County Promotion	\$2,300,000	\$2,000,000
Interest on Long-Term Debt	\$200,000	\$200,000
Total Expenses	\$20,200,000	\$17,000,000
Net Revenue	\$700,000	\$5,800,000

Source: Kane County 2019

Assets represent financial obligations such as cash, receivables, and capital assets such as equipment. Liabilities represent financial obligations such as current accounts payable and long-term bonds payable. As of December 31, 2018, Kane County, Utah, had total governmental assets of \$73,900,000 and total liabilities of \$17,300,000. The asset liability ratio for governmental activities is 4.27. Asset and liability information for 2017 and 2018 is presented in Table 1.4-13 below.

Table 1.4-13 Kane County, Utah, Assets, Liabilities, and Asset Liability Ratios

Measure	Governmental Activities	
	2017	2018
Total Assets	\$71,600,000	\$73,900,000
Total Liabilities	\$16,500,000	\$17,300,000
Asset Liability Ratio	4.34	4.27

Source: Kane County 2019

1.4.4.3 Coconino County, Arizona

Long-term Debt

At the end of the current fiscal year, Coconino County had \$12,000 in special assessment debt outstanding.

Financial Statement Analysis

Coconino County, Arizona, Annual Financial Reports were analyzed for the years ended December 31, 2018 and 2017. These are the most recent years of comprehensive financial statements that are available. These financial reports are independently audited by the Arizona Auditor General. The opinion of the independent auditor is that the financial statements in the report present fairly, in all material respects, the financial position of the county.

The Comprehensive Annual Financial Report for the Fiscal Year ended December 31, 2018, includes a statement of revenues, expenses, and changes in net position. The financial statements indicate that from 2017 to 2018 governmental activities revenue increased from \$136,100,000 to \$147,210,000, an 8.16 percent increase. Overall program revenues increased by \$5.61 million in the current fiscal year. This increase was primarily due to an increase in operating grants and contributions of \$5.59 million primarily from additional grants for Education purposes. Total general revenue increased by \$5.50 million in fiscal year 2018. This was due in large part to increased local county sales tax collections of \$2.71 million, an increase in property tax collections of \$0.28 million, an increase in grants and contributions not restricted to specific programs of \$1.55 million, and an increase in gain on sale of capital assets of \$0.26 million. Property and sales tax accounted for 43.26 percent of Coconino County’s total revenues in 2018.

Financial statements indicate that from 2017 to 2018 governmental expenses increased from \$124,830,000 to \$152,610,000, 22.25 percent increase. Program expenses increased by \$27.78 million in the current fiscal year, primarily due to an increase in general government expenses related to a new Enterprise Resource Planning software system, an increase in public safety expenses for previously deferred repair and replacement projects, and a significant increase in highways and streets expenses due to major heavy equipment replacement schedule and road maintenance projects.

Financial statements indicate that from 2017 to 2018 net revenue decreased from \$11,270,000 to \$5,400,000, a 148 percent decrease. A breakdown of revenues and expenses for the last two fiscal years is shown in Table 1.4-14.

Table 1.4-14 Coconino County, Arizona, Revenues and Expenses

Revenue and Expense Categories	Governmental Activities	
	2018	2017
Program Revenues		
Charges for Services	\$14,440,000	\$14,900,000
Operating Grants and Contributions	\$36,040,000	\$30,450,000
Capital Grants and Contributions	\$1,090,000	\$610,000
General Revenues		
State Shared Revenue	\$26,650,000	\$25,900,000
Sale Tax	\$42,660,000	\$39,950,000
Property Tax	\$21,030,000	\$20,750,000
Grants and Contributions	\$4,240,000	\$2,690,000
Investment Earnings	\$350,000	\$350,000
Gain on Disposal of Capital Assets	\$660,000	\$400,000
Miscellaneous	\$50,000	\$100,000
Total Revenue	\$147,210,000	\$136,100,000
Expenses		
General Government	\$41,680,000	\$38,020,000
Public Safety	\$49,970,000	\$41,650,000
Highways and Streets	\$23,620,000	\$13,110,000
Sanitation	\$2,200,000	\$2,520,000
Health	\$15,010,000	\$13,470,000
Welfare	\$5,210,000	\$4,580,000
Culture and Recreation	\$7,750,000	\$6,760,000
Education	\$7,170,000	\$4,710,000
Interest on Long-Term Debt	-	\$10,000
Total Expenses	\$152,610,000	\$124,830,000
Net Revenue	-\$5,400,000	\$11,270,000

Source: Coconino County 2019

Assets represent financial obligations such as cash, receivables, and capital assets such as equipment. Liabilities represent financial obligations such as current accounts payable and long-term bonds payable. As December 31, 2018, Coconino County, Arizona, had total governmental assets of \$287,680,000 and total liabilities of \$160,270,000. The asset liability ratio for governmental activities is 1.79. Asset and liability information for 2017 and 2018 can be found in Table 1.4-15 below.

Table 1.4-15 Coconino County, Arizona, Assets, Liabilities, and Asset Liability Ratio

Measure	Governmental Activities	
	2017	2018
Total Assets	\$276,400,000	\$287,680,000
Total Liabilities	\$141,270,000	\$160,270,000
Asset Liability Ratio	1.96	1.79

Source: Coconino County 2019

1.4.4.4 Mohave County, Arizona

Long-term Debt

No new debt was incurred and with payments on the remaining long-term debt, the total decrease was \$4.7 million or 3.51 percent from the prior year.

Financial Statement Analysis

Mohave County, Arizona, Annual Financial Reports were analyzed for the years ended December 31, 2018 and 2017. These are the most recent years of comprehensive financial statements that are available. These financial reports are independently audited by the Arizona Auditor General. The opinion of the independent auditor is that the financial statements in the report present fairly, in all material respects, the financial position of the county.

The Comprehensive Annual Financial Report for the Fiscal Year ended December 31, 2018, includes a statement of revenues, expenses, and changes in net position. The financial statements indicate that from 2017 to 2018 governmental activities revenue increased from \$141,855,623 to \$152,000,778, a 7.15 percent increase. Property and sales tax accounted for 62.75 percent of Mohave County's total governmental revenues in 2018.

Financial statements indicate that from 2017 to 2018 governmental expenses increased from \$138,806,052 to \$152,176,827, a 9.63 percent increase. The large increase in general government expenses and increases in Public safety includes pay rate adjustments in order to make salaries competitive with other entities. The increases were offset some by vacancy savings.

Financial statements indicate that from 2017 to 2018 net revenue decreased from \$3,049,571 to (\$176,049), a 106 percent decrease. A breakdown of revenues and expenses for the last two fiscal years is shown in Table 1.4-16.

Table 1.4-16 Mohave County, Arizona, Revenues and Expenses

Revenue and Expense Categories	Governmental Activities	
	2018	2017
Program Revenues		
Charges for Services	\$20,856,142	\$19,090,112
Operating Grants and Contributions	\$33,656,639	\$30,088,516
General Revenues:	-	-
Property Tax	\$49,414,364	\$46,659,672
Other Tax	\$45,962,043	\$44,011,253
Other Revenue	\$2,111,590	\$2,006,070
Total Revenue	\$152,000,778	\$141,855,623
Expenses		
General Government	\$56,969,740	\$49,769,673
Public Safety	\$51,128,853	\$46,357,840
Highways and Streets	\$15,347,089	\$14,603,098
Health	\$15,762,319	\$14,859,906
Welfare	\$5,034,734	\$4,810,588
Sanitation	\$157,942	\$33,790
Culture and Recreation	\$4,654,561	\$5,033,422
Education	\$2,460,661	\$2,574,696
Interest on Long-Term Debt	\$660,928	\$763,039
Total Expenses	\$152,176,827	\$138,806,052
Net Revenue	-\$176,049	\$3,049,571

Source: Mohave County 2019

Assets represent financial obligations such as cash, receivables, and capital assets such as equipment. Liabilities represent financial obligations such as current accounts payable and long-term bonds payable. As December 31, 2018, Mohave County, had total governmental assets of \$362,219,556 and total liabilities of \$136,343,665. The asset liability ratio for governmental activities is 2.66. Asset and liability information for 2017 and 2018 can be found in Table 1.4-17 below.

Table 1.4-17 Mohave County, Arizona, Asset Liability Ratio

Measure	Governmental Activities	
	2017	2018
Total Assets	\$362,479,956	\$362,219,556
Total Liabilities	\$139,532,048	\$136,343,665
Asset Liability Ratio	2.60	2.66

Source: Mohave County 2019

2 Results/Environmental Consequences

This appendix evaluates the effects of the No Action, Southern, and Highway Alternatives together in the following categories and subcategories:

- Water Supply Reliability;
- Economic Costs of Construction and Operations;
- Financial Analysis – ATP and Affordability; and
- Regional Economic Effects;
 - Additional Economic Values Considered; and
 - Effect of Changes in Water Rates on Future Water Use.

2.1 Water Supply Reliability Benefits

Water supply reliability benefits are an important consideration in an evaluation of the water supply benefits of the LPP. Additional supplies provided by the LPP will reduce potential gaps in supply and demand in the future as well as decreasing the potential for shortage events at any particular time. Water supply reliability is not necessarily addressed through a comparison of average annual or monthly demands and supply because average water supply does not adequately reflect specific periods when demand is not fully met. In addition, managing water supplies to meet average demand does not mean that periods of shortage will not occur. As a result, the benefits of avoiding the hardship of water supply shortages needs to be estimated to account for potential improved reliability.

Previously completed studies of the benefits from improved water supply reliability and avoided shortages can help provide insight into the potential benefits of improved reliability in the Washington County, Utah, water supply area. Most water supply reliability studies rely on survey data to estimate benefits, where questionnaires are used to ask water users how they would react to different magnitudes of shortages and various event probabilities and how much they would be willing to pay to avoid those shortages. In some studies, the question is also posed in terms of the WTA for a reduction in reliability either in terms of increased shortage duration or an increased probability of a shortage. The use of surveys and hypothetical conditions to derive benefit estimates is an application of the stated preference approach to estimating benefits.

Water reliability benefits in the Washington County Water Conservancy District (WCWCD) are estimated using previously completed studies of water supply reliability benefits. Use of previously estimated benefit values as a basis for estimating is an application of benefits transfer. The benefits transfer approach can lead to imprecise estimates, mostly due to differences in the characteristics of the resources being valued and the population that the estimates are applied to. As a result, the benefit estimates used to evaluate the water supply provided by the LPP are subject to error. However, the estimates do provide information on the likely magnitude of water reliability benefits that could be generated by the LPP. Several studies have been completed in several states which have estimated water reliability benefits and the benefits of avoiding water supply shortages. Relevant studies are discussed below.

2.1.1 Barakat and Chamberlin Study

A study prepared by Barakat and Chamberlin (1994) estimated the mean monthly willingness to pay (WTP) of residential water customers in southern California to avoid water supply shortages. Mean monthly WTP was estimated to range from \$11.13 to \$16.93 per household per month in 1993 dollars, or \$19.69 to \$29.95 in 2019 dollars using the consumer price index (CPI) for all urban consumers to adjust prices to 2019 dollars. This translates into a range of about \$236 to \$359 annually per household. The lowest value was for a 10 percent reduction once every 10 years and the highest was for a 50 percent reduction once every 20 years. There were several iterations in between the range of values, with different reductions in service (10 percent increments from 10 percent to 50 percent) and frequency of occurrence (from one in three years to one in 30 years).

The results of the Barakat and Chamberlin study indicate the incremental change in the WTP to avoid a water shortage decreases as the shortage (as a percentage of total demand) increases. For example, the WTP to avoid a 40 percent shortage every 10 years is only 43.9 percent higher than the WTP to avoid a 10 percent shortage every 10 years, even though the frequency of shortage is four times (400 percent) higher. Economic theory would generally suggest that the value of a good that is in short supply would tend to increase as the shortage worsens and the WTP to avoid a loss would also tend to increase. The law of diminishing returns and the concept of diminishing marginal utility would explain why the value of water as an input into production or utility tends to increase as less is available. As a result, individuals would be expected to be willing to pay more to avoid a 1 percent reduction in a shortage when the shortage is very large than to avoid a 1 percent reduction in a shortage when the shortage is small. However, the Barakat and Chamberlin study showed the opposite result.

There may be some inconsistencies in the survey respondent estimates of WTP to avoid water supply shortages and therefore there may be some error in the estimates themselves. This inconsistency may be due to the respondents misunderstanding the survey questions, specifically the meaning of the shortage percentages and the probability of a shortage occurring. However, the estimated range of WTP to avoid reliability problems provides information on the perceived benefits from avoiding a water shortage. Therefore, the focus of the estimated values from Barakat and Chamberlin should not be on the specific values for each shortage percentage and frequency of occurrence, but the \$240 to \$360 per household range of annual values associated with avoiding a shortage.

2.1.2 Goddard and Fiske Study

Goddard and Fiske (2005) estimated the effects and degree of hardship that water shortages impose on municipal water systems. The study was conducted for Santa Cruz, California, and evaluated the potential effects water supply shortages impose on municipal water systems. The study evaluated the potential effects of water supply shortages of 10 percent to 60 percent compared to a full supply. The survey included about 1,900 commercial business accounts and 45 industrial accounts. The study indicated a wide variation in production effects associated with various water supply shortages. The study indicated that the production effects from a 15 percent reduction in water supplies varied considerably from business to business. Initial water use reductions were relatively easy to achieve because the least productive water uses will initially be eliminated and revenue losses will be relatively small. Important exceptions indicated in the study included the semiconductor industry, greenhouse and landscaping industries, and restaurants.

The Goddard and Fiske study also indicated that a 25 percent reduction in water deliveries to business and industrial water users would lead to a significant reduction in output, averaging about 20 percent across all sectors. Retailers and restaurants would be particularly hard hit. More affected sectors would include smaller hotels and motels, large semiconductor design firms, and potentially, community facilities. Semiconductor manufacturers would also suffer. The surveys also indicated 60 percent of the respondents said non-economic hardships were considerable or extreme and small businesses would be most adversely affected.

A 35 percent shortage in water supplies to business and industry would result in an average revenue loss across all businesses in excess of 30 percent, which is approximately a proportional change in output resulting from a water shortage compared to a full water supply. The losses would be greater for restaurants and retailers. The surveys indicated 50 percent of non-economic hardships were characterized as “extreme.” A summary is presented in Table 2.1-1 below. Although this study does not provide actual estimates of commercial benefits from improved reliability, it does indicate these benefits could be extensive if severe shortages could be avoided.

Table 2.1-1 Effect of Various Levels of Water Shortage on Businesses

Extent of Shortage	Shortage Percentage	Business Effect ^(a)
Business Shortage		
Mild	4%	1
Moderate	13%	2
Serious	22%	4
Severe	27%	4-5
Critical	33%	6
Extreme	48%	6
Industrial Shortage		
Mild	5%	2
Moderate	15%	3
Serious	25%	5
Severe	30%	5
Critical	35%	6
Extreme	50%	6

Note:

(a) Business Effect definitions:

- 1 = Little or no effects (0% reduced revenue)
- 2 = Some effect (5% reduced revenue)
- 3 = Intermediate effect (15% reduced revenue)
- 4 = Considerable effect (25% reduced revenue)
- 5 = Major effect (33% reduced revenue)
- 6 = Catastrophic effect (100% reduced revenue)

2.1.3 Griffin and Mjelde Study

Griffin and Mjelde (2000) estimated the WTP for a hypothetical increase in water supply reliability or the willingness to accept payment (WTA) for a hypothetical decrease in reliability for seven Texas cities. The mean WTP for sample data was \$8.47 per household per month and the predicted WTP from the model was \$9.76 in 1995 dollars. The mean WTA for the sample mean was \$12.66 and predicted WTA was \$13.20 in 1995 dollars. Indexing these values to 2019 dollars using the CPI results in a range of WTP of \$15.00 to \$17.27 and a WTA of \$22.40 to \$23.35 per household per

month in 2019 dollars. WTA is expected to be higher than WTP for two basic reasons. First, WTA is not bound by income as a constraint while WTP is bound by a household's available disposable income. Second, WTA represents a change to a less desirable level of utility or satisfaction which would generally be avoided by consumers. The improvement in conditions associated with WTP may be from a level of utility that is acceptable and, due to the law of diminishing returns, would not be valued as highly as a decrease in utility to a level that might not be very acceptable without compensation. The range of increased water reliability in annual terms is estimated to range from \$180.00 to \$280.20 in 2019 dollars.

2.1.4 Howe and Smith Study

A study of the value of water supply reliability for three cities along the Colorado Front Range (Boulder, Aurora, and Longmont) looked at the WTP and WTA for decreasing and increasing probabilities, respectively, of annual shortage events (Howe and Smith 1994). For Boulder, the changes in reliability evaluated an increase in probability from 1 in 300 to 1 in 100, an increase in probability from a 1 in 300 to 1 in 50, a decrease in probability from 1 in 300 to 1 in 600, and a decrease in probability from 1 in 300 to 1 in 1,000. For Aurora, the changes in reliability evaluated an increase in probability from 1 in 10 to 1 in 5, an increase in probability from a 1 in 10 to 1 in 2, a decrease in probability from 1 in 10 to 1 in 30, and a decrease in probability from 1 in 10 to 1 in 60. Finally, for Longmont, the changes in reliability evaluated an increase in probability from 1 in 7 to 1 in 4, an increase in probability from a 1 in 7 to 1 in 2, a decrease in probability from 1 in 7 to 1 in 20, and a decrease in probability from 1 in 7 to 1 in 50. The results of the analysis estimated WTP for Boulder ranging from \$4.67 to \$5.32 per customer per month in 1992 dollars and WTA ranged from \$4.53 to \$5.44 per customer per month. The results for WTP for Aurora ranged from \$5.82 to \$6.51 per customer per month in 1992 dollars and WTA ranged from \$6.65 to \$8.73 per customer per month. The results for WTP for Longmont ranged from \$5.99 to \$7.97 per customer per month in 1992 dollars and WTA ranged from \$11.08 to \$16.06 per customer per month. The range of WTP per connection per month for all three cities is \$7.67 to \$13.09 and the range for WTA is \$7.44 to \$26.38 in 2019 dollars. The estimated annual WTP ranges from \$92.04 to \$157.08 and annual WTA ranges from \$89.28 to \$316.56 in 2019 dollars.

2.1.5 Koss and Khawaja Study

A study by Koss and Khawaja (2001) estimated mean monthly WTP to avoid a shortage in 10 California water districts to range from \$11.67 per household per month (a 10 percent shortage one out of every 10 years) to \$16.92 per household per month (a 50 percent shortage one out of every 20 years) in 1993 dollars, depending on the assumed shortage (as a percent reduction from full service) and frequency of occurrence (ranging from a one in three event to a one in 30 event). WTP ranged from \$17.32 to \$25.11 in 2014 dollars and \$18.70 to \$27.12 per month in 2019 dollars. Annual WTP in 2019 dollars ranges from \$224.40 to \$325.44 per water user.

2.1.6 Water Supply Reliability Benefits Associated with the Lake Powell Pipeline

The studies discussed above indicate there are significant benefits associated with maintaining or improving water supply reliability and these benefits accrue to residential and commercial/industrial water users.

The information provided in the Goddard and Fiske study (2005) indicate that a water shortage of 7.5 percent during drought conditions in California would translate into reduced water supplies of about 5.0 percent. However, a water shortage of 15 percent is estimated to translate into an 11.7 percent to 12.1 percent reduction in water supply. A 12 percent reduction in available supplies in a marginal area where negative production output effects are beginning to occur would translate into an overall average of a 5 percent reduction in commercial revenues. This represents a significant positive effect on businesses from avoiding a water shortage.

The household benefits from avoiding a shortage, or increasing water supply reliability, are estimated to range from about \$89 to \$360 per household per year, with a best estimate of \$300 per household per year. Water supply reliability benefits for the LPP study area are estimated by applying the per household benefit estimates to communities in the study area. The estimated water supply reliability benefits to Washington County, Utah, households under current conditions from the LPP are presented in Table 2.1-2.

Table 2.1-2 Estimated Lake Powell Pipeline Household Water Supply Reliability Benefits

Cities	Households	Low estimate of water reliability benefits	High estimate of water reliability benefits	Best estimate of water reliability benefits
Apple Valley	245	\$21,805	\$88,200	\$73,500
Hurricane	5,765	\$513,085	\$2,075,400	\$1,729,500
Ivins	3,134	\$278,926	\$1,128,240	\$940,200
La Verkin	1,267	\$112,763	\$456,120	\$380,100
Leeds	326	\$29,014	\$117,360	\$97,800
St George	28,998	\$2,580,822	\$10,439,280	\$8,699,400
Santa Clara	2,130	\$189,570	\$766,800	\$639,000
Toquerville	521	\$46,369	\$187,560	\$156,300
Virgin	194	\$17,266	\$69,840	\$58,200
Washington	8,363	\$744,307	\$3,010,680	\$2,508,900
Total	50,943	\$4,533,927	\$18,339,480	\$15,282,900

The present value of water supply benefits over a 100-year period assuming a constant number of households and discounting at 2.75 percent ranges from \$153.93 million to \$622.64 million, with a best estimate of \$518.87 million. It is unlikely that the population of the study area will remain constant at the current level for 100 years. Therefore, the present value of water supply reliability benefits is also estimated assuming an annual household growth rate of 2.516 percent. This growth rate is based on the annual average growth rate from the Kem C. Gardner Policy Institute projections of growth in the number of households for Washington County from 2010 to 2065. The present value of water supply benefits over a 100-year period assuming an annual growth rate in the number of households of 2.516 percent discounting at 2.75 percent ranges from \$395.02 million to \$1,597.82 million, with a best estimate of \$1,331.53 million. If a 2.516 percent growth rate in the number of households is assumed for 56 years, which is the period of time included in the Kem C. Gardner projections, and the growth rate is assumed to decrease by one-half after that time, then the present value of household benefits ranges from \$351.48 million to \$1,421.72 million, with a best estimate of \$1,184.78 million.

The benefits presented in Table 2.1-2 account for the benefits to households, but not to commercial establishments. Commercial water supply benefits are attributable to avoiding revenue losses that could occur during periods of low reliability. As discussed in the Goddard and Fiske (2005) study, production effects from a 15 percent to 25 percent reduction in water deliveries can have a significant effect on output, especially for retailers and restaurants. As a lower bound estimate of commercial benefits, the high estimate of household level of benefits is applied to the total number of employer establishments in Washington County. According to the U.S. Census Bureau, 2017 County Business Patterns, there were 5,076 employer establishments in Washington County, Utah. Applying the high estimate of benefits of \$360 per household per year for households to employer establishments, commercial benefits would be at least \$1.83 million per year. The present value of commercial benefits over 100 years would be a minimum of \$62.03 million. Using the Goddard and Fiske (2005) study as a guide, the estimate of commercial water reliability benefits based on household benefits would correspond with the first level of effects which have minimal effects on revenues. The second level of effect would be approximately five times the effect on revenues. Assuming a proportional effect on benefits, the upper end of the potential commercial reliability benefits could be \$9.13 million annually, or a present value of \$310.14 million over 100 years assuming current conditions continue over the period of analysis. Assuming the same potential growth rates in the number of employer establishments as for households, the present value of commercial establishment water supply reliability benefits would range from \$694.83 million to \$766.34 million over 100 years.

The total estimated water supply reliability benefits over a 100-year period of analysis are equal to the household benefits plus the commercial establishment benefits. The estimated total water supply reliability benefits from the LPP are shown in Table 2.1-3.

Table 2.1-3 Estimated Total Water Supply Reliability Benefits from the Lake Powell Pipeline Project

Sector and Growth Assumption	Estimated Present Value of Benefits Over 100 years (millions)		
	Low	High	Best
Households			
No growth	\$153.93	\$622.64	\$518.87
2.516% annual growth	\$395.02	\$1,597.82	\$1,331.53
2.516% growth for over 55 years, then growth reduced to ½ of growth rate	\$351.48	\$1,429.72	\$1,184.78
Commercial Establishments			
No growth	\$62.03	\$310.14	\$310.14
2.516% annual growth	\$153.27	\$766.34	\$766.34
2.516% growth for over 55 years, then growth reduced to ½ of growth rate	\$138.97	\$694.83	\$694.83
Total for Households and Commercial Establishments			
No growth	\$215.96	\$932.78	\$829.01
2.516% annual growth	\$548.29	\$2,364.16	\$2,097.87
2.516% growth for over 55 years, then growth reduced to ½ of growth rate	\$490.45	\$2,124.55	\$1,879.61

2.1.7 Water Supply Benefits Associated with No Action

Water supply activities associated with No Action are aimed at maintaining current conditions in the near future and do not address potential reliability issues that could occur in the long-term future. Therefore, water reliability benefits are not likely to be generated under No Action because long-term potential gaps in supply and demand will remain under No Action. It is acknowledged that other methods, such as conservation, could be implemented to address future supply and demand gaps, but these methods would not generate reliability benefits as measured by WTP.

2.2 Economic Costs of Construction and Operations

The economic costs of the No Action and the LPP alternatives include all resource costs associated with projects and activities. These costs include construction costs, energy costs, OM&R, and IDC.

Total construction costs for the Southern Alternative estimated by Stantec, excluding the Kane County System, are estimated to be \$1,480.5 million and total construction costs for the Highway Alternative, again excluding the Kane County System, are estimated to be \$1,433.0 million.

Under the No Action Alternative, the Project Proponent would not incur the costs of the Proposed Project but would still need to supply water. The estimated costs of that supply are based on the estimated costs of the Ash Creek project, Sand Hollow Regional Pipeline, and various well projects presented in a 2017 Regional Water Impact Fee Facilities Plan & Analysis for the WCWCD (Zions Public Finance and Applied Analysis 2017). The costs of these projects indexed to 2019 using the gross domestic product price deflator is \$82.5 million.

OM&R estimates provided by Stantec for the Southern and Highway Alternatives are estimated to be \$5.120 million annually in 2019 dollars and pumping energy costs are estimated to be \$4.096 million annually, for total annual costs of \$9.216 million. OM&R costs for No Action were not presented, in the 2017 Zions Public Finance and Applied Analysis report but using the same percentage of annual costs relative to construction cost as for the Southern and Highway Alternatives results in annual No Action OM&R costs of \$471,300.

An economic analysis is based on a broad national perspective; therefore, IDC is considered as a part of construction costs to account for the full economic cost of a project. In private project financing, IDC represents the interest that would accumulate on funds borrowed to finance construction of a facility. IDC accrues until a project generates revenues and begins to support project payments. In public financing, IDC represents the difference between funds appropriated for construction and the economic cost of capital invested in the project when the project is brought into service at the end of construction. This difference represents an economic cost that must be included in economic justification and can be thought of as an opportunity cost for funds that could be invested elsewhere if they were not tied up in project construction. IDC is considered as part of project costs regardless of the source of project funds, unless the project is entirely funded through existing equity accounts.

The calculation of IDC is complicated somewhat if different construction periods are assumed for different project components. For this analysis IDC is calculated for the Southern and Highway Alternatives assuming both a five-year construction period and a 10-year construction period. Two different construction periods were assumed to indicate the sensitivity of estimated IDC to the construction period. It is assumed in both cases that construction costs are dispersed in equal increments (1/5 or 1/10) in each year of construction. No Action IDC is estimated assuming a five-year construction period. The FY2020 water project planning rate of 2.75 percent is used to calculate IDC. Estimated IDC for the Southern Alternative and the Highway Alternative are shown in Table 2.2-1, and IDC for No Action is estimated to be \$5.9 million. The estimated IDC is large for both the Southern and Highway Alternatives due to the very high project costs but shortening the construction period can reduce IDC costs substantially.

Table 2.2-1 Interest During Construction Assuming 5-year and 10-year Construction Periods

Pipeline Alternative	Interest During Construction (IDC)	
	Ten-year Construction Period	Five-year Construction Period
Southern	\$220,386,000	\$105,205,000
Highway	\$213,315,000	\$101,830,000

The present value of all economic costs for the Southern, Highway, and No Action Alternatives are shown in Table 2.2-2. It should be noted that although No Action is the lowest cost alternative, No Action does not generate the water reliability benefits produced by the pipeline alternatives.

Table 2.2-2 Estimated Total Proposed Project Alternative Costs

Alternative	Construction (millions)	Interest during construction (millions)	Present value of annual operation, maintenance, replacement, power (millions)	Estimated total project costs
Southern	\$1,480.5	\$105.2 – \$220.4	\$312.9	\$1,898.6 – \$2,013.8
Highway	\$1,433.0	\$101.8 – \$213.3	\$312.9	\$1,847.7 – \$1,959.2
No Action	\$82.5	\$5.9	\$16.0	\$104.4

2.3 Financial Analysis – Ability to Pay and Affordability

ATP has a variety of meanings depending on the context in which it is used. ATP, or financial capability or affordability, can refer to a borrower’s ability to make interest and principal payments on debts from disposable income or cash flow or can refer to the ability of a household or business to cover necessary expenses. In the context of taxation, ATP is the principle that tax rates should vary depending on income/revenues because those with higher income/revenue have greater financial resources to pay taxes. ATP is generally a measure of the financial resources available to pay toward an obligation or for a good or service. There are two common themes in the determination of ATP in the literature: the payment comes from disposable income and payments are constrained by the level of disposable income. The estimation of ATP can help in the evaluation of water supply affordability and the financial viability of a project, but an ATP analysis does not establish a precise payment standard.

The concept of ATP is relatively simple; however, the determination of ATP is not. There is very little guidance regarding what the basis should be for determining the ATP for water service. The U.S. Environmental Protection Agency (EPA) established affordability criteria for drinking water systems as a result of 1996 amendments to the Safe Drinking Water Act. These amendments allowed small public water supply systems to use less extensive water treatment technology if the most effective technology was not considered affordable. The EPA established a four percent of median household income benchmark for affordability (two percent for wastewater treatment and two percent for drinking water supplies). This benchmark was later amended to 4.5 percent to allow 2.5 percent for drinking water expenses.

This simplified approach for estimating ATP has been criticized by many. Teodoro (2017) listed four basic flaws associated with the use of service cost as a percentage of median household income to estimate the affordability of sewer and water service.

1. Use of average residential demand as a basis for affordability analysis inflates the cost of water and sewer service for evaluating affordability because, generally, average residential water consumption is considerably higher than median consumption.
2. The use of water and sewer bills as a percentage of median household income does not focus specifically on low income households, even though affordability affects low income households the most.
3. Conventional approaches to evaluating affordability is insensitive to differences in the cost of living.
4. The use of an affordability percentage standard is not rooted in any theoretical reasoning or a deliberative process.

One approach used by Teodoro (Affordability Ratio or AR20 approach) to evaluate water and sewer utility affordability addresses three of the above four issues by choosing a lower than median household income (20th percentile income), accounting for essential household expenses, and estimating monthly basic service cost as a percentage of disposable income. A second approach (the Hours at Minimum Wage approach) is used by Teodoro where the hours of minimum wage employment needed to cover the monthly basic service cost is estimated. Using either approach, the fourth flaw identified by Teodoro remains. As stated in his paper, “AR20 and [Hours at Minimum Wage] measure affordability; they do not define it.” Therefore, the fourth flaw described by Teodoro is not addressed in his paper.

The Consumer Financial Protection Bureau includes payment for basic living expenses as well as payment of debt service obligations in evaluating the ability to cover a new loan payment. The Consumer Financial Protection Bureau defines basic living expenses as those necessary for the borrower’s health, welfare, and ability to produce income, including health and welfare expenses of dependents. An analysis of ATP as a predictor of actual loan repayment by Rick Hackett (2017) used expenses for shelter, food, transportation, communication, medical care, and dependent childcare as the basis for estimating basic living expenses. The basic living expense data were obtained from actual consumer report data when available and from more general U.S. Bureau of Labor Statistics and U.S. Census Bureau data.

The above referenced reports and analyses generally indicate that ATP is directly related to income, that necessary living expenses should be included in the estimation of ATP, that some consideration should be given to the existence of low income households, and that a consistent definition of an ATP threshold does not exist.

This analysis of the ATP of WCWCD water users for water service includes consideration of necessary living expenses, households located in communities with high poverty rates, and procedures for estimating ATP thresholds for households and commercial establishments. The threshold ATP of households is based on an analysis of actual data for water payments, estimated necessary expenditures, and poverty levels for 43 New Mexico communities, 69 Colorado Communities, and 62 Arizona communities. Data for the New Mexico communities were obtained from a previously completed Navajo – Gallup pipeline study. Colorado data were obtained from the results of a 2018 Colorado Municipal Water and Wastewater Rate Survey conducted by the Colorado Division of Local Government. The Arizona data were obtained from a 2019 Arizona Water and Wastewater Rates Report published by the University of North Carolina, Chapel Hill School of Government, Environmental Finance Center. Average water payment data were not available for the State of Utah; therefore, the three neighboring states were used as representative indicators of the range of water payments applicable to the study area. ATP for commercial establishments is based on the New Mexico data alone because commercial data were not available for Colorado and Arizona.

The estimated percentage of household income actually spent on water service is inferred to be an indication of household ATP. The ATP of commercial establishments is based on an analysis of water payment and gross taxable receipts data for 16 New Mexico cities and the percentage of gross taxable receipts is interpreted to be an indication of commercial ATP.

The household ATP analysis includes an evaluation of potential economic hardship based on percentages of individuals in poverty, which could affect the ATP of households for water service. Economic hardship is addressed by collecting poverty data for New Mexico, Colorado, and Arizona communities and identifying communities which are experiencing high levels of poverty. A threshold level of poverty is established and used to adjust ATP as a percentage of income to account for economic hardship. The economic hardship determination is not applied to commercial ATP because of the difficulty in establishing criteria for business economic hardship.

2.3.1 Estimating the Ability to Pay Threshold

The approach that has traditionally been used by the Bureau of Reclamation (Reclamation) to estimate municipal and industrial ATP is based on an evaluation of observed water payments made by households in a state or region and comparing those payments to median household income. Some analyses also included consideration of the business sector by comparing commercial water payments to business revenues. The simple comparison of water payments to household income to derive water payments as a percentage of income was later modified to include consideration of necessary household expenditures through the use of regional estimates of percentages of income spent on different categories of household expenditures. Discretionary income was defined as the median household income minus the estimated cost of food, housing, apparel, transportation, healthcare, and personal insurance and pensions.

The traditional approach then estimated a range of water payments as a percentage of remaining discretionary income for communities outside the study area. The observed payment percentages were then arranged from high to low, and the percentage of discretionary income spent on water service that separates the top 10 percent from the remaining 90 percent of payment percentages was used to estimate the threshold ATP. The 90 percent payment percentage is applied to discretionary income estimates for the study area to estimate ATP.

This approach has been modified to use a model for estimation of non-discretionary income rather than estimates of necessary expenditures, to use median percentages of water payments as the basis for estimating ATP thresholds rather than mean values, and to consider poverty percentages as a measure of economic hardship in determining ATP.

The model used to estimate non-discretionary income was obtained from a 2017 Navajo Nation ATP analysis (Navajo Nation Department of Justice 2017). The model used in this WCWCD ATP analysis is the non-linear version of the models presented in the Navajo Nation Department of Justice report for estimating non-discretionary expenditures as a function of median household income and household size. This non-linear model is combined with a cost of living adjustment to derive discretionary income for estimating ATP percentages.

Second, rather than using a 90 percent threshold for determining the water payment percentage to apply to discretionary income or gross taxable sales, the threshold is defined as the median observed percentage of discretionary income or taxable sales plus the median absolute deviation of the payment percentage data. Using the median plus the median absolute deviation to determine the water payment percentage for ATP is consistent with the approach used to determine the economic hardship threshold.

Finally, economic hardship is included as an adjustment to ATP thresholds to account for the potential effects of water payments on low income/high poverty communities. This economic hardship adjustment is based on an evaluation of the percentage of population in poverty compared to median poverty levels.

2.3.2 Household Ability to Pay

Water payment data from communities in the three states are combined with secondary data from the ACS. The ACS data includes median household income, household size, and poverty percentages for all persons. Cost of living data are also used in estimating the water payment percentage calculations to account for differences in the cost of obtaining essential goods and services. The cost of living data are obtained from the Sperling's Best Places website (Sperling's Best Places n.d.).

The non-discretionary expenditure models included in the 2017 Navajo Nation ATP Report are based on expenditure and income household survey data from the U.S. Bureau of Labor Statistics Consumer Expenditure Survey data. The data were used to model the relationship between non-discretionary expenditures as a function of income and household size. The non-linear modeling results for estimating non-discretionary income presented in the 2017 Navajo Nation ATP Report are shown in Table 2.3-1. The model was originally estimated using 2010 data. The estimated intercept and income coefficients in Table 2.3-1 are indexed for this analysis to 2019 dollars using the CPI for all urban consumers.

Table 2.3-1 Non-discretionary Expenditure Modeling Results

Explanatory variable	Coefficient 2010 Dollars	Coefficient 2019 Dollars
Intercept	\$4,958	\$5,709
HH Income	0.29	0.29
HH Income squared/million	-0.203	-0.203
Household size	\$3,907	\$4,409
Household size squared	-\$360	-\$415

Source: Navajo Nation Department of Justice 2017

The approach used in this analysis for estimating household ATP of WCWCD water users is based on actual water payments made by households in communities outside of the study area as a percentage of discretionary household income and applying the upper end of the range percentages to the study area. Discretionary income is estimated in this analysis as median household income minus non-discretionary expenditures as estimated using the model coefficients presented in Table 2.3-1. Once discretionary income is estimated, actual water service payments can be compared to discretionary income to derive the water service payment percentages. It should be noted that water service for households and businesses would be considered an essential service. Discretionary income is used as the denominator for the water payment percentage calculation in order to remove all other necessary expenditures from available income that can be spent for water service.

The final step in estimating discretionary income is to apply the cost of living index to the non-discretionary income estimate to account for differences in necessary expenditures for different communities. The cost index used is found on the Sperling's Best Places website (Sperling's Best Places n.d.). The cost of living indices currently available on the Sperling's Best Places website represents data for 2019.

It is important to understand that the estimation of ATP is based on the application of the cost of water service as a percentage of discretionary household income and as a result, the percentages are unit-less factors that can be applied to discretionary income estimates for other communities and percentages from data for different years can be combined to evaluate the appropriate factor to apply to a community. The water payment percentage results are presented in Table 2.3-2 for Colorado communities, Table 2.3-3 for Arizona communities, and Table 2.2-4 for New Mexico communities.

Table 2.3-2 Estimated Colorado Water Payments as a Percentage of Discretionary Income for Use in Estimating Ability to Pay

Community	Median Household Income	Household Size	Cost of Living Index	Estimated Non-Discretionary Expenditures Accounting for Cost of Living	Estimated Discretionary Income	Monthly Water Payments	Water Payment as a Percent of Discretionary Income
Arvada, City of	\$80,055	2.48	128	\$46,806	\$33,249	\$28.17	0.64%
Aspen, City of	\$72,973	2.32	290.1	\$99,476	\$61,885	\$36.80	0.71%
Bayfield, Town of	\$61,045	2.83	110.9	\$36,048	\$33,923	\$27.60	0.98%
Breckenridge, Town of	\$86,493	3.14	141.6	\$56,429	\$60,193	\$35.14	0.70%
Brookside, Town of	\$60,417	2.48	89.6	\$28,163	\$27,813	\$69.50	3.00%
Broomfield, City and County of	\$89,624	2.46	132.2	\$51,503	\$61,824	\$50.92	0.99%
Buena Vista, Town of	\$44,918	2.43	112.1	\$30,415	\$22,667	\$39.00	2.07%
Calhan, Town of	\$51,935	2.48	107.5	\$31,353	\$26,868	\$44.67	2.00%
Carbondale, Town of	\$78,438	2.89	147.3	\$54,799	\$54,853	\$58.24	1.27%
Castle Rock, Town of	\$104,642	2.88	137.2	\$60,098	\$74,505	\$54.07	0.87%
Cokedale, Town of	\$49,375	2.24	83	\$23,078	\$18,378	\$73.00	4.77%
De Beque, Town of	\$60,500	2.42	93.2	\$29,163	\$29,270	\$39.00	1.60%
Delta, City of	\$41,594	2.52	89.1	\$23,586	\$14,401	\$34.50	2.88%
Dolores, Town of	\$44,048	2.28	107.2	\$28,382	\$21,311	\$27.00	1.52%
Durango, City of	\$63,167	2.31	128.9	\$40,847	\$40,226	\$33.13	0.99%
Eckley, Town of	\$51,000	2.98	73.2	\$22,093	\$13,205	\$72.00	6.54%
Estes Park, Town of	\$50,833	1.95	127.3	\$34,791	\$30,861	\$41.89	1.63%
Fort Collins, City of	\$62,132	2.46	118.3	\$37,658	\$37,090	\$38.76	1.25%
Fraser, Town of	\$54,940	3.52	109.3	\$35,418	\$27,886	\$50.00	2.15%
Frisco, Town of	\$70,789	2.42	166.3	\$56,542	\$51,657	\$48.00	1.12%
Georgetown, Town of	\$63,309	1.78	114.3	\$34,430	\$38,534	\$63.55	1.98%
Glenwood Springs, City of	\$63,248	2.43	135.4	\$43,390	\$41,198	\$28.34	0.83%
Grand Lake, Town of	\$75,208	1.72	125	\$41,305	\$50,188	\$46.00	1.10%
Hillrose, Town of	\$55,385	2.1	76.3	\$22,133	\$19,980	\$79.08	4.75%
Hot Sulphur Springs, Town of	\$54,737	2.45	96.9	\$28,911	\$26,218	\$52.74	2.41%
Ignacio, Town of	\$50,625	3.61	106.6	\$33,494	\$23,860	\$36.00	1.81%
Julesburg, Town of	\$45,673	2.16	80.6	\$21,415	\$15,227	\$40.00	3.15%
Kiowa Water/WW Authority	\$57,292	2.4	136.8	\$41,562	\$36,671	\$80.00	2.62%

Table 2.3-2 Estimated Colorado Water Payments as a Percentage of Discretionary Income for Use in Estimating Ability to Pay (continued)

Community	Median Household Income	Household Size	Cost of Living Index	Estimated Non-Discretionary Expenditures Accounting for Cost of Living	Estimated Discretionary Income	Monthly Water Payments	Water Payment as a Percent of Discretionary Income
Kit Carson, Town of	\$34,318	2.81	74.5	\$18,790	\$3,704	\$61.95	20.07%
Kremmling, Town of	\$52,206	2.68	98.3	\$29,261	\$24,302	\$48.00	2.37%
Lochbuie, Town of	\$65,000	3.22	111.8	\$38,521	\$36,558	\$65.00	2.13%
Longmont, City of	\$69,857	2.6	122	\$41,774	\$43,668	\$25.66	0.71%
Loveland, City of	\$64,209	2.39	114.4	\$36,824	\$37,965	\$30.44	0.96%
Lyons, Town of	\$92,159	2.62	137.6	\$55,077	\$64,742	\$53.30	0.99%
Minturn, Town of	\$87,500	2.88	154.7	\$61,108	\$63,554	\$79.00	1.49%
Monument, Town of	\$103,981	3	135	\$59,300	\$73,315	\$45.88	0.75%
Morrison, Town of	\$85,833	2.46	131.8	\$50,076	\$58,681	\$57.22	1.17%
Nunn, Town of	\$62,688	2.43	101.1	\$32,248	\$33,303	\$55.00	1.98%
Oak Creek, Town of	\$46,250	2.22	103.4	\$27,815	\$22,231	\$55.25	2.98%
Peetz, Town of	\$51,667	2.54	74.6	\$21,825	\$15,473	\$25.00	1.94%
Pierce, Town of	\$51,538	2.55	97.6	\$28,545	\$23,888	\$39.00	1.96%
Raymer, Town of	\$47,500	2.46	97.6	\$27,245	\$21,160	\$25.00	1.42%
Red Cliff, Town of	\$64,107	3.16	121.6	\$41,451	\$38,230	\$149.00	4.68%
Rockvale, Town of	\$53,203	2.33	86.7	\$25,222	\$22,106	\$70.00	3.80%
Severance, Town of	\$99,375	2.94	113.2	\$48,267	\$63,910	\$35.00	0.66%
Silver Plume, Town of	\$63,000	1.94	106	\$32,379	\$35,975	\$100.00	3.34%
Telluride, Town of	\$66,613	2.3	189.7	\$61,784	\$50,558	\$40.00	0.95%
Thornton, City of	\$76,236	3	122.8	\$45,307	\$48,249	\$61.32	1.53%
Westminster, City of	\$73,629	2.56	123.3	\$43,302	\$46,985	\$32.42	0.83%
Wiggins, Town of	\$53,438	2.82	93.8	\$28,563	\$23,555	\$125.00	6.37%
Williamsburg, Town of	\$46,731	2.35	83.9	\$22,990	\$16,624	\$70.00	5.05%
Windsor, Town of	\$96,710	2.81	120.5	\$50,195	\$64,145	\$35.91	0.67%
Woodland Park, City of	\$71,295	2.41	117.2	\$39,970	\$44,054	\$35.00	0.95%
Boone, Town of	\$34,219	2.25	73.3	\$17,368	\$16,851	\$102.58	7.31%

Table 2.3-2 Estimated Colorado Water Payments as a Percentage of Discretionary Income for Use in Estimating Ability to Pay (continued)

Community	Median Household Income	Household Size	Cost of Living Index	Estimated Non-Discretionary Expenditures Accounting for Cost of Living	Estimated Discretionary Income	Monthly Water Payments	Water Payment as a Percent of Discretionary Income
Cedaredge, Town of	\$36,992	2.36	93.3	\$23,112	\$13,880	\$42.18	3.65%
Cheraw, Town of	\$48,750	2.29	72.1	\$20,029	\$28,721	\$25.00	1.05%
Collbran, Town of	\$38,000	3.3	89.5	\$24,489	\$13,511	\$33.00	2.93%
Cortez, City of	\$40,048	2.34	93.5	\$23,893	\$16,155	\$38.01	2.82%
Creede, City of	\$50,625	2.06	107.5	\$29,681	\$20,944	\$39.39	2.26%
Crowley, Town of	\$33,516	3.31	71.1	\$18,591	\$14,925	\$50.00	4.02%
Hartman, Town of	\$31,250	2.31	74.5	\$17,168	\$14,082	\$35.00	2.98%
Lamar, City of	\$37,554	2.28	76.6	\$18,920	\$18,634	\$36.57	2.36%
Manzanola, Town of	\$31,974	2.44	71.2	\$16,809	\$15,165	\$80.00	6.33%
Nederland, Town of	\$67,125	2.25	134.2	\$43,697	\$23,428	\$61.66	3.16%
Nucla, Town of	\$32,308	1.99	87.5	\$19,595	\$12,713	\$36.00	3.40%
Poncha Springs, Town of	\$40,625	2.35	101.8	\$26,203	\$14,422	\$30.00	2.50%
Pritchett, Town of	\$31,250	2.26	70.7	\$16,192	\$15,058	\$32.00	2.55%
Ridgway, Town of	\$52,788	1.99	134.6	\$37,660	\$15,128	\$45.47	3.61%
Rocky Ford, City of	\$31,190	2.43	73.9	\$17,266	\$13,924	\$45.00	3.88%

Table 2.3-3 Estimated Arizona Water Payments as a Percentage of Discretionary Income for Use in Estimating Ability to Pay

Community	Median household income	Household size	Cost of living index	Estimated Non-Discretionary Expenditures Accounting for Cost of Living	Estimated Discretionary Income	Monthly Water Payments	Water Payment as a Percent of Discretionary Income
Avondale	\$58,938	3.23	99.7	\$32,773	\$26,165	\$30.11	1.38%
Benson	\$31,132	2.15	84.9	\$19,144	\$11,988	\$35.36	3.54%
Buckeye	\$65,932	3.36	103.3	\$36,154	\$29,778	\$75.18	3.03%
Cave Creek	\$85,529	2.13	153.1	\$56,612	\$28,917	\$82.50	3.42%
Chandler	\$80,716	2.78	103.3	\$38,757	\$41,959	\$25.07	0.72%
Chino Valley	\$47,065	2.45	109.3	\$30,352	\$16,713	\$55.24	3.97%
Clarkdale	\$48,685	1.91	103.9	\$27,665	\$21,020	\$80.87	4.62%
Cottonwood	\$32,143	2.74	100	\$24,445	\$7,698	\$66.46	10.36%
Douglas	\$34,154	2.85	76.5	\$19,335	\$14,819	\$24.45	1.98%
Duncan	\$42,679	2.44	74	\$19,647	\$23,032	\$39.97	2.08%
Eagar	\$64,297	2.92	85.9	\$28,848	\$35,449	\$36.32	1.23%
El Mirage	\$54,646	3.34	100	\$31,961	\$22,685	\$57.07	3.02%
Eloy	\$37,530	3.03	81.3	\$21,653	\$15,877	\$49.73	3.76%
Flagstaff	\$56,015	2.49	117	\$35,436	\$20,579	\$72.22	4.21%
Florence	\$49,674	2.45	95.9	\$27,308	\$22,366	\$43.88	2.35%
Fredonia	\$37,063	2.41	83.9	\$20,916	\$16,147	\$51.12	3.80%
Gila Bend	\$29,712	2.85	84	\$20,197	\$9,515	\$38.25	4.82%
Gilbert	\$92,350	3.14	116.3	\$48,074	\$44,276	\$28.46	0.77%
Glendale	\$52,314	2.93	103.7	\$31,541	\$20,773	\$37.17	2.15%
Globe	\$47,086	2.46	82.6	\$22,965	\$24,121	\$49.65	2.47%
Goodyear	\$80,336	2.97	111.4	\$42,201	\$38,135	\$54.29	1.71%
Holbrook	\$43,462	3.05	77.2	\$21,850	\$21,612	\$22.00	1.22%
Huachuca City	\$36,115	2.53	79.7	\$19,922	\$16,193	\$28.00	2.08%
Jerome	\$43,523	1.96	118.6	\$30,102	\$13,421	\$41.05	3.67%
Kearny	\$54,875	3.02	81.7	\$25,584	\$29,291	\$41.85	1.72%
Kingman	\$45,538	2.45	85	\$23,252	\$22,286	\$30.39	1.64%
Lake Havasu City	\$51,187	2.23	102.7	\$29,027	\$22,160	\$23.36	1.27%
Mammoth	\$41,094	3.24	80	\$22,465	\$18,629	\$44.89	2.89%

Table 2.3-3 Estimated Arizona Water Payments as a Percentage of Discretionary Income for Use in Estimating Ability to Pay (continued)

Community	Median household income	Household size	Cost of living index	Estimated Non-Discretionary Expenditures Accounting for Cost of Living	Estimated Discretionary Income	Monthly Water Payments	Water Payment as a Percent of Discretionary Income
Marana	\$84,491	2.7	104	\$39,817	\$44,674	\$55.19	1.48%
Mesa	\$54,700	2.73	104.2	\$31,848	\$22,852	\$52.03	2.73%
Nogales	\$28,238	3.09	77.2	\$18,683	\$9,555	\$39.51	4.96%
Oro Valley	\$76,484	2.27	109.1	\$38,250	\$38,234	\$51.58	1.62%
Page	\$57,475	3.2	98.3	\$31,865	\$25,610	\$30.58	1.43%
Parker	\$52,708	3.38	90.8	\$28,624	\$24,084	\$32.89	1.64%
Patagonia	\$31,328	2.24	96	\$21,952	\$9,376	\$31.85	4.08%
Payson	\$50,049	2.2	99.1	\$27,619	\$22,430	\$99.28	5.31%
Peoria	\$73,039	2.8	110.5	\$39,318	\$33,721	\$39.06	1.39%
Phoenix	\$54,765	2.87	103.7	\$32,073	\$22,692	\$21.34	1.13%
Prescott	\$54,037	2.11	115.7	\$33,179	\$20,858	\$67.05	3.86%
Prescott Valley	\$48,375	2.38	102.7	\$28,685	\$19,690	\$42.38	2.58%
Quartzsite	\$21,740	1.7	75.2	\$13,931	\$7,809	\$86.46	13.29%
Queen Creek	\$98,214	3.32	112.6	\$48,645	\$49,569	\$34.26	0.83%
Safford	\$52,768	2.85	80.9	\$24,549	\$28,219	\$42.09	1.79%
San Luis	\$34,122	3.75	90.4	\$24,568	\$9,554	\$30.68	3.85%
Scottsdale	\$84,601	2.2	133.2	\$49,212	\$35,389	\$38.57	1.31%
Show Low	\$46,011	2.55	94.7	\$26,283	\$19,728	\$45.35	2.76%
Snowflake	\$44,363	3.65	88.7	\$26,433	\$17,930	\$35.87	2.40%
Springerville	\$41,150	2.88	78	\$21,271	\$19,879	\$48.13	2.91%
St. Johns	\$61,442	4.84	78.7	\$28,413	\$33,029	\$45.05	1.64%
Star Valley	\$26,667	1.91	99.2	\$20,413	\$6,254	\$48.48	9.30%
Surprise	\$65,160	2.76	104.2	\$34,822	\$30,338	\$52.52	2.08%
Taylor	\$43,659	2.69	90.3	\$24,815	\$18,844	\$22.00	1.40%
Tempe	\$54,210	2.44	108.1	\$32,071	\$22,139	\$32.26	1.75%
Tolleson	\$42,935	3.37	97.2	\$28,051	\$14,884	\$45.89	3.70%
Tombstone	\$33,935	1.91	80.1	\$18,100	\$15,835	\$59.93	4.54%
Tucson	\$41,625	2.43	91.6	\$24,032	\$17,593	\$61.33	4.18%

Table 2.3-3 Estimated Arizona Water Payments as a Percentage of Discretionary Income for Use in Estimating Ability to Pay (continued)

Community	Median household income	Household Size	Cost of Living Index	Estimated Non-Discretionary Expenditures Accounting for Cost of Living	Estimated Discretionary Income	Monthly Water Payments	Water Payment as a Percent of Discretionary Income
Wellton	\$47,761	2.35	85.3	\$23,612	\$24,149	\$32.62	1.62%
Wickenburg	\$47,564	2.08	109.1	\$29,287	\$18,277	\$21.67	1.42%
Willcox	\$36,921	2.62	77.7	\$19,779	\$17,142	\$30.52	2.14%
Williams	\$50,781	2.57	98.1	\$28,544	\$22,237	\$79.15	4.27%
Winslow	\$38,043	3.06	78.3	\$21,019	\$17,024	\$42.37	2.99%
Yuma	\$47,702	2.72	88.2	\$25,273	\$22,429	\$39.59	2.12%

Table 2.3-4 Estimated New Mexico Water Payments as a Percentage of Discretionary Income for Use in Estimating Ability to Pay

Community	Median Household Income	Household Size	Cost of Living Index	Estimated Non-discretionary Expenditures Accounting for Cost of Living	Estimated Discretionary Income	Monthly Water Payment	Water Payment as a Percentage of Discretionary Income
Original Communities							
Alamogordo	\$41,640	2.38	0.96	\$23,321	\$18,319	\$36.05	2.36%
Albuquerque	\$46,662	2.4	1.01	\$26,051	\$20,611	\$25.74	1.50%
Artesia	\$40,515	2.74	0.97	\$23,968	\$16,547	\$18.41	1.34%
Bloomfield	\$42,169	3.02	0.92	\$23,647	\$18,522	\$31.89	2.07%
Carlsbad	\$43,995	2.6	0.95	\$24,169	\$19,826	\$27.25	1.65%
Clayton	\$38,607	2.46	0.82	\$19,341	\$19,266	\$26.60	1.66%
Cloudcroft	\$49,583	2.29	0.99	\$26,132	\$23,451	\$51.10	2.61%
Clovis	\$36,638	2.58	0.98	\$22,801	\$13,837	\$45.20	3.92%
Columbus	\$16,625	3.26	0.77	\$14,391	\$2,234	\$35.33	18.98%
Farmington	\$49,705	2.82	1.03	\$28,353	\$21,352	\$42.00	2.36%
Fort Sumner	\$22,372	2.04	0.78	\$13,976	\$8,396	\$31.39	4.49%
Grants	\$39,923	2.8	0.85	\$20,955	\$18,968	\$37.60	2.38%
Las Vegas	\$25,043	2.29	0.87	\$16,773	\$8,270	\$23.60	3.42%
Portales	\$30,135	2.76	0.87	\$18,912	\$11,223	\$33.95	3.63%
Rio Rancho	\$59,063	2.72	0.99	\$29,749	\$29,314	\$28.67	1.17%
Santa Fe	\$49,947	2.1	1.2	\$31,272	\$18,675	\$46.70	3.00%
Santa Rosa	\$30,817	2.58	0.83	\$17,910	\$12,907	\$14.75	1.37%
Timberon	\$35,809	1.96	0.82	\$17,726	\$18,083	\$56.47	3.75%
Vaughn	\$24,148	3.14	0.75	\$15,510	\$8,638	\$28.43	3.95%
Additional Communities/Systems							
Boles Acres Water System	\$46,364	2.33	88	\$22,486	\$23,878	\$44.17	2.22%
Echo Valley Water Co., Inc.	\$48,127	2.4	97.3	\$25,510	\$22,617	\$43.88	2.33%
Alcalde MDWCA	\$46,250	2.54	80	\$20,777	\$25,473	\$31.67	1.49%
Caprock Water Company	\$49,516	2.63	95.4	\$25,856	\$23,660	\$47.82	2.43%
New Mexico Water Service Company	\$31,133	2.48	86.9	\$18,650	\$12,483	\$30.17	2.90%

Table 2.3-4 Estimated New Mexico Water Payments as a Percentage of Discretionary Income for Use in Estimating Ability to Pay (continued)

Community	Median Household Income	Household Size	Cost of Living Index	Estimated Non-discretionary Expenditures Accounting for Cost of Living	Estimated Discretionary Income	Monthly Water Payment	Water Payment as a Percentage of Discretionary Income
Belen	\$31,133	2.48	86.9	\$18,650	\$12,483	\$40.42	3.89%
Bernalillo	\$42,087	2.65	99.3	\$24,814	\$17,273	\$37.03	2.57%
Chamberino MDWCA	\$39,375	3.08	81.4	\$20,346	\$19,029	\$43.60	2.75%
Chamita MDWCA	\$34,276	2.75	85.5	\$19,596	\$14,680	\$25.46	2.08%
Desert Aire	\$25,485	3.46	80.6	\$17,375	\$8,110	\$32.62	4.83%
EPCOR Water New Mexico, Inc.	\$41,421	2.6	91.4	\$22,571	\$18,850	\$42.79	2.72%
Regina MDWCA	\$18,894	1.98	97.4	\$16,326	\$2,568	\$45.09	21.07%
Canon MDWCA	\$55,893	1.95	93.7	\$25,689	\$30,204	\$43.26	1.72%
San Pablo MDWCA	\$41,215	2.43	90.1	\$21,875	\$19,340	\$34.94	2.17%
West Mesa Water Co., Inc.	\$41,215	2.43	90.1	\$21,875	\$19,340	\$24.43	1.52%
La Jara Water Users Association	\$18,894	2.3	73.1	\$12,806	\$6,088	\$70.33	13.86%
La Luz MDWCA	\$39,766	2.4	89.2	\$21,224	\$18,542	\$35.84	2.32%
El Vadito de Los Cerrillos	\$37,381	2.03	104.2	\$23,181	\$14,200	\$34.91	2.95%
Homestead Water Company	\$28,854	2.55	82.3	\$17,240	\$11,614	\$32.35	3.34%
Mountainair	\$26,016	2.22	85.3	\$16,550	\$9,466	\$23.91	3.03%
Polvadera MDWCA	\$16,352	2.66	81.9	\$14,370	\$1,982	\$28.80	17.43%
Quemado	\$36,477	3.43	111.5	\$27,543	\$8,934	\$30.45	4.09%
Thoreau Water & sanitation District	\$19,055	3.45	70.4	\$13,853	\$5,202	\$54.33	12.53%
Truth or Consequences	\$26,844	1.91	84.4	\$15,945	\$10,899	\$19.83	2.18%

Key:

MDWCA = Municipal Domestic Water Consumers Association

2.3.3 Water Payment Percentage Used to Represent Ability to Pay

Reclamation traditionally used the payment percentage that separates the top 10 percent of percentages from the remaining 90 percent as the measure of ATP. However, this approach could be considered somewhat arbitrary and may not be appropriate for all distributions of water payment percentages.

A method that is frequently used to identify outliers in a data set is to characterize an outlier as any observation that is more than one or two standard deviations from the mean. However, the statistics used to identify outliers are themselves strongly affected by the values of the outliers. A measure that is not as heavily influenced by extreme outliers is the median absolute deviation from the median value or median absolute deviation (MAD). The MAD is defined as the following.

$$MAD = \text{median} (|X_i - \text{median}(X)|) \quad (1)$$

The term $|X_i - \text{median}(X)|$ is the absolute value of i th observation minus the median of all X 's in the data set. The median water payment percentage value plus the MAD is used in this analysis to identify the water payment percentage representative used to represent ATP.

Based on the data in Tables 2.3-2, 2.3-3, and 2.3-4, the median household water payment and median absolute deviations are calculated for each state. The results and the average of all three states are presented in Table 2.3-5. The results in Table 2.3-5 are the basis for estimating the ATP of WCWCD households.

Table 2.3-5 Household Ability to Pay as a Percentage of Discretionary Income

State	Median household Water payment as a percentage of discretionary income	Median absolute deviation	Household threshold ability to pay percentage
Colorado	1.995%	1.007%	3.002%
Arizona	2.319%	0.946%	3.265%
New Mexico	2.610%	0.890%	3.500%
Average of all states	2.308%	0.948%	3.256%

The average of the median percentages and median absolute deviations for all three states ATP percentages is 3.256 percent, with a range from 3.002 percent to 3.50 percent. This represents a fairly narrow range of estimated ATP percentages. This calculation does not yet consider the potential economic hardship of relatively high payment percentages that could be imposed on low income communities. Therefore, the ATP range of 3.002 percent to 3.500 percent would be applied to communities that are not experiencing economic hardship.

2.3.4 Consideration of Economic Hardship in Evaluating Ability to Pay

The procedure used to estimate the ability of households to pay for water service is based on the assumption that observed actual payments made by households relative to their income, after adjusting for necessary expenditures, reflects an amount that is within ATP. It is further assumed that the range of observed payment percentages for water service in a region can be applied to other service areas to estimate ATP. If the percentage of income paid for water service is an accurate gauge of ATP, then the only non-arbitrary estimate of ATP would be the highest observed percentage of income spent on water for all of the communities evaluated.

However, it is possible that applying the highest observed percentage of discretionary income to a community that is experiencing economic hardship could increase the level of hardship if that amount was actually imposed on water users. Although the ATP percentages are based on actual payments, it is not known if the payment is shifting spending away from other types of essential goods and services that are not completely accounted for in estimating non-discretionary expenditures.

In order to evaluate the potential for economic hardship associated with water service payments in a community, those communities that are experiencing economic hardship and as a result are economically disadvantaged need to be identified. There are many definitions of economic hardship and disadvantaged areas. The Internal Revenue Service definition of economic hardship for the purposes of collecting tax debt is derived from Treasury Regulation Section 301.6343-1(b)(4), which indicates economic hardship exists if imposition of a levy in whole or in part will cause an individual taxpayer to be unable to pay reasonable basic living expenses. The determination considers general earning potential, basic living expenses, and the cost of living in the taxpayer's geographic location. In other words, economic hardship is determined in part by income, the cost of necessary expenditures, and the relative cost of living.

The approach used in this analysis to identify areas under economic hardship is based on an evaluation of Colorado, Arizona, and New Mexico community poverty rate data. Poverty data were obtained for 452 Colorado communities, 433 Arizona communities, and 322 New Mexico communities from the U.S. Census Bureau, ACS (2018). The same basic procedure was used to define high poverty levels as was used to define high household water percentages. The median value plus the median absolute deviation was define as a high poverty rate. The threshold poverty rate that indicates economic hardship is 17.60 percent for Colorado, 30.30 percent for Arizona, and 29.35 percent for New Mexico. Table 2.3-6 shows the communities for which water payment data were available that are defined as high poverty and the percentage of discretionary income each paid for the cost of water.

For economic hardship communities the lowest percentage of discretionary income is used as the measure of ATP. The water service payment percentages presented in Table 2.3-6 indicate the economic hardship percentage for Colorado would be 1.045 percent, for Arizona it would be 1.592 percent, and for New Mexico is would be 2.90 percent. The average percentage for economic hardship communities for all three states is 1.846 percent.

Table 2.3-6 Communities that Are Under Economic Hardship for which Water Payment as a Percentage of Discretionary Income is Available

Community/Water Supplier	Water service payment as a percentage of discretionary income
Colorado	
Boone	7.305%
Cedaredge	3.647%
Cheraw	1.045%
Collbran	2.931%
Cortez	2.823%
Hartman	2.983%
Kremmling	2.370%
Lamar	2.355%
Nederland	3.158%
Nucla	3.398%
Oak Creek	2.982%
Ridgway	3.607%
Rocky Ford	3.878%
Arizona	
Cottonwood	7.919%
Goodyear	1.592%
Huachuca City	1.868%
Nogales	4.106%
Springerville	2.650%
New Mexico	
New Mexico Water Service Company (Belen)	2.90%
Belen	3.89%
Desert Aire (Chaparral)	4.83%
Columbus	18.98%
Las Vegas	3.42%
Mountainair	3.03%
Polvadera MDWCA	17.43%
Quemado	4.09%
Timberon	3.75%

2.3.5 Estimation of Household Ability to Pay for Washington County Water Conservancy District Households

A range of household ATP is estimated using the range of estimates presented above for non-economic hardship communities, estimates for communities with an economic hardship, and the EPA 2.5 percent of median household income threshold. The average of the three state ATP percentages is applied to the WCWCD cities to estimate ATP for WCWCD water users as a best estimate of ATP. The other estimates represent a sensitivity analysis for various ATP assumptions. Table 2.3-7 shows the data needed to estimate total ATP for communities served by WCWCD. These data are obtained from the most recent available 2018 five-year ACS data. The range of ATP estimates for WCWCD communities are presented in Table 2.3-8.

Table 2.3-7 Data Used to Estimate Discretionary Income and Estimated Discretionary Income Used to Determine Ability to Pay

Cities	Household size	Median household income	Persons in poverty	Population	Households	Cost of living	Non-Discretionary Expenditures	Discretionary household income
Apple Valley	3.52	\$68,466	9.0%	799	245	104.0	\$34,480	\$33,986
Hurricane	2.72	\$52,023	11.1%	16,403	5,765	104.2	\$28,612	\$23,411
Ivins	2.62	\$57,282	9.2%	8,211	3,134	99.1	\$28,411	\$28,871
La Verkin	3.37	\$51,511	14.8%	4,268	1,267	97.6	\$27,753	\$23,758
Leeds	2.41	\$46,441	6.5%	785	326	114.1	\$28,882	\$17,559
St George	2.80	\$55,061	14.6%	82,194	28,998	103.6	\$29,451	\$25,610
Santa Clara	3.34	\$83,100	2.9%	7,118	2,130	110.7	\$40,614	\$42,486
Toquerville	3.85	\$77,422	5.8%	2,031	521	108.3	\$38,879	\$38,543
Virgin	2.53	\$53,333	7.7%	530	194	101.7	\$27,894	\$25,439
Washington	3.03	\$58,815	10.0%	25,395	8,363	107.8	\$32,173	\$26,642

Table 2.3-8 Estimated Range of Ability to Pay for Washington County Water Conservancy District Communities

Cities	Annual household ATP based on EPA 2.5% of median HH income	Annual ATP for all households (EPA 2.5% estimate)	Annual ATP per household for M&I water (Average of 3 states)	Annual ATP for all households (Average of 3 states)	Annual ATP per household for M&I water (low estimate)	Annual ATP for all households (low estimate)	Annual ATP per household for M&I water (high estimate)	Annual ATP for all households (high estimate)
Apple Valley	\$1,712	\$419,354	\$1,117	\$273,704	\$1,020	\$249,948	\$1,190	\$291,432
Hurricane	\$1,301	\$7,497,815	\$770	\$4,436,385	\$703	\$4,051,334	\$819	\$4,723,722
Ivins	\$1,432	\$4,488,045	\$949	\$2,974,242	\$867	\$2,716,096	\$1,010	\$3,166,879
La Verkin	\$1,288	\$1,631,611	\$448	\$567,256	\$248	\$314,557	\$689	\$872,933
Leeds	\$1,161	\$378,494	\$577	\$188,160	\$527	\$171,829	\$615	\$200,346
St George	\$1,377	\$39,916,472	\$483	\$13,995,115	\$268	\$7,760,624	\$743	\$21,536,659
Santa Clara	\$2,078	\$4,425,075	\$1,397	\$2,974,653	\$1,275	\$2,716,472	\$1,487	\$3,167,317
Toquerville	\$1,936	\$1,008,422	\$1,267	\$660,078	\$1,157	\$602,788	\$1,349	\$702,830
Virgin	\$1,333	\$258,665	\$836	\$162,225	\$764	\$148,145	\$890	\$172,732
Washington	\$1,470	\$12,296,746	\$876	\$7,323,851	\$800	\$6,688,186	\$932	\$7,798,204
Total	-	\$72,320,699	-	\$33,555,669	-	\$25,419,979	-	\$42,633,054

Key:

ATP = ability to pay

EPA = U.S. Environmental Protection Agency

HH = household

M&I = Municipal and Industrial

2.3.6 Commercial Ability to Pay for Municipal Water in the Washington County Water Conservancy District Region

The methodology used to estimate the ATP of commercial establishments in the WCWCD region is essentially the same as for household ATP except taxable sales is the basis for estimating water bill payment percentages. Commercial water service account data were available for only 16 New Mexico communities. Therefore, the New Mexico data is the basis for commercial ATP in this analysis. Data for the cost of water supplies as a percentage of taxable sales was obtained for 16 New Mexico cities from the City of Gallup Municipal and Industrial Water Supply ATP Analysis (Reclamation 2011). These percentages are shown in Table 2.3-9.

Table 2.3-9 Commercial Water Cost as a Percentage of Taxable Sales

Municipality	Commercial Water Cost as a Percentage of Taxable Sales
Albuquerque	1.59%
Artesia	0.37%
Bloomfield	1.01%
Carlsbad	0.20%
Clayton	0.33%
Clovis	0.86%
Columbus	2.05%
Farmington	0.36%
Fort Sumner	0.46%
Grants	0.59%
Las Vegas	0.88%
Portales	1.13%
Rio Rancho	0.88%
Santa Fe	5.37%
Santa Rosa	0.58%
Vaughn	3.06%

Source: Reclamation 2011

As was done for household ATP, commercial ATP is estimated to equal the median percentage of water payment relative to taxable sales plus the median absolute deviation of the percentages. The median of the water cost percentages shown in Table 2.3-9 is equal to 0.87 percent and the median absolute deviation is equal to 0.45 percent. Therefore, the commercial ATP as a percentage of taxable sales is estimated to be 1.32 percent. It should be noted that this percentage is considerably less than the ATP percentages applied to households. However, the household percentage is applied to discretionary income while the commercial percentage is applied to gross taxable sales. Therefore, the percentages applied to households and businesses are not comparable. A range of commercial ATP is estimated by applying the 2.5 percent EPA threshold to commercial establishments, where taxable sales is used in place of median household income.

Taxable sales data for Washington Counties were obtained from the Utah State Tax Commission (State of Utah 2020). Total Taxable sales in Washington County was \$3,592.3 million in 2018 and \$3,736.2 million in 2019. Not all commercial establishments are served by WCWCD; therefore, an additional adjustment was made to taxable sales. Approximately 86.04 percent of the Washington County population is represented by communities included in the household ATP analysis.

Therefore, commercial ATP is also estimated assuming 86.04 percent of taxable sales are attributable to WCWCD served communities. Commercial ATP estimates for the study area are shown in Table 2.3-10. The estimated current ATP of commercial water users is estimated to range from \$41.6 million to \$78.8 million annually.

Table 2.3-10 Taxable Sales in Washington and Kane Counties and Estimated Commercial ATP

Taxable sales and ATP	Taxable sales for all of Washington County (millions)			Taxable sales for Washington County adjusted by population served by Washington County Water Conservancy District (millions)		
	2018	2019	Average	2018	2019	Average
Total Taxable sales	\$3,592.3	\$3,736.2	\$3,664.3	\$3,090.8	\$3,214.6	\$3,152.7
ATP based on 1.32% of taxable sales	\$47.4	\$49.3	\$48.4	\$40.8	\$42.4	\$41.6
ATP based on 2.5% of taxable sales	\$89.8	\$93.4	\$91.6	\$77.3	\$80.4	\$78.8

2.3.7 Summary of Total Ability to Pay in the Washington County Water Conservancy District Study Area

The estimated current total household and commercial ATP for water service in the WCWCD study area ranges from \$66.0 million to \$151.1 million annually, with a best estimate of \$75.2 million annually. The results of the ATP analysis are shown by service category in Table 2.3-11.

Table 2.3-11 Total Ability to Pay for the Washington County Water Conservancy District

ATP Category	Low (millions)	High (millions)	Best (millions)
Household	\$25.4	\$72.3	\$33.6
Commercial	\$41.6	\$78.8	\$41.6
Total	\$66.0	\$151.1	\$75.2

This total ATP estimate represents the total financial resources available to pay all necessary expenditures for the provision of household and commercial water supplies. For example, if the cost of providing water supplies was currently \$35 million and total ATP was \$60 million, then the net ATP available to pay for a new project would be \$25 million assuming the original \$30 million in costs remained with a new project in place.

2.3.8 Ability to Pay for the Proposed Project

The WCWCD receives revenue from three basic sources to cover the cost of providing water service: water sales, property taxes, and impact and water availability fees. These sources of revenue are all ultimately paid by the water users and would count toward their ATP. Data obtained from the WCWCD Financial Statements and Additional Information for years ended December 31, 2017 and

2018 (WCWCD 2018, 2019) are used to estimate the current water payments made by WCWCD water users. Water revenue data by source for 2017 and 2018 are presented in Table 2.3-12.

Table 2.3-12 Washington County Water Conservancy District Revenue by Source of Revenue for 2017 and 2018

Source of revenue	Year ended December 2018	Year ended December 2017	Annual average for 2017 and 2018
Property taxes	\$11,437,603	\$11,133,709	\$11,285,656
Impact fees	\$12,663,877	\$18,858,357	\$15,761,117
Water sales	\$10,149,865	\$8,653,150	\$9,401,508
Water availability fees	\$1,521,983	\$1,468,649	\$1,495,316
Total	\$35,773,328	\$40,113,865	\$37,943,597

Based on the best estimate of ATP for the WCWCD study area of \$75.2 million, current water payments are well within water users ATP and would be considered affordable. However, this does not address the affordability of the LPP since water rates, fees, and taxes will need to be increased to pay for the Project. Based on current conditions, the remaining ATP, or net ATP, of WCWCD water users is about \$37.3 million annually.

Future increases in water rates, fees, and taxes that would be needed to pay for the LPP were estimated using information provided in the State of Utah Performance Audit of the Repayment Feasibility of the LPP (State of Utah 2019). The audit report presents one possible approach to funding the project out of many possibilities. However, it does provide a basis for evaluating the affordability of the Project. The projected future increases in rates, fees, and taxes represent revenues necessary to fund all required projects and activities, not just the LPP. However, the majority of future costs are associated with the pipeline.

The State of Utah Performance Audit of the Repayment Feasibility of the Lake Powell Pipeline (Audit Report) indicated WCWCD planned to increase rates by \$0.10 per 1,000 gallons a year until 2045, when the rate would be \$3.84 per 1,000 gallons. After 2045 the Audit Report assumed a 1.5 percent annual increase in water rates. The Audit Report indicated current 2019 impact fees were \$9,417 and they would increase to \$15,448 in 2026, after which a 1.5 percent annual increase is assumed. A continued annual increase in property taxes of 4.31 percent was assumed in the Audit Report. These assumptions are used in this analysis of ATP, recognizing that actual charges, fees, and taxes could be different than assumed.

The Kem C. Gardner Policy Institute projections of growth (2017) in the number of households to 2065 for Washington County is 2.526 percent. Future ATP for the WCWCD is estimated by applying this growth rate to the estimate of current ATP. Applying this growth rate to current ATP assumes that future growth in commercial output and sales would be the same as the growth in the number of households. As a sensitivity analysis growth rates of 2 percent, 1.5 percent, and 1 percent were also applied to recognize that the projected level of growth is not a guarantee of future conditions.

Based on the assumptions described above, future water related charges for WCWCD water users and total ATP are presented in Table 2.3-13. The ATP projections are based on the best estimate of ATP.

Table 2.3-13 Estimated Future Water Charges and Ability to Pay in Washington County Water Conservancy District Study Area

Year	Projected total annual water related charges (millions)	Annual ATP assuming Kem C. Gardner projections (millions)	Annual ATP assuming 2% growth (millions)	Annual ATP assuming 1.5% growth (millions)	Annual ATP assuming 1% growth (millions)
2019	\$37.94	\$75.20	\$75.20	\$75.20	\$75.20
2025	\$57.03	\$87.34	\$84.69	\$82.23	\$79.83
2030	\$69.71	\$98.94	\$93.50	\$88.58	\$83.90
2035	\$81.85	\$112.09	\$103.23	\$95.43	\$88.18
2040	\$95.15	\$126.98	\$113.98	\$102.80	\$92.68
2045	\$109.87	\$143.85	\$125.84	\$110.75	\$97.40
2050	\$125.84	\$162.96	\$138.94	\$119.31	\$102.37
2055	\$142.14	\$184.60	\$153.40	\$128.53	\$107.59
2060	\$161.25	\$209.13	\$169.37	\$138.46	\$113.08
2065	\$183.75	\$236.91	\$186.99	\$149.16	\$118.85
2070	\$210.34	\$268.38	\$206.46	\$160.69	\$124.91

A worst-case scenario that is not presented in Table 2.3-13 is if the population of the region remained flat over the next 15 years and the water charges with a pipeline occurred. If this lack of growth occurred and the Proposed Project was built, the projected water related charges would equal ATP by 2032 and any future rate increases beyond 2032 would not be considered affordable.

2.3.9 Discussion of Ability to Pay for the Lake Powell Pipeline Project Results

The estimated ATP for the WCWCD study area based on the Kem C. Gardner projections indicates ATP is sufficient to cover all water service costs, including Proposed Project alternative costs, through 2070. Under the 2 percent growth scenario ATP is sufficient to cover all water service costs until 2067 and under the 1.5 percent growth scenario ATP is sufficient to cover costs until 2045. Under the 1 percent annual growth scenario ATP would not be sufficient to cover costs by 2039. Under the no growth scenario, ATP would not be sufficient to cover all costs after 2032 if the Proposed Project were built.

It needs to be understood that future ATP to cover costs is dependent on continued growth in the region and that the cost of service assumptions for the future actually occur. If the cost of service (including water charges, fees, and property taxes) increases at a rate that is higher than expected, then this will have an adverse effect on affordability. In addition, two communities in the study area (La Verkin and St. George) were considered to be in the economic hardship category as indicated by poverty percentage and some households in these communities could be more affected by rate increases in the region than other communities.

2.4 Regional Economic Effects

A regional economic effect analysis is distinct from an analysis of economic benefits. Expenditures associated with a project may generate positive regional effects but produce no economic benefit and may even result in negative benefits. Any project or program that results in increased spending

in a region will increase economic activity and generate some level of positive regional effects, but will not necessarily generate economic benefits. Therefore, regional effects cannot be interpreted as a measure of national economic benefit.

The primary purpose of a regional effect analysis is to evaluate the effect of an alternative on income, employment, and the value of output produced on a region of interest. For this analysis, three different affected regions are identified, and the regional effects are estimated for each region. The first is a three-state region that includes Utah, Arizona, and Nevada. The second region is the state Utah. The third region evaluated is a four-county local region, which includes Washington County and Kane County in Utah, and Coconino County and Mohave County in Arizona. The larger the region, the greater the ability of suppliers within the region to provide the necessary materials and labor to build a project. Therefore, the larger the region, the greater the effect of project construction on the regional economy. In order to accurately estimate the regional effects of a project, the percentage of labor and materials supplied from the designated region must be estimated. For the purposes of this analysis it is assumed that the effects associated with each proposal represent incremental effects, or effects that would occur in addition to what would exist without a project. The regional effects that are evaluated in this analysis include:

- Short-term effects from construction expenditures;
- Long-term effects from OM&R expenditures; and
- Long-term effects from power and Aquatic Invasive Species (AIS) related expenditures.

2.4.1 Construction and Operation, Maintenance, and Replacement Expenditures

The estimated construction capital costs and OM&R costs including power were provided by Stantec (2020a and 2020b). Total construction (contract) costs and indirect (non-contract) costs for the Southern Alternative were estimated to be \$1,514.9 million and total construction and indirect costs for the Highway Alternative were estimated to be \$1,439.7 million. Stantec also estimated of annual OM&R costs for both alternatives of \$5.120 million and annual power costs of \$4.096 million.

There are additional costs associated with the Southern and Highway Alternatives associated with AIS. Three possible plans were identified, and representative costs provided (Feltrop 2020). Plan A would include installation of filters and hydro-optic disinfection ultraviolet treatment at an approximate cost of \$1.75 million. Plan B would include chlorination and a neutralizing chemical (sodium bisulfate) at an annual costs of about \$232,000, which is the present value equivalent of about \$7.8 million discounting at the current water project planning rate of 2.75 percent. The Plan C Rapid Response Plan would include chemical eradication at a cost of \$2.1 to \$3.1 million. The cost estimates exclude additional costs, such as operations and maintenance on filters and hydro-optic disinfection ultraviolet systems, and monitoring for infestation within the pipeline and Sand Hollow Reservoir. These costs represent a very small percentage of the total project costs, perhaps a little more than 1/10 of 1 percent of total costs, but it should be noted that these additional costs exist. The regional effects from construction and annual OM&R, power, and AIS related costs are discussed below.

2.4.2 Estimating Regional Effects

The regional economic effects from each project proposal are analyzed using the IMpact analysis for PLANning (IMPLAN) model. The model uses 2017 data. The IMPLAN model is based on national estimates of flows of commodities used by industries and commodities produced by industries. The flow of commodities to industry from producers and consumers, as well as consumption of the factors of production from outside the region, is represented within IMPLAN. These also account for the percentage of expenditures in each category within the region and expenditures that would flow outside the region.

In order to estimate the regional economic effects associated with both alternatives, estimates of changes in expenditures for final goods and services are input into the IMPLAN model. These final expenditures represent construction and OM&R expenditures within the study region that are additional expenditures and not simply transferred spending from one sector to another. As will be discussed below, OM&R expenditures are handled differently than construction expenditures. The expenditure categories, IMPLAN sector, and sector description used to estimate effects are shown in Table 2.4-1.

Table 2.4-1 IMPLAN Sectors Used to Estimate Regional Effects

IMPLAN Sector	IMPLAN sector Description	Final demand item used to estimate effects
58	Construction of other new nonresidential structures	Construction Activities
62	Maintenance and repair construction of nonresidential structures	OM&R Activities

Key:

OM&R = operation, maintenance, and replacement

The regional effects associated with each alternative are measured in terms of changes in employment, labor income, value added, and value of output. Employment is measured in terms of total jobs, which includes full-time and part-time employment. Part-time employment could be temporary or long-term jobs working fewer than 40 hours per week. Labor income is measured in terms of employee compensation. Value added includes employee compensation (including benefits) and proprietor income (i.e., payments received by self-employed individuals), other property related income (payments for rents, royalties, and dividends), and business taxes on production and imports less subsidies. Industry output is a measure of the value of industry's total production and is comparable to Gross Regional Product.

2.4.3 Regional Effects Associated with Construction Expenditures

Total construction costs for the Southern Alternative estimated by Stantec, excluding the Kane County System, are estimated to be \$1,480.5 million and total construction costs for the Highway Alternative, again excluding the Kane County System, are estimated to be \$1,433.0 million. The estimated No Action costs are \$82.5 million.

Construction expenditures would generate short-term regional effects. It should be noted that these short-term regional effects are dependent on construction funding provided from sources outside the region, which would represent an injection of funds to the region. It should also be noted that the WCWCD is planning on increasing rates to accommodate payment for the pipeline, which could have some long-term negative regional economic effects. Money spent on increased water bills will result in reduced spending on other goods and services.

Construction related activities represent an increase in final demand for goods and services required to build the features associated with the Southern and Highway Alternatives. However, not all construction activities and materials will be provided by companies located in the region. Employees and materials brought in from outside the region represent economic leakages outside the region.

A Utah Department of Workforce Services report (Langston 2017) indicated that approximately 86 percent of construction industry hires are from within Utah. Therefore, it is assumed that if the designated economic region is the state of Utah, then 86 percent of payments for labor would have an effect on the Utah economy and 14 percent would have an effect outside of Utah. For the three-state region, it is assumed that 100 percent of labor payments would have an effect on the three-state economy.

Finally, the estimated percentage of labor payments associated with project construction in the four-county region is based on the percentage of total employer establishments (County Business Patterns 2017) and all firms (U.S. Census Bureau 2012) in the four-county region compared to total establishments in Utah. The data used to estimate the labor payment percentage is presented in Table 2.4-2. The percentage used to evaluate regional economic effects is the average of the total employer establishments percentage and the all firms percentage, which is 15.85 percent. The 15.85 percent percentage is also used to estimate non-labor construction expenditures in the four-county local region.

Table 2.4-2 Business Establishments in the Four-county Region as a Percentage of Total Utah

Businesses

Area	Total Employer Establishments (2017)	All firms (2012)	Total Employer Establishments Percentage of Utah	All Firms Percentage of Utah
Washington County, Utah	5,016	15,167	6.26%	6.03%
Kane County, Utah	257	968	0.32%	0.39%
Coconino County, Arizona	3,746	10,934	4.67%	4.35%
Mohave County, Arizona	3,784	12,458	4.72%	4.96%
Utah	80,140	251,419	-	-
Percentage of Utah total	-	-	15.97%	15.73%

Generally, a larger percentage of labor would be expected to be provided locally than for materials. Given the extent of the LPP, a large portion of materials would likely need to be provided by out of state suppliers. For the purposes of this analysis it is assumed that 50 percent of total materials would be provided by sources within Utah and 75 percent would be provided by sources in the three-state region. The percentage of materials that could be provided for construction in the four-county local region is assumed to be the same 15.85 percent that was used for labor, resulting in a four-county construction materials expenditure percentage of 7.93 percent.

The final piece of information that is needed to accurately estimate regional effects is the percentage of pipeline construction costs attributable to labor costs and the percentage attributable to materials, fuel, machinery, and other similar costs. A United States Agency for International Development study (undated) for construction of natural gas pipelines indicated that approximately 40 percent of pipeline construction costs are attributable to labor and 60 percent are attributable to materials. This distribution of costs is used to distribute costs for estimating pipeline construction regional effects. The resulting percentage of total pipeline construction expenditures that would affect each identified region is shown in Table 2.4-3.

Table 2.4-3 Estimated Expenditures in Region as a Percentage of Total Project Construction Costs

Expenditure Category	Three-State Region (% of total)	Utah (% of total)	Four-County Region (% of total)
Labor	40%	34.4%	3.17%
Materials	45%	30.0%	4.76%
Estimated percentage of Total expenditures in region	85%	64.4%	7.93%

Using the percentages of construction expenditures within each region as shown in Table 2.1-3 and the estimated construction costs, the estimated regional effects for the Southern and Highway Alternatives are shown in Table 2.4-4, Table 2.4-5, and Table 2.4-6. The same method for determining the distribution of expenditures is used to estimate the regional effects for No Action. The one difference in the estimation of regional effects for the Southern and Highway Alternatives and the No Action Alternative is that no regional effects are estimated for the three state regional area because it is assumed that the much smaller project expenditures associated with No Action will have little influence on the value of regional output for the three state region. The estimated regional economic effects associated with No Action are shown in Table 2.4-7.

Table 2.4-4 Short-Term Regional Economic Effects from Pipeline Construction for the Four-County Local Region

Type of Effect	Employment	Labor Income	Value Added	Value of output
Southern Alternative				
Direct	916	\$37,819,414	\$54,421,007	\$117,403,650
Indirect	164	\$6,563,674	\$10,644,613	\$21,107,333
Induced	223	\$8,315,360	\$15,836,285	\$28,541,121
Total Effect	1,303	\$52,698,448	\$80,901,905	\$167,052,104
Highway Alternative				
Direct	887	\$36,606,025	\$52,674,976	\$113,636,900
Indirect	159	\$6,353,087	\$10,303,094	\$20,430,131
Induced	216	\$8,048,572	\$15,328,197	\$27,625,414
Total Effect	1,262	\$51,007,684	\$78,306,267	\$161,692,445

Table 2.4-5 Short-Term Regional Economic Effects from Pipeline Construction for the State of Utah Region

Type of Effect	Employment	Labor Income	Value Added	Value of output
Southern Alternative				
Direct	6,197	\$362,306,435	\$524,285,647	\$953,442,000
Indirect	1,907	\$108,447,068	\$173,947,580	\$343,615,539
Induced	2,955	\$129,260,897	\$241,708,989	\$429,966,016
Total Effect	11,059	\$600,014,400	\$939,942,216	\$1,727,023,555
Highway Alternative				
Direct	5,999	\$350,682,284	\$507,464,594	\$922,852,000
Indirect	1,845	\$104,967,678	\$168,366,688	\$332,591,062
Induced	2,861	\$125,113,722	\$233,954,056	\$416,171,092
Total Effect	10,705	\$580,763,684	\$909,785,338	\$1,671,614,154

Table 2.4-6 Short-Term Regional Economic Effects from Pipeline Construction for the Three-State Region

Type of Effect	Employment	Labor Income	Value Added	Value of output
Southern Alternative				
Direct	8,306	\$483,693,141	\$682,855,006	\$1,258,425,001
Indirect	2,391	\$138,542,399	\$225,175,899	\$412,933,665
Induced	4,027	\$183,930,517	\$341,665,408	\$590,209,253
Total Effect	14,724	\$806,166,057	\$1,249,696,313	\$2,261,567,889
Highway Alternative				
Direct	8,039	\$468,174,449	\$660,946,452	\$1,218,050,000
Indirect	2,314	\$134,097,439	\$217,951,411	\$399,685,203
Induced	3,898	\$178,029,336	\$330,703,498	\$571,273,124
Total Effect	14,251	\$780,301,224	\$1,209,601,361	\$2,189,008,327

Table 2.4-7 Short-Term Regional Economic Effects Associated with No Action

Type of Effect	Employment	Labor Income	Value Added	Value of output
Four County Local Effect Region				
Direct	52	\$2,107,465	\$3,032,579	\$6,542,250
Indirect	9	\$365,757	\$593,165	\$1,176,194
Induced	12	\$463,369	\$882,468	\$1,590,437
Total Effect	73	\$2,936,591	\$4,508,212	\$9,308,881
Utah Effect Region				
Direct	345	\$20,189,315	\$29,215,512	\$53,130,000
Indirect	106	\$6,043,150	\$9,693,128	\$19,147,776
Induced	165	\$7,202,988	\$13,469,093	\$23,959,606
Total Effect	616	\$33,435,453	\$52,377,733	\$96,237,382
Three-State Effect Region				
Direct	345	\$26,953,500	\$38,051,700	\$70,150,800
Indirect	106	\$7,720,200	\$12,547,800	\$23,019,000
Induced	165	\$10,249,400	\$19,039,100	\$32,901,200
Total Effect	820	\$44,923,100	\$69,638,600	\$126,071,000

The regional effect results for the value of output shown in Table 2.4-4, Table 2.4-5, Table 2.4-6, and Table 2.4-7 can be compared to BEA estimates of gross regional product county, metro, and other areas to get a sense of the level of regional economic effect associated with pipeline construction (BEA 2020). Table 2.4-8 shows the BEA estimates of gross regional product for each affected region and Table 2.4-9 shows the percentage of total estimated change in the value of output relative to gross regional product.

Table 2.4-8 Gross Regional Product by Affected Region

Effect Region	Gross Regional Product
Four-County Region	\$19,813,851,000
Utah	\$178,137,596,000
Three-State Region	\$695,744,567,000

Table 2.4-9 One-time Percentage Change in the Value of Output from Construction Expenditures Compared to Annual Gross Regional Output

Alternative	Three-State region	Utah	Four-County region
Southern	0.325%	0.969%	0.843%
Highway	0.315%	0.938%	0.816%
No Action	0.018%	0.054%	0.047%

The regional effects results and the comparison of effects for each alternative indicate the pipeline will have a positive regional effect, but the one-time effects amount to less than 1 percent of total annual gross regional product for each region. It should be noted that the short-term effects will occur over a five- to 10-year period of time, so the effects presented in Tables 2.4-4 through 2.4-7 cannot be interpreted as the effects occurring in one year. The effects that may occur in any one year could be one-tenth to one-fifth the values presented in the above tables.

2.4.4 Regional Effects Associated with Annual Operation, Maintenance, and Replacement Expenditures

OM&R costs can also lead to regional economic effects if the expenditures represent additional spending within the region that otherwise would not have occurred. There are two basic questions that must be addressed in order to determine the extent to which OM&R expenditures result in regional effects.

The first question is: Will the OM&R related activities be undertaken by personnel located within the study region and will parts and other necessary equipment originate from within the region? For example, if mechanics must be brought in from outside the study region to complete a maintenance activity, then the majority of the pay earned by those mechanics would be spent outside of the region (except for lodging and meals expenditures while completing the activity). In such case, using those maintenance expenditures to estimate the regional effect associated with maintenance will overstate those effects.

The second question is: Who is paying for the OM&R activity? If the OM&R expenditures are paid by the beneficiaries of the water supplies located within the study region, then the OM&R payments must come from current expenditures on other goods and services (including savings). To the extent OM&R expenditures are a transfer from other categories of spending, assuming all OM&R expenditures generate regional effects will overstate effects. Therefore, the regional effects from OM&R spending are represented by the difference in regional effect from spending on OM&R activities and the regional effect from current categories of spending.

For this analysis of the regional effects from OM&R expenditures associated with the Southern and Highway Alternatives, it can be assumed that most if not all OM&R activities would be provided by personnel within the study area, but that all of the expenditures are paid by entities within the study area. Therefore, the regional effects associated with OM&R activities result only from differences in the effects of different categories of spending on regional activity. Assuming the combination of current expenditures are typical for medium income households, transferring expenditures from the current categories of spending to OM&R expenditures would actually result in little or no regional effect. For the purposes of this analysis it is assumed that the any OM&R regional effects are negligible.

2.5 Additional Economic Values Considered

In addition to the municipal and industrial water supply reliability values discussed previously, there are additional potential effects associated with the LPP that are likely to be of a smaller magnitude but need to be recognized. These include ecosystem values associated with disturbed acres, recreation effects from reduced access, and the economic effects associated with reduced grazing acreage. An example of the relevance of ecosystem values are short-term and long-term disturbed acreage of vegetation communities and riparian areas associated with the project alternatives. Disturbance of these acres can lead to lost ecosystem service benefits. If recreation access or recreation areas are affected, then recreation values are relevant.

2.5.1 Potential Ecosystem Values

Ecosystem services can be broadly defined as the benefits obtained as a result of ecosystem functions. The Millennium Ecosystem Assessment (2019) describes four categories of ecosystem services and provides specific examples within these categories.

- Provisioning: Food, Raw Materials, Fresh Water, and Medicinal Resources.
- Regulating: Local Climate, Carbon Sequestration, Moderation of Extreme Events, Wastewater Treatment, Soil Erosion and Fertility, Pollination, and Biological Control.
- Habitat or Supporting Services: Habitats for Species and Maintenance of Genetic Diversity.
- Cultural: Aesthetic Appreciation and Inspiration for Culture, Tourism, Spiritual Experience and Identity, and Recreation.

Functioning ecosystems provide a range of services that are essential to support economic activity and improve environmental conditions. Ecosystems directly and indirectly support services that contribute toward social welfare. Some are essential for human survival (such as food), while others support services that contribute toward human enjoyment (such as recreation).

The U.S. Department of Agriculture Forest Service (Forest Service) recognizes the public benefits generated by the above categories of ecosystem services and the need to increase public awareness of ecosystem services and support opportunities for market-based conservation on private and community lands (USDA 2019a). Market-based conservation refers to transactions such as auctions and trading of credits as payment for ecosystem services. Forest Service efforts such as the Forests to Faucets project recognize some of these public benefits using geographic information systems to model and map the continental United States land areas most important to surface drinking water, the role forests play in protecting these areas, and the extent to which these forests are threatened by development, insects and disease, and wildland fire.

The categories of ecosystem benefits listed above represent valuable services that, if not provided by an ecosystem, would require public or private expenditures in order to provide the service. As a result, these ecosystem services provide an actual benefit (avoided expenditure) to society. However, many of these ecosystem benefits are difficult to measure in terms of the quantity of service provided. The primary reason for the difficulty in estimating ecosystem benefit quantities is the uncertain linkage between the effect of a project or policy on ecosystem services. For example, if the quantity of ecosystem benefits is dependent on acreage with specific characteristics, then the linkage is acreage. If the linkage can be reliably measured/evaluated, then the next step necessary to completely measure economic benefits is to monetize the service provided.

2.5.2 Valuation of Ecosystem Service Benefits

Assuming the linkage between ecosystem and the quantity of ecosystem services can be quantified and the technical issues associated with assumed linkage are identified, the next challenge is to value the per unit value of those ecosystem service benefits. Some categories of ecosystem services, such as recreation and water supply, can be valued using traditional types of economic analyses based on market data and/or cost of service information.

Ecosystem valuation research results are available, which provide a range of values for different types of ecosystem services in different geographical and biological areas, and can be used as an application of benefits transfer. A summary of ecosystem services values is presented in the report “Sustaining Environmental Capital: Protecting Society and the Economy” (Executive Office of the President 2011) and in “The Economics of Ecosystems and Biodiversity for Water and Wetlands” (Russi et al. 2013). The ecosystem service values presented in the Executive Office of the President report (2011) are divided into the four categories of ecosystem service benefits and represent benefits in 2007 dollars. These values are converted into values per acre and indexed into 2019 dollars using the BEA CPI. Potential ecosystem benefits are presented in Table 2.5-1.

The study by Russi et al. (2013) does not divide ecosystem service values into the four categories of ecosystem service benefits but does indicate where the average ecosystem service value for all benefit categories combined by habitat type fits within the range of estimated benefits. The estimated average ecosystem service benefit value as a percentage of the estimated maximum value from Russi et al. (2013) is used to calculate average ecosystem service values, which are presented in Table 2.5-2.

Table 2.5-1 Potential Annual Ecosystem Benefits by Type of Habitat and Benefit Category in 2019 Dollars

Habitat Type	Minimum per acre per year				Maximum per acre per year			
	Provisioning	Cultural	Regulating	Habitat	Provisioning	Cultural	Regulating	Habitat
Coastal systems	\$0.50	\$0	\$81	\$37	\$3,612	\$19,814	\$14,568	\$78
Coastal wetlands	\$21	\$5	\$916	\$13	\$3,966	\$1,389	\$64,759	\$32,913
Inland wetlands	\$1	\$310	\$154	\$5	\$4,645	\$4,018	\$11,012	\$1,661
Rivers and lakes	\$559	\$146	\$146	\$0	\$2,763	\$1,308	\$2,382	\$0
Temperate forests	\$12	\$0.50	\$1.50	\$0	\$831	\$46	\$218	\$1,232
Woodlands	\$3	\$0	\$4	\$0	\$412	\$0	\$521	\$0
Grasslands	\$113	\$0	\$29	\$0	\$342	\$5	\$989	\$143

Table 2.5-2 Estimated Average Ecosystem Benefit Value by Type of Habitat and Benefit Category

Habitat Type	Average as a percentage of maximum value	Average benefit per acre per year			
		Provisioning	Cultural	Regulating	Habitat
Coastal systems	5%	\$181	\$991	\$728	\$4
Coastal wetlands	15%	\$595	\$208	\$9,714	\$4,937
Inland wetlands	33%	\$1,533	\$1,326	\$3,634	\$548
Rivers and lakes	33%	\$912	\$431	\$786	\$0
Temperate forests	33%	\$274	\$15	\$72	\$407
Woodlands	5%	\$21	\$0	\$26	\$0
Grasslands	67%	\$229	\$4	\$663	\$96

Source: Russi et al. 2013

Another source of ecosystem service value data is the ecosystem service valuation database created by the Economics of Ecosystems and Biodiversity (TEEB). TEEB is a global initiative with a stated objective of “making nature’s values visible” by including biodiversity and ecosystem services value as part of mainstream decision-making (ESP 2020). One of the activities of this group to support recognition of the wide range of benefits provided by ecosystems was to create the TEEB Valuation Database from which values could be evaluated. The database is in an Excel file format and available at <https://www.es-partnership.org/services/data-knowledge-sharing/ecosystem-service-valuation-database/>.

The TEEB Valuation Database includes 1,310 listed ecosystem service valuations, of which 102 observations are for studies based in the United States. There are 48 U.S. observations, after removing studies valuing coastal wetlands, coral reefs, coastal habitats, and tropical forest areas not applicable to a temperate climate. Finally, observations based on studies valuing ecosystem services in the northeast, southeast, and northern Midwest United States were removed. The remaining 28 values represent studies in the southwest, rocky mountain, and southcentral regions of the United States that are most representative of the LPP area. Ecosystems represented by these remaining 28 ecosystem service values include cultivated land, desert, forests, fresh water, grasslands, and inland wetlands. Ecosystem services represented by these remaining 28 values are shown in Table 2.5-3. Total economic value is included as an ecosystem service and benefit category for cultivated land, desert, and grasslands. Total economic value is a concept that reflects human based values from a natural resource such as cultural values, rural lifestyle, use and non-use values, and others. Any of the ecosystems listed in Table 2.5-3 could include total economic value as an ecosystem benefit, but the TEEB Valuation Database specifically identified total economic value for these three ecosystems.

Table 2.5-3 Ecosystem Service and Benefit Categories from the TEEB Database Applicable to the Lake Powell Pipeline Region

Ecosystems	Ecosystem Service Categories	Ecosystem Service Benefit Categories
Cultivated Land	Erosion Soil fertility Total Economic Value	Erosion prevention Maintenance of soil structure Total Economic Value
Desert	Total Economic Value	Total Economic Value
Forest	Genepool Total Economic Value	Biodiversity protection Total Economic Value
Fresh Water	Energy Water Waste Recreation	Hydroelectricity Irrigation water Industrial water Waste treatment Recreation
Grasslands	Aesthetic Climate Erosion Total Economic Value Food	Attractive landscapes Carbon sequestration Gas regulation Erosion prevention Total economic value Food
Inland Wetlands	Waste treatment Recreation in Floodplains Extreme events (marshes)	Waste treatment Recreation Flood prevention

Total Economic Value referenced in Table 2.5-3 represents the sum of all benefits obtained from a resource. Typically, these benefits include use value, option value, bequest value, and existence value. Use value is obtained by removing a product in nature (direct use value) such as timber or water, or through the benefit of a non-removable product in nature (indirect use value) such as a sunset or waterfall. Non-use values are derived from the existence of the natural resource, such as knowing a desirable species exists even though we may never see them. Option value represents the potential future ability to use a resource, even though it is not currently used. This reflects the willingness to preserve an option for potential future use. Bequest value is derived from the satisfaction of preserving a natural environment for future generations.

The TEEB valuation database values for the 28 observations are shown in Table 2.5-4. The range of median to average values for each of the ecosystems included in the TEEB valuation database represent a range of potential measures of central tendency for ecosystem values. The standard deviation shown in Table 2.5-4 is a measure of the amount of variation or dispersion of the data. Smaller standard deviations indicate reduced variation of the data. The ecosystem service values presented in Table 2.5-4 are within the range of values presented in the other studies discussed above, which provides supporting evidence for the magnitude of values presented in Table 2.5-4.

There are two potential sources of impacts identified for the Proposed Project alternatives that could have ecosystem value effects, riparian area impacts and vegetation community impacts. Potential temporary riparian impacts were identified for 2.85 acres for the Southern Alternative and 2.67 acres for the Highway Alternative. Given the limited acreage and temporary nature of riparian impacts, an economic value is not estimated for these potential effects.

The permanent disturbance effects to vegetation communities could have a measurable effect on ecosystem service values. The permanently disturbed vegetation area is estimated to be 168.3 acres for the Southern Alternative and 170.6 acres for the Highway Alternative. Over 4,000 acres were estimated to be temporarily disturbed for each alternative, but the extent of this disturbance on ecosystem service values is not known, so ecosystem loss values are not estimated for temporarily disturbed acres.

The permanently disturbed acres in the Colorado Plateau and Mojave Desert regions would most closely fit the desert and forest ecosystems listed in table 2.5-4, with the majority a desert type of ecosystem. Therefore, an annual value of \$200 per acre is used to value ecosystem services on these acres. The value of ecosystem services on permanently disturbed vegetation acres are estimated to be about \$33,700 annually for the Southern Alternative and \$34,100 annually for the Highway Alternative. The present value of the vegetation ecosystem impacts over 100 years discounting at the current project planning rate of 2.875 percent is \$1,103,300 for the Southern Alternative and \$1,116,400 for the Highway Alternative.

2.5.3 Recreation

Recreation activities occurring throughout the Project Area involve a broad spectrum of pursuits ranging from dispersed and casual recreation to organized, BLM-permitted group recreation. Typical recreation in the region includes off-road driving, scenic driving, hunting, hiking, wildlife viewing, horseback riding, camping, backpacking, mountain biking, geocaching, picnicking, night-sky viewing, and photography. Large-scale undeveloped areas and remoteness which provide a variety of recreational opportunities for users who wish to experience primitive and undeveloped recreation, as well as those seeking more organized or packaged recreation experiences. With the increase in local populations has come a dramatic increase in the level of off-road use, which is expected to continue growing. Future growth and associated recreation could be supported by additional water supplies that reduce constraints to growth. Recreational values are provided below for reference, recognizing that estimates of the changes in recreation visitation are not available so recreation effects cannot be estimated.

A Forest Service report of recreation economic values (Rosenberger et al. 2017) provides estimates of recreation values by type of use for Forest Service Regions within the United States. Forest Service Region 3 includes Arizona and New Mexico while Forest Service Region Four includes Utah, Nevada, and portions of Idaho and Wyoming. Estimated recreation values for various activities in Regions Three and Four are shown in Table 2.5-5.

The recreational effects associated with the Southern and Highway Alternatives are described as temporary access restrictions of one day. There could be some loss of recreation benefits associated with these short-term restrictions, but the extent of the loss is unknown and likely to be small. Therefore, no adverse economic impact values are estimated for recreation. However, it is recognized that recreation is a valuable resource to the region.

Table 2.5-4 Ecosystem Service Values Per Acre in 2019 Dollars

Ecosystem	Observations	Average	High	Low	Standard Deviation	Median	Median to Average range
Cultivated land	4	\$72.96	\$124.53	\$29.52	\$39.84	\$68.88	\$68.88 - \$72.96
Desert	1	\$184.87	NA	NA	NA	NA	NA - \$184.87
Forests	3	\$962.68	\$2,645.65	\$47.55	\$1,459.36	\$194.83	\$194.83 - \$962.68
Fresh water	9	\$363.93	\$1,521.47	\$1.16	\$485.78	\$160.69	\$160.69 - \$363.93
Grasslands	8	\$37.69	\$149.67	\$0.03	\$51.76	\$18.49	\$18.49 - \$37.69
Inland Wetlands	3	\$929.10	\$2,334.43	\$226.43	\$1,217.06	\$226.43	\$226.43 - \$929.10

Table 2.5-5 Recreation Values by Type of Activity for Forest Service Regions Three and Four

Recreation Activity	Region Three - Arizona and New Mexico	Region Four - Utah, Nevada, and Parts of Idaho and Wyoming	Average of Region Three and Four Values
Backpacking	\$40.89	\$42.81	\$41.85
Hiking	\$92.20	\$94.12	\$93.16
Nature related	\$67.87	\$69.79	\$68.83
Off-Highway Vehicle	\$58.19	\$60.11	\$59.15
Other	\$72.75	\$74.66	\$73.70
Average of all activities	\$76.20	\$77.04	\$76.62

2.5.4 Grazing

The value of land for grazing purposes is evaluated using two data sources. County level estimates of cash rent values per acre for pastureland were obtained from the Utah Department of Agriculture and Food (2019) for the Southern District and specifically for Kane County and Washington County. Average pastureland cash rent values in 2019 were \$2.00 per acre for Kane County and \$3.20 per acre for Washington County. The average 2019 pasture rent value for the Utah Southern District was \$2.90 per acre. County-specific pastureland data were not available for Arizona.

State level grazing fee data were obtained from a 17-state grazing fee report (USDA 2019b) for Utah and Arizona. Average grazing fees in 2019 were estimated to be \$18 per animal unit month (AUM) for Utah and \$9.50 per AUM for Arizona. An AUM represents the amount of forage required for one animal unit: one mature cow and a calf as old as 6 months or their equivalent, for 1 month. Assuming 7 to 8 acres are required per AUM, the grazing value would range from \$2.25 to \$2.57 per acre. The grazing value per acre is very similar to the pastureland cash rent values. Since the grazing values are based on state-wide averages, the more site-specific Utah Southern District value of \$2.90 per acre is used to value the economic effects on grazing.

The permanent grazing effects for all land managers and owners are estimated to be 112.6 acres for the Southern Alternative and 114.9 acres for the Highway Alternative. Temporary effects were also estimated, equaling about 3,603 acres for the Southern Alternative and about 2,723 acres for the Highway Alternative. The extent of the temporary effects and the ultimate effect on grazing values is not known so those values are not estimated here. At a value of \$2.90 per acre, the adverse permanent grazing effects are estimated to be about \$327 annually for the Southern Alternative and \$333 annually for the Highway Alternative. The present value of these impacts over 100 years discounting at the current project planning rate of 2.875% is \$10,700 for the Southern Alternative and \$10,900 for the Highway Alternative.

2.5.5 Kaibab Indian Reservation

As discussed in Section 1.4.4 above, the KIR has a population with relatively low income and high unemployment. As a result, any rights-of-way payments associated with the LPP alternatives would provide some needed funds to the Kaibab Band of Paiute Indians. In addition, pipeline construction activities and expenditures would provide added short-term opportunities for employment and income in the study region, including the KIR.

2.6 Effect of Changes in Water Rates on Future Water Use

Another potential effect of the LPP that needs to be considered is the influence of increased water rates needed to pay a portion of the pipeline costs on future use. The State of Utah Performance Audit of the Repayment Feasibility of the Lake Powell Pipeline (Audit Report) indicated WCWCD planned to increase rates by \$0.10 per 1,000 gallons a year over a 30-year period. This results in an annual equivalent increase in water costs of about 5.2 percent. Beyond that time, a 1.5 percent increase was assumed. This rate of increase is likely to result in reduced water use and demand, and potentially reduced water service revenues.

2.6.1 Price Elasticity of Demand for Municipal and Industrial Water Use

Previously completed municipal water demand studies have identified important factors that influence household and commercial water demand and have estimated municipal water demand curves. These studies have included several different variables to explain water use, several different measures of price, different functional forms to model demand, and different base level supply conditions. Despite the different approaches used, modeling results have been consistent in terms of the influence of price on quantity demanded. The price and income elasticity of demand for water has been shown to be consistently inelastic.

Elasticity is an important concept that is used to describe how the quantity demanded for a good or service reacts to changes in the variables that influence demand. A general definition of elasticity is:

Elasticity = $(\Delta x/x)/(\Delta y/y)$ or the percentage change in x divided by the percentage change in y.

If we are interested in the price elasticity of demand, Price elasticity of demand (ϵ_d) = $(\Delta Q/Q)/(\Delta P/P)$ where Q is quantity demanded and P is price. In terms of calculus:

$$\epsilon_d = [\partial Q/\partial P_Q] * [P_Q/Q] \quad (2)$$

The term $[\partial Q/\partial P_Q]$ is equivalent to the coefficient for price in a double log demand equation. In other words, the effect of a change in price on quantity demanded is constant throughout the range of possible prices and quantities.

For a normal good, price elasticity of demand is negative (a higher price results in less of a good purchased) and income elasticity is typically positive (higher income results in more purchased). If the calculated absolute value of price elasticity of demand is greater than one, the good is characterized as being price elastic, meaning that the quantity demanded is very responsive to a change in price. An absolute value of price elasticity less than one is inelastic demand, where a percentage change in price results in a percentage change in quantity demanded that is less than the percentage change in price. A greater price elasticity of demand, more elastic, implies greater effectiveness of price as a conservation tool.

Most of the previous studies of domestic water demand have estimated an inelastic price elasticity of demand. Given that water does not have any real substitutes and generally represents a small percentage of total household expenditures, demand would be expected to be price inelastic. Some previously completed water demand studies and estimated price elasticities are summarized in Table 2.6-1.

Additional studies using the meta-analysis technique, where the characteristics of previously completed studies are used to derive common relationships, have also been completed which can help in evaluating long run elasticities which is most applicable to a long-term period of analysis. Espey, Espey, and Shaw (1997) reviewed 24 journal articles providing 124 estimates of price elasticity. The median long-run elasticity was estimated to be -0.64. Another meta-analysis study by Worthington and Hoffman (2008) estimated a range of long-run elasticities from -0.5 to -1.0. Therefore, a long-run elasticity of -0.65 appears reasonable.

There are some general observations from the studies presented in Table 2.6-1 that can be made. First, although there is a wide range of estimated elasticities, previous studies indicate a typical range of about -0.20 to -0.60. Second, the estimated long-run elasticities are consistently greater, in absolute value terms, than the estimated short-run elasticities. This result is expected because water users can adjust to price changes in the long run using new technology, reduced lawn area and different landscape materials, or other adjustments in water application and use. Third, the price variable used in previous water demand studies has included average price, marginal price, or a combination of both. Arguments have been made for the use of both average and marginal price as the relevant price influencing consumer behavior.

2.6.2 Long-run Effect of Increasing Municipal Water Prices on Domestic Water Use

Assuming a long-run price elasticity of demand for domestic water supply of -0.65 and an annual increase in retail water rates of 5.2 percent as described for water costs in the Audit Report over 30 years, water use per user would decrease by 3.38 percent annually. A 1.5 percent increase in price would result in a 0.975 percent annual decrease in use per user. However, if the number of households and commercial users increase greater than the decrease in use, then total demand would increase. The estimated price elasticities less than -1.0 also indicates total water revenues from water charges would continue to increase overall.

Table 2.6-1 Price Elasticities Estimated in Previous Water Demand Studies

Author(s)	Year of Study	Price Elasticities	Geographic Region
Agthe and Billings	1980		Tucson, AZ
- short run		-0.179 to -0.358	
- long run		-0.266 to -0.705	
Agthe, Billings, Dobra, Raffice	1986		Tucson, AZ
- long run		-0.125 to -0.624	
- short run		-0.019 to -0.364	
Billings and Day	1989		Tucson, AZ
Dalhuisen, et al. (meta-analysis)	2003		U.S.
- mean		-0.41	
- median		-0.35	
Espey, Espey, and Shaw (meta-analysis)	1997		U.S.
Foster and Beattie	1979		U.S.
- Rocky Mountains		-0.226	
- Southwest		-0.122	
Gottlieb	1963		Kansas
Howe and Linaweaver	1967		U.S.
Jones and Morris	1984		Denver, CO
Martin and Wilder	1992		Columbia, SC
Nieswiadomy	1992		U.S.
Nieswiadomy and Molina	1989		Denton, TX
Nieswiadomy and Cobb	1993		
- increasing block rate structure		-0.64	U.S.
- decreasing block rate structure		-0.46	
Piper	2003		U.S.
Renwick and Archibald	1998		Southern CA
- all water users		-0.33	
- less than \$20,000 income		-0.53	
- \$20,000 to \$59,999 income		-0.21	
- \$60,000 to \$99,999 income		-0.22	
- over \$100,000 income		-0.11	
Renwick and Green	2000		California
Schneider and Whitlach	1991		Columbus, OH
- residential		-0.110 to -0.262	
- commercial		-0.234 to -0.918	
- industrial		-0.112 to -0.438	
Weber	1989		Oakland, CA
Williams	1985		U.S.
Williams and Suh	1986		U.S.
- long run residential		-0.294 to -0.485	
- long run commercial		-0.141 to -0.360	
- long run industrial		-0.438 to -0.735	
Wong	1972		Chicago area
- Cities over 25,000 people		-0.530	
- Cities 10,000 to 24,999 people		-0.817	
- Cities 5,000 to 9,999 people		-0.463	
- Towns less than 5,000 people		-0.257	
Young	1973		Tucson, AZ

Key:

- AZ = Arizona
- CA = California
- CO = Colorado
- OH = Ohio
- SC = South Carolina
- TX = Texas
- U.S. = United States

2.7 Comparative Analysis of Alternatives

Under the No Action Alternative, the Proposed Project would not be constructed, and water demands would attempt to be met through a variety of other projects, as well as more aggressive conservation measures. The No Action Alternative would have major adverse effects to water supply reliability and result in negligible beneficial regional economic effects over the long term due to construction of other projects to meet anticipated demand for water in the region.

Under either of the proposed action alternatives, the Proposed Project would be constructed and operated. The socioeconomic effects of both action alternatives are essentially the same, with negligible differences in projected costs and positive economic impacts.

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4 Acronyms

ACS	(U.S. Census Bureau) American Community Survey
AIS	Aquatic Invasive Species
ATP	Ability to pay
AUM	animal unit month
BEA	Bureau of Economic Analysis
CPI	consumer price index
EPA	U.S. Environmental Protection Agency
Forest Service	U.S. Department of Agriculture Forest Service
IDC	Interest during construction
KIR	Kaibab Indian Reservation
IMPLAN	IMPact analysis for PLANning
LPP	Lake Powell Pipeline Project
OM&R	Operation, maintenance, and replacement costs
Reclamation	Bureau of Reclamation
TEEB	The Economics of Ecosystems and Biodiversity
WCWCD	Washington County Water Conservancy District
WTA	Willingness to accept payment
WTP	Willingness to pay

5 Consultation and Coordination

No specific consultation or coordination efforts took place.



— BUREAU OF —
RECLAMATION

Lake Powell Pipeline Project Appendix C-24: Environmental Justice

**Coconino and Mohave Counties, Arizona
Kane and Washington Counties, Utah**

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1 Introduction/Affected Environment

1.1 Regulatory Framework

Executive Order 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations was issued by President William J. Clinton in 1994 and is the impetus for including an analysis in National Environmental Policy Act documents on disadvantaged populations. Its purpose is to focus federal attention on disproportionately high and adverse environmental and human health effects of federal actions on minority and low-income populations, with the goal of achieving environmental protection for all communities. Executive Order 12898 does not dictate how federal agencies should respond to potential effects on minority and low-income populations, only that those effects be disclosed.

1.2 Methodology

A survey of the environmental justice (EJ) characteristics of a selection of blockgroups was completed to determine whether one or more EJ populations was present in the study area. Blockgroups surveyed included blockgroups through which the Lake Powell Pipeline Project (LPP) alternative routes pass, as well as a sample of blockgroups from the surrounding region. EJ population percentage data were identified by means of the U.S. Environmental Protection Agency's EJScreen web tool (EPA 2018). Figures 1.2-1 through 1.2-3 depict the census blockgroup numbers and location.

There are three types of EJ populations: minority, low-income, and American Indian. A minority or low-income EJ population was found to be present if the EJ population exceeded 50 percent of the population of the blockgroup or the EJ population was 10 or more percentage points above the corresponding EJ population of the state of Utah or the state of Arizona, which served as reference populations for their respective counties. An American Indian EJ population was found to be present if a concentrated population of American Indians—based on U.S. Census Bureau data, compiled by Headwaters Economics—was present in a surveyed blockgroup (Headwaters Economics 2020).

A discussion of cumulative effects is provided in Appendix C-25, Cumulative Effects.

1.3 Environmental Protection Measures

There are no environmental protection measures for EJ for this project.

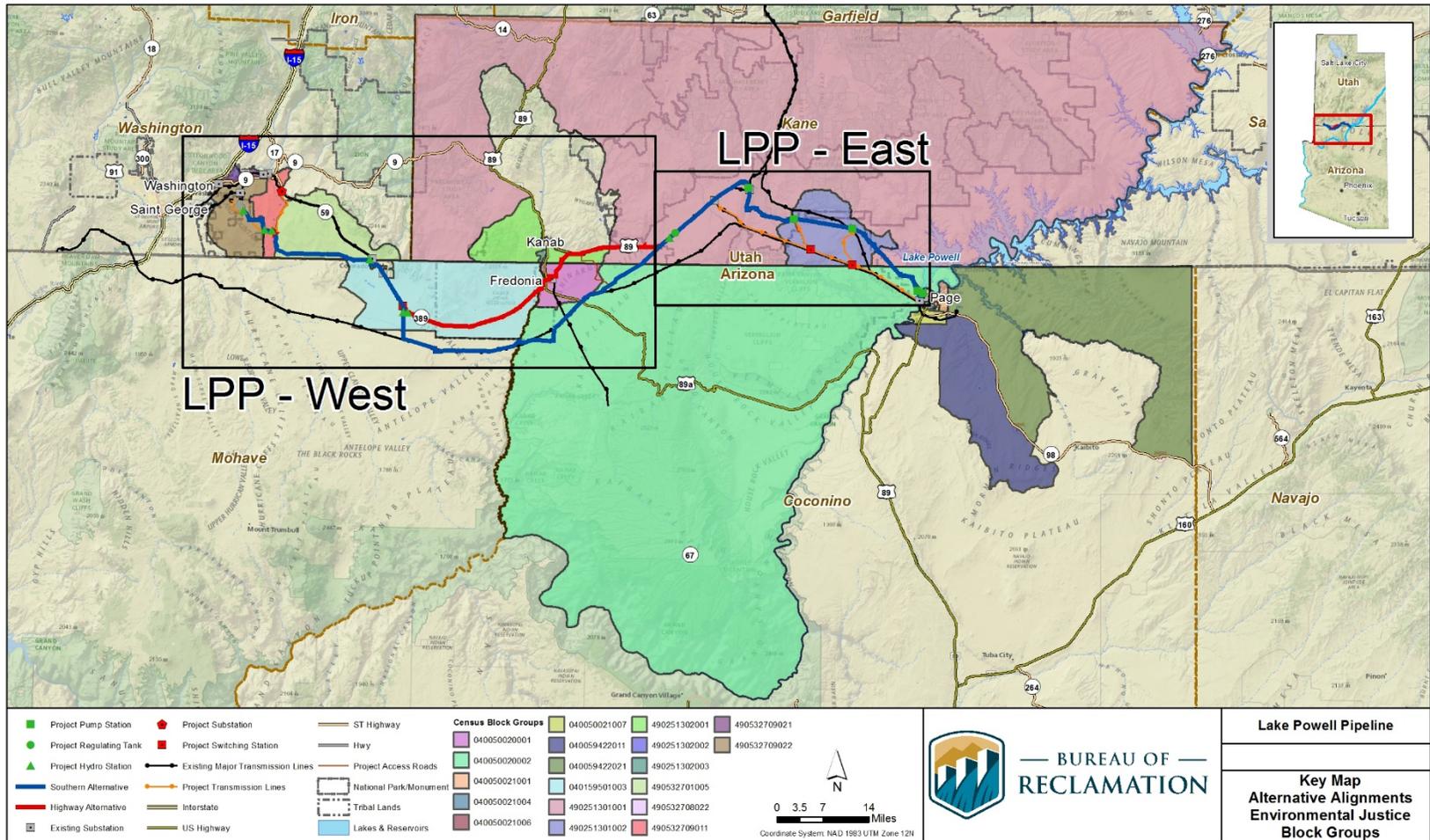


Figure 1.2-1 Key Map Alternative Alignments Environmental Justice Block Groups

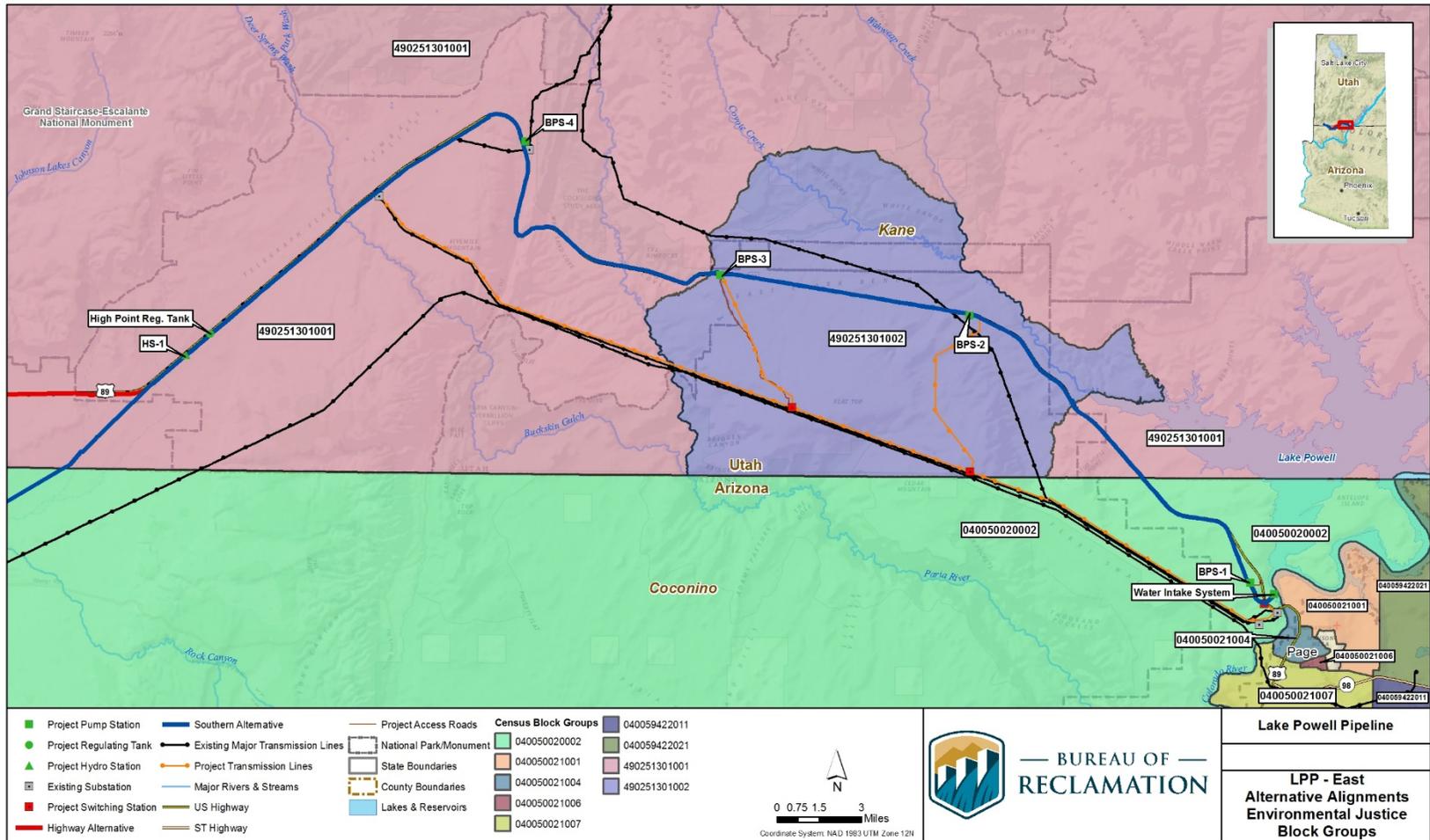


Figure 1.2-2 LPP – East Alternative Alignments Environmental Justice Block Groups.

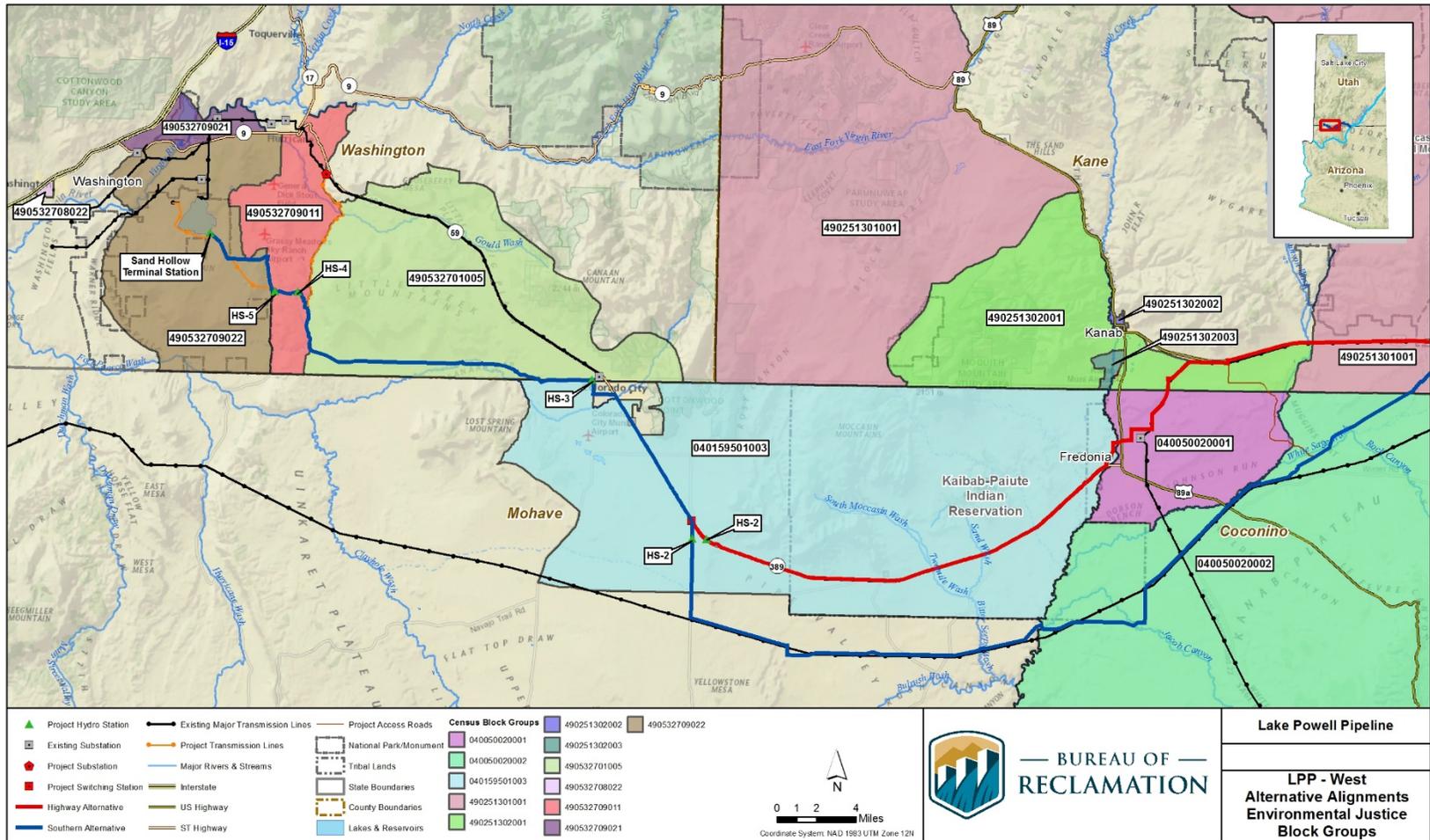


Figure 1.2-3 LPP – West Alternative Alignments Environmental Justice Block Groups.

1.4 Existing Conditions

All three types of EJ populations are present in the Project Area (Table 1.4-1).

A low income EJ population is present. The percentage of the population classified as low income in multiple blockgroups analyzed is equal to or greater than 50 percent, or it is more than 10 percentage points higher than that of the reference populations of the state of Utah and the state of Arizona. A low income EJ population, therefore, is considered present for the purposes of this analysis.

A minority EJ population is also present. The percentage of the population identified as belonging to a minority group in multiple blockgroups analyzed is equal to or greater than 50 percent, or it is more than 10 percentage points higher than that of the reference populations of the state of Utah and the state of Arizona. A minority EJ population, therefore, is considered present for the purposes of this analysis.

An American Indian EJ population is present. There are multiple concentrated populations of American Indians living within one or more of the blockgroups included in the analysis. An American Indian EJ population, therefore, is considered present for the purposes of this analysis.

Table 1.4-1 Percentage of Population within Each Blockgroup by Type of Environmental Justice Population

Population	Low Income	Minority	American Indian
Blockgroup 040050021001	19%	54%	37.74%
Blockgroup 040059422011	41%	99%	96.57%
Blockgroup 040059422021	78%	98%	97.68%
Blockgroup 040050021006	19%	91%	91.11%
Blockgroup 040050021004	54%	43%	38.38%
Blockgroup 490251301002	45%	15%	0.25%
Blockgroup 490251301001	28%	4%	0.58%
Blockgroup 040050020001	49%	30%	19.56%
Blockgroup 040050020002	34%	17%	3.72%
Blockgroup 040159501003	69%	6%	5.66%
Blockgroup 490251302001	22%	6%	0.95%
Blockgroup 490251302002	33%	2%	0.0%
Blockgroup 490532701005	67%	0%	0.0%
Blockgroup 490532709011	39%	10%	3.94%
Blockgroup 490532709022	41%	17%	0.34%
Blockgroup 490532708022	57%	44%	13.35%
Blockgroup 49053279021	24%	20%	2.18%
Blockgroup 040050021007	62%	70%	63.83%
Blockgroup 490251302003	29%	16%	5.78%
State of Utah	11.0%	21.0%	1.1%
State of Arizona	17.0%	44.4%	4.4%

2 Results/Environmental Consequences

2.1 No Action Alternative

The No Action Alternative would have no effect on EJ populations. If the LPP were not built, the Proposed Project would have no additional negative effects on EJ populations.

2.2 Southern Alternative

The Proposed Project would disproportionately affect the low-income and American Indian EJ populations. The American Indian EJ population would be adversely affected due to construction activities for the Proposed Project, which would cause permanent damage to locations that are culturally significant to local tribal groups, visual effects, and social effects on the tribes. Low-income households would be disproportionately affected by expected increases in water rates and by other economic variables that are influenced by the price of water (see Appendix C-23, Socioeconomics). No disproportionately high adverse impacts to the minority EJ population are anticipated.

The Kaibab Band of Paiute Indians (Tribe) has indicated that the Southern Alternative would damage culturally significant natural landscape features and would harm the Tribe's well-being (Appendix D, Analysis and Perspective of the Tribe, Supplement #3). The adverse effects of these specific physical damages to these landscape features would be unique to the Tribe and would not be shared by the wider population. Disproportionate adverse effects on the Tribe are, therefore, anticipated to occur under this alternative. Additional concerns from the Tribal perspective can be found in Appendix C-21, Ethnographic Resources, and Appendix D, Analysis and Perspective of the Tribe.

2.2.1 Mitigation Measures

No mitigation measures are proposed.

2.3 Highway Alternative

The Proposed Project would disproportionately affect the low-income and American Indian EJ populations. Similar to the Southern Alternative, the American Indian EJ population would be adversely affected due to construction activities for the Proposed Project, which would cause permanent damage to locations that are culturally significant to local tribal groups, visual effects, and social effects on the tribes, and disproportionate adverse effects on low-income households are anticipated due to expected increases in water rates. No disproportionately high adverse impacts to the minority EJ population are anticipated.

In addition, although the Tribe has indicated that the Highway Alternative would damage culturally significant natural landscape features and would harm the Tribe's well-being, the effect would not affect the Tribe to the same degree as under the Southern Alternative (see Appendix D, Supplement #3). The adverse effects of these specific physical damages to these landscape features would be unique to the Tribe and would not be shared by the wider population. Disproportionate adverse effects on the Tribe are, therefore, anticipated to occur under this alternative. Additional concerns from the Tribal perspective can be found in Appendix C-21, Ethnographic Resources, and Appendix D, Analysis and Perspective of the Tribe.

Under the repayment plan for the Proposed Project described in the Draft Environmental Impact Statement Section 3.20, Socioeconomics, and Appendix C-23, Socioeconomics, low-income populations living within the area to be served by the Proposed Project are expected to pay a higher percentage of their disposable incomes for water delivery, for property impact fees (whether directly or indirectly), and for local goods and services that incorporate higher water costs into their price structures in comparison to the broader community. Because demand for basic culinary water service is relatively price inelastic—meaning that the baseline amount of water consumed per person in a typical household is relatively inflexible regardless of the price charged per unit consumed—it is expected that lower income homes would experience disproportionate adverse economic effects from implementation of the proposed action. See the socioeconomic resources referenced above for additional information.

2.3.1 Mitigation Measures

No mitigation measures related to EJ are proposed for this project.

2.4 Comparative Analysis of Alternatives

The Proposed Project would have disproportionate adverse effects on EJ populations, regardless of the action alternative. Adverse effects on American Indian populations would be less under the Highway Alternative than the Southern Alternative.

Under either of the proposed action alternatives, there would be disproportionate adverse effects on the low income and American Indian EJ populations. The effects on low-income populations due to repayment would be adverse for both action alternatives. Effects on the concentrated American Indian populations living within the study area would be greater under the Southern Alternative than the Highway Alternative.

3 References

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4 Glossary

Blockgroup. Census block group with demographic information tied to each block. The smallest geographical unit for which the United States Census Bureau publishes sample data.

5 Acronyms

DEIS	Draft Environmental Impact Statement
EJ	Environmental Justice
LPP	Lake Powell Pipeline Project
Tribe	Kaibab Band of Paiute Indians

6 Consultation and Coordination

No specific consultation or coordination efforts took place.



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Lake Powell Pipeline Project Appendix C-25: Cumulative Effects

**Coconino and Mohave Counties, Arizona
Kane and Washington Counties, Utah**

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1 Introduction/Affected Environment

To support an informed decision, the Bureau of Reclamation (Reclamation) assessed potential contributions to cumulative effects on affected resources attributable to the Proposed Project. Cumulative effects associated with the Proposed Project could result from the combined direct and indirect effects of construction and operation of the Lake Powell Pipeline Project (LPP) facilities with other past, present, or reasonably foreseeable future actions, that overlap with the geographic scope and timeframe of the Proposed Project. The direct and indirect effects of the Proposed Project are discussed in detail in other sections and appendices of this Draft Environmental Impact Statement (DEIS).

1.1 Regulatory Framework

According to the Council on Environmental Quality's (CEQ's) regulations for implementing the National Environmental Policy Act (NEPA) (40 Code of Federal Regulations [CFR] Section 1508.7), a cumulative effect is an effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant actions taking place over a period of time. Thus, 40 CFR Section 1508.7 requires that these effects be analyzed for relevant resources in all environmental impact statements (EISs) prepared under NEPA. This analysis also comports with the direction for cumulative effects assessment in the U.S. Department of Interior's regulations for implementing NEPA (43 CFR Part 46) and Reclamation's NEPA Handbook (Reclamation 2012).

1.2 Methodology

This cumulative effects analysis generally follows the methodology set forth in relevant CEQ, U.S. Environmental Protection Agency (EPA) and Reclamation guidance (White House CEQ 1997, 2005; EPA 1999; Reclamation 2012). Under these guidance documents, inclusion of projects within this analysis is based on identifying commonalities of effects from other projects to potential effects that would result from the Proposed Project. Cumulative effects are based on net effects (i.e., effects remaining after mitigation has been applied) not gross effects. If the Proposed Project would not affect a resource, there also would be no potential for cumulative effects on that resource. In general, the overlapping effects from past and present actions are taken into account as part of the baseline conditions described in the Affected Environment section for each resource area analyzed in this DEIS.

The approach taken for this cumulative effects analysis is consistent with the intent of CEQ Regulations for Implementing NEPA at 40 CFR 1502.22, *Incomplete or Unavailable Information*. This regulation directs agencies on how to proceed when evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS, and there is incomplete or unavailable information. While information describing the characteristics and potential effects of other projects

and activities within the temporal and spatial boundaries used in this analysis is primarily qualitative, and, in some cases is incomplete or unavailable, there still is sufficient information to complete a fair disclosure and hard look at potential cumulative effects attributable to the Proposed Project.

For each resource that would be affected by the Proposed Project, this cumulative effects analysis includes the following steps:

- Any relevant interrelated effects from other past, present, and reasonably foreseeable future actions considered in this analysis are discussed; and
- The total combined cumulative effects of the Proposed Project and the effects from relevant past, present, and reasonably foreseeable future actions are discussed.

1.2.1 Spatial and Temporal Scope of Analysis

The following sections describe how the determination was made by Reclamation for the geographic and temporal boundaries used to identify other past, present, and reasonably foreseeable future actions that may have overlapping effects on one or more resources analyzed as part of this DEIS. For an action to be included in this analysis for a given resource, it must overlap with both the geographic *and* temporal scopes described in the sections that follow.

1.2.1.1 Geographic Scope of Analysis

The geographic scope of the cumulative effects analysis defines the physical limits or boundaries of the Proposed Project's effect on various resources, with the understanding that if the Proposed Project has no direct or indirect effect on a resource beyond a certain location, then there cannot be any overlapping effect from other actions that may lie beyond that point. Because the Proposed Project would affect various resources differently, the geographic scope for each resource analyzed in this DEIS varies. In general, the boundaries for the cumulative effects analysis for a specific resource are the same as those described in the Affected Environment section for each respective resource.

1.2.1.2 Temporal Scope of Analysis

The temporal scope used for this cumulative effects analysis has no set number of years going back in time; the key principle used for the analysis is to include past actions that may still contribute overlapping effects with the Proposed Project. For reasonably foreseeable future actions, the cumulative effects analysis considers effects that may occur up to 50 years into the future based on the expected operational life of the Proposed Project and lifespan of the LPP water exchange contract.

2 Past, Present, and Reasonably Foreseeable Future Actions

This section describes past, present, and reasonably foreseeable actions that were identified using the geographic and temporal boundaries described in Section 1.2.1, above, that could contribute to cumulative effects from construction and operation of the Proposed Project. Past and present actions identified are those that would likely have overlapping effects with the Proposed Project. Reasonably foreseeable future actions are those future actions where there is a reasonable expectation that the action could occur, such as a proposed action already under environmental analysis; a project where environmental analysis has already been completed, but construction/implementation has not yet begun; a project that has already started construction; or a future action stated in a report, such as a planning document and/or that has obligated funding.

The list of past, present, or reasonably foreseeable future actions with potential overlapping cumulative effects with the Proposed Project that fall within the geographic and temporal boundaries was obtained by researching potential actions implemented by the following local, state, and federal agencies and tribes:

- Federal Energy Regulatory Commission;
- Bureau of Land Management (BLM);
- National Park Service (NPS);
- U.S. Forest Service;
- U.S. Fish and Wildlife Service (USFWS);
- U.S. Geological Survey;
- Utah Division of Wildlife Resources;
- Utah Department of Transportation (UDOT);
- Washington County Water Conservancy District (WCWCD);
- Washington County, Utah;
- Kane County, Utah;
- Planning and public works departments of the Utah cities of St. George, Washington, Hurricane, Santa Clara, Ivins, Toquerville, LaVerkin, Hildale, and Kanab;
- Planning and public works departments of the Arizona cities of Colorado City, Fredonia, and Page;
- Arizona Department of Transportation (ADOT);
- Arizona State Land Department;
- Arizona Department of Fish and Game;
- Mohave County, Arizona;
- Coconino County, Arizona;
- Kaibab Band of Paiute Indians (Tribe);
- Paiute Indian Tribe of Utah;
- Sierra Club;
- Southern Utah Wilderness Alliance;

- Citizens for Dixie’s Future, Living Rivers; and
- American Rivers.

2.1 Past and Present Actions

Reclamation – Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead EIS and Record of Decision (ROD)

Current Status: Completed and in implementation phase

Proximity to Project: West portion of proposed pipeline is within the Colorado River Lower Basin

ROD Date: 2007

In December 2007, the Secretary of the Interior adopted the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead. This action was taken to address water availability in the lower basin and operations of Lake Powell and Lake Mead during drought and low-reservoir conditions.

Coordinated operations under the 2007 ROD primarily govern the annual release from Lake Powell, and the reservoir operations decisions under the Guidelines will remain in effect through 2026. The Guidelines provide direction to Reclamation on monthly to annual operations of Glen Canyon Dam to better “equalize” the contents of Lake Powell and Lake Mead. The equalization provisions state that if the forecasted end-of-year storage (September 30 of each year) in Lake Powell is greater than the end-of-year storage in Lake Mead, Lake Powell will release more than the minimum objective release to equalize storage between the two reservoirs. Equalization only occurs if there is enough storage in the Upper Basin.

The Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead Guidelines have been fully integrated into the technical analysis and modeling of the LPP Project.

Reclamation – Adoption of Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead

Current Status: Completed and in implementation phase

Proximity to Project: Eastern portion of the Proposed Project is located in the Lower Colorado River Basin

ROD Date: 2007

Reclamation published a Final EIS on the proposed adoption of specific Colorado River Lower Basin shortage guidelines and coordinated reservoir management strategies to address operations of Lake Powell and Lake Mead, particularly under low reservoir conditions, through 2026.

Reclamation – Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona, 2011 Through 2020 Environmental Assessment

Current Status: Completed and in implementation phase

Proximity to Project: 0 Miles; project starts at the Glen Canyon Dam

Finding of No Significant Impact (FONSI) Date: 2012

Reclamation’s Environmental Assessment (EA) and FONSI approved experimental releases of high-water volumes from Lake Powell that will occur through 2020. The action evaluated as part of the EA affects reservoir water surface elevations.

Reclamation and NPS – Glen Canyon Dam Long-Term Management Plan EIS and ROD

Current Status: Completed and in implementation phase

Proximity to Project: 0 miles; pipeline starts at Glen Canyon Dam

ROD Date: 2016

Reclamation and NPS developed a long-term management plan to determine the timing and volume of water flows from Glen Canyon Dam. Those flows affect hydroelectricity production, beach recreation, native fish, and other river-related plants and animals, as well as archaeological sites in Grand Canyon National Park and Glen Canyon National Recreation Area.

The long-term management plan addressed routine operations, as well as “experimental” flows that provide additional scientific information about how to protect endangered fish and lessen the effects of dam operations on downstream ecology and other resources. The plan is intended to ensure that regulated flows on the Colorado River meet the goals of supplying hydroelectricity and water for communities, agriculture, and industry at the same time they protect the ecologies of the Grand Canyon and Glen Canyon and improve and protect resources pursuant to the 1992 Grand Canyon Protection Act, while also complying with the Law of the River, the Endangered Species Act of 1973 (ESA), and other applicable laws.

NPS – Glen Canyon National Recreation Area - South Central Communications (SCC) Buckskin to Page Project

Current Status: Completed

Proximity to Project: U.S. Highway 89 road right-of-way (ROW), which is within NPS administered lands from the Glen Canyon boundary near Big Water, Utah, to Page, Arizona

Categorical Exclusion Date: 2016

The NPS categorically excluded from further NEPA analysis and issued a ROW permit for the Buckskin to Page Project for South Central Utah Telephone Association, Inc., doing business as SCC, within the Glen Canyon National Recreation Area. SCC constructed and now operates and maintains a buried telecommunications system within the UDOT/ADOT U.S. Highway 89 road ROW, which is within NPS-managed lands from the Glen Canyon boundary near Big Water, Utah to Page, Arizona.

NPS – Glen Canyon National Recreation Area - Off-Road Vehicle Management Plan/EIS

Current Status: Completed

Proximity to Project: Overlapping in the Ferry Swale area and along Proposed Project access routes and ROW

ROD Date: 2017; Final Rule to be promulgated Spring 2020

The NPS completed the Glen Canyon Off-Road Vehicle (ORV) Plan/EIS in 2017. This plan analyzes the impacts of off-highway vehicle ([OHVs], street-legal all-terrain vehicles) use on paved and unpaved park roads (roads defined in the 1979 Glen Canyon General Management Plan), as well as impacts of vehicle use off of park roads on ORV routes and at ORV play areas. This plan and pending final rulemaking process allow for OHV/all-terrain vehicle use on over 200+ miles of park roads and authorizes/designates off-road use of vehicles on 21+ miles of designated ORV routes in the Ferry Swale area and 14 designated ORV areas within Glen Canyon. ORV areas exist adjacent to the Lake Powell shoreline areas.

NPS – Glen Canyon National Recreation Area Ferry Swale Visitor Use Area Developments

Current Status: Completed, in process, and planned

Proximity to Project: Proposed Project staging area, access routes, and ROW overlap the Ferry Swale visitor use area

Categorical Exclusion Date: 2017 for designated a camping area and formalizing loop trail; civic engagement completed in 2019 for fee collection for entrance and camping at the location.

As a result of increasing demand for land-based recreational opportunities, especially in front-country areas, the increase in popularity for overnight stays/camping opportunities, and a socially created front-country loop hiking trail, the NPS formalized a designated camping area and loop trail that has been heavily used by visitors over the past few years in order to better manage visitor use and protect resources.

This area will also be developed to include an ORV staging area for the ORV Routes recently designated under the Glen Canyon ORV Plan/EIS for users of the 21+ miles of routes in the Ferry Swale area. Additional future plans to accommodate visitor use include installation of an “iron ranger” fee collection unit, vault toilets, parking, formal trail heads, and potentially the formalization of an additional loop trail.

Reclamation – Closure of the Navajo Generating Station

Current Status: Completed

Proximity to Project: The Navajo Generating Station site is approximately 5 miles southeast of the proposed intake structure in Lake Powell for the Proposed Project.

In December 2019, the Department of the Interior and the other owners of the Navajo Generating Station - Arizona Public Service, NV Energy, Salt River Project, and Tucson Electric Power – decided to close the 2,250 mega-watt (MW) coal-fired generating station. The closure has resulted in a significant decrease in air pollutant emissions in the region, including greenhouse gas (GHG) emissions.

Bureau of Indian Affairs and BLM – St. George Wastewater Reuse Project

Current Status: Completed and in implementation phase

Proximity to Project: About 15 miles west from end of proposed pipeline at the Sand Hollow Reservoir

ROD Date: 2002

The Shivwits Band of the Paiute Indian Tribe of Utah Water Rights Settlement Act (Settlement Act), Public Law 106-263, confirmed a water right of 4,000 acre-feet per year for the Shivwits Band of Paiute Indians in 2000. The Settlement Act became fully effective in November 2003, when the Secretary of the Interior determined that all of the requirements of the Settlement Act had been completed. One of the projects that provide the Shivwits Band their water is the St. George Water Reuse Project (SGWRP), which treats and recycles discharges from the St. George Regional Wastewater Reclamation Facility. The SGWRP will provide 2,000 acre-feet per year of water.

As part of this project, WCWCD and the City of St. George constructed an 8-mile pipeline from the wastewater treatment plant to the Ivins Reservoir for the purpose of delivering this water to irrigators and the Shivwits Band. The SGWRP is designed for expansion to generate approximately 11,732 acre-feet per year; however, State Engineer restrictions result in generating only 5,800 acre-feet per year. In addition to the 2,000 acre-feet per year allocated for the Shivwits Band, 3,800 acre-feet per year are provided for irrigation use at golf courses, city parks, and cemeteries.

UDOT – Southern Corridor (Parkway) Highway

Current Status: Construction partially complete, and project is in operation phase

Proximity to Project: About 3 miles west of the western end of the proposed pipeline at Sand Hollow Reservoir

ROD Date: 2005

The Southern Corridor is a four-lane, limited-access highway designated as Utah Route 7 beginning at Interstate 15 (I-15) near the southwest end of St. George about 2 miles from the Arizona border at the Atkinville interchange. It will eventually connect with Utah State Highway 9 in Hurricane. In 2005, the UDOT released the Southern Corridor Final EIS for the project. To date, a portion of the highway has been constructed as four lanes and is in service from the junction with I-15 south of St. George to approximately 3 miles west of Sand Hollow Reservoir.

BLM – Red Cliffs National Conservation Area Trailhead Projects

Current Status: Construction completed, and project is in operation phase

Proximity to Project: The White Reef Trailhead is approximately 8 miles northwest of the Proposed Project, and the Red Mountain Trailhead is approximately 20 miles northwest of the western terminus of the Proposed Project at Sand Hollow Reservoir.

FONSI Date: 2010

The Red Cliffs National Conservation Area (NCA) is in central Washington County. Funding was obligated through the American Recovery and Reinvestment Act of 2009 and an EA was prepared for construction of two new trailheads (White Reef and Red Mountain) that provide fenced parking areas, interpretive kiosks, vault toilets, and other visitor amenities. Both trailheads were completed in

fiscal year 2010. The White Reef trailhead provides access to a newly designated approximately 6-mile-long non-motorized trail system that will provide connections to other trails in the NCA.

Kane County Water Conservancy District – Jackson Flat Reservoir

Current Status: Construction completed in 2013 and in operation phase

Proximity to Project: About 1.5 miles from proposed pipeline near Kanab, Utah

The Jackson Flat Reservoir is a 4,228-acre-foot reservoir that stores non-potable water. The reservoir is located just south of Kanab and just east of Kanab municipal airport in Kane County, Utah. The reservoir was completed in 2013 and filled with water diverted from Kanab Creek. The water beneficiaries are the Kanab Irrigation Company shareholders. The cost of the project was \$12 million, which was funded by a \$5 million grant from the U.S. Army Corps of Engineers and other monies from Utah State Division of Water Resources and other entities.

BLM – SCC Buckskin to Page Project

Current Status: Completed and in operation phase

Proximity to Project: Runs parallel to eastern portion of proposed pipeline

FONSI Date: 2016

BLM prepared an EA for the proposed Buckskin to Page Project for South Central Utah Telephone Association, Inc., doing business as SCC, within the Grand Staircase-Escalante National Monument (GSENM) and on lands administered by the BLM Kanab Field Office. SCC constructed and now operates and maintains a buried 35.45-mile (187,196-foot) telecommunications system within the UDOT U.S. Highway 89 ROW, which follows the congressionally designated utility corridor through GSENM and the BLM Kanab Field Office. The project route originates at Five Mile Mountain Road turnoff, approximately 30 miles east of Kanab, Utah, and continues east-southeast to Page, Arizona.

BLM – SCC Fiber Optic Project

Current Status: Completed and in operation phase

Proximity to Project: Cottonwood Road is approximately 11 miles from the Proposed Project.

FONSI Date: 2017

BLM prepared an EA for SCC's proposal to construct, operate, and maintain a buried 38.99-mile (205,843-foot) telecommunications system within the Kane County Road ROW and the Skutumpah Road (BLM 500) ROW. The project route originates from SCC infrastructure located approximately 7.85 miles north of State Route 89 on Johnson Canyon Road, turns to follow Skutumpah Road, heads north toward Cannonville, and ends at Cottonwood Canyon Road.

A 15-foot-wide easement was required for construction of the telecommunications system. A new conduit and fiber optic line was installed by a tractor-mounted cable plow (plowed) and, where needed, trenching and boring was conducted. A rock-cutting trencher or micro-trencher was used when solid rock was encountered, and horizontal boring equipment was used to cross any washes or stream crossings that were not culverted as well as access roads. Most of the conduit was plowed in with a typical disturbance width of 1 foot and little disturbance to vegetation. No new access roads were created as part of the project.

Natural Resources Conservation Service, Fredonia Natural Resource Conservation District, and Town of Fredonia – Flood Retarding Structure

Current Status: Project is not constructed and still awaiting funding

Proximity to Project: Structure is 0.25 miles from the proposed pipeline

FONSI Date: 2009

The original Fredonia Flood Retarding Structure was constructed by the Natural Resources Conservation Service (then the Soil Conservation Service) in 1973 and situated east of Fredonia and south of Lost Spring Wash, a tributary of Kanab Creek. It is operated and maintained by the Town of Fredonia.

The 1.8-mile-long earthen structure provides flood protection to the Town of Fredonia, including about 1,250 residents and 230 residential and commercial properties and related infrastructure. The original flood retarding structure has developed safety deficiencies and inadequacies during since its initial construction related to embankment cracking and emergency spillway capacity.

The Fredonia Natural Resource Conservation District and Town of Fredonia, with assistance from the Natural Resources Conservation Service, completed a Supplemental Watershed Plan and EA (Plan/EA) in 2009. The Plan/EA details replacement of the flood retarding structure with a levee/floodway system to provide continued flood protection for the Town of Fredonia. The total damage reduction benefit from the rehabilitation project is estimated at \$31 million.

BLM – Kitchen Corral Road and Whitehouse Road Realignment

Current Status: Completed and in operation phase

Proximity to Project: 0 miles; Whitehouse Road intersects with U.S. Highway 89 and the proposed pipeline

FONSI Date: 2017

Portions of Kitchen Corral Road and White House Road are located in floodplains adjacent to meandering stream and river channels. Flood flows in the channels along with saturation of stream bank soils from rain and snow have caused the stream banks to fail, washing out segments of both roads. Additionally, there have been instances when visitors have been stranded at the White House Campground until Paria River flood waters recede, creating a significant public safety concern.

BLM proposed to reroute short segments of Kitchen Corral and White House Roads away from stream and river channels to provide safe and reliable public access. BLM, GSENM prepared an EA to evaluate environmental effects of realigning portions of the Kitchen Corral Road and the Whitehouse Road. Segments in each road are located in floodplains adjacent to meandering stream and river channels. The project was approved in 2017.

BLM – Lava Ridge Trailhead Improvements

Current Status: Completed and in operation phase

Proximity to Project: 11 miles west of the western terminus of the proposed pipeline at Sand Hollow Reservoir

FONSI Date: 2018

An EA was prepared to evaluate potential impacts of a BLM proposal to improve the Lava Ridge Trailhead. The trailhead is located in Washington County, Utah, on public lands administered by the St. George Field Office. It is situated directly adjacent to the Red Cliffs NCA. Although the trailhead is not within the NCA, its purpose is to serve NCA visitors.

The proposed action included the following: relocation and improvement of the current parking surface to accommodate 15 to 20 passenger vehicles; installation of a wood three-rail fence to delineate the parking area; installation of a four-sided, roofed steel kiosk; removal of the existing wooden fence, range fence, vehicle gate, and stepover within the NCA; installation of new range fence, vehicle gate, and stepover on the NCA boundary; and relocation of the trailhead identification sign.

2.2 Reasonably Foreseeable Future Actions

BLM and USFWS – Northern Corridor Highway ROW Incidental Take Permit, and Resource Management Plan Amendments, Washington County, Utah

Current Status: In environmental review process

Proximity to Project: About 8 miles west of the western portion of the proposed pipeline
The BLM and the USFWS issued a Notice of Intent to prepare an EIS for the Northern Corridor Highway Project on December 5, 2019. The UDOT has submitted an application for a ROW grant for the proposed project north of the City of St. George, Utah, on BLM-managed public lands in the Red Cliffs NCA and the Red Cliffs Desert Reserve.

The Northern Corridor is a proposed 4-mile-long roadway connecting the Red Hills Parkway and Green Springs. In addition to the ROW grant, the project also involves potential amendments to the BLM St. George Field Office and Red Cliffs NCA Resource Management Plans, and the issuance of an Incidental Take Permit for Mojave desert tortoise to Washington County, Utah, under Section 10(a)(1)(B) of the ESA.

UDOT Projects – State Route 9 (SR-9), between I-15 to Southern Parkway

Current Status: In environmental review process

Proximity to Project: Approximately 4 miles north of the western terminus of the Proposed Project

The UDOT has proposed improvements to SR-9 in Washington County, Utah, between I-15 and the future Southern Parkway. They are conducting a study in order to evaluate the long-term transportation goals and objectives for a 6.5-mile-long section of SR-9, between I-15 and the future Southern Parkway connection at milepost 6.5, at approximately 2800 West.

According to the Draft Study (UDOT 2020), “the study area generally includes 300 feet on the north and south sides of the SR-9 corridor—primarily in UDOT ROW—and also includes widening at major intersections to accommodate the proposed improvements.” This project is within an area for which planning is directed by the Dixie Metropolitan Planning Office, UDOT, Washington City, and the City of Hurricane.

UDOT – Southern Corridor (Parkway) Highway Expansion

Current Status: Under construction and targeted for completion in 2020

Proximity to Project: Adjacent to Sand Hollow Reservoir at the western terminus of the Proposed Project

The Southern Corridor is a four-lane, limited-access highway beginning at I-15 near the southwest end of St. George about 2 miles from the Arizona border at the Atkinville interchange. The project is under construction to connect with SR-9 in Hurricane.

The initial construction of the Southern Corridor Parkway called for a further expansion of the road to finish making the highway four lanes for the length of the road. This final \$75 million segment of the Southern Parkway extends from Sand Hollow Reservoir to SR-9. Construction began in November 2019 and will continue through 2020.

BLM – Sand Hollow Regional Pipeline Project

Current Status: Under construction

Proximity to Project: 0 miles; Proposed Project ends at Sand Hollow Reservoir

FONSI Date: 2018

The purpose of the federal action is to respond to the WCWCD application for a ROW grant to install a culinary water transmission pipeline in Washington County, Utah. The Sand Hollow Regional Pipeline Project includes 11.5 miles of new pipeline, a water storage tank, and associated facilities bringing water from the Sand Hollow Reservoir well field through Warner Valley to existing transmission systems operated by its municipal wholesale customers. The purpose of the pipeline is to provide additional transmission capacity for culinary water to the southern areas of St. George and Washington City.

Currently, these areas are serviced through only one existing pipeline, known as the “Regional Pipeline,” which is fed from the Quail Creek Water Treatment Plant, along with limited capacity from the Sand Hollow Reservoir well field. The pipeline would neither add a new water source to the WCWCD system nor would it change the amount of water that can already be pushed through the existing system. It provides a redundant water connection from the Sand Hollow Reservoir well field, which is already connected to the existing regional pipeline servicing the same areas.

The pipeline will connect to existing city of St. George and Washington City culinary water transmission pipelines along Washington Fields Road. The project is intended to provide efficiency, reliability, and redundancy as an independent loop to the system; improve security in the event of an emergency or system maintenance or malfunction; and allow culinary-quality water to bypass the Quail Creek Water Treatment Plant to enhance water quality and decrease treatment and pumping costs.

NPS (Glen Canyon National Recreation Area) – Decision Related to the BLM Grand Staircase-Escalante National Monument and Kanab-Escalante Planning Area Proposed Resource Management Plans/EIS

Current Status: In Process. The BLM has issued a ROD, but the NPS is in the process of completing the Determination of Effects under Section 106 and the Biological Assessment/consultation requirements with USFWS under the ESA in order to adopt the BLM analysis and issue a ROD for grazing related decision in the EIS on NPS land, which the BLM manages.

Proximity to Project: The portions of the Proposed Project that occur on NPS-managed lands also coincide with grazing allotments on NPS-managed lands (except for where the Proposed Project is co-located within the ADOT or UDOT ROW corridors).

On December 4, 2017, President Trump issued Presidential Proclamation 9682 modifying GSENM and excluding from designation and reservation approximately 861,974 acres of BLM-managed surface land. Because the BLM manages grazing permits on NPS land within Glen Canyon National Recreation Area, the grazing-related discussion within this plan included analyses for NPS-managed lands to support a decision related to grazing on NPS-managed lands.

NPS (Glen Canyon National Recreation Area) – Trails Planning and EA

Current Status: Currently conducting internal scoping and inventory. Will likely begin public planning and NEPA evaluation/documentation in Fiscal Year 2021 with implementation beginning in 2022.

Proximity to Project: Proposed Project staging areas, access routes, and ROW overlap or are proximate to trails, which will be formalized or identified for expanded use in the Page area to near the Arizona/Utah State line.

As a result of increasing demand for land-based recreational opportunities, especially in front-country areas, and focused on hiking and bicycle use, the NPS has identified several locations near the Page area and into southern Utah for the formalization of existing social trails and designation of some trails for multiple uses, to include hiking, bicycling, and equestrian. Some of these trails will interconnect with trails on adjacent lands.

Locations for future trails management and development include: Hanging Gardens connector to the Page Rim Trail, the Horseshoe Bend Canyon Rim Trail (Horseshoe Bend to the Glen Canyon Dam Bridge), additional trails in the Ferry Swale Area, trails on Studhorse Mesa (overlooking a portion of the pipeline alignment), and the Blue Pools Arch trail and Blue Pools Canyon trail for hiking and canyoneering.

City of St. George – St. George Regional Water Reclamation Facility Rehabilitation Project

Current Status: Under construction

Proximity to Project: About 14 miles west of the western end of the proposed pipeline

In response to rapid population growth, the City of St. George began a \$60 million expansion of the St. George Regional Water Reclamation Facility. The facility treats water of which a portion is reused as non-potable irrigation water, and a portion is discharged into the Virgin River.

ADOT – US89 Widening and Horseshoe Bend Left-Turn Lane Project

Current Status: Construction will occur in 2020

Proximity to Project: Approximately 5 miles south of the Proposed Project at Lake Powell

ADOT is proposing to widen U.S. Highway 89 south of the city of Page, Arizona and within the Navajo Nation limits between milepost 544.40 and milepost 544.89. The project will widen the east side of U.S. Highway 89 to allow for a northbound left-turn lane into the Horseshoe Bend Turnout and will include new pavement for widening, milling and replacement on the travel lane, fog coating, shoulder buildup, signing, striping, and related work.

ADOT – State Route 389 Short Creek Bridge Scour Repair Project

Current Status: Construction will occur in 2020

Proximity to Project: Adjacent to the proposed route of the Highway Alternative on State Route (SR) 389 in Colorado City, Arizona.

ADOT is proposing to remove the existing deck surface of the Short Creek Bridge by mechanical milling and replacing it with polyester polymer concrete overlay, and removing the existing bridge barrier and replacing it with F-shape concrete barrier and barrier transition. Additional work will include upgrading the guardrail system, constructing scour protection systems, retaining walls, installing gabion baskets, and other miscellaneous work. The project will occur on SR-389 between mileposts 0.91 and 1.13, approximately 1 mile south of the Utah-Arizona border in Colorado City, Arizona.

2.3 Existing Conditions

Existing conditions are not a part of a cumulative effects analysis, as the effects contribution from past and present actions are captured in the baseline conditions described in the Affected Environment section for each resource area analyzed in this DEIS.

2.4 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

EPMs for each resource area analyzed in this DEIS are described in Appendices C-1, Geology and Soils, through C-24, Environmental Justice; this cumulative effects analysis focuses on the net effect of those direct and indirect effects stemming from the Proposed Project (including EPMs) combined with the effects contributions from any other relevant past, present, and reasonably foreseeable future actions that may have overlapping effects.

3 Results/Environmental Consequences

The following discussion describes the cumulative effects for each of the resources considered in this DEIS.

3.1 Geology and Soils

3.1.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to geology and soils expected from the past, present, and reasonably foreseeable future actions because it would not be constructed.

3.1.2 Southern Alternative

Surface disturbing activities, such as excavation, grading, removal of vegetation, and removal of biological soil crust cover is expected to result in direct effects associated with construction of LPP infrastructure. Areas disturbed during construction, or removed permanently for LPP facilities or roads, would support little or no vegetation. Soil erosion could occur from increased stormwater runoff as a result of protective vegetative and biological soil crust cover removal, soil compaction or alteration of drainage patterns related to construction of the pipeline, roads, and other associated infrastructure. These direct soil loss effects would occur within the Proposed Project ROW areas during construction and operation activities. Disturbance in most areas would be short-term and effects would be controlled through implementation of EPMs. Once construction is complete, the construction corridor would be restored, which would minimize soil erosion in the long term. An exception is the Kanab Creek crossing, where steep topography and areas of sensitive and erosion-prone soils occur. This area has the potential for higher rates of erosion.

Temporary groundwater drawdown at the intake pump station site could result in unmeasurable inflow from Lake Powell into the Navajo sandstone bedrock and have cumulative effects with the past, present, and future actions involving Glen Canyon and Lake Powell levels. These potential short-term cumulative effects would not be measurable. The water supply well at the intake pump station would not be expected to cause groundwater drawdown intercepting the Lake Powell water surface, and there would be no long-term cumulative effects with the past, present, and future actions involving operation of Glen Canyon Dam and Lake Powell levels. There would be no other measurable effects associated with geology and soil resources; therefore, there would be no cumulative effects.

Other interrelated actions that could have overlapping effects to geology and soils include the continued construction and operation of the Southern Corridor Highway, which is a four-lane highway, part of which has already been constructed from I-15 south of St. George to SR-9 in Hurricane. Construction of the highway has, and will, eliminate soil resources within the footprint of the roadway. Ongoing operation of the highway will permanently remove access to soil resources within the footprint of the roadway.

Overall, construction and operation of the Southern Alternative would contribute to cumulative effects to geology and soils in combination with other past, present, and reasonably foreseeable future actions.

3.1.3 Highway Alternative

The cumulative effects would be the same as described for the Southern Alternative.

3.2 Paleontology

3.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to paleontological resources expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. Other actions that require or result in significant ground disturbance—including road and other types of infrastructure construction and quarrying—may cause significant ground disturbance, which could damage or destroy paleontological resources. In addition, construction of new roads could provide additional access to illegal collectors of these resources.

3.2.2 Southern Alternative

Ground disturbance from construction of the Proposed Project could adversely affect paleontological resources. In the past, paleontological resources along the Southern Alternative have been affected by ground-disturbing activities, such as road construction, power line pole insertion, and utility trenching. Although not in the direct area of potential effect, flagstone quarrying at Bitter Seep and other Lower Red Member sites has damaged and destroyed important Early Triassic vertebrate track fossils. Other uses, such as recreation, livestock grazing, and realty actions, have less effects to fossil resources than those that involve significant ground disturbance.

Overall, construction of the Southern Alternative would contribute to the overall cumulative effects to paleontological resources when combined with other past, present, and reasonably foreseeable future actions.

3.2.3 Highway Alternative

Cumulative effects of the Highway Alternative are the same as those of the Southern Alternative, with the exception that there would be lesser effects to fossil vertebrate track resources in the Lower Red Member of the Moenkopi Formation and potentially greater effects to Chinle Formation fossils, which have historically been highly sought after by hobby collectors and rock hounds.

Overall, construction of the Highway Alternative would contribute to the overall cumulative effects to paleontological resource sin combination with other past, present, and reasonably foreseeable future actions, but that contribution would be less than under the Southern Alternative.

3.3 Noise and Vibration

3.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to noise and vibration expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. However, other actions would still occur and may generate noise and vibration and that could affect nearby sensitive receptors. Noise sources are added logarithmically, and noise decreases with distance based on the inverse square law. These projects and their contribution to effects are described in Table 3.3-1, below, and would not result in significant levels of noise or vibration following construction.

3.3.2 Southern Alternative

Under the Southern Alternative, construction and operation of the Proposed Project would generate short-term noise and vibration effects on sensitive receptors. Fourteen other completed and potential projects were analyzed for the potential of cumulative noise or vibration effects in combination with the Proposed Project. Of the 14 total projects analyzed, none were found to have cumulative long-term effects, nine were found to have no cumulative short-term effects when combined with the Proposed Project, and five were found to have short-term cumulative effects when combined with the Proposed Project.

Table 3.3-1 lists past, present, and reasonably foreseeable future actions that when combined with the Proposed Project could have cumulative noise and vibration effects.

Overall, construction and operation of the Proposed Project would contribute to the overall cumulative effects to noise and vibration when combined with some of the other past, present, and reasonably foreseeable future actions.

3.3.3 Highway Alternative

The cumulative noise and vibration effects of the Highway Alternative would be the same as the Southern Alternative where pipeline routes are the same. Noise effects where the alternatives routes differ would be similar in intensity, but differ in the location combination with other sound and vibration sources.

Table 3.3-1 Cumulative Effects with Past, Present, and Reasonably Foreseeable Future Actions

Project Name/Status	Proximity to Proposed Project	Cumulative Effects
Past and Present Actions		
NPS, Glen Canyon National Recreation Area Ferry Swale Visitor Use Area Portions of project completed, portions in process, and portions planned.	Lake Powell Pipeline staging area, access routes, and right-of-way overlap the Ferry Swale visitor use area.	Short-term cumulative effects could occur on receptors if construction of the Proposed Project and the NPS action occur simultaneously. No long-term cumulative effects expected.
UDOT, Southern Corridor (Parkway) Highway Construction partially completed and in the operation phase	Approximately 3 miles west of the western end of the Proposed Project at Sand Hollow Reservoir	Short-term cumulative effects on receptors during construction of the Proposed Project could occur if construction on both projects occurred simultaneously. No long-term cumulative effects expected.
BLM, Red Cliffs National Conservation Area Trailheads Projects Construction is completed and project is in the operation phase.	The White Reef Trailhead is approximately 8 miles northwest, and the Red Mountain Trailhead is approximately 20 miles northwest of the western terminus of the Proposed Project at Sand Hollow Reservoir.	No cumulative effects are expected due to the distance from the Proposed Project and construction of BLM action being completed.
BLM, SCC Buckskin to Page Project Project is completed and in the operation phase.	Runs parallel to eastern portion of Proposed Project.	Short-term cumulative effects during construction of Proposed Project could occur due to construction of BLM action being completed and maintenance noise occurring for short time periods. No long-term cumulative effects expected.
BLM, SCC Fiber Optic Project Project is completed and in the operation phase.	Cottonwood Road is approximately 11 miles from the Proposed Project.	No cumulative effects are expected due to the distance from the Proposed Project, construction of BLM action being completed, and maintenance noise occurring for short periods.
BLM, Kitchen Corral Road and Whitehouse Road Realignment Project is completed and in the operation phase.	0 miles. Whitehouse Road intersects with U.S. Highway 89 and the Proposed Project.	Short-term cumulative effects on receptors could occur during construction where Proposed Project intersects BLM action. No long-term cumulative effects expected.
BLM, Lava Ridge Trailhead Improvements Project is completed and in the operation phase.	11 miles west of the western terminus of the Proposed Project pipeline at Sand Hollow Reservoir.	No cumulative effects are expected due to the distance from the Proposed Project and construction being completed.

**Table 3.3-1 Cumulative Effects with Past, Present, and Reasonably Foreseeable Future Actions
(continued)**

Project Name/Status	Proximity to Proposed Project	Cumulative Effects
Reasonably Foreseeable Future Actions		
BLM and USFWS, Northern Corridor Highway Right-of-Way, Incidental Take Permit, and Resource Management Plan Amendments, Washington County, UT Project is in the environmental review process.	About 8 miles west of the western portion of the Proposed Project.	No cumulative effects are expected due to the distance between the proposed action and the Proposed Project, even if short-term construction on both projects occurred simultaneously.
UDOT, SR- 9, between I-15 to Southern Parkway Project is in the environmental review process	Approximately 4 miles north of the Proposed Project western terminus	No cumulative effects are expected due to the distance between the proposed action and the Proposed Project, even if short-term construction on both occurred simultaneously.
UDOT, Southern Corridor (Parkway) Highway Expansion Project is under construction and targeted for completion in 2020.	Adjacent to Sand Hollow Reservoir at the western terminus of the Proposed Project.	No cumulative effects are expected, as construction of the UDOT action should be completed prior to the start of construction of the Proposed Action.
BLM, Sand Hollow Regional Pipeline Project Project is under construction.	0 miles. Proposed pipeline ends at Sand Hollow Reservoir.	Short-term cumulative effects could occur on receptors if construction of the Proposed Project and the BLM action occur simultaneously. No long-term cumulative effects expected.
City of St. George, St. George Regional Water Reclamation Facility Rehabilitation Project Project is under construction.	About 14 miles west of the western end of the Proposed Project.	No cumulative effects are expected due to the distance between the proposed action and the Proposed Project, even if short-term construction on both occurred simultaneously.
ADOT, U.S. Highway 89 Widening and Horseshoe Bend Left-Turn Lane Project Construction will occur in 2020	Approximately 5 miles south of beginning of the Proposed Project at Lake Powell.	No cumulative effects are expected, as construction of the ADOT action should be completed prior to the start of construction of the Proposed Action.

Table 3.3-1 Cumulative Effects with Actual and Potential Actions (continued)

Project Name/Status	Proximity to Proposed Project	Cumulative Effects
ADOT, SR-389 Short Creek Bridge Scour Repair Project Construction will occur in 2020	Adjacent to the proposed route of the Highway Alternative on SR-389 in Colorado City, Arizona.	No cumulative effects are expected, as construction of the ADOT action should be completed prior to the start of construction of the Proposed Action.

Key:

ADOT = Arizona Department of Transportation

BLM = Bureau of Land Management

I-15 = Interstate 15

NPS = National Park Service

SCC = South Central Communications

SR-9 = State Route 9

SR-389 = State Route 389

UDOT = Utah Department of Transportation

USFWS = U.S. Fish and Wildlife Service

3.4 Electric and Magnetic Fields

3.4.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects of increased exposure of electric and magnetic fields (EMFs) on nearby sensitive receptors expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. None of the reasonably foreseeable future actions identified as part of the cumulative effects analysis would construct new electrical transmission lines in the vicinity of the Proposed Project. Therefore, these projects would not result in cumulative effects in combination with the Proposed Project due to increased EMFs. However, existing transmission lines would continue to produce EMFs.

3.4.2 Southern Alternative

Portions of the electrical transmission lines that would be constructed under the Proposed Project would be sited within existing designated utility corridors or adjacent to existing electrical transmission lines. While no projects that would construct new electrical transmission lines in the vicinity of the Proposed Project were identified as part of the cumulative effects analysis, colocation of the Proposed Project transmission lines with existing transmission lines within the same corridor, including the lines listed in Section 1.4.1 of Appendix C-4, Electric and Magnetic Fields, would increase EMF strength. The levels of cumulative EMFs associated with the colocation of transmission lines would depend on technical design factors, such as circuit configuration, power rating, conductor phasing, ROW width, etc. Most of the existing transmission lines that would overlap with the Proposed Project are located in remote, non-populated areas, at distances greater than 300 feet from sensitive receptors. The existing underground 12.47 kilovolt distribution line at the Twin Cities substation is located closer to sensitive receptors; however, because this line is buried, magnetic fields produced by this line are estimated to be well below the most restrictive occupational and general public exposure limits listed in Table 1.1-1 of Appendix C-4, Electric and Magnetic Fields.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to EMF increases when combined with other past, present, and reasonably foreseeable future actions.

3.4.3 Highway Alternative

Colocation of the Proposed Project electrical transmission lines with existing or new transmission lines within the same corridor would increase EMF strength. The levels of cumulative EMFs associated with the colocation of transmission lines would depend on technical design factors, such as circuit configuration, power rating, conductor phasing, ROW width, etc. Most of the existing transmission lines that would overlap with the Proposed Project are located in remote, non-populated areas, at distances greater than 300 feet from sensitive receptors. The existing underground 12.47 kilovolt distribution line at the Twin Cities substation is located closer to sensitive receptors; however, because this line is buried, magnetic fields produced by this line are estimated to be well below the most restrictive occupational and general public exposure limits listed in Table 1.1-1 of Appendix C-4, Electric and Magnetic Fields.

Overall, construction and operation of the Highway Alternative would contribute in certain, mostly non-populated, locations to the overall cumulative effects to EMF increases when combined with other past, present, and reasonably foreseeable future actions.

3.5 Air Quality

3.5.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to air quality expected from the past, present, and reasonably foreseeable future actions because it would not be constructed, and therefore, no emissions of air pollutants would occur.

3.5.2 Southern Alternative

The Southern Alternative would have short-term direct cumulative effects on air quality with the effects of the Southern Corridor Highway. Constructed areas restored and planted for revegetation would be susceptible to wind erosion causing fugitive dust, until the vegetation cover is re-established. The fugitive dust emissions from the restored Southern Alternative construction areas and the Southern Corridor Highway construction areas could combine near Sand Hollow Reservoir (where the projects would intersect) to cause increased fugitive dust emissions. Nevertheless, exceedances of the National Ambient Air Quality Standards criteria would not be expected.

Overall, construction and operation of Southern Alternative would contribute to short-term cumulative effects to air quality combination with other past, present, and reasonably foreseeable future actions.

3.5.3 Highway Alternative

The Highway Alternative would have cumulative effects on air quality as described for the Southern Alternative.

3.6 Land Use

3.6.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to land use expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. However, other actions in the Project Area could result in the need to coordinate crossings, physical aboveground features that would have a permanent effect on land use and existing ROWs, and temporary adverse effects on grazing. Coordination with the existing landowner/land managing agency would be required to minimize adverse effects from these actions.

3.6.2 Southern Alternative

The Southern Alternative could contribute to short-term cumulative effects on land use when combined with the existing ROWs within the proposed alignment. However, these effects would be minimized by the EPMS described in Section 1.3 of Appendix C-6, Land Use.

Known past, present, or reasonably foreseeable actions that could contribute to cumulative effects from construction and operation of the Proposed Project, when completed, include the Ferry Swale and Wahweap Allotments Pipeline Extensions and Water Troughs Developments, the SCC Buckskin to Page Project, and the NPS Decision Related to the BLM GSENM and Kanab-Escalante Planning Area Proposed Resource Management Plans/EIS.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to land use when combined with other past, present, and reasonably foreseeable future actions.

3.6.3 Highway Alternative

The Highway Alternative could have short-term cumulative adverse effects on land use when combined with the existing ROWs within the proposed alignment. These effects would be minimized by the EPMS and due to the temporary nature and relatively small areas that would be affected.

Other known past, present, or reasonably foreseeable actions that could contribute to cumulative adverse effects from construction and operation of the Proposed Project, when completed, include the same projects as described for the Southern Alternative. The only exceptions are the Ferry Swale and Wahweap Allotments Pipeline Extensions, which would not apply to the Highway Alternative.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to land use when combined with other past, present, and reasonably foreseeable future actions.

3.7 Special Designations

3.7.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to special designations expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. These other actions involve a wide variety of uses and activities occurring on the lands within and adjacent to the Kanab Creek Area of Critical Environmental Concern (ACEC), Old Spanish National Historic Trail (NHT), and Pipe Spring National Monument. Specific actions that have occurred, are occurring, or are likely to occur in the reasonably foreseeable future that may affect special designation lands include:

- Livestock grazing – The Arizona Strip, Kanab-Escalante Planning Area, and the adjacent BLM-managed lands are active grazing allotments. Livestock grazing in the region has evolved and changed considerably since it began in the 1860s and is one factor that has created the current environment. At the turn of the century, large herds of livestock grazed on unreserved public domain in uncontrolled open range. Eventually, the range was stocked beyond its capacity, causing changes in plant, soil, and water relationships. Some speculate that the changes were permanent and irreversible, turning plant communities from grass and herbaceous species to brush and trees. Protective vegetative cover was reduced, and more runoff brought erosion, rills, and gullies. In response to these problems, livestock grazing reform began in 1934 with the passage of the Taylor Grazing Act. Subsequent laws, regulations, and policy changes have resulted in adjustments in livestock numbers, season-of-use changes, and other management changes. Given the past experiences with livestock effects on public land resources, as well as the cumulative effects that could occur on the larger ecosystem from grazing on various public and private lands in the region, management of livestock grazing is an important factor in ensuring the protection of public land resources. Past, present, and reasonably foreseeable actions within the analysis area would continue to influence range resources, watershed conditions and trends. The effect of actions, such as voluntary livestock reductions during dry periods and implementation of a grazing system, have improved range conditions. The net result has been greater species diversity, improved plant vigor, and increased ground cover from grasses and forbs.
- Recreation – Recreation activities occurring throughout the area involve a broad spectrum of pursuits ranging from dispersed and casual recreation to organized, BLM-permitted group uses. Typical recreation in the region includes OHV driving, scenic driving, hunting, hiking, wildlife viewing, horseback riding, camping, backpacking, mountain biking, geocaching, picnicking, night-sky viewing, and photography. The Arizona Strip and the Kanab-Escalante Planning Area are known for their large-scale undeveloped areas and remoteness, which provide an array of recreational opportunities for users who wish to experience primitive and undeveloped recreation, as well as those seeking more organized or packaged recreation experiences.
- SCC Buckskin to Page Project – This project (which has been constructed) is a buried 35.45-mile telecommunications system within the UDOT U.S. Highway 89 road ROW, which follows the congressionally designated utility corridor. The project route originates at Five Mile Mountain Road turnoff, approximately 30 miles east of Kanab, Utah, and continues east-southeast to Page, Arizona. Construction and operation of this action contributed to ground disturbance and visual impacts to some special designation lands.

3.7.1.1 *Kanab Creek Area of Critical Environmental Concern*

Under the No Action Alternative, the Arizona Strip Field Office Resource Management Plan (RMP) would not be amended. There are no other reasonably foreseeable future actions (besides the Proposed Project) that have been proposed within the ACEC. However, other uses and activities are occurring on the lands within and adjacent to the ACEC.

Old Spanish National Historic Trail

The NHT is primarily affected by OHV use and the existing utility corridor. Population growth in the area and the resulting increase in recreational use would continue under the No Action Alternative and are expected to have a major effect on the trail and its historic setting. Population growth would result in more recreational use of the NHT, which would increase OHV traffic along the trail corridor, the potential for vandalism, and demands for use of the utility corridor. Increased use of the NHT would result in increased GHG emissions through higher numbers of vehicle trips and increased use of OHVs.

3.7.2 Southern Alternative

3.7.2.1 *Kanab Creek Area of Critical Environmental Concern*

The Southern Alternative would amend the RMP in order to allow for authorization of the Proposed Project. While amending the RMP would not directly involve ground disturbance or development, these actions could allow for the construction, operation, and maintenance of the LPP and potentially other utility lines. In addition, other uses and activities are occurring on the lands within and adjacent to the ACEC. Effects from these other actions would combine with the Proposed Project to create a higher level of potential ground disturbance and development on the ACEC. Future development proposals would be analyzed under project-specific NEPA analyses.

3.7.2.2 *Old Spanish National Historic Trail*

The pipeline alignment and associated appurtenances would run parallel to and cross the NHT and associated high potential segments and sites and would be located within the viewshed of the NHT. Construction would result in increased dust, noise, creation of a landscape scar, and presence of construction-related equipment within the viewshed of the trail and may temporarily prevent access to portions of the trail that would result in short-term effects to the purpose and nature of the trail. The presence of facilities and access roads would remain throughout pipeline operations and result in short-term and long-term effects to the trail and high potential route segments and sites that will contribute to similar adverse effects caused by livestock grazing, recreational activities, and construction projects that will also occur in the vicinity of the NHT.

3.7.2.3 *Pipe Spring National Monument*

The LPP alignment would be approximately 4 miles from Pipe Spring National Monument, and would, therefore, not directly affect lands and resources within the monument boundary. From that middle ground distance, views of the Proposed Project components from the monument would not be visually evident, with no apparent change to the setting. However, fugitive dust generated from construction activities would temporarily affect visibility/views across the Arizona Strip, and could combine with fugitive dust from other actions that may occur in the vicinity of the monument if they have similar construction timing.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to special designation lands when combined with other past, present, and reasonably foreseeable future actions.

3.7.3 Highway Alternative

3.7.3.1 Kanab Creek Area of Critical Environmental Concern

Under the Highway Alternative, no pipeline or associated infrastructure would be constructed within the ACEC, so current management of the ACEC and the resources for which it was designated (habitat for the endangered southwestern willow flycatcher [*Empidonax traillii*] and riparian, scenic, and cultural resources) as prescribed in the RMP would continue.

3.7.3.2 Old Spanish National Historic Trail

Under the Highway Alternative, effects to the Old Spanish NHT would be similar to those described for the Southern Alternative, except that effects to the Pipe Spring National Monument High-Potential Segment are more likely to occur under the Highway Alternative since this alignment runs immediately adjacent to the LPP corridor. The hydrostations would have short-term, direct, and indirect effects on recreational users of the trail during construction of the pipeline as this construction crosses the trail. Direct effects related to the Old Spanish NHT viewshed are analyzed in DEIS Section 3.16, Visual Resources, and in Appendix C-19, Visual Resources. These effects on recreational users will combine with similar effects from other past, present, and reasonably foreseeable future actions to create a higher level of cumulative effects.

3.7.3.3 Pipe Spring National Monument

The LPP alignment proposed under this alternative would be approximately one-half mile from Pipe Spring National Monument and would therefore not directly affect lands or resources within the monument boundary. However, views of the Proposed Project components from the monument would be visually evident, and fugitive dust generated from construction activities would temporarily affect visibility/views across the Arizona Strip. These visual and visibility effects on the monument will combine with similar effects from other past, present and reasonably foreseeable future actions nearby to create a higher level of visual and visibility cumulative effects.

Adverse effects from the Proposed Project under the Highway Alternative to the ACEC, the NHT, and Pipe Spring National Monument would contribute to overall cumulative effects to these special designation lands in combination with effects from other past, present and reasonably foreseeable future actions.

3.8 Transportation

3.8.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to transportation resources expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. These other projects may result in changes that affect transportation resources, such as delays associated with construction vehicles and workers and physical alterations to the existing transportation system (e.g., new roads or expanded roads).

3.8.2 Southern Alternative

This analysis of cumulative effects on transportation addresses the effects of the Southern Alternative in conjunction with past, present, or reasonably foreseeable future projects in or near the Proposed Project. It considers potential effects associated largely with potential changes to traffic. This analysis assumes that other projects are being constructed and implemented in accordance with the appropriate jurisdictions as they relate to potential changes in transportation resources (e.g., use of ROW, traffic controls, and safety measures) and thereby would not cause effects associated with non-conformance or public safety.

Other known past, present, or reasonably foreseeable actions that could contribute to cumulative effects from construction and operation of the Proposed Project include the following:

- NPS – Glen Canyon NRA – ORV Management Plan/EIS: overlapping in the Ferry Swale area and along proposed access roads and ROW.
- NPS – Glen Canyon NRA – Ferry Swale Visitor Use Area Developments: Proposed Project staging areas, access routes, and ROW would overlap with the Ferry Swale visitor use area.
- UDOT – Southern Corridor (Parkway) Highway: approximately 3 miles west of the western end of the proposed pipeline at Sand Hollow Reservoir.
- BLM – Red Cliffs NCA Trailhead Projects: approximately 8 miles northwest (White Reef Trailhead) and 20 miles northwest of the western terminus (Red Mountain Trailhead).
- BLM – SCC Buckskin to Page Project: located parallel to the eastern portion of the proposed pipeline.
- BLM – SCC Fiber Optic Project: Cottonwood Road is located approximately 11 miles from the Proposed Project.
- National Resource Conservation Service, Fredonia National Resource Conservation District, and Town of Fredonia – Flood Retarding Structure: approximately 0.25 mile from the proposed pipeline.
- BLM – Kitchen Corral Road and Whitehouse Road Realignment: Whitehouse Road intersects with U.S. Highway 89 and the proposed pipeline.
- BLM – Lava Ridge Trailhead Improvements: approximately 11 miles west of the western terminus of the proposed pipeline at Sand Hollow Reservoir.
- BLM and USFWS – Northern Corridor Highway ROW, Incidental Take Permit, and Resource Management Plan Amendments, Washington County, Utah: approximately 8 miles west of the western portion of the pipeline.
- UDOT Projects – SR-9, between I-15 to Southern Parkway: approximately 4 miles north of the Proposed Project’s western terminus.
- UDOT – Southern Corridor (Parkway) Highway Expansion: adjacent to Sand Hollow Reservoir at the western terminus of the Proposed Project.
- BLM – Sand Hollow Regional Pipeline Project: proposed pipeline ends at Sand Hollow Reservoir.
- NPS – Glen Canyon NRAs, Trails Planning and EA: Proposed Project staging areas, access routes, and ROW overlap or are in proximity to trails.
- ADOT – U.S. Highway 89 and Horseshoe Bend Left-Turn Lane Project: approximately 5 miles south of beginning of the Proposed Project.
- ADOT – Arizona SR-389 Short Creek Bridge Scour Repair Project: adjacent to the proposed route of the Highway Alternative on Arizona SR-389 in Colorado City, Arizona.

Depending on the schedule of construction activities, the potential for cumulative effects could vary. If construction were conducted simultaneously in the same or adjacent areas, some short-term cumulative effects on traffic may occur. Effects on traffic may involve lane closures, reduced speed zones, and/or detours throughout the duration of construction activities. Limited cumulative operational effects are anticipated due to the contributions to additional traffic associated with the Southern Alternative.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to transportation infrastructure when combined with other past, present, and reasonably foreseeable future actions.

3.8.3 Highway Alternative

The Highway Alternative would have similar cumulative effects on transportation infrastructure and services as described for the Southern Alternative.

3.9 Recreation

3.9.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to recreation resources expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. Several other projects, including the Southern Corridor Highway and the Sand Hollow Regional Pipeline, would have long-term effects on access to recreational resources in the BLM Sand Mountain Special Recreation Management Area.

3.9.2 Southern Alternative

This section identifies the cumulative effects of the Southern Alternative in conjunction with past, present, or reasonably foreseeable actions. Construction activities for the Proposed Project under the Southern Alternative would have temporary direct effects on recreational users accessing some recreation resources. These effects include visual changes, air pollutants, noise, and additional LPP construction traffic on recreation use, which could include temporary closures, detours, and congestion. In addition, some recreation lands would be permanently closed to recreational uses.

Other projects— including the Southern Corridor Highway and the Sand Hollow Regional Pipeline projects – would contribute additional effects to those caused by the Proposed Project. These effects include permanent removal of some open space and recreational lands, air pollution and noise from construction activities, visual changes to the landscape, and temporary and permanent closures of recreation lands.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to recreation resources when combined with other past, present, and reasonably foreseeable future actions.

3.9.3 Highway Alternative

The Highway Alternative would have the same cumulative effects as described for the Southern Alternative.

3.10 Hydrology

3.10.1 No Action Alternative

The hydrology modeling used in this analysis (see Appendix C-10, Hydrology) incorporates the effects of the No Action Alternative with other past, present, and reasonably foreseeable projects. However, because the Proposed Project would not be implemented under this alternative, there would be no direct or indirect effects on the Colorado River, and thus, there would be no additional contribution to cumulative effects. The combined effect of other water development projects in Washington County with the planned projects from the No Action Alternative would contribute to decreased flows in the Virgin River and potentially its tributaries, depending on the location of those developments.

3.10.2 Southern Alternative

The LPP would contribute to reduced storage values in Lake Powell induced by reasonably foreseeable projects modeled in this analysis. This contribution is within the variability affected by hydrology and is insignificant compared against both hydrologic variability and cumulative reasonably foreseeable projects.

The LPP would contribute to increased flows in the lower reaches of the Virgin River that were modeled in the Virgin River Daily Simulation Model. This may offset other cumulative projects that reduce flows in those same stretches. This offset was not quantified within the Virgin River Daily Simulation Model.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects on hydrology when combined with other past, present, and reasonably foreseeable future actions.

3.10.3 Highway Alternative

The cumulative effects of the Highway Alternative would be the same as those described for the Southern Alternative.

3.11 Water Quality

3.11.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects on water quality expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. Other actions may affect water quality including the following projects:

- Reclamation - Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead EIS and ROD (2007);
- Bureau of Indian Affairs and BLM – St. George Wastewater Reuse Project (2002);
- Reclamation and NPS - Glen Canyon Dam Long-Term Management Plan EIS and ROD (2016); and
- Current WCWCD water conveyance and conservation operations.

These actions and projects determine the elevation, storage, release, operational timing, and volume of water in Lake Powell, in addition to the release rates, volumes, and operational timing of releases from Glen Canyon Dam into the Colorado River. Under the No Action Alternative, these projects would continue to affect surface water quality in the study area. During periods of low water supply, the water volumes of Lake Mead and Lake Powell are regulated to conserve water supply, while maintaining hydroelectric supply for communities, agriculture, and industry. Dam releases during periods of low regional water supply could increase short-term turbidity and total dissolved solids downstream of dam releases into the Colorado River.

3.11.2 Southern Alternative

The cumulative effects of the Southern Alternative on the study area generally would not differ from those detailed above for the No Action Alternative, except with the cumulative effect posed by additional utility lines in the utility corridor through the ACEC. With the correct implementation of industry standards or practices, the Southern Alternative would have short-term effects on surface water and shallow groundwater quality during construction and operation activities. When combined with the St. George Wastewater Reuse Project, the Southern Alternative would have long-term cumulative effects on surface water quality. The Southern Alternative would utilize 3,000 acre-feet of off-stream storage of reuse water associated with the return flow management with the Proposed Project water distribution throughout the St. George, Utah, metropolitan area (UBWR 2016a). The influence of the Proposed Project could result in a change to the water quality of reuse water for parks, golf courses, and cemeteries. Reuse water would be managed in combination with other non-potable water supplies to meet system requirements, and the potential long-term cumulative effects on surface water quality (in this case, the reuse water) would not be significant (UBWR 2016a).

With correct implementation of EPMs, the Southern Alternative would have short-term and long-term effects on surface water and groundwater quality during construction and operation activities. Under Direct Natural Flow conditions, median seasonal water temperatures of Glen Canyon Dam releases are projected to increase by 0.4 degrees Celsius (°C) (which is a +0.72 change on the Fahrenheit scale) in the spring to a change of +0.7°C (or +1.26 °F) in the winter due to water diversions via the Proposed Project. Release temperatures are slightly greater compared to the No Action Alternative because the Proposed Project would convey water from Lake Powell, decreasing the total pool elevation and the cold-water pool volume over time. Average annual temperature changes between the Southern Alternative and the No Action Alternative range from -0.4 °C (-0.72°F) to +1.6 °C (+2.9 °F).

There could be cumulative effects from the Proposed Project on surface water quality from the construction of other future utility lines in the utility corridor once the RMP would be amended, when the effects are combined with those from the past, present, and reasonably foreseeable future actions.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to water quality when combined with other past, present, and reasonably foreseeable future actions.

3.11.3 Highway Alternative

The cumulative effects of the Highway Alternative are similar to those described for the Southern Alternative, with the exception of the potential for additional utility lines in the ACEC/utility

corridor, since the Arizona Strip Field Office Resource Management Plan Amendment (RMPA) would not be required under this alternative.

In summary, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to water quality when combined with other past, present, and reasonably foreseeable future actions.

3.12 Aquatic Invasive Species

3.12.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects on the spread of aquatic invasive species (AIS) expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. Some of these other actions could result in effects on AIS, in particular those projects that may have overlapping effects on the potential for invasion of quagga mussels in several waterbodies. Currently, the greatest threat to Sand Hollow and Quail Creek reservoirs is recreational boats spreading AIS. Sand Hollow Reservoir is classified as high risk for potential invasion due to the number of boaters traveling there from other nearby quagga mussel-infested waterbodies, such as Lake Powell and Lake Mead. Based on the usage data, Sand Hollow Reservoir has the highest threat of becoming infested with quagga mussels in Utah.

The cumulative effects from other projects affecting AIS in relation to the hydrology of Lake Powell resources are accounted for in the Colorado River Simulation System modelling (see Appendix C-10, Hydrology). Based on those cumulative effects, there would be no change in releases from Glen Canyon Dam or operation of Lake Powell. Therefore, none of the projects accounted for in that modeling would contribute to lower water surface elevations at Lake Powell.

3.12.2 Southern Alternative

The inter-basin transfer of Proposed Project water from Lake Powell to Sand Hollow Reservoir through the Proposed Project could result in transfer of undesirable and invasive aquatic organisms from the upper Colorado River basin to the Virgin River basin. While no LPP water would be directly discharged into the Virgin River or any of its tributary streams, Quail Creek Reservoir has an outlet to the Virgin River and a direct connection to Sand Hollow Reservoir via a connecting pipeline. All of the Proposed Project water conveyed through the pipeline would flow into Sand Hollow Reservoir for the specific purpose of providing municipal and industrial raw water supply for treatment in a water treatment facility and distribution as culinary water.

The Southern Alternative would increase the overall threat to spreading quagga mussels to Sand Hollow and Quail Creek Reservoirs. Implementing the EPMS would minimize that risk to the greatest extent given the practicality of treatments to this specific project while using the best available information to inform both the EPMS and mitigation measures. After accounting for these measures in analyzing the environmental consequences, the Proposed Project poses a lower risk to spreading quagga mussels into Sand Hollow Reservoir than the risk that recreational boaters pose. In 2018 and 2019, the only Utah reservoir that required more decontaminations than Sand Hollow Reservoir was Lake Powell. While Sand Hollow Reservoir is designated as a high-risk reservoir, the Proposed Project has the potential for adverse effects on the environment by contributing to

additional risks of quagga mussel infestation to a watershed that currently has no established populations.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to the spread of AIS when combined with other past, present, and reasonably foreseeable future actions.

3.12.3 Highway Alternative

The cumulative effects would be the same as those described for the Southern Alternative.

3.13 Vegetation Communities

3.13.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects on vegetation communities expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. Population growth in and within the vicinity of St. George and Hurricane, Utah, along with accompanying residential and commercial development and increased use of public lands for recreation, would result in long-term effects on vegetation communities through removal of vegetation for development and indirect effects, such as soil compaction, increased deposits of dust on vegetation near travel ways, and introduction of invasive species.

3.13.2 Southern Alternative

Effects on vegetation communities were assessed to address potential cumulative effects from the Southern Alternative. Such effects are assessed in conjunction with past, present, or reasonably foreseeable future projects or actions in or near the Proposed Project. This is conducted because, in general, the resource effects may be individually minimal but potentially significant when considered in conjunction with other projects or other environmental effects.

The regions of Arizona and Utah that the Proposed Project traverses are not, in general, subject to intense residential and commercial developmental pressures, with the exception of the St. George and Hurricane, Utah areas. St. George, Utah, is the fastest-growing metropolitan area in the country, according to data from the U.S. Census Bureau (WBUR 2018). It has been projected that St. George and Hurricane will both experience population growth over the next several decades as well, resulting in land development to accommodate increased demand for housing and commercial structures.

The increase in population in the area has also resulted in a dramatic increase in the level of recreational activities. Much of the LPP Project Area is known for its large-scale undeveloped areas and remoteness, which provide an array of recreational opportunities for users who wish to experience primitive and undeveloped recreation, as well as those seeking more organized or packaged recreation experiences (see Appendix C-13, Vegetation Communities, for a description of the LPP Project Area for this resource). OHV use has seen a dramatic increase in the region, which is expected to continue growing. Continued population growth and the resulting growth in vehicle and OHV use and visitation in the region would likely increase disturbance to vegetation through trampling, soil compaction (which restricts root growth), increased deposition of dust on vegetation

adjacent to travel ways, and introduction and spread of invasive plants. Droughts would also affect vegetation communities by reducing overall vegetative cover.

In addition to population growth and accompanying increased use of the public lands in the area, other past and currently approved projects were assessed to determine potential cumulative effects on vegetation when considered in combination with the Southern Alternative. Other reasonably foreseeable projects were also considered. It is expected that some of those projects (such as the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell) may not have effects on vegetation communities in the Project Area. Any projects with a federal nexus would include resource protection measures. Projects without a federal nexus could have a more substantial effect on this resource than the LPP due to a lack of regulatory protection of these resources. For example, a project that does not require an authorization from a federal agency may not be required to implement any resource protection measures that could minimize or avoid affecting vegetation communities. Therefore, due to the implementation of EPMs that would restore vegetation communities, the Southern Alternative would not contribute to a significant cumulative effect.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to vegetation communities when combined with other past, present, and reasonably foreseeable future actions.

3.13.3 Highway Alternative

The Highway Alternative would have the same cumulative effects on vegetation communities as described for the Southern Alternative.

3.14 Wetland and Riparian

3.14.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to wetland and riparian areas expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. The regions of Arizona and Utah that the Proposed Project traverses are not, in general, subject to residential and commercial developmental pressures, with the exception of the Kanab, St. George and Hurricane, Utah areas. Current and future development in these areas is therefore considered here. It has been projected that St. George and Hurricane will both experience dramatic population growth over the next several decades, resulting in land development to accommodate increased demand for housing and commercial structures. Kanab is also predicted to experience population growth, although not at the same rate. This population growth and development would continue to increase the demand for water and the need to divert water from springs and streams, ultimately reducing the number and size of riparian areas. Droughts could also affect wetlands, riparian areas, and jurisdictional waters by reducing available surface and sub-surface water, as well as overall vegetative cover.

Many of the specific actions that would contribute to adverse effects occur at the western (i.e., Sand Hollow Reservoir and Hurricane City) or eastern Proposed Project terminus (Lake Powell).

Considering wetland resources affected by past, current, and future projects, this resource has an extremely limited distribution throughout southern Utah and northern Arizona. Since this resource

is rare, any potential cumulative projects affecting wetlands could be important. However, since this resource is protected by Clean Water Act regulations and BLM policy, it is reasonable that the probability that wetlands would be adversely affected as a result of these cumulative actions is low.

Riparian areas are also uncommon in this region. Any projects with a federal nexus would include resource protection measures. Projects without a federal nexus could have a more substantial effect on this resource due to a lack of regulatory protection of these resources. For example, a project that does not require an authorization from a federal agency may not be required to implement any resource protection measures that could minimize or avoid affecting riparian resources. Therefore, other actions could contribute cumulative effects to riparian areas.

3.14.2 Southern Alternative

Construction of the Proposed Project would cause effects on wetland and riparian areas. In addition, amending the RMP could allow for additional ground-disturbing activities to occur within the ACEC, since management direction for the area would change due to reducing the size of the ACEC or changing the configuration of the utility corridor. While mitigation for impacts from new land use authorizations (that would be determined during site-specific project planning) would still be required, construction, operation, and maintenance of new ROWs (and other land use authorizations) could result in direct effects to riparian vegetation, as well as indirect effects to riparian resources from sedimentation and erosion as vegetation is removed. Disturbance to riparian areas from project construction would therefore still occur, and riparian resources would be lost at least in the short term.

Past and currently approved projects, as well as reasonably foreseeable projects, were also assessed to determine potential cumulative effects on wetlands and riparian areas when considered in combination with the Southern Alternative. These other projects either occur at the western (Sand Hollow Reservoir and Hurricane City) or eastern Proposed Project terminus (Lake Powell). Considering wetland resources being affected by past, current, and future projects, this resource has an extremely limited distribution throughout southern Utah and northern Arizona. Since this resource is rare, any potential projects affecting wetlands could be interpreted as significantly affecting that resource from cumulative actions. However, since this resource is protected by Clean Water Act regulations and BLM policy, it is reasonable that the probability that wetlands would be affected as a result of cumulative actions is low.

Riparian areas are also uncommon in this region. However, implementing Proposed Project EPMS would reduce potential effects. Any projects with a federal nexus would include resource protection measures. Projects without a federal nexus could have a more substantial effect on this resource than the LPP due to a lack of regulatory protection of these resources. For example, a project that does not require an authorization from a federal agency may not be required to implement any resource protection measures that could minimize or avoid affecting riparian resources.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to wetland and riparian areas when combined with other past, present, and reasonably foreseeable future actions.

3.14.3 Highway Alternative

The Highway Alternative would have the same cumulative effects on wetlands and riparian areas as described for the Southern Alternative.

3.15 Special Status Plants

3.15.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to special status plants expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. Cumulative effects would occur to special status plants from many of those other actions.

From a regional perspective, these plant species would be experiencing an additive adverse effect. Actions that are linear in nature (e.g., roadways and telecommunication lines) would result in the most pronounced affects; however, many of these past, present, and reasonably foreseeable actions on federally managed lands require vegetation reestablishment criteria, focusing on native and non-native plant species, and, conversely, focusing on preventing/limiting the spread of weed and invasive plant species. Consequently, cumulative effects would occur; but existing and anticipated effect minimization and reestablishment efforts for all actions is expected to result in a lower level of combined cumulative effects. However, if reestablishment of special status plant species is unsuccessful, it is expected that some noxious weeds and invasive plant species could have the capability to adapt to these extremely dry conditions and become established in areas where they were not previously.

3.15.2 Southern Alternative

The construction, operation, and maintenance of the Southern Alternative would result in both direct and indirect effects on special status plants due to construction of Proposed Project features and actions such as vegetation clearing, soil excavation, and stock piling of soil materials. The disturbance associated with construction, operation, and maintenance activities could lead to invasive species and noxious weed invasion, persistence, and spread. Other past, present, and reasonably foreseeable future actions would contribute similar types of effects as described for the No Action Alternative.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to special status plants when combined with other past, present, and reasonably foreseeable future actions.

3.15.3 Highway Alternative

Cumulative effects associated with the Highway Alternative would be the same as those described for the Southern Alternative.

3.16 General Fish and Wildlife

3.16.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to general fish and wildlife expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. Some of these other actions have resulted in adverse effects on general fish and wildlife resources.

The combined actions of land disturbance resulting from these past, present, and reasonably foreseeable future actions contribute to incremental loss, alteration, and fragmentation of foraging, nesting, breeding habitat, and refuge and/or escape cover for wildlife. These effects could be more intense if future development occurs in areas where specialized habitat types are limited, such as riparian corridors. Residential, agricultural, and infrastructure development has influenced natural aquatic habitats resulting in decreased soil stability, removing shade, higher water temperatures, decreased oxygen potential, and embeddedness of substrate, which may reduce breeding habitats for a variety of sensitive fish. Introduction of non-native fish have reduced native fish populations through predation, reducing diversity, and increasing competition for available resources.

3.16.2 Southern Alternative

The Proposed Project alternatives would have no measurable long-term effects on general fish and wildlife resources. These potential effects, when combined with past, present, and reasonably foreseeable future actions would have no measurable long-term cumulative effects on general fish and wildlife resources.

Habitats crossed by the Southern Alternative are similar to habitats impacted by similar past and present actions and reasonably foreseeable future actions. The Proposed Project's contribution to effects associated with the Southern Alternative would be incremental and discountable in comparison to the landscape-scale effects of past, present, and reasonably foreseeable future actions. Effects to sensitive species and associated habitats would be incrementally more along the Southern Alternative, presumably due to effects from previous highway construction and ongoing traffic that have already degraded and fragmented habitats.

Additionally, the Southern Alternative has the potential for increased negative effects to mule deer winter range even though construction would occur outside of the migration and wintering period. The effects associated with construction, operation, and maintenance of the Proposed Project would be greatly reduced through avoidance and implementation of the EPMS and mitigation measures. The potential effects to general fish and wildlife species would be discountable in the long term. Noxious weed prevention and control is difficult with construction projects, especially given the low success rate of restoration activities in desert environments. Although all restoration activities may not be successful, the overall amount of impacted area is expected to be low.

Areas that are not immediately restored to preconstruction conditions are expected to return to a similar condition within five years (DEIS Section 3.11, Vegetation Communities, and C-13, Vegetation Communities). See the DEIS Section 3.4, Land Use, and Appendix C-6, Land Use, for details on permanently maintained lands for the Proposed Project, such as hydro facilities, parking lots, and access roads (some would be restored). The total amount of potential effects from the

Proposed Project would be minimal based on the small area, limited temporal scope, and extensive spatial scale of the general fish and wildlife habitats and vegetation communities that occur.

Recreational pursuits, including OHV use, camping, and target shooting may increase due to additional Proposed Project access roads on BLM property that could cause disturbance to wildlife species and their habitats. Disturbance can come from noise, wildlife collisions, or the mere presence of humans. Different species, and individuals within species, react differently to disturbances. The type of reaction also differs with the time of year, location of disturbance in relation to breeding sites, type of disturbance, and duration of disturbance. With the increase in local populations has come a dramatic increase in the level of OHV use, resulting in increased disturbance, injury, and mortality to wildlife, particularly ground-dwelling species with low mobility. Transportation corridors exist through the habitat of virtually all species found within the analysis area discussed. Effects often vary by species and by the location, level of use, and speed of travel over the road. However, the Southern Alternative when combined with cumulative effects would have discountable effects from increased recreation.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to general fish and wildlife when combined with other past, present, and reasonably foreseeable future actions.

3.16.3 Highway Alternative

The potential cumulative effects that would vary from the Southern Alternative are based on the timing and location of these other cumulative actions. However, none of the projects examined for cumulative effects occur along the Proposed Project during big game migration or when construction would occur for the Proposed Project in the mentioned areas of concern.

The Highway Alternative would contribute to cumulative effects on Mojave Desert Region and Colorado Plateau wildlife habitats. The vegetation clearing for construction would temporarily and permanently remove wildlife habitat. The total amount of potential Proposed Project effects is minimal, based on the small area, limited temporal scope, and extensive spatial scale of the general fish and wildlife habitats and vegetation communities that occur throughout the Project Area. The cumulative effects of the Highway Alternative on Mojave Desert Region and Colorado Plateau Region wildlife habitats would be short-term. These potential effects, when combined with past, present, and reasonably foreseeable future interrelated actions would have no measurable long-term cumulative effects on general fish and wildlife resources.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to general fish and wildlife when combined with other past, present, and reasonably foreseeable future actions.

3.17 Sensitive Species – Fish and Wildlife

3.17.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to sensitive fish and wildlife species expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. Other actions, including those described in

Section 3.17.2 below, have and would continue to affect sensitive fish and wildlife species. The combined incremental effects of all past, present, and future actions could be extensive and occur over the majority of available habitat in the study area.

3.17.2 Southern Alternative

The effects of the Southern Alternative, including RMPA sub-alternatives, could contribute to existing and ongoing loss, fragmentation, and modification of vegetation and terrain that provide potential habitat for sensitive species. The quality and quantity of sensitive species habitats (e.g., riparian corridors and contiguous habitats in the ecoregions) are important for maintaining viable population of sensitive species. Direct and indirect effects of any one past, present, or future action may not affect sensitive species or their habitat to the degree that existing populations would be affected. The combined incremental effects of all past, present, and future actions could be extensive and occur over the majority of available habitat. Modification and fragmentation of sensitive species habitats could result in shifts in species composition and diversity.

BLM manages lands in the Project Area for multiple-resource use (see Appendix C-15, Special Status Plants, for a description of the Project Area). NPS manages Glen Canyon National Recreation Area and Pipe Springs National Monument in accordance with the NPS Organic Act (54 United States Code 100101 et seq.), NPS Management Policies, and manages park resources using site-specific plans and park-wide plans for future use and management. Actions taken by the NPS may include repairing and rehabilitating access roads, managing ORVs, camping areas, trails, commercial air tours, non-native aquatic species management, communication sites, dam operations and facilities, vegetation management, visitor use and recreation, and preservation of cultural and natural resources and interpretation.

Past and present actions include wildfire, vegetation treatments, invasive and noxious species management, livestock grazing, recreation use (e.g., OHV use, trailheads, biking, hiking, camping, and hunting), transmission lines, highways, utility corridors (West Wide Energy Corridor), residential subdivision expansion, flood protection, reservoirs (Jackson Flat), water management and dams (e.g., Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, Operation of Glen Canyon Dam, Interim surplus Criteria, Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, St. George Waste-water Reuse Project), and communication site development (SCC Buckskin to Page Project, SCC Fiber Optic Project). Reasonably foreseeable future actions include Northern Corridor Highway ROWs, UDOT Projects SR-9, and Fredonia Flood Retarding Structure.

The combined actions contribute to incremental loss, alteration, and fragmentation of foraging, nesting, breeding habitat and refuge and/or escape cover sensitive species and could be more intense if development occurs in areas where specialized habitat types are limited such as riparian corridors. Residential, agricultural, and infrastructure development has influenced natural aquatic habitats resulting in decreased soil stability, removing shade, higher water temperatures, decreased oxygen potential, and embeddedness of substrate which may reduce breeding habitats for a variety of sensitive fish. Introduction of non-native fish can reduce native fish populations through predation, reducing diversity and increasing competition for available resources.

Habitats crossed by the Southern Alternative are similar to habitats impacted by similar past and present action and reasonably foreseeable future actions. The Proposed Project's contribution to effects associated with the Southern Alternative would be incremental in comparison to the landscape-scale effects (e.g., wildfire) of past, present, and reasonably foreseeable future actions. Amending the land use plan under RMPA Sub-alternative 1 would allow new land use authorizations within the ACEC when effects to sensitive resources for which the area was designated could be mitigated, which would result in cumulative effects on sensitive species that use riparian habitats associated with the ACEC similar to those previously described. Under RMPA Sub-alternative 2, amending the size of the ACEC would reduce the acreage of the ACEC by 905 acres, which would overlap with important riparian corridors that may be used by other sensitive species.

Effects to sensitive species and associated habitats would be incrementally more along the Southern Alternative because one might assume that the effects of a highway have already degraded and fragmented habitats limiting their value for sensitive species, which is the case along the Highway Alternative. The effects associated with construction, operation, and maintenance of the Southern Alternative would be greatly reduced through avoidance and implementation of the EPMs. The potential to mitigate effects to sensitive species and their habitats is high and the indirect cumulative effects on sensitive species would be less with implementation of mitigation. Effects to habitat in some areas may be more long-term because of restoration rates of some components of habitat (e.g., pinyon pine-juniper and blackbrush) potential for invasive, non-native species within the ROWs, which would result in some effects to sensitive species habitat within the ROWs; therefore, cumulative effects associated with sensitive species habitat would occur in some localized areas within the ROWs. Projects with no federal nexus may not include extensive EPMs and could result in cumulatively more substantial effects than the Proposed Project is likely to have.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to sensitive fish and wildlife species when combined with other past, present, and reasonably foreseeable future actions.

3.17.3 Highway Alternative

Cumulative effects associated with the Highway Alternative would be similar to those disclosed for the Southern Alternative.

Habitats crossed by the Highway Alternative are similar to habitats impacted by similar past and present action and reasonably foreseeable future actions. The Proposed Project's contribution to effects associated with the Highway Alternative would be incremental in comparison to the landscape-scale effects of past, present, and reasonably foreseeable future actions. Effects to sensitive species and associated habitats would be incrementally less along the Highway Alternative compared to the Southern Alternative because one might assume that the effects of an existing highway have already degraded and fragmented habitats limiting their value for sensitive species for a good portion along the Highway Alternative. The effects associated with construction, operation, and maintenance of the Proposed Project could be greatly reduced through avoidance and implementation of the EPMs. The potential to mitigate effects to sensitive species is high. Effects to habitat in some areas may be more long-term because of restoration rates of some components of habitat (e.g., pinyon pine-juniper and blackbrush), including the potential for invasive, non-native species within the ROWs, which would result in some adverse effects to sensitive species habitat within the ROWs

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to sensitive fish and wildlife species when combined with other past, present and reasonably foreseeable future actions.

3.18 Threatened and Endangered Species

3.18.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to threatened and endangered species expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. However, some of these actions would cause adverse effects to ESA-listed species.

3.18.2 Southern Alternative

The effects of the Southern Alternative including RMPAs could contribute to existing and ongoing loss, fragmentation, and modification of habitat for ESA-listed species. The combined incremental effects of all past, present, and reasonably foreseeable future actions could be extensive and occur over the majority of available habitat in the Proposed Project area. Modification and fragmentation of ESA-listed species habitats could result in shifts in species composition and diversity.

Lands administered by the BLM in the Proposed Project area are managed for multiple-resource use (see Appendix C-18, Threatened and Endangered Species for a discussion of the Proposed Project area). The NPS manages Glen Canyon National Recreation Area and Pipe Springs National Monument in accordance with the NPS Organic Act (54 United States Code 100101 et seq.) and NPS Management Policies, and it manages park resources using site-specific plans and park-wide plans for future use and management. Actions taken by the NPS may include repairing and rehabilitating access roads; managing ORVs, camping areas, trails, commercial air tours, non-native aquatic species, communication sites, dam operations and facilities, vegetation, and visitor use and recreation; and preserving cultural and natural resources and providing interpretation.

Past and present actions include wildfire, vegetation treatments, invasive and noxious species, livestock grazing, recreation use (e.g., ORV use, trailheads, biking, hiking, camping, and hunting), transmission lines, highways, utility corridors (West Wide Energy Corridor), residential subdivision expansion, flood protection, reservoirs (Jackson Flat), water management and dams (e.g., Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, Operation of Glen Canyon Dam, Interim Surplus Criteria, Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Sand Hollow Regional Pipeline Project), and communication site development (SCC Communications Buckskin to Page Project, SCC Fiber Optic Project), St. George Wastewater Reuse Project, Southern Corridor (Parkway) Highway, Red Cliffs NCA Trailhead Projects, Kitchen Corral Road and Whitehouse Road Realignment, and Lava Ridge Trailhead improvements. Reasonably foreseeable future actions include Northern Corridor Highway ROW, UDOT Projects SR-9, Southern Corridor (Parkway) Highway Expansion, St. George Water Reclamation Facility Rehabilitation Project, U.S. Highway 89 Widening and Horseshoe Bend Left-Turn Lane Project, SR-389 Short Creek Bridge Scout Repair, and Fredonia Flood Retarding Structure.

The combined actions contribute to incremental loss, alteration, and fragmentation of foraging, nesting, breeding habitat, and refuge and/or escape cover for ESA-listed species and could be more intense if development occurs in areas where specialized habitat types are limited such as riparian corridors. Residential, agricultural, and infrastructure development has influenced natural aquatic habitats resulting in decreased soil stability, removing shade, higher water temperatures, decreased oxygen potential, and embeddedness of substrate which may reduce breeding habitats for ESA-listed fish. Introduction of non-native fish can reduce native fish populations through predation, reducing diversity and increasing competition for available resources.

Habitats crossed by the Southern Alternative are similar to those affected by comparable past, present, and reasonably foreseeable future actions. The Proposed Project's contribution to effects associated with the Southern Alternative would be incremental in comparison to the landscape-scale effects (e.g., wildfire) of past, present, and reasonably foreseeable future actions. By amending the land use plan under the RMPA, Sub-alternative 1 would allow new land use authorizations within the ACEC. When effects to sensitive resources for which the area was designated could not be mitigated, this would result in cumulative effects on ESA-listed species, such as southwestern willow flycatcher that use riparian habitats associated with the ACEC similar to those previously described.

Under RMPA Sub-alternative 2, amending the size of the ACEC would reduce the acreage of the ACEC by 905 acres, which would overlap with important riparian corridors that may be used by other sensitive species. The effects associated with construction, operation, and maintenance of the Proposed Project could be greatly reduced through avoidance and implementation of the EPMs. The potential to mitigate effects for most ESA-listed species is high. The potential to mitigate effects to occupied or suitable upland habitat is low due to the potential for invasive species, such as annual cheatgrass, to come into the ROWs and the low success rate of restoration activities in some desert environments. The potential to mitigate effects within riparian habitats is higher, and restoration activities are more likely to succeed.

Even with successful restoration efforts, portions of the ROW would be maintained in a condition that would be suitable to the operation and maintenance of the Proposed Project. This may not allow for full restoration of occupied or suitable habitats; therefore, cumulative effects associated with ESA-listed species habitat, would degrade habitat in some areas, depending on the species. USFWS considers the Northern Corridor/Washington County Habitat Conservation Plan to be a major cumulative effect to threatened and endangered species, particularly Mojave Desert tortoise.

Overall, the cumulative effects to threatened and endangered species resulting from the construction and operation of the Southern Alternative, and in combination with other past, present, and reasonably foreseeable future actions, would degrade habitat depending on location.

3.18.3 Highway Alternative

Cumulative effects associated with the Highway Alternative would be the same as those described for the Southern Alternative.

3.19 Visual Resources

3.19.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to visual resources expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. For other actions involving new construction near existing development, effects would occur. Effects would also occur if other actions would involve new construction in mostly undeveloped landscapes.

3.19.2 Southern Alternative

The Southern Alternative would result in visual resource effects within the area of analysis when combined with the effects of the past, present, and future actions. The pipeline follows highway or roads through much of the alignment, resulting in limited cumulative visual effects. The large facilities (booster pump stations, hydrostations, and related infrastructure), when located near areas of existing development, would result in cumulative visual effects as they would blend with other structures. In locations where these facilities would be constructed in mostly undeveloped landscapes and occur at regular intervals, their size and repetition could result in cumulative visual effects, especially when combined with other visually disharmonious projects. The transmission lines in several locations would be located in proximity to existing lines, thus resulting in cumulative visual effects.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to visual resources when combined with other past, present, and reasonably foreseeable future actions.

3.19.3 Highway Alternative

The Highway Alternative visual resource cumulative effects would be similar to those described for the Southern Alternative. However, one additional cumulative effect could occur when the effects of construction and operation of the Proposed Project under the Highway Alternative is combined with the effects of the Jackson Flat Reservoir Project. The visual resource effects of the Highway Alternative in the affected environment near the Jackson Flat Reservoir would have short-term cumulative effects on the characteristic landscape because of changes in line, form, color, and texture introduced as a result of land disturbance caused by both projects (see Appendix C-19, Visual Resources, for a discussion of the affected environment). The cumulative effects would diminish over time as the Highway Alternative becomes revegetated in the area of potential effect near the Jackson Flat Reservoir.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to visual resources when combined with other past, present, and reasonably foreseeable future actions.

3.20 Cultural Resources

3.20.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to cultural resources expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. However, permitted land uses, such as, but not limited to, realty actions, mineral exploration/development, livestock grazing, and special-recreation permits, would continue to occur. Depending on the location, allowed uses, such as OHV use, camping, hiking, and sightseeing, and unauthorized uses, such as illegal collection of artifacts, vandalism, and damage to cultural resources, would also continue to occur. These potential effects may include the natural deterioration of cultural resources and the settling of dust from OHV use on cultural resources, and ground-disturbing actions associated with the construction of utility lines.

3.20.2 Southern Alternative

In the past, cultural resources along the Southern Alternative have been affected by the construction of roads, highways, and utilities (e.g., fiber-optic lines). In 2017, SCC also completed an additional fiber-optic line north of U.S. Highway 89, on Johnson Canyon and Skutumpah Roads. The construction of these fiber-optic projects, and the authorization of the Proposed Project would add to the overall effects on cultural resources from utility projects in the area of the Proposed Project. Many of the negative effects from these fiber-optic lines were avoided where the fiber-optic line was constructed in areas of previous surface disturbance (e.g., within the highway prism).

The completed portions of UDOT's Southern Corridor (Parkway) added to the effects on cultural resources in the area. These effects included the data recovery (e.g., archaeological excavation) efforts that were conducted prior to destruction of habitation sites, some of which contained human remains. The completion of the Sand Hollow Regional Pipeline Project resulted in damage to one historic property. Depending on which alternative is selected for the Northern Corridor Highway, approximately two to seven historic properties may be damaged or destroyed.

Land use planning and water-use projects that do not authorize ground disturbance and contain provisions to protect and manage cultural resources, such as the BIA and BLM - St. George Wastewater Reuse Project, do not add to the cumulative effects of the Proposed Project.

Overall, the cumulative effects to cultural resources resulting from the construction and operation of the Southern Alternative, and in combination with other past, present, and reasonably foreseeable future actions, would include damage or destruction of cultural resources. Cumulative effects from permitted land uses, such as, but not limited to, realty actions, mineral exploration/development, livestock grazing, and special-recreation permits are also present. Cumulative effects from allowed uses, such as OHV use, camping, hiking, and sightseeing, and unauthorized uses, such as the illegal collection of artifacts, vandalism, and damage to cultural resources, would also continue to occur.

3.20.3 Highway Alternative

Cumulative effects for the Highway Alternative would be the same as those described for the Southern Alternative, except when combined with impacts from the Jackson Flat Reservoir. Effects to cultural resources occurred with the construction of the Jackson Flat Reservoir. Completed in 2013, the Jackson Flat Reservoir is a 4,228-acre-foot reservoir that stores non-potable water. This reservoir is located south of Kanab and east of Kanab municipal airport in Kane County, Utah.

Prior to construction of the reservoir, a series of archaeological excavations were conducted to mitigate the effects on cultural resources. At the Jackson Flat project area, numerous cultural resource sites, including prehistoric (e.g., subsurface pit houses) and historic site types were destroyed. A large number of Native American human remains were located during these archaeological excavations. The previous construction of this reservoir and the authorization of the Proposed Project would increase the overall effects on cultural resources in the area of the Proposed Project. These effects include the destruction of cultural resource sites that may contain Native American human remains and important archaeological information.

3.21 Ethnographic Resources

3.21.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to ethnographic resources expected from the past, present, and reasonably foreseeable future actions because it would not be constructed.

3.21.2 Southern Alternative

The Southern Alternative, in particular, would have more cumulative long-term adverse effects than the Highway Alternative from the perspective of the Southern Paiute Advisory Committee (SPAC) due to its crossing of the Kanab Creek Traditional Cultural District. This would have a greater cumulative effect on tribal identity than most projects due to the physical and spiritual sensitivity of the area, and the potential of future projects being placed in the same alignment. While no additional projects are known, revising the RMPA to allow for future projects jeopardizes sacred sites and would impair community identity.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to ethnographic resources when combined with other past, present, and reasonably foreseeable future actions.

3.21.3 Highway Alternative

The Highway Alternative would contribute less to the cumulative effects associated with tribal identity than the Southern Alternative. This alternative does not cross the Kanab Creek Traditional Cultural District, so it has less of a cumulative effect on the Tribe. While there are important sites and ethnographic resources along this route, those are comparatively less important than the Kanab Creek Traditional Cultural District.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to visual resources when combined with other past, present, and reasonably foreseeable future actions, but to a lesser degree than under the Southern Alternative.

3.22 Indian Trust Assets

3.22.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to Indian Trust Assets (ITAs) expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. Other actions have resulted in adverse effects on ITAs, including effects on fishing and hunting rights, visual effects on reservation lands, short-term construction noise on reservation lands, and effects to traditional plant resources.

3.22.2 Southern Alternative

Based upon the proposed ROW, the Southern Alternative would have no effect on ITAs, and thus would not contribute any additional cumulative effects to ITAs.

3.22.3 Highway Alternative

The Highway Alternative would interfere with the use, value, occupancy, character, and enjoyment through effects on fish and wildlife where fishing and hunting rights exist. The Highway Alternative would also have short-term visual effects on the reservation. The construction of the pipeline would create a visual corridor devoid of vegetation during construction. Once construction is completed, however, the pipeline corridor would be restored and revegetated, so visual contrasts would disappear over time. In addition, the LPP corridor would become substantially unnoticeable over time because it would largely be parallel to an existing paved highway where disturbance has already occurred. Construction noises would have a temporary effect on the enjoyment of the reservation. Permits to maintain the pipeline would encumber the reservation for decades along the proposed LPP ROW. The Highway Alternative would also impair resource use on the reservation during construction. Traditional plant resources within the construction corridor would be disturbed, and revegetation efforts could take years to achieve full growth. Some of the other past, present, and reasonably foreseeable future actions described for the No Action Alternative have contributed to adverse effects on ITAs that would combine with the effects from the Proposed Project to create a greater cumulative effect on ITAs.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to ITAs when combined with other past, present, and reasonably foreseeable future actions.

3.23 Socioeconomics

3.23.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to socioeconomics expected from the past, present, and reasonably foreseeable future actions because it would not be constructed. Those effects would be primarily be from the construction activities from those actions. If those actions (or other trends) lead to substantial additional population growth in the region, under the No Action Alternative the Proposed Project would not contribute to the beneficial effect of meeting water needs, which could be at least partially met if the Sand Hollow Regional Pipeline project is implemented.

3.23.2 Southern Alternative

The Southern Alternative would contribute to cumulative effects to regional socioeconomics if the construction period coincided with the construction period of other reasonably foreseeable actions. Those effects would be temporary beneficial effects from construction employment.

Overall, construction and operation of the Southern Alternative would contribute to overall beneficial cumulative effects to socioeconomic resources when combined with other past, present, and reasonably foreseeable future actions.

3.23.3 Highway Alternative

Cumulative effects for the Highway Alternative would be the same as those described for the Southern Alternative.

3.24 Environmental Justice

3.24.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to environmental justice (EJ) populations expected from the past, present, and reasonably foreseeable future actions because it would not be constructed.

However, adverse effects to EJ populations that have resulted from several of these past and present project actions would continue to occur. In addition, several of the reasonably foreseeable future actions would likely contribute to adverse, disproportionate effects on EJ populations. These effects would primarily be the result of construction projects that have caused permanent damage to locations that are culturally significant to local tribal groups, other adverse social effects, adverse visual effects, and lower property values.

3.24.2 Southern Alternative

The Southern Alternative would have direct and indirect adverse effects to EJ populations, and would, therefore, contribute to cumulative effects on EJ populations from other past, present, and reasonably foreseeable future actions as described for the No Action Alternative. The Proposed Project would adversely affect all three types of EJ-defined populations (low-income, minority, and American Indian). Each EJ population would be adversely affected due to construction activities for the Proposed Project, permanent damage to locations that are culturally significant to local tribal groups, visual effects, and other social effects on the tribes. There is also potential for long-term effects on property values in low-income communities as a result of power corridor routing. In addition, low-income households would be disproportionately affected by expected increases in water rates and by other economic variables that are influenced by the price of water. Low-income populations living within the area to be served by the proposed pipeline are expected to pay a higher percentage of their disposable incomes for water delivery, impact fees (whether directly or indirectly), and for local goods and services that incorporate higher water costs into their price structures in comparison to the broader community. Because demand for basic culinary water service is relatively price inelastic—meaning that the baseline amount of water consumed per person in a typical household is relatively inflexible regardless of the price charged per unit consumed—it is expected that lower income populations would therefore experience disproportionate adverse economic effects as compared to the overall population.

In addition, the Tribe has indicated that the Southern Alternative would damage culturally significant natural landscape features and would harm the Tribe’s well-being. The adverse effects of these specific physical damages to these landscape features would be unique to the Tribe and would not be shared by the wider population. Therefore, a disproportionate adverse effect on the Tribe is anticipated to occur under this alternative.

Overall, construction and operation of the Southern Alternative would contribute to the overall adverse cumulative effects to EJ populations when combined with other past, present, and reasonably foreseeable future actions.

3.24.3 Highway Alternative

Cumulative effects for the Highway Alternative would be the same as those described for the Southern Alternative.

3.25 Comparative Analysis of Alternatives

The effects of the Proposed Project in combination with other past, present, and reasonably foreseeable future actions would largely be the same for all agencies. Table 3.25-1 provides a summary of the cumulative effects by alternative.

Table 3.25-1 Summary of Cumulative Effects by Alternative

Alternative	Cumulative Effects
No Action	The Proposed Project would not be constructed in this alternative and, therefore, there would be no additional contribution from the Proposed Project to cumulative effects for any resource. However, other past, present, and reasonably foreseeable future actions would contribute to effects for nearly all resources, with the level of effects varying by resource.
Southern Alternative	Construction and operation of the Southern Alternative would contribute to the total cumulative effects when combined with contributions from other past, present, and reasonably foreseeable future actions, with the level of effects varying by resource.
Highway Alternative	For nearly all resources, the total cumulative effect from constructing and operating this alternative would be similar to the Southern Alternative. For some resources, the total cumulative effect for implementing the Highway Alternative would be less than for implementation of the Southern Alternative, and for other resources it would be greater.

4 References

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5 Glossary

Cumulative effects. Cumulative effects are defined as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such actions.

6 Acronyms

ACEC	Kanab Creek Area of Critical Environmental Concern
ADOT	Arizona Department of Transportation
AIS	aquatic invasive species
BLM	Bureau of Land Management
CE	Categorical Exclusion
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EJ	environmental justice
EIS	environmental impact statements
EMF	electric and magnetic fields
EPA	U.S. Environmental Protection Agency
EPM	environmental protection measures
ESA	Endangered Species Act of 1973
FONSI	Finding of No Significant Impact
GHG	greenhouse gas
GSENM	Grand Staircase-Escalante National Monument
I-15	Interstate 15
LPP	Lake Powell Pipeline
LTEMP EIS	Glen Canyon Dam Long-Term Experimental and Management Plan Environmental Impact Statement
NCA	National Conservation Area
NEPA	National Environmental Policy Act
NHT	National Historic Trail
NPS	National Park Service
OHV	off-highway vehicle
ORV	Off-Road Vehicle
Plan/EA	Supplemental Watershed Plan and EA
Reclamation	Bureau of Reclamation
RMP	Arizona Strip Field Office Resource Management Plan
RMPA	Arizona Strip Field Office Resource Management Plan Amendment
ROD	Record of Decision
ROW	right-of-way
SCC	South Central Communications
SGWRP	St. George Water Reuse Project
SR-9	State Route 9
Tribe	Kaibab Band of Paiute Indians
UDOT	Utah Department of Transportation
USFWS	U.S. Fish and Wildlife Service
WCWCD	Washington County Water Conservancy District

7 Consultation and Coordination

Section 2 describes the consultation and coordination process Reclamation used to identify relevant past, present, and reasonably foreseeable future actions that were likely to have overlapping effects with the Proposed Project.