

# **Utah Board of Water Resources**

## **Lake Powell Hydroelectric System**

### **Revised Study Plan**

*In accordance with 18 CFR §5.11*

**Project No. 12966**

**Prepared by Utah Division of Water Resources**

**December 2008**

## **Attachment A**

### **Revised Study Plan**

The Utah Board of Water Resources (UBWR), applicant for the Lake Powell Pipeline Hydroelectric Project, FERC No. 12966, submit their revised study plan (RSP) in accordance with the Federal Energy Regulatory Commission (FERC) regulations at 18 CFR §5.11. This document includes studies that respond directly to requests submitted by FERC staff, other federal agencies and third parties. The studies also include those necessary to meet the respective resource impact analysis needs of the participating federal land management agencies responsible for permitting portions of the project. These federal agencies include the Bureau of Land Management, National Park Service and Bureau of Reclamation. These agencies each will prepare a Record of Decision (ROD) on the environmental impact statement (EIS) prepared by FERC after they adopt the EIS as cooperating agencies to satisfy their National Environmental Policy Act (NEPA) compliance requirements for the respective decisions they will make on the Lake Powell Pipeline Project.

The applicant filed with the FERC and known stakeholders, a Notice of Intent to license the Lake Powell Hydroelectric Project (a system included in the Lake Powell Pipeline Project) and a Pre-Application Document (PAD) describing the existing conditions at the Project on March 4, 2008. In accordance with the process plan and schedule established for the Lake Powell Pipeline Project by the FERC, resource agencies, tribes and other stakeholders were given until July 7, 2008, to file comments on the PAD, Scoping Document 1, and request studies of the applicant. FERC issued Scoping Document 2 on August 21, 2008. The applicant submitted the Proposed Study Plan (PSP) to FERC on August 21, 2008. The applicant scheduled and held initial study plan meetings on September 8, 2008 in Salt Lake City, UT and on September 9, 2008 in St. George, UT. The applicant incorporated informal comments made on the PSP into specific resource sections following the initial study plan meetings and distributed updated resource sections to FERC, federal and state agencies, tribes, and public participants prior to additional study plan meetings. Additional study plan meetings were held in St. George, UT on October 26, 27, and 29, 2008 for various resource disciplines. Additional study plan meetings were held in Salt Lake City, UT on October 28 and in Phoenix, AZ on October 29, 2008. Additional study plan conference calls were held in November 2008. The applicant also met with specific federal and state agencies during the study plan development process to discuss comments on the study plans.

This document contains the applicant's response to the requested studies. Each study plan prepared for a specific resource or environmental discipline comprises a section of the RSP. The studies included in this section respond directly to a study request submitted by a resource agency, a tribe, or a stakeholder. The revised study plans are generally structured to collect and provide the requested data in the manner reflected in the original study request with certain modifications in some instances. In several cases, studies requested from different entities mirrored each other or differed only with respect to one or more components. In these cases, the applicant combined the study requests to address the objectives of each requesting entity. The revised studies are:

- Air Quality
- Aquatic Resources
- Cultural Resources
- Geology and Soils
- Groundwater Resources
- Land Use Plans and Conflicts
- Noise
- Paleontological Resources
- Recreation Resources

- Water Resource Economics/Socioeconomics
- Special Status Aquatic Resource Species and Habitats
- Special Status Plant Species and Noxious Weed Assessment
- Special Status Wildlife Species and Habitat Assessment
- Transportation
- Vegetative Community Mapping
- Visual Resources
- Surface Water Quality
- Surface Water Resources
- Water Supply and Climate Change
- Wetlands and Riparian Resources
- Wildlife Resources
- Alternatives Development
- Ethnographic Resources

Figure 1 shows the primary dependency relationships of the analyses for the resource disciplines included in the Revised Study Plan. The relationships depicted on Figure 1 are intended to indicate the flow of primary analysis results starting from the top of the diagram and proceeding to the bottom of the diagram. Arrows connecting one resource discipline to another indicate the primary dependency for analysis results to be included in the subsequent analyses. The diagram is not intended to show the secondary relationships between resources, and there may be interdependencies between many more of the resources that shown by the primary resource relationships depicted on Figure 1.

The PAD presented the Utah Board of Water Resources' preferred alternative alignment for the Lake Powell Pipeline Project. This alternative is now referred to as the south alignment alternative, which traverses land south of the Kaibab Indian Reservation. Figure 2 shows the Project water intake and conveyance systems, including the pipeline alignment and locations of pump stations and regulating tanks. Figure 3 shows the hydro system, including penstocks and hydro stations, and the south alignment alternative. Based on comments received from FERC, the federal and state resource agencies, Kaibab Band of Paiute Indians, and third parties, a second alignment alternative along Arizona State Highway 389 across the Kaibab Indian Reservation has been identified and incorporated into the Revised Study Plan. This alternative is referred to as the existing highway alignment alternative (Figure 3). Figure 4 shows the existing and proposed transmission line corridors and substations that would serve the water intake and conveyance systems. Page Electric has confirmed that existing electric power generation and transmission capacity is sufficient to bring electricity to the Glen Canyon substation to serve the Lake Powell Pipeline Project without building new generating plants or transmission lines. The transmission line and substation features shown on Figure 4 may require either upgrades or new construction adjacent to existing power facilities. Figure 5 shows the existing and proposed transmission lines and substations that would serve the hydro system.

Figure 6 shows the Cedar Valley Pipeline system alternative alignments that would convey LPP water from the St. George area to the Cedar Valley. Figure 7 shows the existing and proposed transmission line and substation features that would serve the Cedar Valley Pipeline system.

The UBRW appreciates your interest in the Lake Powell Pipeline Project and looks forward to discussing the proposed study plans with all stakeholders over the coming months.

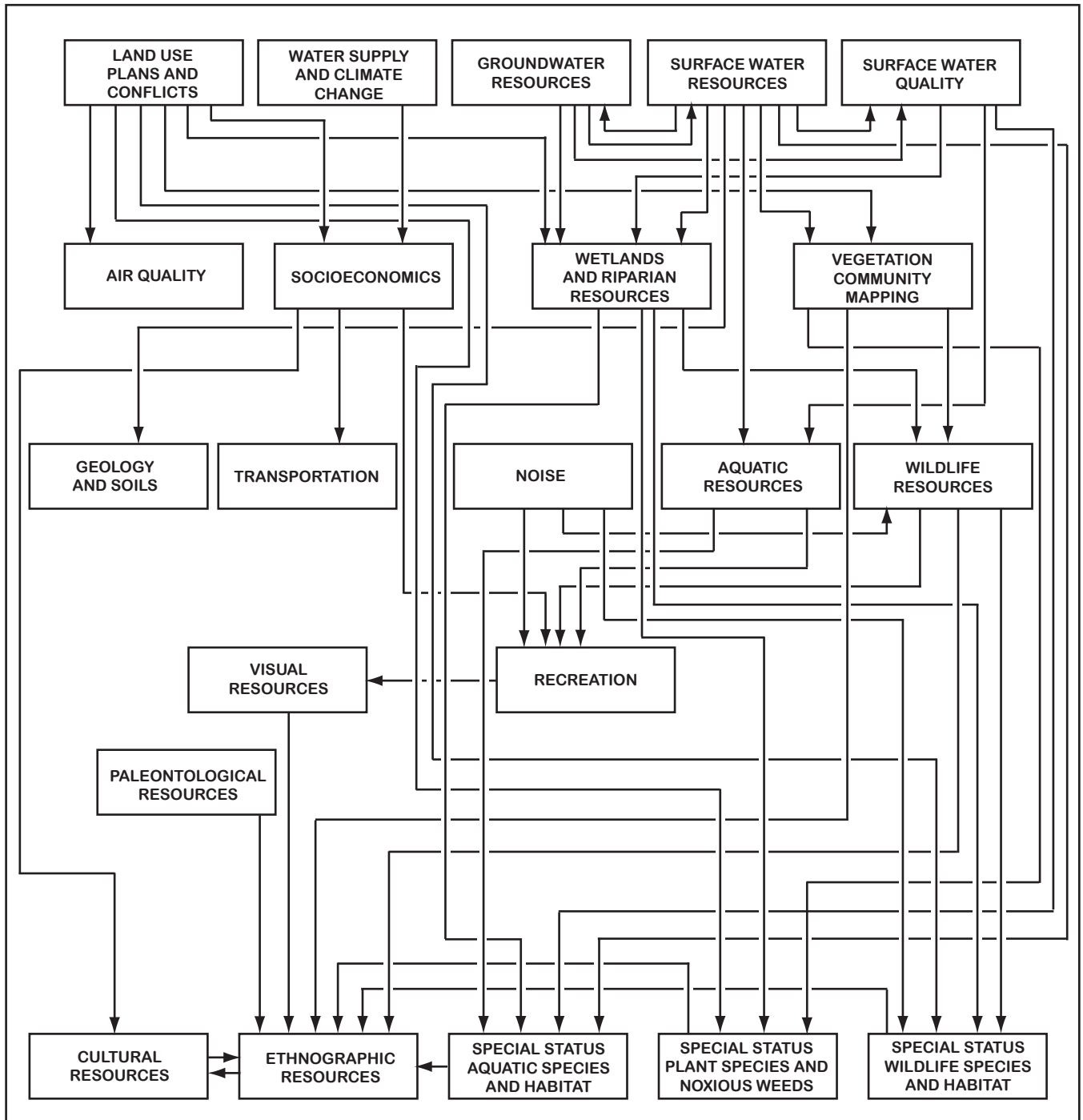
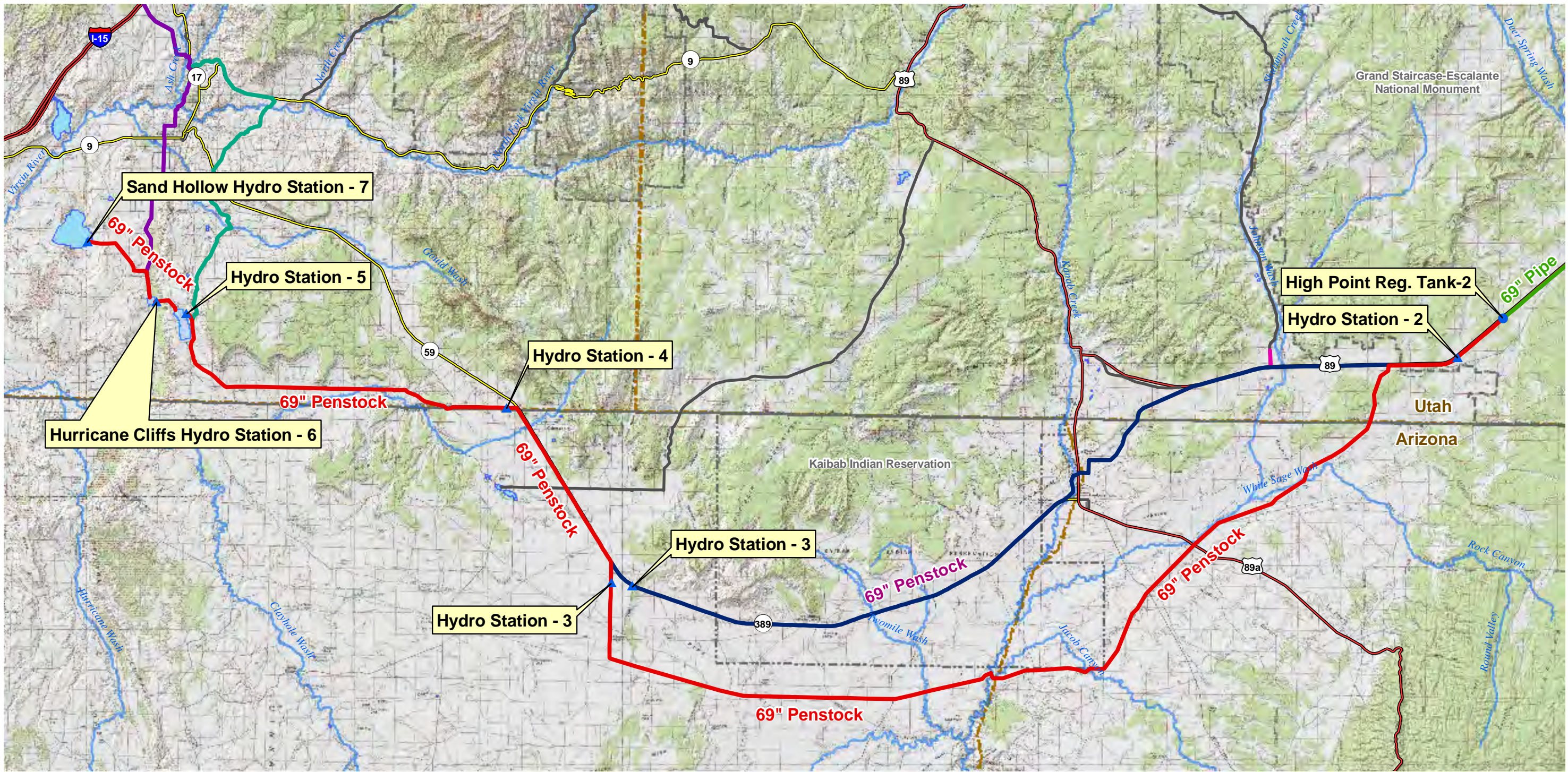


Figure 1  
Lake Powell Pipeline Study Plans  
Primary Resource Relationships









**Legend**

- |                                   |   |            |                        |
|-----------------------------------|---|------------|------------------------|
| Project Pump Station              | Project Pipeline Alignment                          | Interstate | National Park/Monument |
| Project Regulating Tank           | Project South Penstock Alignment Alternative        | US Highway | GSENM Boundary         |
| Project Hydro Station             | Project Existing Hwy Penstock Alignment Alternative | ST Highway | Tribal Lands           |
| Major Rivers & Streams            | KCWCD Pipeline Spur                                 | Hwy        | State Boundaries       |
| Hurricane Cliffs Forebay/Afterbay | CVP C Alternative                                   | Major Road | County Boundaries      |
| Lakes & Reservoirs                | CVP G Alternative                                   |            |                        |

**Lake Powell Pipeline Project**

1:300,000 Scale

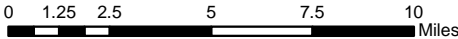
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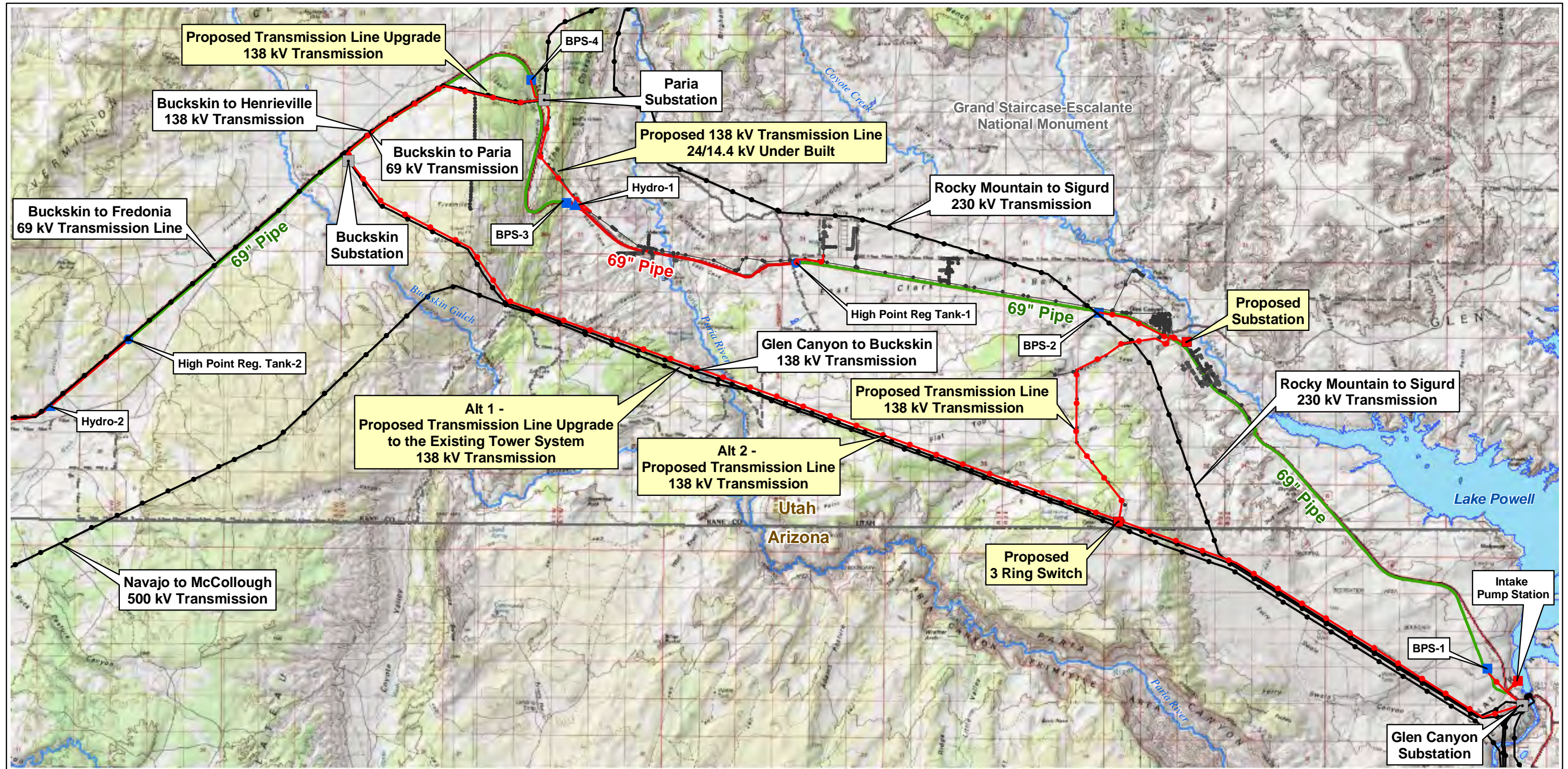
**Figure - 3**



**Lake Powell Pipeline  
Hydro System**







#### Legend

- |                              |                               |                      |                            |
|------------------------------|-------------------------------|----------------------|----------------------------|
| ■ Substation                 | ■ Project Intake Pump Station | — Interstate         | — Major Rivers & Streams   |
| ■ Proposed Substation        | ■ Project Pump Station        | — US Highway         | — National Park/Monument   |
| — Proposed Transmission Line | ● Project Regulating Tank     | — ST Highway         | — GSENM Boundary           |
| — Existing Transmission Line | ▲ Project Hydro Station       | — Hwy                | — State Boundaries         |
| — Existing OH Primary Line   | — Project Pipeline Alignment  | — Major Road         | — NGS USA Topographic Maps |
| — Existing UG Primary Line   | — Project Penstock Alignment  | — Lakes & Reservoirs |                            |

#### Lake Powell Pipeline Project

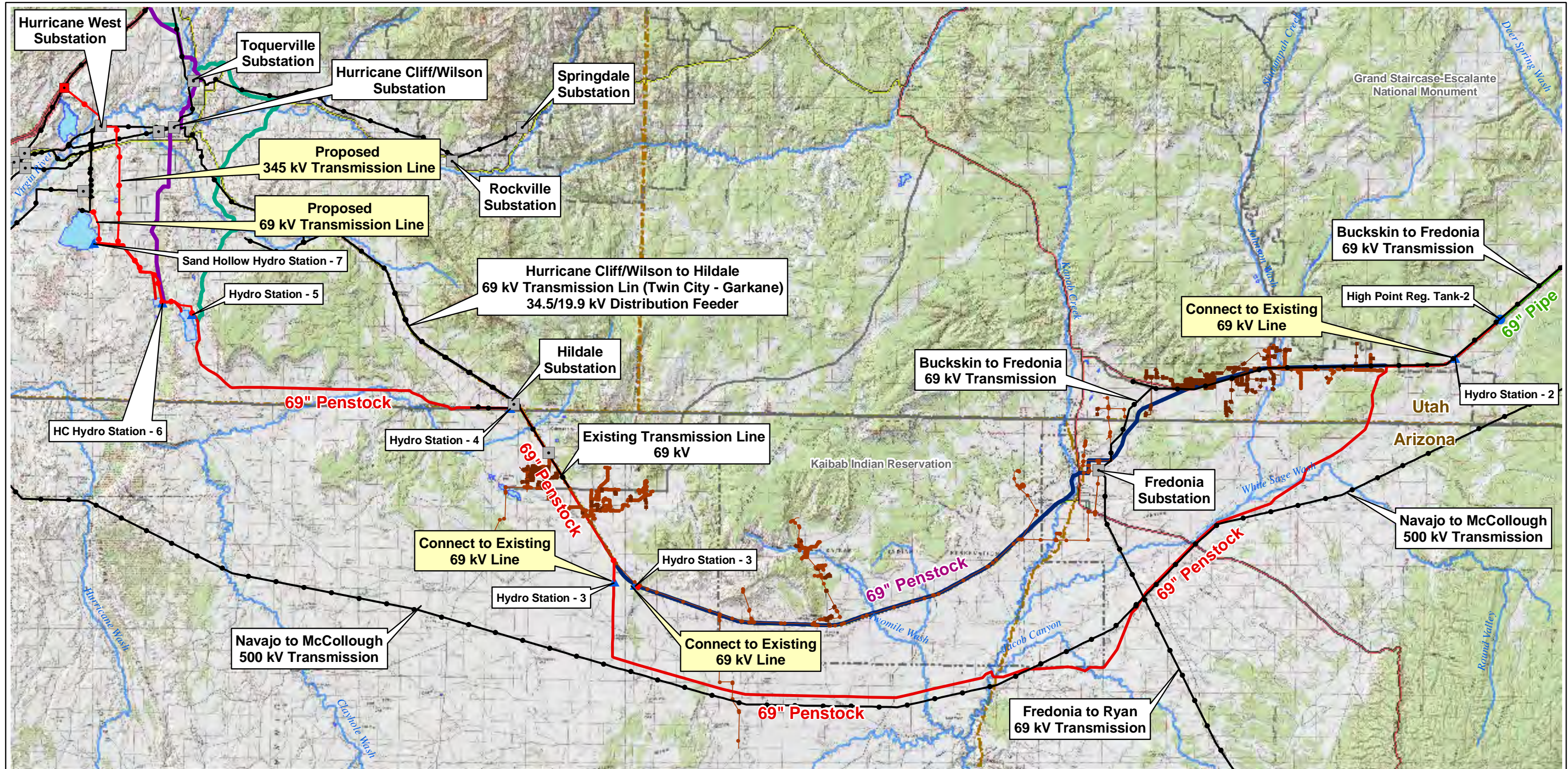
1:175,000 Scale  
Spatial Reference: UTM Zone 12N, NAD-83

UDWR Figure - 4 MWH

#### Lake Powell Pipeline Water Conveyance System Power Transmission Lines

0 0.5 1 2 3 4 Miles





**Legend**

Substation	Project Pump Station	Project Pipeline Alignment	Interstate	National Park/Monument
Proposed Substation	Project Regulating Tank	Project South Penstock Alignment Alternative	US Highway	GSENM Boundary
Proposed Transmission Line	Project Hydro Station	Project Existing Hwy Penstock Alignment Alternative	ST Highway	Tribal Lands
Existing Transmission Line	Major Rivers & Streams	KCWCD Pipeline Spur	Hwy	State Boundaries
Existing OH Primary Line	Hurricane Cliffs Forebay/Afterbay	CVP D Alternative	Major Road	County Boundaries
Existing UG Primary Line	Lakes & Reservoirs	CVP G Alternative		

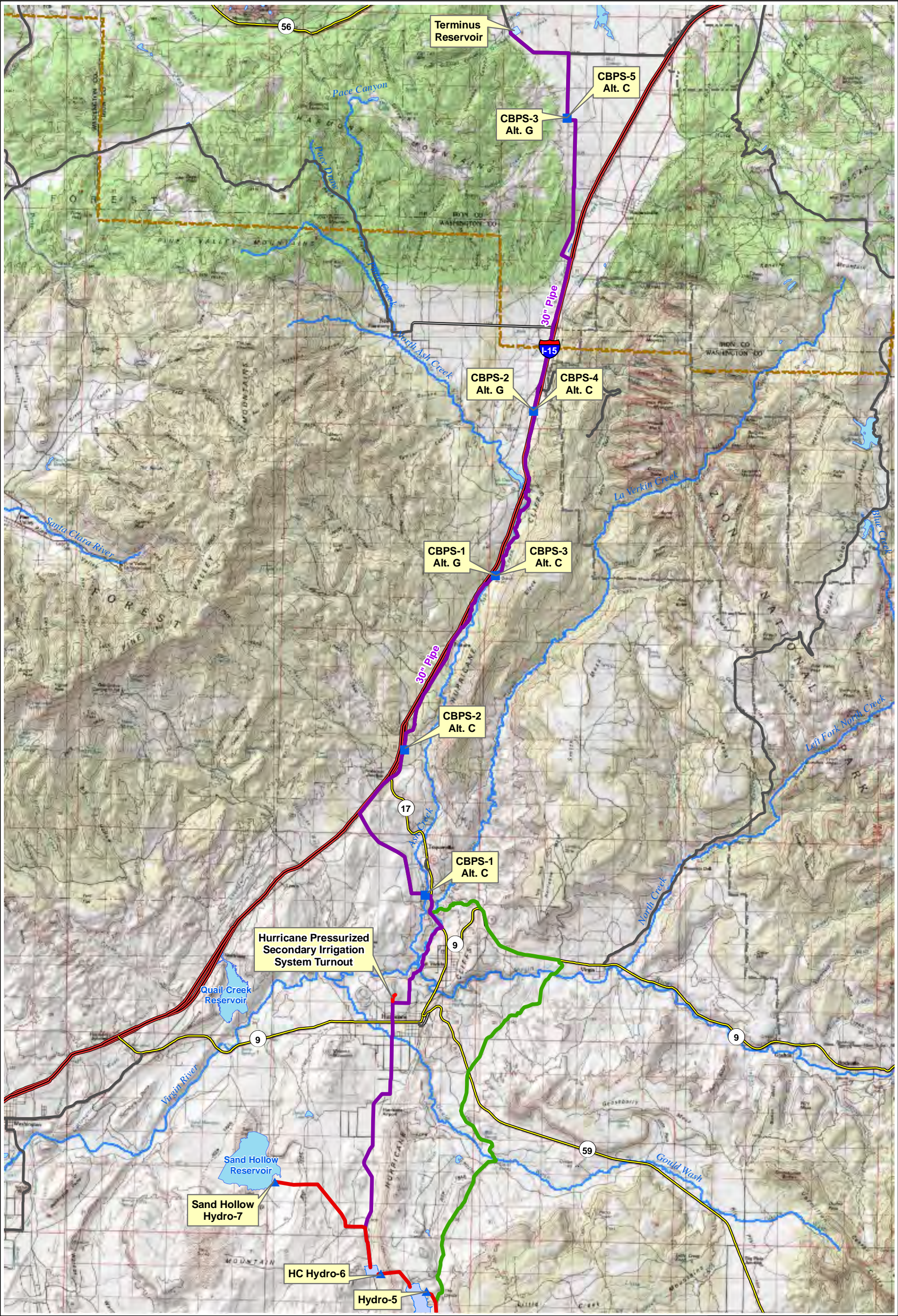
**Lake Powell Pipeline Project**  
1:300,000 Scale  
Spatial Reference: UTM Zone 12N, NAD-83

**UDWR Figure - 5** **MWH**

**Lake Powell Pipeline  
Hydro System  
Power Transmission Lines**

0 1.25 2.5 5 7.5 10 Miles





**Legend**

- |                              |              |                                     |
|------------------------------|--------------|-------------------------------------|
| ■ Project Pump Station       | — Interstate | ■ Hurricane Cliffs Forebay/Afterbay |
| ● Project Regulating Tank    | — US Highway | ■ CVP Reservoir                     |
| ▲ Project Hydro Station      | — ST Highway | ■ Lakes & Reservoirs                |
| — Project Penstock Alignment | — Hwy        | — Major Rivers & Streams            |
| — CVP Alternative C          | — Major Road | ■ National Park/Monument            |
| — CVP Alternative G          |              |                                     |
- NGS USA Topographic Maps

0 0.5 1 2 3 4 Miles

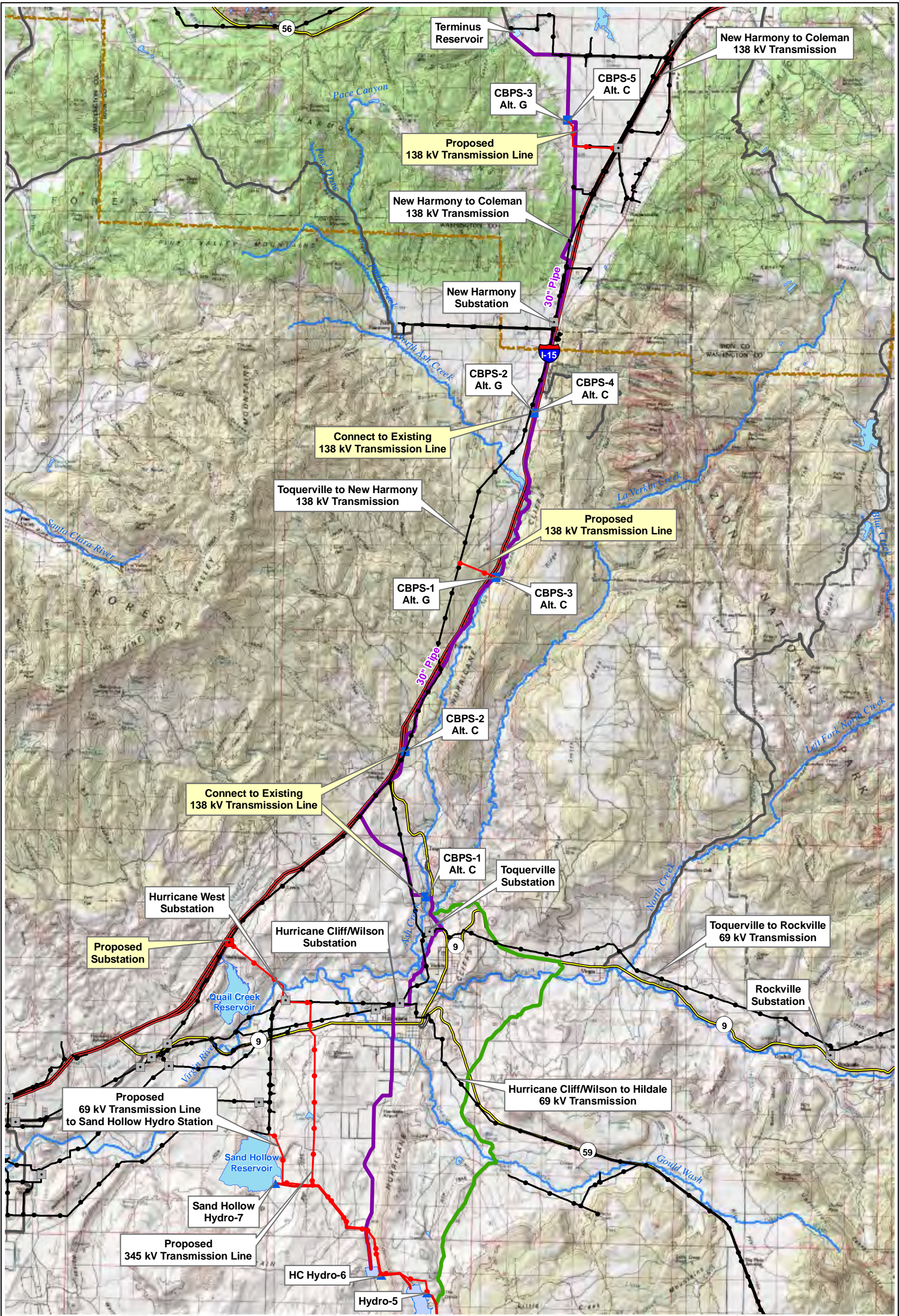
**Lake Powell Pipeline Project**

1:180,000 Scale  
Spatial Reference: UTM Zone 12N, NAD-83

UDWR Figure - 6 MWH

**Cedar Valley Pipeline System**





**Legend**

- |                              |                              |              |                                     |
|------------------------------|------------------------------|--------------|-------------------------------------|
| ■ Substation                 | ■ Project Pump Station       | — Interstate | ■ Hurricane Cliffs Forebay/Afterbay |
| ■ Proposed Substation        | ● Project Regulating Tank    | — US Highway | ■ CVP Reservoir                     |
| — Proposed Transmission Line | ▲ Project Hydro Station      | — ST Highway | ■ Lakes & Reservoirs                |
| — Existing Transmission Line | — Project Penstock Alignment | — Hwy        | — Major Rivers & Streams            |
| — Existing OH Primary Line   | — CVP Alternative C          | — Major Road | ■ National Park/Monument            |
| — Existing UG Primary Line   | — CVP Alternative G          |              |                                     |

NGS USA Topographic Maps

0 0.5 1 2 3 4 Miles

**Lake Powell Pipeline Project**

1:180,000 Scale  
Spatial Reference: UTM Zone 12N, NAD-83

UDWR Figure - 7 MWH

**Cedar Valley Pipeline  
Power Transmission Lines**



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# **Study Plan 1: Air Quality**

## **1.1 Introduction**

The purpose of this study plan is to document impacts on air quality resulting from the proposed pipeline project. This information will be a factor in determining the methods for planning and preliminary design of the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those provided in the September and October study plan meetings in Salt Lake City and St. George, Utah. This study plan presents an approach for advancing knowledge and understanding of air quality conditions and potential impacts associated with the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative.

## **1.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

This study plan describes goals and objectives, provides a description of the study area, describes the Project nexus, presents the proposed methodology, presents staffing and equipment requirements, provides a budget for activities associated with the air quality portion of the study, and provides a generalized project schedule. The study will identify potential impacts and measures to protect air quality from potentially adverse effects associated with the Project. The study will address local and regional air quality conditions that might reasonably be affected by construction, operations, and maintenance of the Project. The study will recommend methods to help mitigate impacts on air resources during construction and operation of the Project. The study plan also addresses safety considerations associated with air quality conditions.

### ***1.2.1 Goals and Objectives***

The goals of the air quality study plan are to determine potential impacts on air quality and identify measures to protect air quality to the extent that it may be affected by Project construction, operation, and maintenance. Specific effects on air resources could include emissions from construction equipment and fugitive dust during Project construction and operation as well as indirect and cumulative impacts of increased emissions as a result of population growth.

Specific air quality-related objectives include determining how Project construction and operations may affect the air quality within the study area. Following are the primary objectives of the study with regard to air quality.

- determine air quality limits (non attainment areas) within the project area
- determine and explain appropriateness of width of impact corridor
- describe as possible, the historical air quality for the project area (air quality baseline)
- determine agency goals and incorporate goals into plan
- fully define significant air quality impacts
- quantify Project construction emissions (periodic and construction life emissions inventory) and the associated air quality impacts
- quantify Project operation emissions and the associated air quality impacts including ancillary facilities and structures



- evaluate alternative pipeline alignments for potential significant air quality impacts from Project construction activities
- evaluate alternative pipeline alignments for potential significant air quality impacts during Project operation
- analyze any cumulative impacts on air quality within the study area using the EPA preferred (or similar) model
- evaluate whether any significant air quality impacts along the Project alignments can be mitigated by design, construction, or O&M practices, or whether some air quality impacts cannot be mitigated
- identify what, if any, mitigating or corrective measures would be necessary to protect human health and safety from significant air quality impacts

### **1.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. The various agencies will be contacted to gather information regarding their air quality goals. These goals will be incorporated into the studies.

### **1.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

#### ***1.4.1 Background Description***

The air quality in the study area has been evaluated on a large, general scale via regional air quality studies. Limited information is available about local air quality.

Air quality throughout the study area is described as typical of most rural regions, with the primary air quality condition characterized by elevated concentrations of fugitive dust. Fugitive dust has been identified as a threat to air quality in the study area (Southern Utah Air Quality Taskforce 2007) (NRCS 2007).

#### ***1.4.2 Study Area Definition***

The air quality study area would include the entire length of the pipeline alignment alternatives from Lake Powell to Sand Hollow and continuing on to the Cedar Valley near Quichipa Lake. The alignments and alternatives, including ancillary facilities will be identified and described. If areas are redefined the plans will be adjusted accordingly. Particular attention will be required for the following:

- Culturally sensitive areas
- Tourist use areas
- Environmentally sensitive areas
- Areas containing endangered species
- Locations of economic or perceived aesthetic value
- Relatively dense population areas

#### ***1.4.3 Issues and Data Needs***

The air quality specific analyses will include the following:



- Verification of what is known about historical air quality
- Review of all State, 5 County Association, and local entities for air quality information.
- Review state implementation plans.
- Review of EPA's AP-42 document for typical construction spread. Coordinate with EPA representatives.
- Air quality model capability
- Historic and projected population data. Use population growth information to analyze future baseline air quality.
- Data on Project features and the emissions from them
- Air quality limits within the study area
- Culturally sensitive areas
- Environmentally sensitive areas
- Economically important areas
- Determination of power sources for pumping and potential impacts of developing additional generating capacity

## **1.5 Nexus to Project (§5.11(d)(4))**

The proposed Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, air release and pipeline blow-off equipment, and other features to facilitate conveyance of water from Lake Powell to the St. George area and continuing on to the Cedar Valley. The pipeline and associated features will require installation through native soils and rocks. The air quality along the alternative pipeline alignments may be affected by Project construction and operation activities. Potential impacts associated with the Project may require mitigation of construction, operations, or maintenance, or all three. FERC licensing, other federal and state agency permits, and specifically, the Utah State Engineer approval of the Project design will require demonstration that these potential adverse impacts on air quality have been identified and avoided or mitigated in such a way that impacts are minimized.

## **1.6 Proposed Study Methodology (§5.11(d)(5))**

### ***1.6.1 Introduction and Overall Approach***

A substantial number of documents, including technical reports, scientific and engineering journal publications, and other literature were previously reviewed and information consolidated. This information was compiled and summarized for inclusion in the PAD. Additional review of literature presenting air quality conditions will be performed by identifying and reviewing available technical reports and literature that may not have been identified previously to determine what is known of the air quality conditions regionally and at specific locations along the alternative alignments. The air quality study analyses and results will be documented in a technical memorandum.

### ***1.6.2 Methods for Preliminary Analysis and Preliminary Design***

The proposed methods for analyzing impacts on air quality are identified in this section.

#### **1.6.2.1 Task 1 – Review of Existing Air Quality Literature**

Previous review of existing literature has uncovered some air quality information on a broad scale. A more detailed review of existing air quality data and information relevant to the Project that are available



in current published reports, studies, and literature will be performed. This literature review will include information from established agency sources such as the EPA, the National Park Service, State of Utah, State of Arizona, the Natural Resources Conservation Service, the U.S. Bureau of Reclamation, affected counties, and other similar sources. Previous preliminary investigation work performed by engineering and scientific consultants and organizations will be obtained and reviewed. Information regarding the type of construction activities that would occur with the Project and their potential effect on air quality will be reviewed and compiled as well.

#### **1.6.2.2 Task 2 – Field Investigations**

Previous investigations have included a broad, general inspection of field conditions along the pipeline alignment. Field investigations associated with this task will include a more detailed physical inspection of the south alignment alternative and the existing highway alignment alternative. Particular attention will be given to locations and features identified as sensitive areas such as culturally, economically, and environmentally sensitive areas. Field investigations will be in accordance with commonly accepted field investigation practices. The following field investigations are anticipated.

- Physical inspection and video recording of the LPP and CVP alternative alignments
- Identification of sensitive air quality areas
- Recording selected meteorological data (wind speed and direction) at sites along the pipeline alignment alternatives
- Review of geological/pipeline installation recommendations to identify blasting areas or type of construction excavation activities that could result in fugitive dust emissions

#### **1.6.2.3 Task 3 – Data Analyses**

Data collected from the literature review and field investigations will be compiled and analyzed by experienced, licensed engineers. Data evaluations will focus on satisfying the identified goals and objectives; specifically, establishing baseline air quality, and determining how the Project construction will affect air quality, how the Project operations would affect air quality, and identifying potential mitigation measures. The analysis will involve air quality modeling utilizing the SCREEN3 model to simulate potential pollutant dispersion. Air quality simulation results will be compared to the National Ambient Air Quality Standards (NAAQS) and applicable state or local standards. The results of the data analyses will be used to determine the need for mitigation measures. The SCREEN3 model will be run as necessary to help determine the effectiveness of mitigation measures in controlling Project air emissions that would meet air quality standards.

#### **1.6.2.4 Task 4 – Technical Report Preparation**

A technical report will be prepared that documents the findings of the literature review, field investigations, and data analyses. The technical report will focus primarily on those activities that that would have potential high impact on air quality and the extent to which they would impact air quality in the study area.

The technical report will present project goals and objectives and describe the study area, document the literature review, and note general and specific conditions that pertain to air quality in the study area. Field investigation activities and methods will be described, and data analyses and results will be presented. Results will be discussed with a focus on the study objectives. Conclusions, where warranted, will be provided, and will address prevention or mitigation of potential air quality impacts resulting from



the Project. These conclusions may include recommendations that could affect Project feature design and construction.

### **1.7 Schedule and Level of Effort (§5.11(d)(6))**

The research into local and regional air quality data will involve professionals with appropriate experience to conduct the field investigations and data evaluations. Professionals performing research will provide their own sheets and notes to document activities, data and findings. Field investigation equipment (wind meters, binoculars, compasses, maps, cameras, etc.) will be provided by the task manager. Total study costs are estimated to be approximately \$65,000.

An approximate schedule for performance of the study is shown in Table 1-1. The study can be completed within one year.

<b>Table 1-1 Air Quality Proposed Study Schedule</b>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review of Air Quality Literature	Ongoing	February 2009	-
2	Field Investigations	March 2009	October 2009	20
3	Data Analyses	November 2009	December 2010	30
4	Final Tech Memo Preparation	January 2010	February 2010	45

### **1.8 Progress Reporting (§5.11(b)(3))**

Progress reports will be prepared every six months, beginning in March 2009, and will be updated in October 2009. The final report will be submitted in February 2010.

### **1.9 Dependencies on Other Resource Analyses**

The air quality analysis may be dependent on the analyses results of the land use plans and conflicts analysis.

### **1.10 References**

Cooper, C. D., and F. C. Alley. 1994. *Air pollution control, a design approach*. 2<sup>nd</sup> ed. Prospect Heights, Ill.: Waveland Press, Inc.

Natural Resources Conservation Service (NRCS). 2007. Escalante Valley – Iron County, Utah Rapid Watershed Assessment – 8 Digit HUC #16030006. May. Iron County, Utah.

Southern Utah Air Quality Task Force. 2007. *Air Quality in Southern Utah, It's Everybody's Business*. Website: <http://www.sgcity.org/airquality/>



U.S. Environmental Protection Agency (EPA). 2001. *Code of federal regulations*, Appendix W to Part 51 – Guideline On Air Quality Models.

Utah Department of Environmental Quality. (UDEQ). 2000a. *Utah Division of Air Quality modeling guidelines*. Revised Draft (August 17, 2000). Utah Division of Air Quality Technical Analysis Section. Available from World Wide Web  
<<http://airquality.utah.gov/Planning/modelingguidelines817.pdf>>

## **Study Plan 2: Aquatic Resources**

### **2.1 Introduction**

This study plan documents the methods for assessing impacts on aquatic resources for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those provided in the September and October study plan meetings in Salt Lake City and St. George, Utah. This study plan presents an approach for advancing knowledge and understanding of aquatic resources as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan addresses study requests made by FERC, other federal, state and tribal agencies, and the public throughout the study plan development process.

The proposed Project would consist of constructing and operating a water conveyance system that includes approximately 186 miles of buried pipeline, water intake facilities at Lake Powell, buried and surface water storage reservoirs, irrigation system turnout, in-line hydro stations, hydro-electric generation facilities and transmission lines on federal, state, private and possibly tribal lands in Kane, Washington, and Iron counties in Utah; and Coconino and Mohave counties in Arizona. The alternative alignments under consideration include the existing highway alignment that would cross the Kaibab Indian Reservation along Arizona Highway 389 and the south alignment bypassing the Reservation to the south.

The purpose of this study plan is to define the procedures and methodologies for analyzing the Project's potential direct, indirect and cumulative impacts on aquatic resources. This study plan describes goals and objectives, provides a description of the study area, describes the Project nexus, presents the proposed methodology, presents staffing and equipment requirements, provides a budget for activities associated with the aquatic resources portion of the study, and provides a generalized project schedule. The study will identify potential impacts of the Project on aquatic resources during construction, operation, and maintenance, and identify measures to mitigate impacts on aquatic resources that could be affected by Project construction, operation and maintenance activities. The study plan addresses those aquatic resources issues that might reasonably be affected by Project construction, operations, and maintenance as well as changes in instream flow and aquatic habitat.

The following aquatic resources impact topics and issues have been identified.

- Aquatic fish populations
- Non-fish species aquatic populations
- In-stream aquatic habitat
- Invasive aquatic species
- Potential changes in Virgin River flows between Quail Creek Diversion and Washington Fields Diversion and associated aquatic habitat
- Resource agency management goals
- Changes in stream flows as a result of the proposed Project that may have a measureable impact on aquatic resources



## **2.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

### ***2.2.1 Study Goals and Objectives***

The goals of the aquatic resources study plan are to identify and determine aquatic resource impacts resulting from Project construction, operation and maintenance. Information regarding potential aquatic resource impacts is needed to guide decisions in the Project design, construction, operation and maintenance so that impacts on aquatic resources may be avoided or minimized.

Specific aquatic resources-related objectives include determination of how the Project construction, operation and maintenance would affect aquatic resources along the alternative alignments. Following are the primary objectives of the aquatic resources study.

- Identify and determine impacts that could occur on fish and other aquatic species from Project construction and operation
- Identify the potential effect of invasive species transfer as a result of the Project is implementation and the relationship to aquatic management plans throughout the study area
- Determine long- and short-term impacts that could occur on aquatic habitat from Project construction and operation
- Identify how the Project operation could affect the objectives of the Virgin River Management Plan and other management programs
- Prepare a mitigation plan as part of the study to address mitigation measures and concepts, standard construction procedures, standard operating procedures, and best management practices. The plan would include the monitoring and controlling the spread of invasive species as a result of Project implementation.

### ***2.2.2 Data Needed to Perform the Analysis***

The following data are required and will be collected and compiled to perform the analysis.

- Identify open water, stream and riverine habitat available within the impact area
- Information on fish and aquatic species distributions, life history (spawning areas and migration patterns, seasonal habitat use, etc.) and responses to Project-related activities (turbidity, flow variation, temperature and other water quality data, increased human presence, etc.)
- Areas of important habitat and/or the distribution of aquatic species within the impact area need careful delineation
- Sport fish information for the potentially affected lakes, reservoirs and streams that support game fish populations
- Information on long-term and short-term response to Project implementation activities



- Analysis of construction impacts of the various stream crossing options on water quality and aquatic habitat conditions along the pipeline route
- Information on the characteristics of Lake Powell in the area of the proposed intake and intake pump station will be used to assess potential impacts of Project construction and operation on aquatic resources
- Document species of special concern and potential effects on them (see Study Plan 11) in the study area

## **2.3 Agency Resource Management Goals (§5.11(d)(2))**

The Fish and Wildlife Service, participating federal land management agencies, Utah Division of Wildlife Resources, and Arizona Game and Fish Department have specific resource management goals with respect to aquatic resources (see Section 2.4.3). The Project would divert water from the Colorado River at Lake Powell upstream Glen Canyon Dam, and convey that water into the Virgin River drainage basin for municipal and industrial uses. While the proposed Project is not currently anticipated to significantly alter the aquatic habitat or fishery of either the Colorado River and the Virgin River drainage, documentation of the existing condition of the resources is vital in adapting a reactive and prescriptive long-term management approach. Identifying the existing habitat condition as well as evaluating, to the extent possible, the historic conditions is critical to providing a realistic assessment of project effects and their relationship to defined agency management goals. The existing information base for aquatic resources is considered adequate to document baseline conditions but the study will confirm that assumption and will be prepared to augment the current database as necessary.

## **2.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

### ***2.4.1 Study Area***

The Project study area would include the following:

- Paria River in the area where the pipeline would cross the live stream
- Kanab Creek pipeline crossing (Existing Highway Alternative alignment)
- The Virgin River, La Verkin Creek and Ash Creek where the Cedar Valley Pipeline System would cross the live stream
- Other ephemeral and intermittent streams that would be crossed by the pipeline
- Sand Hollow Reservoir System would receive water from the Lake Powell Pipeline. The impact on the aquatic resource resulting from this transfer will need to be identified. Biota transfer of non-endemic organisms and the resultant modification of water quality on the aquatic habitat of Sand Hollow Reservoir and potentially Quail Creek Reservoir will require investigation and analysis.
- The Lake Powell intake and intake pipeline construction and operation may result in some short-term changes, and the potential for long-term impacts on the character and habitat of Lake Powell will be assessed



- Other impacts related to water transfer and groundwater resources that may impact aquatic species or habitat
- Streams potentially crossed by transmission line corridors to provide power to pumping stations
- The study area for invasive species (Asiatic clam, quagga mussel, etc.) will require that the study area be expanded to Lake Powell and perennial streams that could receive blowoff releases during maintenance periods.

### **2.4.2 Existing Information**

There are numerous drainages within the Project area that convey water intermittently or during storm events. The Paria River, Virgin River, La Verkin Creek, and Ash Creek are the only drainages that convey perennial flow across the Project alignment. Kanab Creek conveys perennial flow under Arizona State Highway 389 where the existing highway alternative alignment would cross this stream; however, Kanab Creek does not flow perennially where the south alternative alignment would cross it south of the Kaibab Indian Reservation.

Reaches of the Paria River may provide habitat for Flannelmouth sucker (*Catostomus latipinnis*), Bluehead sucker (*Catostomus discobolus*), Razorback sucker (*Xyrauchen texanus*), Rainbow trout (*Oncorhynchus mykiss*) and Speckled dace (*Rhinichthys osculus*). These fish, with the exception of Rainbow trout and Speckled dace, are considered sensitive by the State of Utah. The Razorback sucker is federally listed as endangered and is discussed in further detail in the Special Status Aquatic Species Study Plan. The Bluehead sucker feeds on algae from the bottom of stream substrate and typically inhabits large rivers and mountain streams with variable turbidity and temperature. The Flannelmouth sucker is a bottom feeder consuming algae, other fragmented vegetation, seeds and invertebrates. The species lives within moderate to large rivers and is typically affected by nonnative species, hybridization, habitat alteration and blockage of migration routes. The Flannelmouth and bluehead sucker are managed under a Conservation Agreement that has precluded federal species listing (UDWR 2006). Rainbow trout is a game fish common in Utah reservoirs and rivers and can be found in water bodies associated with the Project area. The Speckled dace is a minnow common in many western waters. It is a bottom-dwelling species and is an important forage fish.

Kanab Creek north of Kanab has perennial flow through the narrow, rock canyon upstream of the Project pipeline alignment. Kanab Creek supports no large populations of sport fish because of the intermittent flows associated with the water feature. Flannelmouth sucker, a sensitive species, may be present in Kanab Creek upstream of the south alignment (Speas 2003). Speckled dace are present in Kanab Creek upstream from the town of Kanab. Upstream users of Kanab Creek in Utah divert flows for municipal and irrigation purposes, leaving it mostly dry in the summer season where the south alignment would cross the creek (BLM 2007a).

The Virgin River drainage, including La Verkin Creek and Ash Creek, provides habitat for various aquatic resources. The Virgin River Resource Management and Recovery Program has been established to help recover various sensitive and listed species within the river including the Woundfin minnow (*Plagopterus argentissimus*) and the Virgin River chub (*Gila seminuda*), which are both federally listed as endangered species and are discussed in further detail in the Special Status Aquatic Species Study Plan. The Flannelmouth sucker and the Virgin spinedace are managed under a Conservation Agreement



(UDWR 2006). The Virgin River Resource Management and Recovery Program also aims to provide habitat to other native fish while allowing for continued use of the water resources.

Sand Hollow Reservoir and Quail Creek Reservoir are off-stream, managed waters that were completed in 2002 and 1985, respectively. Fish species diversity in each of the reservoirs is considered low, and predominantly is associated with introduced stock game fish. Game fish in Sand Hollow Reservoir include Bluegill (*Lepomis macrochirus*), Largemouth bass (*Micropterus salmoides*), and Bullhead catfish (*Ictalurus melas*) (Angler Guide 2007). The Quail Creek Reservoir supports populations of Rainbow trout (*Oncorhynchus mykiss*), Largemouth bass (*Micropterus salmoides*), Bluegill (*Lepomis macrochirus*), and Threadfin shad (*Dorosoma petenense*). As of August, 2006, the reservoir had not been chemically treated to control rough fish competition, so it could contain some of the original fish populations of Quail Creek and the Virgin River (Quail Creek Reservoir 2006). Quail Creek is a historic habitat for Virgin spinedace and recent reintroductions of Virgin spinedace to this stream have been successful (UDWR).

Lake Powell is a much larger reservoir and is older than Sand Hollow Reservoir or Quail Creek Reservoir with the Glen Canyon Dam construction completed and reservoir fill initiating in 1963. Hence, fish species diversity in this reservoir is relatively high. The lake supports approximately 20 species of fish, the majority of which are introduced game fish. Game fish in Lake Powell include Rainbow trout (*Oncorhynchus mykiss*), Striped bass (*Morone saxatilis*), Largemouth bass (*Micropterus salmoides*), Smallmouth bass (*Micropterus dolomieu*), Walleye (*Stizostedion vitreum*), Channel catfish (*Ictalurus punctatus*), Bullhead catfish (*Ictalurus melas*), Black crappie (*Pomoxis nigromaculatus*), Bluegill (*Lepomis macrochirus*), and Green sunfish (*Lepomis cyanellus*) (Blue Ribbon Fisheries 2006). Open water habitats in Lake Powell are dominated by bass; however Lake Powell is a highly productive fishery for all above-listed species.

Quail Creek Reservoir is not considered eutrophic because sediments have not yet accumulated in quantity (Quail Creek Reservoir 2006). Aquatic diversity is fairly low in Quail Creek Reservoir as well as in Sand Hollow Reservoir. Quail Creek Reservoir and Sand Hollow Reservoir have been planted with trout, bluegill, and largemouth bass. Threadfin shad (*Dorosoma petenense*) are an abundant food base for larger predatory fish in Quail Creek Reservoir.

Zebra mussels (*Dreissena polymorpha*), quagga mussels (*Dreissena rostriformis bugensis*) and Asian clams (*Corbicula fluminea*) are exotic mollusk species whose occurrence is moving west. Recent findings indicate, but do not substantiate, “the presence of an extremely small number of individual, larval quagga or zebra mussels in Lake Powell” (USFWS et al. 2007). The extent to which Lake Powell has been influenced to date by these mussels is thought to be minimal but additional study is required. Measures to prevent the spread and infestation of mussels in Lake Powell include boat decontamination stations available in Glen Canyon National Recreation Area marinas. Quagga and zebra mussels and Asian clams are present in Lake Mead as well as the Virgin River, and have been documented to foul water intake structures. The Utah Division of Wildlife Resources has hired aquatic resource biologists and technicians, and has purchase mobile sprayers for use in decontaminating boats. The Utah Division of Wildlife Resources is preparing a plan to help control the spread of invasive mussel and clam species. The proposed pipeline design will require careful investigation of containments of all ancillary releases (blowoffs, holding areas for waste, etc.) to make sure this water is fully contained and not allowed to contaminate local drainages.

A current description of the *Dreissena* mussel occurrences in the Colorado River Basin will be developed as part of the study. Recent discoveries of *Dreissena* sp. in Lake Granby and other reservoirs in the Upper Colorado River Basin are important to this project because they are upstream of Lake Powell.



An indication of the status of the native mussel community in the project area, even if native mussels are absent, will be provided with a more complete ecological understanding of the aquatic resources. Baseline information, including existing data, on *Dreissena* occurrence in the Project area would be documented as part of the study.

Descriptions of current and possible future decontamination strategies for *Dreissena* transport will be developed as part of the study.

A description and location of all outlets along the pipeline route (supply discharge, blowoff valves, etc.) will be provided. This information would identify locations where introduction of invasive species to natural drainages from the Project could potentially occur.

The Spiny water flea (*Bythotrephes cederstroemi*), a small, invasive, nearly microscopic crustacean from Australia, was recently found in Lake Powell. The species is very prolific and can cause food cycle changes in reservoirs that can be detrimental to sport fisheries. Native zooplanktons are a more desirable food source for game fish than the Spiny water flea. Biologists believe that the Spiny water flea may displace native zooplanktons in Lake Powell (Trophy 2007).

The invasive New Zealand mudsnail (*Potamopyrgus antipodarum*) has recently been found in several trout streams in Utah and throughout the West, however this species has not been reported within the Paria River, Kanab Creek, or the Virgin River drainage and has not been reported within the Project area. New Zealand mudsnails are very hardy, are capable of surviving several days out of water, reproduce asexually, and can flourish in most waters (Utah Fishing Proclamation 2006).

### **2.4.3 Identified Data Sources**

The following data sources have been identified to date.

- Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operation for Lake Powell and Lake Mead, 2007
- Navajo Generating Station Environmental Assessment
- Paria River Management Plan
- Arizona Rivers, Streams and Wetland Study (also a FERC 10(a)(2)(A) Comprehensive Plan)
- Unique Wildlife Ecosystems of Arizona, USFWS, 1978 (also a FERC 10(a)(2)(A) Comprehensive Plan)
- Utah Division of Wildlife Resources Aquatic Nuisance Species documents
- Arizona Strip EIS
- GSENM Management Plan
- Escalante Management Framework Plan
- Kanab Resource Management Plan
- Colorado River Management Plan
- Biological Opinion for the Colorado River Management Plan
- Biological Opinion on the Operation of Glen Canyon Dam
- Biological Opinion for the Arizona Strip Resource Management Plan
- Virgin River Resource Management and Recovery Program
- Virgin River Management Plan
- Virgin River Watershed Management Plan
- Virgin Spinedace Conservation Agreement and Strategy
- Virgin River Fishes Recovery Plan



- Colorado River Ecology and Dam Management Proceedings 1990, Santa Fe, New Mexico
- New Zealand Mudsail Second Annual Conference 2002, Montana State University
- Glen Canyon Dam Proposed Temperature Control Device Environmental Assessment 2004, U.S. Bureau of Reclamation
- Utah Wildlife Action Plan (in progress)
- Water Delivery Financing Task Force Report Financing the Lake Powell Pipeline and Bear River project 2004, State of Utah
- River Resource Management in the Grand Canyon, 1996
- Kanab Field Office Resource Management Plan
- Kanab Field Office Areas of Critical Environmental Concern Draft Report
- Grand Staircase-Escalante National Monument EIS
- Final EIS on Operation of Flaming Gorge Dam, 2006
- St. George Office of BLM (RMP)

The current available data are expected to be sufficient to analyze preliminary proposed alternatives to estimate general levels of impact on aquatic species and habitat for comparison of alternatives. It is recognized that other information, data and research may be available and will be collected, compiled and documented during the course of the study with the assistance of agency and academic personnel.

#### ***2.4.4 Additional Data Needed***

The following additional data needs have been identified.

- Field reconnaissance and review by an aquatic biologist to evaluate pipeline alignment and stream crossings, reservoirs and the Lake Powell intake structure
- Discussion with local state fishery experts regarding Lake Powell Pipeline intake structure and screen and the species that need to be protected
- Development of a control strategy with Division of Wildlife Resources staff on potential biota transfer and invasive species introduction concerns. This may require establishment of a sampling/monitoring program.
- Any specific additional sampling and field data collection identified during the evaluation and the primary data collection tasks
- Extent of quagga mussel distribution in the Colorado River Basin and most recent control and management approach
- Conveyance system decontamination strategy studies
- Fish screening methods for the Lake Powell intake

The additional data will be sufficient to perform detailed analysis of impacts on aquatic species and habitat for the Project alternatives.

## **2.5 Nexus to Project (§5.11(d)(4))**

The diversion of water from Lake Powell to Sand Hollow Reservoir in the Virgin River drainage and potential for annual maintenance-related water releases to the Paria River may result in a biota transfer of potentially harmful species. In addition, it will be important to develop a Lake Powell intake structure that will not entrain or trap fish or other valuable biological resources.

Design of the water intake and intake structure will need to meet all appropriate regulatory standards for escapement (screen size, intake velocity, etc.) to protect fish. Typically the selection of the proper criteria (well defined) has been demonstrated to reduce entrainment of fish to an acceptable level.

Of more importance is the recent concern regarding quagga mussels in the Lower Colorado River system. This organism is highly adaptable and has demonstrated a propensity for rapid invasion of a variety of waters (lakes, streams, reservoirs, canals, pipelines, etc.). The prevention of the spread of this organism is critical. Not only can it impact the hydraulic carrying capacity and maintenance of the pipeline but once established in a suitable water body it can devastate the primary production of water and result in the loss of productivity of other valuable species. The understanding and mitigation of quagga mussel invasions is vital to the proper design and successful operation of the Project.

## **2.6 Proposed Study Methodology (§5.11(d)(5))**

The following subsections describe the methodology that will be used to address issues and concerns and to define existing aquatic species distributions and habitat use and analyze impacts. Aquatic resource impacts will be analyzed by estimating Project impacts on native species, estimating the area of critical riverine or instream habitat disturbed by construction and operation of the Project alternatives, estimating the impact of Project construction and operation on existing aquatic populations, estimating direct mortality and potentially significant impacts on fish and other aquatic species of concern from construction and operation of Project alternatives, and potential indirect mortality from habitat loss. Biota transfer of invasive species will be identified and the risk quantified for the alternatives.

### ***2.6.1 Define Baseline Conditions***

Aquatic resources baseline conditions will be defined for the existing fish and other critical aquatic species and populations and habitat conditions in the immediate impact area and surrounding area. Species and habitats will be described using existing data and information, and quantitative field surveys within the impact area are not anticipated. The existing information regarding species, distribution and habitat conditions is considered adequate for this study.

Fish and other critical aquatic species will be mapped for occurrence density and distribution using a geographic information system (GIS). Fish species will be identified by type (sport, native, etc.) and available information will be used to identify distribution, population density and areas of specific impact.

All available local and state records, creel census, Utah Division of Wildlife Resources information, Arizona Game and Fish Department information, tribal information, and academic research papers will be collected, catalogued and used to analyze the aquatic resource within the potential impact areas.



## ***2.6.2 Analyze Impacts***

Disturbances caused by pipeline crossing of streams and channels will be identified in detail and the surrounding areas of direct and indirect potential impact mapped to determine if any aquatic species may be affected.

Of particular interest will be the issue of invasive species, including quagga mussels, mudsnails and other non-native species that have been found in the southwest Colorado River drainage. The distribution of species present in Lake Powell and not in the potential receiving systems will be defined in order to assess how the Project could impact or be impacted by these organisms.

The Project alternatives will be evaluated with regard to significance criteria to define measurable potential impacts and determine the need to mitigate for significant impacts.

There are no specific regulatory guidelines for supporting aquatic species populations or aquatic habitat loss or impacts. Therefore, significance criteria are based on past experience with similar projects, best professional judgment, and Recovery Program and Conservation Agreement objectives and guidelines. Sport fishing waters are subject to specific regulations governing the harvesting of some species.

The following will be used initially to determine significant long- and short-term and cumulative impacts on aquatic species and the various aquatic habitats:

- The Project has the potential to aide in management and recovery of some of the Virgin River species through release of Virgin River water presently diverted into the Hurricane pressure irrigation system in exchange for LPP water to operate the Hurricane pressure irrigation system. The effects of potentially eliminating this diversion and changes in the flow regime of the Virgin River will be assessed to determine potential impacts on aquatic species.
- Activities that could have a measurable effect or disturbing influence on any aquatic species or their habitat in the project impact area will need to be carefully analyzed. Significant impacts are not expected to occur on any aquatic species as a result of Project; however, all potential impacts need to be considered and significant impacts mitigated as necessary.
- Sport fishing species that could be impacted need to have a monitoring plan developed and implemented. The Utah Division of Wildlife Resources and the Arizona Game and Fish Department would be the primary agencies involved in this effort since it would involve a long time period. The loss or improvement of sport fish recreation is a significance criterion.
- Biota transfer of native and invasive species (i.e. quagga and zebra mussels) would require monitoring and periodic assessment. The Project is only one of many mechanisms for potential biota transfer; however, because of the volume of water involved, it becomes a primary concern. It may not be possible to absolutely manage this potential problem to any practical extent for all species; however, the ability to monitor the problem is a critical factor. Control and mitigation measures, where possible, will be investigated and their impacts analyzed. The impact of the application of management methods and maintenance (i.e. treatment, pipeline cleaning, etc.) will be identified. Pipeline maintenance may require pigging and drain control points along pipeline. Outlets and containment ponds will require careful management. A detailed management control plan for quagga mussels and other invasive species will be developed.

- Any Project activity that changes the quality of the aquatic resource, instream habitat and spring sources or habitat either through disturbance or reduction will be identified and evaluated.
- Project activities that could restrict or prevent the natural movement, migration or use by aquatic resources will be considered.
- Invasive species biota transfer potentials will be defined and mitigation measures identified.
- Economic and biological impact of non-native and invasive species on agency management plans and activities.

The analysis of impacts on aquatic resources will incorporate standard construction and operating procedures and measures to avoid or reduce impacts that have been used in similar water intakes, pipeline and power generation and transmission projects. The significance criteria for aquatic resources will be applied to determine if Project impacts would be significant. Mitigation measures would be developed to offset significant impacts. The mitigation measures will be based on applicable state and Federal statutes and regulations, past experience and best professional judgment to either satisfy a legal requirement or to satisfy the public interest. In some cases significant impacts may not be able to be mitigated. All reasonably foreseeable mitigation options will be evaluated by the FERC, Bureau of Land Management, and other responsible federal agencies and factored into the respective decision documents.

### ***2.6.3 Cumulative Impacts Analysis***

The aquatic resources cumulative impacts analysis will address the combined impacts of the alternatives and any past or future proposed or planned actions that have or are likely to affect the aquatic species and resources in the impact areas. The inter-related projects and project elements will be identified for analysis of cumulative impacts. A mitigation plan for any defined impacts will be developed to eliminate or reduce the extent of significant impacts that may result from implementing the project.

### ***2.6.4 Invasive Aquatic Species Analysis***

The control of the quagga mussel and other biological organism that could be transferred from the Colorado River to the Virgin River and Paria River drainages will involve evaluating existing management alternatives to select the best apparent control and management option for the Project. At this time, bench and/or pilot-scale testing of control options are not envisioned as necessary. However, this approach is possible if conditions or information warrant.

The quagga mussel has been shown to be very prolific in the warmer waters of the southwest. In northern climates winter cold limits reproduction to seasonal warm periods. In the warm southwest, year-round reproduction has been observed and the problems the mussel cause are accelerated.

The focus of the evaluation of mussel (and other organisms) biota transfer control will be to adapt a proven method(s) that will provide a very low risk of intersubbasin transfer. Treatment and control methods with the lowest risk of failure will be considered and ranked in terms of effectiveness, implementability, reliability and life cycle cost. This information will be developed from existing experiences in Lake Powell and Lake Mead and from other sources.



Currently, the majority water users in the region (i.e. Central Arizona Project, LAW, SNWA and other entities in California and Nevada) have been addressing this issue because of the impact quagga mussels are having on their delivery systems or are expected to have in the future if the infestation continues.

The research done by others as well as the project team's experience will be used to develop and screen invasive species management control methods. This information and recommendations will be used by the engineering team to formulate a concept design approach based on risk reduction. Criteria to address risk avoidance and reduction will be developed in concert with state and federal agency experts as well as others from academia and the water industry.

The invasive species information developed will be used to prepare baseline information and to estimate future indirect impacts on fish and the aquatic resources when examining the potential implementation of Project alternatives.

Workshop discussion sessions are proposed to develop the problem description as well as management options. The quagga mussel problem in the Lower Colorado River basin is so recent (2007 – 2008) that a significant portion of the information is not yet published. The workshops will include interested parties with experience in the resources of the affected area and agency and industry experts in water resources management. Information from the workshop sessions will be utilized in developing a recommended biota transfer management approach and alternative effects analysis.

### ***2.6.5 Report Preparation***

An aquatic resources draft technical report will be prepared to document the literature review, field investigations, and data analyses. It will present Project goals and objectives of the study, describe the study area and the methodologies used in data collection, and identify the sources of information used in the analysis. The draft technical report will document the assumptions, analysis and results of the aquatic resources analysis and impact assessment. Mitigation measures will be documented in a mitigation plan incorporated as a section of the technical report. The mitigation measures would be identified to reduce any significant impacts on aquatic resources from Project construction, operation and maintenance. Following review of the draft aquatic resources technical report, comments will be incorporated and a final aquatic resources technical report will be prepared and submitted. Any variances from the study plan will be summarized in the technical report.

## **2.7 Schedule and Level of Effort (§5.11(d)(6))**

The research into aquatic resource impacts resulting from the Project will require fish and aquatic habitat professionals to perform the literature review, field reconnaissance and data analyses identified above. The study approach is based upon the use of existing information and the need for extensive field investigation is not anticipated. The study can be completed within a one-year period. The study will include a level of effort necessary to provide the project engineering team the information necessary to develop a complete concept design that includes the mitigation required to prevent or reduce significant impacts on aquatic resources and be able to monitor and prescriptively manage the future Project operation. Total study costs are estimated to be approximately \$225,000, including the biota transfer studies.

## **2.8 Progress Reporting (§5.11(b)(3))**

Progress reports will be prepared on a quarterly basis, beginning in April 2009, and will be updated in July 2009, October 2009 and January 2010. The final report will be submitted in February 2010.

## 2.9 Dependencies on Other Resource Analyses

The aquatic resources analysis will be primarily dependent on the analyses results of the following resources:

- Surface Water Hydrology
- Surface Water Quality
- Species of Special Concern

## 2.10 References

Holden, P.J., M.E. Golden, and P.J. Zucker. 2001. An Evaluation of Changes in Woundfin (*Plagopterus argentissimus*) Populations in the Virgin River, Utah, Arizona, and Nevada, 1976-1999. PR-735-1. Prepared for the U.S. Fish and Wildlife Service.

United States Fish and Wildlife Service (USFWS). 1990. Biological Opinion for the Arizona Strip Resource Management Plan. U.S. Fish and Wildlife Service, Phoenix, AZ, 10pp.

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\_\_\_\_\_. 2006. Virgin River Basin, 2004 – 2005 Temperature and Flow Monitoring. Final Report. June 2006. Publication No. 06-09.

\_\_\_\_\_. 2008. Virgin River Fishes Population Response Stations 2007. Final Report. February 2008. Publication No. 08-09.

(also see Section 2.4.3)



## **Study Plan 3: Archaeological and Historic-Era Resources**

### **3.1 Introduction**

This study plan documents the methods for planning and analysis of archaeological and historic-era resources for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those provided in the September and October study plan meetings in Salt Lake City and St. George, Utah. This study plan presents an approach for advancing knowledge and understanding of historical and archaeological resources as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative, as well as access roads, transmission lines, and ancillary facilities. The information developed during execution of this study plan will be incorporated into a Historic Properties Management Plan per instructions developed for the study plan by the FERC and approved by the Advisory Council on Historic Preservation (ACHP) on May 20, 2002. This study plan addresses study requests and comments made by FERC, other federal, state and tribal agencies, and the public.

### **3.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

The study plan describes goals and objectives, provides a description of the study area, describes the Project nexus, presents the proposed methodology, presents staffing and equipment requirements, provides a budget for activities associated with the archaeological and historic-era resources study, and provides a generalized Project schedule. The study will identify potential impacts of the Project on eligible historic properties during Project construction and operation, and identify measures to avoid or mitigate impacts on archaeological and historic-era resources that could be affected by Project construction, operation and maintenance activities.

The Project construction, operation and maintenance activities would involve pipelines, pump stations, hydro-electric generating stations, transmission lines and substations, material borrow and disposal areas, staging areas, and access roads. Project alternative alignments would cross perennial and ephemeral streams, rivers, washes and other drainage-ways.

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, requires federal agencies having the authority to license any undertaking to take into account the effect of the undertaking on historic properties. Because the FERC is being designated as lead agency of a non-federal pipeline and hydroelectric project, the licensing process is considered a federal undertaking and the NHPA and its implementing regulations are applicable. Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the National Register of Historic Places (NRHP: 36 CFR 800.26 [1][1]). They include archaeological sites, burial sites, cultural landscapes, historic standing structures, and archaeological and historic districts. Traditional cultural properties (TCPs) are a type of cultural resource that are eligible for the NRHP because of their "association with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community" (Parker and King 1991). For the purposes of this project, TCPs are included as part of the Ethnographic Resources study plan (Study Plan 23) portion of this document.

For this evaluation, impacts on cultural resources are considered significant if resources are eligible for inclusion in the NRHP or have already been listed. Eligibility to the NRHP is determined by federal legislation 36 C.F.R. Part 60.4 which states that consideration is given to “districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and; (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or 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 (d) that have yielded, or may be likely to yield, information important in prehistory or history.”

Federal legislation 36 C.F.R. Part 800 states that cultural resource assessments of federal “undertakings” of eligible properties should result in one of three determinations; (a) no effect; (b) no adverse effect, i.e., one or more historic properties will be affected, but the historic qualities that make them significant will not be harmed; or (c) adverse effect, i.e., the undertaking will cause harm to one or more historic properties.

Ultimately, eligibility of sites would be determined by the lead federal agency in consultation with the federal land owning agency (applicable) and the State Historic Preservation Office (SHPO). The lead federal agency, in consultation with the federal land owning agency (as applicable), the SHPO and the Advisory Council on Historic Preservation (ACHP), determines the significance of impacts and treatment planning related to these resources. If the eligibility of a site is not determined, it is assumed for the purpose of this analysis that the site is eligible. Impacts on archaeological and historic-era resources are considered significant if either of the following occurs.

The archaeological and historic-era study will document historic properties within the Project’s Area of Potential Effect (APE), evaluate the NRHP eligibility of these historic properties within the APE, and assess the potential effect of any Project-related impacts. All archaeological and historic-era resources within the Project APE will be evaluated utilizing methodologies that are consistent with the *Secretary of Interior’s Standards and Guidelines for the Identification of Historic Properties*.

The purpose of this study plan is to establish comprehensive baseline information about archaeological and historic-era resources within the Project boundary for the development of a Historic Properties Management Plan (HPMP).

Specifically, the goals are to:

- Briefly identify existing data and data needs
- Identify issues and concerns
- Define the area of potential impact and significance criteria to be used in the study
- Describe the analysis methodology
- Identify dependency items and relationships among other resources

The study will be prepared in compliance with the following federal legislation: the Antiquities Act of 1906 (P.L. 59\_209; 34 Stat. 225; 16 U.S.C. 431\_433); the Historic Sites Act of 1935 (P.L. 74\_292; 49 Stat. 666; 16 U.S.C. 461\_467); the National Historic Preservation Act of 1966 (NHPA)(P.L. 89\_665; 80 Stat. 915; 16 U.S.C. 470 as amended by P.L. 90\_243, P.L. 93\_54, P.L. 94\_422, and P.L. 94\_458); the National Environmental Policy Act of 1969 (NEPA)(P.L. 91\_190; 83 Stat. 852; 42 U.S.C. 4321 et seq.); Executive Order 11593 of 1971; Executive Order 13007; the Archaeological and Historical Conservation



Act of 1974 (P.L. 86\_523, as amended by P.L. 93\_291; 16 U.S.C. 469\_469c); American Indian Religious Freedom Act of 1978 (AIRFA) (P.L. 95\_341); Native American Graves and Repatriation Act of 1990 (NAGPRA) (P.L.101-601); National Register of Historic Places (NRHP), National Register Bulletins; and other pertinent legislation and implementing regulations. Utah state legislation to be complied with consists of the Antiquities Protection Act of 1993 (U.C.A. Sec. 9-8-101-806). Arizona state legislation to be complied with consists of the Arizona Antiquities Act A.R.S. 15-1631, A.R.S. 41-841, Arizona State burial protection laws A.R.S. 41-844 and 41-865, and the Arizona State Historic Preservation Act A.R.S. 41-861 through 864.

Following completion of the archaeological and historic-era study, a Programmatic Agreement (PA) will be developed by the FERC that would call for the implementation of a HPMP upon issuance of a project license. The HPMP would be drafted by the State in consultation with appropriate agencies and Tribes according to ACHP's *Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects* (ACHP 2002) and other appropriate guidance. The HPMP would call for the avoidance or protection of historic properties whenever possible. Both site-specific and general treatment measures may be provided in the HPMP. General treatment measures may include a process and protocol for any archaeological and historic-era resources monitoring, public and employee education and interpretation, and general land management designed to reduce Project-related effects. The HPMP will also identify measures to be undertaken if effects on NRHP-eligible resources are unavoidable, including ongoing adverse effects that cannot be eliminated or removed. The FERC will enter into the PA with the Advisory Council on Historic Preservation (ACHP), the SHPO, and any other agencies or entities that FERC deems appropriate.

Specific archaeological and historic-era resource-related objectives include determining how the Project may affect the historic properties along the alternative alignments. The primary objectives of the study plan with regard to historic properties and cultural resources are:

- Determine the impacts on archaeological and historic-era resources from Project construction and operation
- Identify impacts that would occur on archaeological and historical sites as well as historical buildings and structural sites
- Identify cultural landscapes and archaeological districts within and near the APE and how would they be affected
- Address specific concerns about cultural resources noted by the Kaibab Band of Paiute Indians with respect to aboriginal land and the Kaibab Indian Reservation
- Determine the steps that would be taken to protect archaeological and historic-era resources from possible construction accidents, operational failures or maintenance damage
- Identify the impacts that could occur from Project construction, operation and maintenance on Indian Trust Assets within the APE

### **3.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. While no specific agency resource management goals have been identified with regard to archaeological and historic-era resources in this study plan, each of the various agency resource management plans and guidelines that specifically identify goals and objectives will be consulted prior to commencing the Class III inventory.

### **3.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

#### ***3.4.1 Overview and Background***

The Class I archaeological and historic-era resources analysis will involve compiling and collecting information about previously completed investigations and known sites within and near the project area, and background understanding of the prehistory, ethnography and history of the project area. Identified sites may include archaeological sites, historic sites, and historic buildings and structure sites. The Class I will include the preparation of both a Prehistoric and Historic context, which will be used to evaluate the historic properties within the APE. Results of the evaluation studies will also be required for the archaeological and historic-era resources identified as eligible to the NRHP within the Project APE.

Cultural resources within the Project APE are quite variable. There are portions of the alternative routes where several previous inventories may have been carried out. These include archaeological and historic-era resource reports on various road construction projects along SR 59 in Utah, SR 389 in Arizona, and U.S. 89 and U.S. Alt 89 in both Utah and Arizona. It is quite possible that some portions of the highway corridors followed by the Project alternative alignments have not been inventoried for archaeological and historic-era resources and also that surveys are dated enough that re-survey will be necessary. Inventories may be needed in inadequately inventoried areas in order to establish the presence or absence and significance of archaeological and historic-era resources.

While there have been a number of recent projects completed within the Project area, only two were called out in the scoping process as examples. These two inventories were completed in the general vicinity of the proposed Project in Washington County, Utah. In June 1988, Paul R. Nickens and Associates completed a report on a proposed 23 mile transmission line entitled: "Cultural Resource Inventory of the Garkane Power Association Colorado City to Sand Mountain 138kV Transmission Line." A total of 24 archaeological sites were documented on this project. In 1975, a proposed 45 mile long pipeline route was surveyed by Desert Research Institute. It was known as the AWW-Alton Pipeline. A total of 39 sites were recorded on this project. These are two of many other projects, most of which are much more recent than these studies, which are known within the project area. These additional project reports, as well as widely published research materials will be sought out during the Class I document preparation.

There is a need to seek out and review published sources on the prehistory, ethnography and history of the area that will be used in the preparation of the archaeological and historic-era report. Many archaeological and ethnographic studies have been carried out in the area of the project. Archaeological studies (both academic and archaeological and historic-era resources studies) include both surveys and excavations covering time periods of occupation by the Anasazi, Paiute, Fremont, and earlier Archaic cultures (these terms are deeply embedded within the scientific literature, denote specific temporal and spatial cultural manifestations within the project area, and are widely understood concepts which have been accepted by the scientific community as well as a much wider audience; as such, the terms will be used in the course of discussion in this document). This is particularly true in the St. George area where rapid urban growth has occurred in the area of the Virgin River Anasazi. In addition, historic archaeological work has been carried out near the project area. Academic historical studies also continue to be produced in the region. In addition, academic ethnographic studies have recently been published concerning the history and ethnography of several bands of the Paiute and many exist concerning various Pueblo tribes, Upper Yuman peoples (Hualapai, Havasupai and Yavapai) and the Navajo Nation. These studies have produced detailed information about the prehistory, history and ethnography of the area, which provide more accurate generalizations about the region as a whole. This information benefits the present study since it provides a broader database with which to compare.



Prehistoric occupation of the Virgin River Valley, where the western portion of this project is located, was intense, especially during the Anasazi occupation up to about 1300 A.D. Occupation along other portions of the corridor were likely more moderate in intensity, but still prominent. The lower density of occupation was likely due to the fact that this portion of the corridor lies at higher elevations with less water and fewer available food resources. As such, occupation here was more seasonal, though year around occupation was still possible and likely. As a result, archaeological sites in those areas may be somewhat smaller, and more specialized, but will still provide evidence of significant habitation activities. Sites to be expected will include moderately intensive occupation sites, small campsites, lithic procurement sites, perhaps rock art sites, and lithic scatters. Occupation of lower elevation areas, especially along and near the Virgin River and (former) Glen Canyon of the Colorado River (at and near Lake Powell), were much more substantial and occupied year around. As such, large village sites could be encountered, including Archaic, Anasazi and Late Prehistoric sites. Also, Fremont period sites could be encountered in and near the Cedar Valley area.

Historic occupation, which began with trappers in the early to mid 1800s, was far more eclectic in nature. Historic sites include a broad range of feature types and locations. The location of these sites is not restricted by topography or other environmental factors to the same extent as prehistoric sites. Sites expected in the immediate LPP corridors include historic roads and trails, homesteads, irrigation systems and associated features, grazing related sites and, possible historic recreation sites.

In addition to Native American consultation, completion of a archaeological and historic-era resources overview, data gathering of site information and reports, as well as National Register and National Landmark information, and historic information will require close coordination with appropriate Federal and State agencies and the Kaibab Band who own and/or manage lands on and near the Project area as well as those agencies which license and direct archaeological and historic-era resources project work in Utah and Arizona. Additionally, the study will require identification and assessment of potential effects upon Indian Trust Assets. Thus, the study will require consultation activities in addition to data gathering and analysis.

### ***3.4.2 Primary Data Needed***

The initial phase of work for the LPP will not require in field survey or recording of archaeological or historic sites. However, once the south alignment is finalized, a Class III field inventory of corridors for pipelines, power lines, roads, surge ponds, staging areas and hydroelectric plants and related facilities will be carried out, as necessary. This will involve not only inventory, but also recording of sites and isolates encountered, as well as evaluation of these resources for eligibility to the NRHP.

Geoarchaeological analysis is also proposed at this time. Geographic Information System (GIS) will be used to forecast landscape settings conducive to buried sites. Natural Resource Conservation Service (NRCS) soils mapping of soils provides spatial data on the distribution of sediments that have suitable thickness, age-range, and depositional regime to bury and preserve archaeological sites. In addition, geoarchaeological analysis will be made of selected recorded sites within the project corridor. This will provide informed knowledge of the potential for suitable sediment to contain buried cultural horizons. Such information is invaluable in making informed decisions about recovery of significant information or other possible mitigation measures to be undertaken following the Class III inventory. This method will not preclude the recommendation or use of monitoring or testing, which will be part of the discussion in HPMP. Finally, a literature summary of useable paleoclimatic studies will be undertaken in order to model the paleoclimate of the project area. Depending upon budget constraints, this could be followed up

with a reconstruction of the effective climate, which can be digitized on maps, providing archaeologists with a dataset with which to correlate the distributions of sites, artifacts and features.

### ***3.4.3 Secondary Data Needed***

It will be necessary to carry out several tasks in order to establish the need for and the complexity of the field inventory. These tasks will involve consultation with the affected agencies in order to establish methodological guidelines for inventory and recordation. In addition, it will be necessary to complete archaeological and historic-era resource overviews, including the prehistory, ethnography and history of the project area, as well as gather data from a variety of sources. Preparation of the overview and acquisition of site and report data will be required to help assess where inventories have been carried out in the past, and where new inventory may need to be done. In addition, collecting information on known sites will be important in order to identify which ones may only need re-evaluation.

Literature searches of appropriate repositories are an essential task in order to establish a baseline understanding of the nature, types, number, and density and of archaeological and historic-era resources sites located within and near the project corridors and facility locations. It is proposed that site and survey data lying within a two mile wide corridor (one mile either side of the proposed centerline of each pipeline alternative including reservoirs, and other ancillary features), be obtained in order to help understand the nature of the archaeological and historic-era resources within the area and to help predict the density and types of resources which could be found along any one of the corridors. In order to gather this information it will be necessary to visit a number of state and federal government facilities, to copy appropriate archaeological and historic-era resource report and site information, and then to compile and analyze the data.

Initial research will begin at the State Historic Preservation Office (SHPO) in Salt Lake City and at the Arizona State Museum where a comprehensive database of site information and project reports for Utah and Arizona are housed. Unfortunately, the databases located here are not complete, with many project reports and some site information residing in land management agency offices. Thus, in addition to the SHPO files (Arizona and Utah), it will be necessary to visit and obtain information from Bureau of Land Management Cedar City (Cedar City), St. George (St. George), Kanab (Kanab), Escalante-Grand Staircase (Kanab), and Arizona Strip (St. George) Field Offices. In addition, it is likely that several other government offices will need to be visited for this purpose including the Glen Canyon National Recreation Area office in Page, Arizona, and, possibly, the Utah Department of Transportation Region 4 Office in Richfield, the Bureau of Reclamation, Provo Project Office, the Arizona State Lands Office in Phoenix and the Tribal offices of the Kaibab Band of Paiute Indians on the Kaibab Indian Reservation in Arizona. Additional facilities to be included in the file search include the Arizona State Museum, the Museum of Northern Arizona and the Northern Arizona University.

Historic research on the LPP project area will also be an integral part of the archaeological and historic-era resources investigations. This research is a critical part of the initial overview document which outlines the history of the area encompassed by the LPP, and will provide needed data to help evaluate known historic sites and those located as a result of the inventories carried out during the Class III inventory. It is proposed that the following facilities be researched to help understand historic use of the project area and complete the overview document.

- State Historic Preservation Office, Salt Lake City
- State Historic Library, Salt Lake City
- Arizona Historical Society Library, Tucson
- Arizona State Historic Preservation Office, Phoenix

- Arizona State Library, Archives, and Public Records, Phoenix
- Arizona State Museum, Tucson
- Bureau of Land Management, General Land Office, Phoenix
- Southern Utah State University Library, Cedar City
- Cedar City Library, Cedar City
- Washington County Library, St. George
- Dixie College Library, St. George
- Kane County Library, Kanab
- Coconino County Library, Fredonia
- Tribal Office, Kaibab Indian Reservation
- Other identified research facilities to be identified

### **3.5 Nexus to Project (§5.11(d)(4))**

The proposed Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, air release and pipeline blow-off equipment, and other features to facilitate conveyance of water from Lake Powell to the St. George area and continuing on to the Cedar Valley. The pipeline and associated features would require installation through native soils, rocks and areas that could contain historical and/or archaeological resources. Project construction, operation and maintenance could adversely affect archaeological and historic-era resources and the study is necessary to determine potential impacts on archaeological and historic-era resources and to identify mitigation measures where necessary. Potential impacts associated with the Project may require mitigation of construction, operations, or maintenance impacts. FERC licensing, other federal agency permits, and Utah State Engineer approval of the Project design would require demonstration that these potential adverse impacts on archaeological and historic-era resources have been identified and avoided or mitigated in such a way as minimize harm to the affected resource.

### **3.6 Proposed Study Methodology (§5.11(d)(5))**

The analysis of impacts on archaeological and historic-era resources will involve identifying the properties eligible for, or listed on, the NRHP located within the impact area of influence, defining the characteristics of each property that contribute to their eligibility, and determining the effect of the alternatives and cumulative impacts on each property.

Specifically, it is anticipated that the following procedures will be undertaken;

#### ***3.6.1 Introduction and Overall Approach***

Broadly, the methodology will include the following tasks:

- Consultation with the lead agency and above identified agencies and parties
- Determine the extent of the APE
- Additional consultation between FERC designated Native American Tribes (claiming ancestral affiliation) to identify issues concerning archaeological and historic-era resources
- Identification of baseline conditions through a literature search of all known archaeological, historical and standing structure studies carried out within one mile of the proposed pipeline (2 mile wide corridor)



- After consultation, undertaking intensive pedestrian survey, as applicable, of a 250 ft wide corridor centering on the proposed pipeline alignment, edge of reservoirs, buildings, centerline of the transmission line corridors, access roads, and ancillary features
- Undertaking a geoarchaeological assessment of the APE
- Recording all newly identified sites and re-evaluating previously recorded sites within the surveyed corridor
- Preparation of a Class III archaeological and historic-era resources report detailing results of the survey and site recording; it will also include NRHP eligibility recommendations
- Preparation of the HPMP to include narrative text, and recommendations for proposed steps to be taken in the effective management of identified resources.

### 3.6.2 Methodology

The following subsection describes the methodology that will be used to address issues and concerns related to archaeological and historic-era resources, to identify archaeological and historic-era resources within the impact area of influence, and to analyze impacts on the resource.

The analysis of impacts on archaeological and historic-era resources will involve identifying the properties eligible for, or listed on, the NRHP located within the impact area of influence, defining the characteristics of each property that contribute to their eligibility, and determining the effect of the alternatives and cumulative impacts on each property.

#### 3.6.2.1 Research and Collection Methods

There are three generally accepted levels or classes of archaeological and historic-era resource research and inventory. Class I studies involve conducting a file search of existing literature and preparing an overview of an area which may include predictions of probable site types and densities. Class II inventories are statistically based sample surveys covering only a portion of a particular area. Using the data-base generated by the survey, predictions are then made for the entire area for types and densities of sites as well as the topographic and environmental settings within which they could be found. Class III inventories consist of a complete survey of a geographic area and are designed so that virtually all archaeological and historic-era resources within that area are identified and recorded.

It is proposed that research for the LPP will be divided into five phases. Phase 1 will involve compilation of background research of information known for the LPP in preparation for undertaking fieldwork. Phase 2 will be the preparation of an historic context. These two phases reflect the tasks identified for a Class I study. Phase 3 will be field inspection and recordation of archaeological and historic-era resources. Phase 4 will involve preparation of the technical report for the project. These two phases reflect the requirements of a Class III survey. Phase 5 will involve preparation of sections of the HPMP document involving archaeological and historic-era resources.

**Phase 1** will involve obtaining existing information on known sites and previous archaeological and historic-era resource projects and published sources from the files of a number of agencies and institutions. In addition to this information, it will be necessary to consult the NRHP and the county historic files of the Arizona and Utah SHPOs.

**Phase 2** will involve historic research on the proposed LPP project area, which will be an integral part of the archaeological and historic-era resources investigations. This research is a critical part of the initial overview document which outlines the history of the LPP area, in particular, and will provide needed data

to help evaluate known historic sites and those located as a result of the inventories carried out during the archaeological and historic-era resource inventory. Libraries and other data sources to be consulted include those listed in the Primary Data Needed and Secondary Data Needed, Sections 3.4.2. and 3.4.3 (see above). In addition, it might be necessary to identify and interview individuals who have knowledge of irrigation facilities or other historic properties for which information is not otherwise available. Information obtained from documents and individuals may be critically important in establishing eligibility of sites to the NRHP.

**Phase 3** will include field inspections and recordation of archaeological and historic-era resources within the LPP area. It is not known how many sites within the project area have been recorded and whether those existing site forms are adequate for the purposes of this study. As such, only general methodological guidance for the field portion of the project is described here. When information is obtained which better defines the alternative alignments and when information is obtained concerning previous surveys in the area, a more detailed inventory plan will be prepared for the LPP.

Field inventory of the project alternative(s) will be divided into two separate surveys:

- 1) an inventory of all historic standing buildings, structures, and features associated with the historic period within the project area;
- 2) a Class III inventory of all prehistoric and historic archaeological sites within the project area

The inventory of historic buildings, structures, and features will involve recordation of all historic properties (to include buildings, engineering structures, canals, reservoirs and other above ground features) within the project APE utilizing Historic Building Inventory Forms in Utah and in Arizona. Only properties dating within the historic period will be recorded (1970 or earlier). The recordation of these properties will include historic and structural information as well as a photograph; enough information to be able to evaluate sites for NRHP eligibility. Previously recorded sites within the project area will be revisited and reevaluated for eligibility to the NRHP.

The Class III inventory of all prehistoric and historic archaeological sites will involve a pedestrian survey of all alternative corridors, followed by recordation and evaluation of sites identified during the inventory. Archaeological sites, including both prehistoric and historic archaeological sites, will be recorded on IMACS forms in Utah and the ASM Site Recording Form in Arizona. Each site will be described and photographed and evaluated for eligibility for the NRHP. Previously recorded sites within the project area will be revisited and reevaluated for eligibility to the NRHP. Should it be determined necessary, they will be re-recorded, as well. Site numbers for archaeological sites will be obtained from the Antiquities Section, SHPO. For the purposes of this study, only sites that date to or before 1970 will be recorded and evaluated for eligibility for the NRHP.

**Phase 4** will involve the preparation of a project report to include introduction, setting, methodology, prehistoric, ethnographic and historic contexts, results and recommendations. Detached appendices to this report will include completed site forms for all sites recorded or rerecorded during the inventory. This report will form the basis for the preparation of the Technical Report for the LPP HPMP and EIS.

**Phase 5** will involve the preparation of the draft and final HPMP document, compiled from information contained in the archaeological and historic-era resource technical report.

### **3.6.3 Standard Operating Procedures for Archaeological and Historic-Era Resources**

During the environmental review process for the Lake Powell project, a number of cultural resources and historical sites will be identified within the proposed area of potential effects (APE) and will be evaluated for their eligibility to the National Register of Historic Places. Those properties that can be mitigated will be detailed in the HPMP. In addition, not all construction staging areas, access roads, material source sites, and other construction related sites may be covered during the environmental review process. The following are the procedures and guidelines for the Contractor to follow concerning the management of these cultural resources and historic properties, as well as undiscovered resources, prior to and during the construction of the proposed pipeline.

After the award of contract and prior to the start of construction, the Contractor will be responsible to have all staging areas, material resource areas, access roads, and any other associated construction sites not covered in the environmental process surveyed for archaeological and historic-era and paleontological resources. These new disturbance areas are to be inventoried in a manner consistent with the Standard Operating Instruction standards and guidelines for this project. The results of the surveys must be submitted to the Utah State Water Board Project Manager, who will be responsible for submittal to either or both the Arizona and Utah State Historic Preservation Offices (SHPOs) and the appropriate Native American Tribes for review and concurrence.

Prior to the commencement of construction, the Contractor, his Project Manager, Field Supervisors, and Heavy Equipment Operators, as well as the Utah State Water Board Project Manager will be required to attend a training and orientation class on the laws and regulations regarding the treatment of cultural and historical resource sites, procedures to follow when a human burial, cultural or paleontological material is encountered, and procedures to follow to avoid a flagged site, along with the treatment and avoidance of Traditional Cultural Properties. This class will be conducted by a qualified professional archaeologist and paleontologist.

#### **3.6.3.1. Monitoring**

Once construction begins, the potential to adversely affect those historic properties located within the APE that were determined eligible for National Register of Historic Places (NRHP) during the environmental review process and that were also determined could be avoided remains a possibility. In order to avoid these sites, each cultural property will be identified by staking the area with lath and easily visible flagging. The stakes and flagging will at minimum be placed in each of the four cardinal directions and at a distance five feet from the outer boundary of the site. In addition, an archaeologist will be on site to monitor all construction activities in and around each flagged site. Once construction activities conclude in the area, the stakes and flagging will be removed and no subsequent disturbance is to occur in the area.

Since the project passes through some areas of cultural sensitivity, it will be necessary to implement a construction monitoring program. It is anticipated that this program will consist of a combination of construction worker training, as outlined above, excavation monitoring and trench inspection. This program will specifically require the training of field supervisors and equipment operators in the recognition of archaeological and historic-era resource material and features. It will also involve the monitoring of excavation by qualified professional archaeologists. In addition, trench inspection will be carried out in culturally sensitive areas by qualified professional archaeologists.

#### **3.6.3.2. Traditional Cultural Properties**

Ethnographic research is ongoing concerning identification of traditional cultural properties and cultural and religious significance attributed by the tribes to the already identified archaeological resources. Since these areas are considered sacred or culturally sensitive by the Native Americans, information on their



location are quite restrictive, which will require close cooperation between the Contractor, Utah State Water Board, and the Project Consulting Archaeologist/Ethnographer. These areas will be identified in broad terms and closely monitored by qualified professional archaeologists/ethnographers.

### **3.6.3.3. Discovery**

In accordance with 36 CFR 800.11(a) and (b) (1), Utah State Water Board has provided for the protection, evaluation, and treatment of any historic property discovered prior to or during project pre-construction design survey or testing. This document outlines the procedures and instructions to the Contractor for the protection of any archaeological, historical, and paleontological resources discovered in the course of construction. Specifically, upon discovery, construction operations shall be immediately stopped in the vicinity and the Project Manager shall be verbally notified of the nature and exact locations of the findings. The Contractor shall not damage the discovered objects and shall provide written confirmation of the discovery to the Project Manager within two (2) calendar days. The Project Manager will inform the Contractor when the restriction is terminated, with written confirmation following within two (2) calendar days.

Should a discovery occur, the Utah State Water Board will consult with the SHPOs, and the Advisory Council on Historic Preservation in accordance with 36 CFR 800.11(b)(2)(ii) toward developing and implementing as appropriate research design or specific treatment plan prior to resuming construction.

### **3.6.3.4. Discovery of Human Remains**

In addition, the potential for the discovery of subsurface resources is also possible, including human remains, which are protected under federal legislation, such as the Native American Graves Protection and Repatriation Act (NAGPRA) and Arizona and Utah state laws protecting the discovery of human remains. During the course of the Class III inventory, the Native American Graves Protection and Repatriation Act will be implemented for all burials discovered on all federal administered lands. Arizona and Utah State laws, policies, and procedures will be strictly adhered to for burials discovered on state or private lands.

In the unlikely event that human remains are encountered in the course of construction, all work in the area must cease and the Project Manager be contacted immediately. The Project Manager will ensure that the remains and any grave-associated artifacts are treated in a manner consistent with applicable federal and state laws and with the ACHP's *Policy Statement Regarding Treatment of Human Remains and Grave Goods*.

### ***3.6.4 Define Baseline Conditions***

Archaeological and historic-era baseline conditions will be defined by identifying known sites, sites eligible for, or listed on, the NRHP located within the APE, and establishing if there are portions of the project area, which have been previously adequately inventoried. Characterization of the baseline conditions will include the following archaeological and historic-era resource topics:

- Archaeological sites
- Historical sites
- Cultural landscapes
- Archaeological districts
- Historical buildings and structures

### ***3.6.5 Analyze Alternatives***

During the Class III inventory, impacts on archaeological and historic-era resources will be analyzed for the south alternative alignment, existing highway alternative alignment, and no action alternative. Each property will be assessed to determine its eligibility. The areas of ground disturbing activities and alteration of surrounding topographic features will then be assessed to determine the impact of the project upon the historic property. Geoarchaeological evaluation of the sites will also be undertaken as part of the development of an archaeological landscape burial sensitivity model. This will provide information to more accurately assess the impacts to the sites.

The features of each alternative will be superimposed onto the baseline project maps, clearly indicating all areas of proposed ground disturbing activities. Each archaeological and historic-era resource site, including archaeological sites and historical buildings and structures, will be drawn on the project baseline map. Each property will be assessed to determine what characteristics contribute to the eligibility of the property. These characteristics will then be compared to the alternatives, especially in relation to areas of ground disturbing activities and alteration of surrounding topographic features. Potential measures for mitigating impacts on archaeological and historic-era resources will be determined following completion of the impact analysis.

#### **3.6.5.1 Significance Criteria for Cultural Resources**

Eligibility to the NRHP is determined by federal legislation 36 C.F.R. Part 60.4, which states that consideration is given to “districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and; (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or 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 (d) that have yielded, or may be likely to yield, information important in prehistory or history.”

Federal legislation 36 C.F.R. Part 800 states that archaeological and historic-era resource assessments of federal “undertakings” of eligible properties should result in one of three determinations; (a) no effect; (b) no adverse effect, i.e., one or more historic properties will be affected, but the historic qualities that make them significant will not be harmed; or (c) adverse effect, i.e., the undertaking will cause harm to one or more historic properties.

Ultimately, eligibility of sites would be determined by the lead federal agency in consultation with the federal land owning agency (applicable) and the appropriate State Historic Preservation Office (SHPO) in Arizona or Utah (depending upon the location of the site). The lead federal agency, in consultation with the federal land owning agency (as applicable), the SHPO and the Advisory Council on Historic Preservation (ACHP), determines the significance of impacts and treatment planning related to these resources. If the eligibility of a site is not determined, it is assumed for the purpose of this analysis that the site is eligible. Impacts on archaeological and historic-era resources may be considered significant if either of the following occurs.

- Disturbance or alteration of archaeological and historic-era resource site surfaces and/or features; excavation, burial or inundation of any archaeological and historic-era resource that is listed in or is eligible for nomination to the NRHP
- Alteration of surrounding topographic features, archaeological and historic-era features that adversely affects the feeling, setting or association of a significant site

### **3.6.5.2 Mitigation of Potential Impacts**

Potential measures for mitigating impacts treatment measures on archaeological and historic-era resources will be determined following completion of the impact analysis, pursuant to 36 CFR 68 in consultation with the agencies and interested parties. The analysis of impacts on archaeological and historic-era resources will be based on the standard operating procedures (the *Secretary of Interior's Standards and Guidelines for the Identification of Historic Properties*), and measures to avoid or reduce impacts that are included in the project description. The significance criteria for archaeological and historic-era resources will then be applied to determine if the impact would be significant or not. Mitigation measures, where possible, would then be developed for the significant impacts. The mitigation measures would be based on applicable regulations, past experience, geoarchaeological assessments and best professional judgment. In some cases it may not be possible to mitigate significant impacts. All reasonably foreseeable mitigation options will be evaluated by the Federal Energy Regulatory Commission, Bureau of Land Management, the State Historic Preservation Offices, and other responsible federal agencies and factored into the respective decision documents.

### **3.6.5.3 Historic Properties Management Plan**

The Historic Properties Management Plan will be developed subsequent to the archaeological and historic-era resources investigation, incorporating results of studies, as well as including the proposed mitigation and treatment plans. This document will identify all of the historic properties within the APE, their eligibility status, including the nature and significance of historic properties that may be affected by construction as well as project maintenance and operation. It will identify goals for the preservation of historic properties, detail treatment measures, establish guidelines for maintenance and operation and include the results of consultation carried out with the SHPOs, agencies, Tribes and other interested parties.



### ***3.6.4 Analysis of Cumulative Impacts***

Analysis of cumulative impacts will involve identifying other planned or proposed projects coincident with the impact area of influence for archaeological and historic-era resources. If any other planned or proposed projects would affect archaeological and historic-era resources within the impact area of influence, then such impacts will be considered cumulative and identified as such.

The archaeological and historic-era resources cumulative impacts analysis will address the combined impacts of any past or future proposed or planned actions that have or are likely to affect on archaeological and historic-era resources when combined with Project impacts in the impact area. There are a number of inter-related projects that will be analyzed for cumulative impacts. Two examples of these types of projects are:

- St. George Airport (now under construction)
- Southern Corridor Highway Project (St. George to Hurricane Highway)

It is anticipated that both prehistoric and/or historic artifacts may be collected during the process of carrying out the field inventory. Should it become necessary to collect any artifacts, they will be curated at a federally recognized museum facility within the appropriate state. These artifacts will be curated according to the standards and procedures outlined in 36 CFR 79.

### ***3.6.5 Report Preparation***

A single Class I Literature and File Search report will be prepared that will include both a prehistoric and historic context of the project area that will include Southern Utah and Northern Arizona. Two Class III inventory technical reports, one for Arizona and one for Utah, will be prepared to document the various historic properties located immediately adjacent or within the Project APE. The report will present the study goals and objectives and describe the study area, and document the literature review. Field investigation activities and methods will be described, and data analyses and results will be presented. Results will be discussed with a focus on the study objectives and the National Register of Historic Places eligibility for each identified resource. Conclusions and recommendations, where warranted, will be provided, and will address avoidance and mitigation of impacts on historic properties. These conclusions may include recommendations that would affect Project design. The report will be prepared for limited distribution to only those consulting Federal and state agencies, Tribes and SHPO offices responsible for managing archaeological and historic-era resources and is not intended for public review or distribution. The Class I and Class III work will be performed under the direct supervision of persons meeting the Secretary of the Interior's Professional Qualifications Standards (FR 44716, Sept 1983). These reports will become part of the two Historic Preservation Management Plans (Arizona and Utah) that will also include a treatment plan for the archaeological and historic-era resource properties identified.

## **3.7 Schedule and Level of Effort (§5.11(d)(6))**

The archaeological and historic-era resources studies will require professional archaeologists, geoarchaeologists and anthropologists with appropriate experience to perform the literature review, field investigations and data analyses identified in this study plan. The archaeological and historic-era resources professionals will be registered with and approved by the Utah and Arizona SHPOs, Bureau of Land Management, National Park Service and Bureau of Reclamation. At this time, total study costs are estimated to be approximately \$950,000. It is anticipated that the archaeological and historic-era resources study can be completed within one year.

The proposed schedule for carrying out the various tasks of the archaeological and historic-era resources studies is as follows:

- Draft Class I Report - 20 February 2009
- End of Comment Period - 20 March 2009
- Final Class I Report - 21 April 2009
- Fieldwork Begins - 2 March 2009
- End of Fieldwork - 15 September 2009
- First Draft Class III Report - 29 January 2010
- Final Draft Class III Report - 21 May 2010
- Draft HPMP - 25 June 2010

### 3.8 Progress Reporting (§5.11(b) (3))

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009, August 2009, and November 2009. The final report will be submitted in February 2010.

In order to facilitate communication between the various members of the Cultural Resource Working Group (FERC, Federal and State agencies, the Tribes, and other interested parties), quarterly meetings will be held in Salt Lake City and Saint George, Utah, and Phoenix, Arizona. These meetings will take place in conjunction with other project activities and will be open to in-person attendance or teleconferencing. These meetings are proposed for the following dates:

- |                         |   |                 |   |                      |
|-------------------------|---|-----------------|---|----------------------|
| • Class I Report        | - | 2 March 2009    | - | Salt Lake City, Utah |
|                         | - | 3 March 2009    | - | Saint George, Utah   |
|                         | - | 4 March 2009    | - | Phoenix, Arizona     |
| • Class III – Fieldwork | - | 27 April 2009   | - | Salt Lake City, Utah |
|                         | - | 28 April 2009   | - | Saint George, Utah   |
|                         | - | 29 April 2009   | - | Phoenix, Arizona     |
| • Class III – Fieldwork | - | 27 July 2009    | - | Salt Lake City, Utah |
|                         | - | 28 July 2009    | - | Saint George, Utah   |
|                         | - | 29 July 2009    | - | Phoenix, Arizona     |
| • Class III Report      | - | 26 October 2009 | - | Salt Lake City, Utah |
|                         | - | 27 October 2009 | - | Saint George, Utah   |
|                         | - | 28 October 2009 | - | Phoenix, Arizona     |

### 3.9 References

Nickens, Paul R. 1988. *Cultural Resource Inventory of the Garkane Power Association Colorado City to Sand Mountain 138kV Transmission Line*. Nickens and Associates.

Desert Research Institute. 1975. A proposed 45 mile long pipeline route was surveyed by Desert Research Institute. It was known as the AWW-Alton Pipeline.

## **Study Plan 4: Geology and Soils**

### **4.1 Introduction**

This study plan documents the methods for planning and determining preliminary design criteria for geologic and soils conditions for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Document 1 and 2, as well as draft study plan review comments received during study plan meetings and filed with FERC. This study plan presents an approach for advancing knowledge and understanding of geologic and soils conditions as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan addresses study requests made by FERC, other federal, state and tribal agencies, and the public.

### **4.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

The study plan describes goals and objectives, provides a description of the study area, describes the Project nexus, presents the proposed methodology, presents staffing and equipment requirements, provides a budget for activities associated with the geology and soils portion of the study, and provides a generalized project schedule. The study will identify potential impacts of the Project on geologic and soil conditions during Project construction and operation, document the potential influence of soil and geologic conditions on Project features, and identify measures to mitigate impacts on geologic and soils conditions that could be affected by Project construction, operation and maintenance activities. The study plan also addresses identification of safety issues associated with geologic and soils conditions.

#### ***4.2.1 Goals and Objectives***

The goals of the geologic and soils conditions study are to: 1) provide information needed to guide decisions in the Project design, construction, operation and maintenance that would protect geologic and soil features and resources; 2) provide information to assist in Project design, construction, operation, and maintenance decisions that will protect the pipeline facilities from problems and hazards related to geology and soils; and 3) address safety issues associated with geologic and soils conditions during Project construction, operation, and maintenance.

Specific geologic and soils-related objectives include determining how geologic and soils features will affect the pipeline facilities, and how those facilities may affect the geology and soils along the alternative alignments. The primary objectives of the study plan with regard to geology are:

- Identify risks associated with pipeline crossings of each active fault or fault zone along the alternative alignments. (For the purposes of this study, an active fault or fault zone is defined as a fault which has had movement during the Holocene Epoch (within the past 10,000 years) and is therefore likely to experience more movement in the future)
- Identify geologic hazards (faults, unstable slopes, sinkholes, erosion) along the alternative alignments that could pose substantial threats to safety during construction or maintenance or that may damage the structure



- Evaluate whether geologic hazards along the alternative alignments can be mitigated by design, construction, or O&M practices, or whether some hazards cannot be mitigated and may require re-routing
- Estimate relative proportions of the pipeline excavation that would be accomplished by excavating, by ripping, and by blasting
- Determine the characteristics of the rocks and geologic structures at the probable locations of tunnels and shafts
- Determine where groundwater infiltration may occur into tunnel shafts or excavation trenches in sufficient quantities to require dewatering for construction, operation, or maintenance, and estimate how much water will need to be removed and how this will be accomplished
- Estimate rock strength characteristics for foundations at pump station and hydroelectric plant sites
- Estimate how the characteristics of rocks along the alternative alignments would affect the Project design, construction, operation and maintenance
- Identify potential mitigating or corrective measures that may be necessary to protect human safety and the environment during Project construction, operation and maintenance
- Identify permitting requirements pertaining to removal and disposal of minerals associated with pipeline excavation and/or installation

The primary objectives of the study plan with regard to soils are:

- Determine how the Project construction, operation and maintenance may affect soil conditions and processes along the alternative alignments
- Evaluate the potential risk of soil erosion along the alternative alignments resulting from Project construction, operations, and maintenance
- Estimate soil strength characteristics for foundations at pump station and hydroelectric plant sites
- Estimate soil characteristics, such as bearing capacities and liquefaction potentials along the alternative alignments
- Estimate how the characteristics of soil and rocks along the alternative alignments may affect the Project design, construction, operation and maintenance
- Determine whether mitigating or corrective measures would be necessary as part of the Project design, construction, or operations and maintenance to protect the pipeline from damage at locations of known or probable soils hazards
- Identify potential mitigating or corrective measures that may be necessary to protect human safety and the environment at locations during Project construction, operation and maintenance

### **4.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied.

### **4.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

#### ***4.4.1 Background Description***

The geologic and soils conditions in the Project area have been evaluated on a large, general scale, and in some instances in greater detail, by several studies, each of which has looked at a selected portion of the

Project area. The findings of these studies are documented in various reports prepared by the U.S. Geological Survey (USGS), the Utah Geological Survey (UGS), the Bureau of Land Management (BLM), the National Park Service (NPS), the Natural Resources Conservation Service (NRCS), and other agencies as well as studies commissioned to engineering and scientific consultants. A summary of geologic and soils conditions is included in the PAD. These information sources, as well additional information obtained from field reconnaissance and studies performed during Phase 1, are documented in a series of Technical Memoranda (MWH 2008a; 2008b; 2008c; 2008d; 2008e; 2008f). The geologic and soils conditions as documented in these studies and reports are briefly summarized below.

#### ***4.4.2 General Geology***

The Project alignment alternatives traverse physiographic provinces of the western Colorado Plateau into the transition zone between the Plateau and the Basin and Range in Utah and Arizona. These two physiographic provinces define the topographic, geologic, and hydrologic features of much of the western United States.

The Colorado Plateau encompasses most of southern and eastern Utah, western Colorado, northern Arizona, and northwestern New Mexico. Along the routes of the alternative pipeline alignments, the Colorado Plateau lies east of the Hurricane Cliffs and consists of flat to gently dipping rocks which are regionally uplifted northward. Surface faults exist within the Plateau region and can be locally significant, but are generally not dominant surface features on a large scale. However, subsurface faulting and the associated deformation are more common at greater depths, and the same forces have caused gently to steeply inclined folds at the surface, exhibited as anticlines, synclines, and monoclines.

Most of the rocks exposed or in the shallow subsurface of the Colorado Plateau in the vicinity of the alignment alternatives are sedimentary rocks formed in large, shallow seas, broad river plains, and expansive deserts during the late Permian to the late Cretaceous Periods. Much of the Colorado Plateau has been dissected by erosion to form canyons, cliffs, and other features. Mostly unconsolidated surficial sediments were deposited during the Holocene and Pleistocene Epochs over the past 1.6 million years. Most of the surface deposition was associated with alluvial, fluvial, and eolian deposits, as well as reworked glacial deposits from the last great (Pleistocene) ice age. Basalt flows from cinder cones and fissures of Miocene to Holocene origin (15 million years to present) are exposed at the surface in a number of places, mostly in the western part of the alignments east and west of the Hurricane Cliffs (Boyle 2003; USGS 1998; USGS 2002; WCWCD 2005; USGS 2004a).

The Basin and Range Physiographic Province includes western Utah, most of Nevada, and parts of central and southern Arizona, central and southwestern New Mexico, eastern California, southeastern Idaho, and southeastern Oregon. Basin and Range geology is a result of uplift and crustal extension forces that began during the Miocene Epoch and continue today; these forces have caused the region to be broken up into north-south trending mountain ranges and valleys, known as “horst-graben” structures, caused by downthrown blocks “dropping” into the gaps caused by uplift and extension. The upthrown blocks have been partially eroded to fill much of the valley floors, covering the downthrown blocks and in many instances depositing several thousand feet of sediments in the intermontane valleys. Localized basalt flows associated with Basin and Range extension are present in the western parts of the alignment routes (Boyle 2003; USGS 1998; WCWCD 2005; USGS 2004b).

The province transition zone from the Colorado Plateau to the Basin and Range begins at the Hurricane Cliffs and its associated fault system (the fault zone represents the eastern edge of the Basin and Range horst-graben faulting in this region) and extends westward beyond St. George to approximately the region of Gunlock and Santa Clara, Utah (WCWCD 2005). The transition zone is characterized by an increase in the number and abundance of faults from east to west, with horst-graben type block faulting that forms

mountains and valleys not clearly defined but with a significant active fault system (the Hurricane Fault) bounding the eastern edge. Because all alignment alternatives from Lake Powell terminate at a hydropower afterbay at the base of the Hurricane Cliffs about 11 miles east of St. George, the westernmost reaches of the pipeline alignment routes from the Hurricane Cliffs westward to the afterbay are contained within the transition zone. The pipeline alignment from the afterbay to Cedar Valley is aligned parallel to the Hurricane Cliffs and also is contained within the transition zone.

#### ***4.4.3 Geology of Pipeline Alignments***

The following paragraphs summarize the geology along the pipeline alignment alternatives.

Long reaches of sedimentary rocks consisting primarily of sandstone, limestone, siltstone, and shale occur along much of the alternative alignments. Beginning at the proposed Intake System at Lake Powell and traveling westward to the Cockscomb Ridge, the pipeline alignment crosses through mostly Jurassic and Cretaceous sandstone, siltstone, and limestone, and overlying Quaternary alluvium and windblown deposits (USGS 1963).

Beginning near Big Water and westward to the Hurricane Cliffs, the pipeline alignment crosses a number of mostly north-south trending monoclines, synclines, and anticlines, as well as at least seven faults, some of which have been determined to be active (i.e. showing evidence of seismic activity/movement within the last 10,000 years and believed to be under active stresses that could result in future activity). There are a number of these structural features, with only the more important structures being listed below:

- The Coyote Creek Syncline, a north-south trending feature that is structurally associated with the Cockscomb a few miles further west
- The Cockscomb, a north-south trending ridge that exists because of differential erosion of juxtaposed rocks at the crest of the East Kaibab Monocline
- The East Kaibab Monocline, an eastward-dipping monocline with steep vertical and right-lateral faulting at the axis
- The Kaibab Anticline, characterized by a fault zone along the axis resulting from extensional stresses
- The Telegraph Fault Zone, a north-northeast trending, normal, westward downthrown fault system
- The Paunsaugunt Fault Zone, a north-trending, westward downthrown fault
- The Johnson Canyon Fault Zone, one to three normal, horst-graben type faults
- The Kanab Creek Fault Zone, a north-south trending, eastward-downthrown fault series
- The Sevier Fault, a major, active, north-south trending fault downthrown to the west
- The Moccasin Monocline, an east-dipping monocline that is parallel to and just west of the Sevier Fault Zone and appears to be associated with the faulting
- The Hurricane Cliffs, a massive, active fault zone consisting of a series of steeply westward-dipping normal faults that trend north-south with more than 5,000 feet of vertical displacement

The pipeline alternative alignments would cross through alluvial and eolian deposits, as well as slope talus and colluvium. Substantial reaches of the alignments would pass through bedrock, consisting of various sedimentary rocks (sandstone, limestone, siltstone, and evaporates), as well as basalt flows.

#### ***4.4.4 Soils of Pipeline Alignments***

Soils in the pipeline alternative alignments are typically alluvial or eolian or sometimes fluvial deposits and terraces, occasionally including reworked glacial outwash sediments. Soils are generally moderately well drained and shallow, although there are many exceptions.



Most soils in the eastern part of the alternative alignments are sands or sandy to gravelly loams from 0 to 5 feet deep (deeper soils tend to occur in larger valleys and deep basins and washes), with large areas of rock outcrop that have little to no soil. Some soils are saline and, when associated with marine parent rocks or nonmarine evaporite rocks, high in gypsum content and sometimes moderately high in calcium carbonate. More often, soils originating from nonmarine, nonevaporite rocks are generally nonsaline and low in gypsum but may be relatively high in calcium carbonate (NRCS 2003; 2007a).

Soils in the Arizona Strip include so-called “clayhole washes” which typically consist of clay, silty loams, silty clay loams, or sandy loams, 0 to 5 feet deep and in some instances deeper. Some clayhole wash soils may be relatively high in gypsum because of gypsiferous parent materials. Soils may be deeper in depressions and other places where deposition is more likely to occur. Outside of the clayhole washes, soils are typically eolian or alluvial sands or gravelly to sandy loams that originate from sandstone parent material. These soils are mostly less than five feet deep but may be deeper, are usually low in gypsum and may be low to moderately high in calcium carbonate (NRCS 1983; 2007b).

In the western part of the alternative alignments, soils are alluvial and eolian fine sands, sandy loams and cobbly loams amid large areas of exposed bedrock. Much of the parent material is limestone and calcareous shale, and as a result soils are often high in calcium carbonate and low in gypsum. Soils are typically thin, often less than two feet deep. Near Sand Hollow Reservoir, eolian and alluvial sandy soils are generally deeper than two feet (NRCS 1971; 2007c).

The southern reach of the proposed Cedar Valley Pipeline System alignment route from Hurricane Valley to Cedar Valley passes through sandy gravelly loam soils associated with alluvium derived from limestone, sandstone, and shale. It is typically nonsaline, high in calcium carbonate, and low in gypsum. Fine eolian sand deposits derived from sandstone also are common. Where the alignment passes through sediments deposited over or near volcanic rock, the soil is primarily cobbly sandy loam derived from basalt or from windblown sand deposits. The soils include cobbly clay loam and silt loam in the southern part of the Cedar Valley. Most soils within the Cedar Valley are in excess of 5 feet deep, and often much deeper away from the valley margins and bedrock outcrops (NRCS 1996; 2007d).

#### ***4.4.5 Study Area Definition***

The study area would include the entire length of the alternative alignments; particular attention will be required for the following:

- River and stream crossings
- Soils subject to liquefaction during seismic events
- Shaft and tunnel locations
- Fault crossings (characterization of fault features)
- Rock outcrops and areas of shallow soils where rock excavation is likely
- Steep slopes
- Locations where shallow groundwater is known or suspected and could intercept excavations
- Soil and rock characteristics within 1,000 feet of manmade structures
- Locations where limestone bedrock or gypsiferous rock or soil are anticipated within 100 feet depth of pipelines or associated structures
- Soil and rock strength characteristics at pumping stations, forebay and afterbay reservoirs, and hydroelectric plant sites
- Locations where construction spoils (soil and rock) will be disposed
- Locations where borrow of construction materials (soil and rock) may occur

#### ***4.4.6 Issues and Data Needs***

The geologic and soils specific analyses will include the following:

- Estimating fault locations and determination of fault activity
- Field survey for potential unidentified fault locations (minor faults, fault zone displacements, fault spurs, etc.)
- Determining known seismic activity – magnitude and acceleration
- Determining rates and magnitudes of past and probable future fault displacements at locations where the Project would cross faults where a risk of fault activity has been identified
- Identifying locations and types of soil and rock conditions subject to liquefaction
- Risk of liquefaction occurrence
- Identifying landslides, potentially unstable slopes, and related features
- Identifying locations along the alternative alignments where soil and/or rock conditions have been or may be conducive to subsidence, including soluble rock and soil such as gypsum deposits and vacuous limestones
- Characterizing locations at risk of landslides, rock falls, debris flows, and other geologic hazards
- Characterizing the possible risks to Project features and to human safety associated with geologic hazards that could be affected by Project features
- Identifying potential effects of construction blasting on nearby rock and soil stability, buildings and other structures, natural gas or municipal pipelines, water wells, and other features
- Characterizing specific types of soils along alternative alignments
- Estimating engineering characteristics of soils at selected locations along alternative alignments
- Identifying rock engineering characteristics pertaining to excavation, tunneling, removal and disposal along alternative alignments
- Determining the presence of groundwater, at what levels and within what range of fluctuations within the alternative alignments
- Estimating groundwater inflow rates into excavations and tunnels
- Estimating soil and rock strength characteristics at the Lake Powell Intake and Hurricane Cliffs Hydropower Facilities
- Recommending mitigation measures for problems and hazards associated with geologic and soils features
- Identifying best methods and locations for reuse and/or disposal of waste rock and soil resulting from Project construction
- Identifying best methods and locations for obtaining rock and soil for Project construction
- Identifying mineral deposits within the pipeline alignments subject to mineral disposal rules under the requirements of 43 CFR 3600, and identify characteristics of mineral deposits required for permitting (free use or sale)

#### **4.5 Nexus to Project (§5.11(d)(4))**

The proposed Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, air release and pipeline blow-off equipment, and other features to facilitate conveyance of water from Lake Powell to the St. George area and continuing on to the Cedar Valley. The pipeline and associated features would require installation through native soils and rocks and would cross or be in close proximity of faults, steep and potentially unstable slopes, rivers and streams, and short but potentially problematic reaches of groundwater-saturated rock or soil. The pipeline and associated features may be affected by these geologic and soil conditions because

of the potential for pipeline corrosion, slope failures, fault movement, soil liquefaction, erosion, and/or subsidence. These factors may affect successful project construction, operations, or maintenance, or all three. Alternatively, construction and/or operation of the project facilities may adversely affect geology or soil conditions in ways that alter existing conditions and could result in increased erosion, slope failure, or other impacts on the environment. Potential impacts associated with the Project may require mitigation of construction, operations, or maintenance, or all three. FERC licensing, other federal agency permits, and Utah State Engineer approval of the Project design would require demonstration that these potential adverse impacts on geologic and soils conditions have been identified and avoided or mitigated in such a way that resources are not adversely affected.

## **4.6 Proposed Study Methodology (§5.11(d)(5))**

### ***4.6.1 Introduction and Overall Approach***

A substantial number of documents, including technical reports, scientific and engineering journal publications, and other literature were previously reviewed and information was compiled. This information was documented in technical memoranda and was summarized in the PAD. Additional literature review involving geologic and soil conditions will be performed by identifying and reviewing available technical reports, maps, aerial photos, and literature that may not have been identified previously, to determine what is known of the geologic and hydrogeologic conditions regionally and at specific, potentially problematic locations along the alignment; performing field investigations to verify and improve on information obtained from the literature review; drill test boreholes and cores at selected locations and use physical and geophysical tools to characterize rock, soil and groundwater conditions; analyze field investigation data; and prepare a summary report documenting these findings.

### ***4.6.2 Methods for Preliminary Analysis and Preliminary Design***

Methods pertaining to evaluation of geologic conditions that may affect preliminary engineering analysis and preliminary design are identified in this section.

#### **4.6.2.1 Task 1 - Review of Existing Geologic Literature**

Previous reviews of existing literature have uncovered a large body of information on a broad scale. A more detailed review of existing geologic and soils data and information relevant to the Project that are available in current published reports, maps, aerial photography, and literature will be performed. This literature review will include information from established agency sources such as the U.S. Geological Survey, the Utah Geological Survey, the Natural Resources Conservation Service, the U.S. Bureau of Reclamation, the affected counties, and other sources. Previous preliminary investigation work performed by engineering and scientific consultants and organizations will be obtained and reviewed. Available information on specific conditions that pertain to pipeline construction and operation will be identified, such as active fault movement and orientation; groundwater occurrence, depth, and permeability; rock types, thicknesses, orientation, and characteristics such as hardness and weathering; and seismic conditions such as seismic zone and intensity, peak ground acceleration and associated return periods. If information is available that pertains to corrosion potential, swelling soils, or other potentially adverse effects on pipelines, concrete, earthwork, or other features, these will be reviewed and extracted.

#### **4.6.2.2 Task 2 - Field Investigations**

Previous investigations have included a broad, general inspection of field conditions along the pipeline alignment. Field investigations associated with this task will include a more detailed physical inspection

of the south alignment. Particular attention will be given to locations and features identified in the geologic literature review and previous field reconnaissance that may present challenges to the pipeline engineering, construction, or operation, such as known or suspected active faults, stream channel crossings, steep or potentially unstable slopes, soils at risk of increased erosion, or potentially liquefiable soils. Field investigations will be in accordance with commonly accepted field investigation practices and will be performed by licensed geologists, engineers, and drillers. The following activities are anticipated:

- Physical inspection and photograph documentation of the alternative alignments as well as potential borrow and spoil placement areas by a qualified geologist
- Identification of mineral resource deposits within the alternative alignments
- Documentation of observations that suggest potentially unstable slopes (evidence of previous slope failures, rock falls, cracks and fractures, perched seeps on steep soil slopes, and other indicators of risk of slope failure), or of potential for excessive erosion (loose and/or unvegetated soils on slopes, gully, or other features)
- Visual inspection of representative soils along the alternative alignments to estimate soils characteristics, estimate whether and at what depth bedrock might be encountered during pipeline construction, and estimate soils risks such as soft or expanding clays or organic soils
- Submission of selected surface and coring samples for laboratory analyses
- Core drilling at shafts and tunnels (Lake Powell Intake site and Hurricane Cliffs Hydropower Facility) to characterize lithology, fracture patterns, and collect rock core samples for analysis
- Performance of borehole geophysical tests in deep rock boreholes at the Intake site and Hurricane Cliffs to characterize lithology and fracture patterns
- Performance of surface seismic surveys at the Hurricane Cliffs site to further characterize lithology and fracture patterns
- Construction of observation wells and performance of an aquifer pumping test at the intake shaft to characterize the occurrence of groundwater and to estimate the rate of inflow that will require dewatering during construction
- Identification of manmade physical structures, such as buildings, pipelines, highways, wells, etc. in areas where bedrock blasting may occur, such as along the alternative alignments where shallow bedrock would require blasting for pipeline placement, at the Intake site, and at the Hurricane Cliffs crossing. Structures or groups of structures within 1,000 feet of possible blast sites will be identified and documented. The type of surface soil and/or rock between the blast site and the structure(s), and supporting the structure(s), will be noted.

Continuous coring will be performed in bedrock at the Intake site and at the Hurricane Cliffs crossing, with percent recovery and the Rock Quality Designation (RQD) recorded for each core interval. The test holes will extend to the maximum anticipated depth of the tunnel shafts. It is anticipated that one boring will be drilled at the Lake Powell Intake Pumping Station Shaft to a depth of approximately 350 feet and that one boring will be drilled at the top of the cliffs at the Hurricane Cliffs Crossing to a depth of approximately 1200 feet. One boring will be drilled to a depth of approximately 40 feet at the Hurricane Cliffs tunnel portal, near the foot of the cliffs. Cores of rock will be analyzed by physical description, point load and unconfined compressive strength tests. Deep boreholes at anticipated tunnel sites will be used to conduct geophysical investigations. The nature of the geophysical tools used in the boreholes will be determined after examination of borehole samples. It is anticipated that most sites will include a video camera survey, caliper, natural gamma, neutron, density, spontaneous potential and sonic logging techniques. The geophysical techniques selected will help characterize rock strength, competence, stability, and fracture patterns, and will help determine potential for groundwater inflow during construction.



#### **4.6.2.3 Task 3 - Data Analyses**

Data collected from the literature review and field investigations will be compiled and analyzed by experienced, licensed engineers and geologists. Data evaluations will focus on meeting the goals and objectives identified in Section 1.2.1; specifically, determining how the Project would be affected by geologic and soils conditions, how the geology and soils in the study area would be affected by the Project, and what geologic and/or soils-related safety risks may arise pertaining to Project construction, operation, and maintenance. Based upon the results of field and laboratory testing, analyses will be performed to evaluate excavation methods; structure foundation type and bearing capacity estimates; dewatering methods; slope stability; other conditions which may impact construction costs. Test borehole data, including video camera logs, geophysical logs, and core descriptions will be evaluated to further characterize rock and soil types and thicknesses, weathering, the presence of fractures, fault zones, fault gouge, and depth to groundwater.

In addition, soil and rock material properties from areas that are anticipated to be disposed of as spoil will be preliminarily evaluated, where practical, for reuse during construction. Soils suitable for trench backfill and rock that can be crushed for bedding will be identified. If excess materials are identified that are suitable for other (non-Project) purposes, such as general road base or maintenance, site reclamation, or new construction, the evaluation will consider whether other local applications are feasible.

Data analyses will be performed with the recognition that other disciplines may utilize the evaluation results. Specifically, potential for pipeline corrosion may be associated with high or low pH (acidic or alkaline), high organic content, and/or fine-grained soils, and especially combinations of high acidity or alkalinity with silts or clays.

Where blasting may occur within 1,000 feet of manmade structures, conditions will be noted that are likely to convey substantial blast energy to the structure (such as massive bedrock), or that may weaken underlying materials (such as saturated granular or soft soils).

#### **4.6.2.4 Task 4 – Report Preparation**

A technical report will be prepared that documents the findings of the literature review and field investigations. The report will focus primarily on those geologic and soils features that would be potential hazards to pipeline construction, operations, or maintenance, or that, conversely, might potentially be adversely affected by pipeline construction, operations, or maintenance. Potential hazards to the safety of operators and others that may be aggravated by geologic and soils conditions will be identified. The viability of spoils disposal areas and materials reuse will be discussed, as well as mineral resource deposits that may be subject to permitting and disposal requirements as specified in 43 CFR 3600.

The report will present the study goals and objectives and describe the study area, document the literature review, and note general and specific geologic and soils conditions that pertain to Project protection, geology and soils, and human safety. Field investigation activities and methods will be described, and data analyses and results will be presented. A series of sequential geologic maps will be prepared for the pipeline alignments for each alternative using information currently available as identified in Sections 4.4.3 and 4.4.5, as well as supplemental information developed in connection with Tasks 1 through 3 in Sections 4.6.2.1, 4.6.2.2, and 4.6.2.3. These maps will show the basic and relevant geologic features (structural features and geologic hazards) listed in Section 4.4.3 and 4.4.5, new and relevant features that may be identified during performance of Tasks 1 through 3, and provide descriptions of geologic units and features. The primary emphasis of the maps will be on geologic features and hazards relevant to the pipeline; more general geologic information will be presented but will not be the focus of the maps. The

maps will show as much detailed information as is available and relevant for understanding of primary features and their impacts on the pipeline, and/or impacts of the pipeline on geologic features.

Results will be discussed with a focus on the study objectives. Conclusions, where warranted, will be provided, and will address prevention or mitigation of potential hazards to the LPP facilities associated with geology and soils; protection of geologic features and soils from erosion, mass wasting, and other disturbances; and protection of human health and safety. These conclusions may include recommendations that would affect Project design.

#### **4.7 Schedule and Level of Effort (§5.11(d)(6))**

The geological and soils studies will require licensed geologists and geotechnical engineers with appropriate experience to perform the field investigations and data analyses identified above. A licensed drilling contractor will be required for drilling, soil and rock sample collection, and for test and observation well construction at the Intake site. A licensed geophysical survey crew will be required to perform the borehole geophysical survey in deep rock boreholes at the Intake site and at the Hurricane Cliffs shaft. Required licenses shall be valid in the state in which work is performed (Utah and/or Arizona).

Equipment requirements will include a rock drill (wireline or similar). Deep bedrock drilling for construction of a test well and possibly for observation wells (piezometers) is likely to be performed using an air rotary drill rig. The drilling contractor tasked with test well construction will provide a test pump, power source, and discharge piping for an aquifer pumping test at the Lake Powell Intake site. Water level monitoring and recording will be performed using electric water level line probe sounders, pressure transducers, and dataloggers. Borehole geophysical surveying will be performed using downhole camera, nuclear, electrical, mechanical, and sonic survey tools.

Each professional engineer or geologist and each contractor will provide his/her own sheets and notes for documentation of activities and findings. Field investigation equipment (hand lenses, binoculars, compasses, maps, cameras, etc.) will be provided by the geologists and engineers involved.

Drilling contractors will be responsible for obtaining any required drilling permits and authorizations in the respective states and on tribal land, as well as any required local permits such as pumping discharge, site access authorizations, etc.

Total study costs including field investigations at the Water Intake System site and Hurricane Cliffs are estimated to be approximately \$3,727,000. Study costs exclusive of the field investigations at the Water Intake System site and Hurricane Cliffs are estimated at \$400,000.

An approximate schedule for performance of the study is shown in Table 4-1. The study can be completed within one year.

**Table 4-1**  
**Geology and Soils Proposed Study Schedule**

<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review of Existing Geologic Literature	Ongoing	February 2008	-
2	Field Investigations	March 2009	September 2009	210
3	Data Evaluation	May 2009	October 2009	150
4	Final Report Preparation	September 2009	November 2009	90

#### **4.8 Progress Reporting (§5.11(b)(3))**

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009 and August 2009. The final report will be submitted in November 2009.

#### **4.9 References**

Boyle Engineering Corporation. 2003. Lake Powell Pipeline Feasibility Study – Supplemental Analysis of the Hurricane Cliffs, the Cockscomb, and Alternate Alignments.

MWH. 2008a. Lake Powell Pipeline Phase I – Preliminary Engineering and Environmental Studies, Task 5 – Develop and Analyze Alternatives, Technical Memorandum 5.11, Geological, Geotechnical and Foundation Conditions.

\_\_\_\_\_. 2008b. Lake Powell Pipeline Phase I – Preliminary Engineering and Environmental Studies, Task 5 – Develop and Analyze Alternatives, Technical Memorandum 5.11A, Lake Powell Intake Structure Geological, Geotechnical and Foundation Conditions.

\_\_\_\_\_. 2008c. Lake Powell Pipeline Phase I – Preliminary Engineering and Environmental Studies, Task 5 – Develop and Analyze Alternatives, Technical Memorandum 5.11B, Lake Powell Pipeline Features Geological, Geotechnical and Foundation Conditions.

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## **Study Plan 5: Groundwater Resources**

### **5.1 Introduction**

This study plan documents the methods for planning and analysis of groundwater resources for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as draft study plan review comments received during study plan meetings and filed with FERC. This study plan presents an approach for advancing knowledge and understanding of geologic and soils conditions as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan addresses study requests made by FERC, other federal, state and tribal agencies, and the public.

### **5.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

This study plan describes goals and objectives, provides a description of the study area, describes the Project nexus, presents the proposed methodology, presents staffing and equipment requirements, provides a budget for activities associated with the groundwater resources portion of the study, and provides a generalized project schedule. The study will involve compiling groundwater aquifer, level, and quality data and information, identify potential impacts of the Project on groundwater resources during construction, operation, and maintenance, and identify measures to mitigate impacts on groundwater resources that could be affected by Project construction, operation and maintenance activities. The study plan addresses those groundwater resources issues that might reasonably be affected by Project construction, operations, and maintenance.

#### ***5.2.1 Goals and Objectives***

The goals of the groundwater resources study are to determine potential impacts on groundwater resources and identify measures to protect groundwater resources to the extent that they may be affected by Project construction, operation, and maintenance.

Specific groundwater resources-related objectives include determining how Project construction and operations may affect the groundwater resources within the study area. The primary objectives of the study with regard to groundwater resources are:

- Identify what impacts could occur on groundwater resources from Project construction, operation, and/or maintenance
- Determine whether seepage from unlined forebay and afterbay reservoirs would result in groundwater recharge, and if so, what impacts would result
- Determine how groundwater resources would be quantitatively impacted by recharge
- Determine how groundwater resources would be qualitatively impacted by recharge
- Evaluate whether groundwater recharge resulting from the Project would affect groundwater-surface water interactions
- Identify changes in groundwater quality resulting from the Project

### **5.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied.

### **5.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

#### ***5.4.1 Background Description***

Existing groundwater resources conditions have been generally evaluated in portions of the Project. The findings of these studies are documented in various reports prepared by the U.S. Geological Survey (USGS), the Utah Geological Survey (UGS), and the Washington County Water Conservancy District, among others. A summary of groundwater resources is included in the PAD. These information sources, as well additional information obtained from field reconnaissance and studies performed during Phase 1 investigations, are documented in a series of Technical Memoranda prepared by MWH (2008a; 2008b). The following briefly summarizes groundwater resources conditions documented by these studies and reports.

Groundwater is used throughout the area and is obtained primarily from wells, with lesser quantities derived from springs. Groundwater is obtained from shallow alluvial aquifers within river valleys, from basalt bedrock, and from shallow to deep fractured and weakly cemented sedimentary rock aquifers with relatively high primary (pore space) porosities and secondary (fracture) porosities, most notably the Navajo Sandstone aquifer system but from others as well. In the vicinity of Sand Hollow Reservoir, a 50,000 acre-ft capacity off-stream reservoir that is supplied by water diverted from the Virgin River, recharge to groundwater from the reservoir occurs to the shallow unconsolidated overburden (alluvial and eolian sand), to the basalt bedrock north of the reservoir, and primarily to the underlying Navajo Sandstone (USGS 2005). A series of wells near the reservoir captures some of this recharge, which originates from water in the Virgin River that is diverted into the reservoir; the groundwater is pumped from the wells for use in St. George and nearby communities west of the reservoir. Sand Hollow Reservoir was completed in 2002 and filled between 2002 and 2004, with an initial rate of recharge to the Navajo Sandstone aquifer system of 16,670 acre-ft from March 2002 to February 2003; this rate of recharge declined to approximately 12,920 acre-ft for the period from May 2005 to April 2006, even though the hydraulic head in the reservoir increased over that time period as the reservoir filled. The cause(s) of the decline of the rate of recharge have not been determined definitively at Sand Hollow Reservoir, although some decline in recharge rates from surface impoundments is normal and may result from decreased gradient as the water table rises; clogging from accumulated sediment; clogging from biomatting; trapped air bubbles or expanded bubbles caused by dissolution and expansion in warmer water (USGS 2007); or precipitation of dissolved minerals in the vadose zone underlying the recharge basins.

Groundwater in the Cedar Valley is a primary source of water for Cedar City and most of the communities in the valley. Groundwater is pumped from the alluvial aquifer. Groundwater quality is variable in the valley aquifer, with high TDS in pockets near the mouth of Cedar Canyon and north of Cedar City, and mostly very good quality further out in the valley. Much of the water used for potable purposes originates from a wellfield near Quichapa Lake and from wells near the City of Enoch (Cedar City Engineer 2007).

### ***5.4.2 Study Area Definition***

The study area would include the alternative alignments along the Lake Powell Pipeline and Cedar Valley Pipeline; particular attention will be required for the following:

- Groundwater levels and aquifer hydraulic conditions at hydropower facility forebay and afterbay reservoirs
- Groundwater levels and aquifer hydraulic conditions near Sand Hollow Reservoir and in the vicinity of proposed recharge basins in southwestern Cedar Valley
- Groundwater quality near Sand Hollow Reservoir and the proposed recharge basins in southwestern Cedar Valley
- Groundwater levels and aquifer hydraulic conditions at existing groundwater production wells near proposed recharge locations at Sand Hollow Reservoir and southwestern Cedar Valley
- Locations of major seeps and springs, primarily associated with the Virgin River north of Sand Hollow Reservoir
- Seepage to Quichapa Creek in the segment between the Harmony Mountains and Quichapa Lake
- Seepage to Quichapa Lake

### ***5.4.3 Issues and Data Needs***

The groundwater resources specific analyses will address the following:

- Groundwater levels at the water intake site
- Groundwater levels at locations where the pipeline would cross streams
- Groundwater levels at the forebay and afterbay reservoirs
- Groundwater levels and trends associated with existing recharge at Sand Hollow Reservoir
- Groundwater quality and trends associated with existing recharge at Sand Hollow Reservoir
- Groundwater levels along the Cedar Valley Pipeline, particularly at stream crossings
- Groundwater levels and trends near the proposed recharge basins in southwestern Cedar Valley
- Groundwater quality and trends near the proposed recharge basins in southwestern Cedar Valley
- Projected groundwater level changes associated with recharge of Lake Powell water at Sand Hollow Reservoir and southwestern Cedar Valley
- Projected groundwater quality changes associated with recharge of Lake Powell water at Sand Hollow Reservoir and southwestern Cedar Valley
- Identification of groundwater production wells within the projected recharge spheres of influence on water quantity and quality at Sand Hollow Reservoir and southwestern Cedar Valley
- Projections of surface water and groundwater interactions at the Virgin River, lower Quichapa Creek, and Quichapa Lake

## **5.5 Nexus to Project (§5.11(d)(4))**

The Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, and other features to convey water from Lake Powell to the St. George area via Sand Hollow Reservoir and from the St. George area to proposed recharge basins in southwestern Cedar Valley. One objective of the Project is to recharge the Navajo Sandstone aquifer at Sand Hollow Reservoir near St. George, and the Cedar Valley alluvial aquifer, with Lake Powell water. The Project could include unlined hydropower facility forebay and afterbay reservoirs

that may result in unintentional groundwater recharge. Groundwater recharge may affect groundwater levels that could increase groundwater resource availability to wells and possibly springs; may increase groundwater discharge to surface water bodies such as rivers, streams, lakes, and wetlands; and may change groundwater quality. Furthermore, chemical interactions between Lake Powell recharge water and existing groundwater, as well as soil and rocks in the vadose zone overlying the aquifers, may result in precipitation or dissolution of minerals in the aquifers. This could affect aquifer permeability and associated groundwater production potential. Impacts associated with the project may limit or require mitigation of the Project construction, operations, or maintenance, or all three. FERC licensing and Utah State Engineer approval of design will require demonstration that these potential adverse impacts on groundwater resources have been identified and avoided or mitigated in such a way that groundwater resources are not adversely affected.

## **5.6 Proposed Study Methodology (§5.11(d)(5))**

### ***5.6.1 Introduction and Overall Approach***

Several documents, including technical reports, scientific and engineering journal publications, and other literature were previously reviewed and information compiled. This information was documented in technical memoranda and presented in the PAD. Additional review of literature involving groundwater resource conditions will be performed by identifying and reviewing available technical reports, maps, and literature that may not have been previously reviewed, to determine what is known of the hydrogeologic conditions regionally and at specific, potentially problematic locations along the alternative alignments. Field investigations will be performed to verify and improve on information obtained from the literature review, and collect and analyze groundwater quality samples. The field investigation data will be analyzed and used to help prepare and run groundwater hydraulic and water quality models. The analysis results and model predictions will be incorporated into a summary report documenting the findings.

### ***5.6.2 Methods for Preliminary Analysis and Preliminary Design***

Methods pertaining to evaluation of impacts affecting groundwater resources that may guide preliminary engineering analysis and preliminary design are identified in this section.

#### **5.6.2.1 Task 1 - Review of Existing Hydrogeologic Literature and Records**

Previous reviews of existing literature have identified groundwater resources information, primarily in the St. George and Cedar Valley areas. The remainder of the Project area has limited information pertaining to groundwater resources. A more detailed review of existing hydrogeologic data and information relevant to the Project and available in current published reports, maps, aerial photography, and literature will be performed. This literature review will include information from established agency sources such as the U.S. Geological Survey, the Utah Geological Survey, the Washington County Water Conservancy District, and other similar sources. Previous preliminary investigation work performed by engineering and scientific consultants and organizations will be obtained and reviewed. Knowledgeable groundwater scientists and managers associated with the above-referenced agencies and organizations, cities, and others will be interviewed. Available information on specific conditions that pertain to groundwater resources will be reviewed and compiled, such as existing groundwater hydraulic and quality models, well construction logs and lithologic logs, well pumping tests, production records, water level records, and water quality data.



### **5.6.2.2 Task 2 - Field Investigations**

Additional field data will be collected where deficiencies in groundwater resources data exist. This would include measurement of groundwater levels in existing wells that are open to shallow, unconfined aquifers and water quality sampling at selected wells near Sand Hollow Reservoir to supplement existing information about basic physical water quality parameters (cations/anions, iron, pH, TDS, conductivity, temperature). Groundwater level data will be collected from the forebay and afterbay reservoir sites during drilling activities at the Hurricane Cliffs discussed in the Geology and Soils Study Plan (PSP section 4).

Production well locations in areas of proposed recharge will be determined and, where such locations are unclear, field verified if accessible. The focus will be on production wells that are within the areas affected by groundwater recharge, as identified by groundwater modeling that has previously been performed and that would be supplemented by activities under Task 3. Therefore performance of this part of Task 2 field investigations would occur concurrent with or after performance of Task 3.

Spring and seep locations that may be affected by groundwater recharge would be identified and inspected. Wetland locations and riparian areas that may be influenced by shallow groundwater will be identified, if those areas are (1) close to the pipeline and may be affected by pipeline trench dewatering during construction, or (2) close to anticipated pipeline blowoff features and may receive substantial inflows during annual pipeline drainages. The affected springs and seeps would be determined based on modeling performed under Task 3, and therefore also would occur concurrent with or after performance of Task 3. Wetland and riparian areas would be identified during Task 1 and from pipeline reconnaissance performed under other study plans.

At pipeline blowoff features, the potential overflow locations where seepage to groundwater may occur will be inspected to verify soil types identified during literature review.

### **5.6.2.3 Task 3 – Groundwater Modeling**

Groundwater modeling will be performed at Sand Hollow Reservoir and the proposed location of recharge basins in southwestern Cedar Valley. Groundwater modeling will consist of two components: hydraulic simulation and water quality simulation. Where existing models have been constructed, notably the groundwater flow simulation in Cedar Valley prepared by the USGS (Brooks and Mason 2005), the USGS will be contacted and an attempt will be made to utilize data from the existing MODFLOW model (Harbaugh et al., 2000) to facilitate construction of an updated model. Currently the USGS is preparing a numerical groundwater flow model using MODFLOW and is using the FEMWATER modeling code to evaluate the effects of recharge from Sand Hollow Reservoir on groundwater flow and quality in the underlying Navajo Sandstone aquifer system. To the extent possible within the time constraints of this project, the USGS-developed models will be used to help evaluate impacts associated with current recharge conditions. The USGS system models will then be modified to evaluate potential impacts associated with replacing the existing reservoir source water from the Virgin River with water from Lake Powell.

Groundwater quality modeling has been performed on the Cedar Valley alluvial aquifer. Although substantial research has been performed on water quality associated with groundwater recharge in the Navajo Sandstone aquifer underlying Sand Hollow Reservoir, no model has been developed. The primary objectives of groundwater quality modeling will be to determine (1) whether blending of Lake Powell recharge water and groundwater would result in precipitation or dissolution of minerals, which could affect groundwater production capacity by reducing aquifer permeability, or (2) whether groundwater

quality would decline such that current aquifer classifications would change, thereby limiting the availability of groundwater for current uses. The USGS water quality model PHREEQC would be used to meet the first objective. For simulating changes in water quality in the affected aquifers, EPA's MT3DMS fate and transport model would be employed to simulate changes in Total Dissolved Solids (TDS). This model interacts with MODFLOW and would be compatible with hydraulic simulations.

#### **5.6.2.4 Task 4 - Data Analyses**

Data collected from the literature review and field investigations will be compiled and evaluated by experienced, licensed engineers and geologists. Data analyses will focus on satisfying the goals and objectives identified in Section 1.2.1; specifically, determining how the Project construction, operations, and maintenance will affect groundwater resources. Based upon the results of field and laboratory testing, analyses will be performed to determine potential recharge impacts on groundwater resource production. Data analyses will be performed with the recognition that other disciplines may utilize the evaluation results. Specifically, pipeline construction may encounter groundwater in trenches, shafts, and tunnels. Information developed during the groundwater resources analyses may be used to address dewatering and hydrostatic stability along the alternative alignments. Water quality evaluation, including surface water, may be affected by aquifer recharge where recharge promotes increased discharges to springs and seeps, so quantitative and qualitative conclusions associated with groundwater resources may be useful there.

#### **5.6.2.5 Task 5 – Report Preparation**

A technical report will be prepared to document the findings of the literature review, field investigations, and groundwater modeling. The report will present project goals and objectives and describe the study area, document the literature review, describe and document input for groundwater hydraulic and quality modeling, and note general and specific groundwater resource conditions that may be affected by the Project. Field investigation activities and methods will be described, and data evaluations and results will be presented. Results will be discussed with a focus on the study objectives. Conclusions, where warranted, will be provided, and will identify measures to mitigate potential impacts on groundwater resources. These conclusions may include recommendations that could affect Project design.

### **5.7 Schedule and Level of Effort (§5.11(d)(6))**

The groundwater resources studies will require licensed geologists and geotechnical engineers with appropriate experience to conduct the field investigations and data evaluations. A licensed water quality laboratory will be contracted to analyze groundwater samples. Required licenses shall be valid in the state in which work is performed (Utah and/or Arizona).

Equipment requirements will include water level line probe sounders. It is assumed that groundwater quality sampling will be achieved using existing well production pumps. However, if necessary, lightweight, pre-cleaned, disposable bailers will be used for sample collection in wells where pumps are not available.

Each professional engineer or geologist and each contractor will provide his/her own sheets and notes for documentation of activities and findings. Field investigation equipment (hand lenses, binoculars, compasses, maps, cameras, etc.) will be provided by the geologists and engineers involved.

Total study costs are estimated to be approximately \$155,000.

An approximate schedule to perform the study is shown in Table 5-1. The study can be completed within a one year period.

<p style="text-align: center;"><b>Table 5-1</b> <b>Groundwater Resources Proposed Study Schedule</b></p>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review of Existing Geologic Literature	Ongoing	February 2009	-
2	Field Investigations	March 2009	October 2009	210
3	Groundwater Modeling	March 2009	August 2009	180
4	Data Evaluation	May 2009	November 2009	150
5	Final Report Preparation	October 2009	December 2009	90

## 5.8 Progress Reporting (§5.11(b) (3))

Progress reports will be prepared on a quarterly basis, beginning in March 2009, and will be updated in June 2009 and September 2009. The final report will be submitted in December 2009.

## 5.9 References

Cedar City Engineer. 2007. Cedar City 2006 Water Report, Appendix E, Water Quality: Report to the Mayor and City Council, Cedar City, Utah.

MWH. 2008a. Lake Powell Pipeline Phase I – Preliminary Engineering and Environmental Studies, Task 5 – Develop and Analyze Alternatives, Technical Memorandum 5.11, Geological, Geotechnical and Foundation Conditions.

\_\_\_\_\_. 2008b. Lake Powell Pipeline Phase I – Preliminary Engineering and Environmental Studies, Task 5 – Develop and Analyze Alternatives, Technical Memorandum 5.13C, Aquifer Recharge Issues.

U.S. Geological Survey (USGS). 2005. Pre- and post-reservoir ground-water conditions and assessment of artificial recharge at Sand Hollow, Washington County, Utah, 1995-2005: U.S. Geological Survey Scientific Investigations Report 2005-5185. Prepared by V.M. Heilweil, D.D. Susong, P.M. Gardner, and D.E. Watt.

\_\_\_\_\_. 2007. Assessment of Artificial Recharge at Sand Hollow Reservoir, Washington County, Utah, Updated to Conditions through 2006: U.S. Geological Survey Scientific Investigations Report 2007-5023. Prepared by V.M. Heilweil and D.D. Susong.

## **Study Plan 6: Land Use Plans and Conflicts**

### **6.1 Introduction**

This study was proposed by the UDWR in the Lake Powell Pipeline Project Pre-Application Document (PAD) (Utah Board of Water Resources 2008). During the scoping period, several agencies, groups and individuals including, but not limited to, the National Park Service, Bureau of Land Management and U.S. Fish and Wildlife Service, LPP Coalition, Great Basin Water Network, Citizens Education Project, the Kaibab Band of Paiute Indians, and others requested additional information, provided comments, and provided reference to materials applicable to the Land Use Plans and Conflicts study plan, as reflected in this revised study plan. Comments received during the study plan development process have been incorporated into this revised study plan. The Land Use Plans and Conflicts study will provide land information about the Project area that will be incorporated into the FERC license application and right-of-way permit applications submitted to the Bureau of Reclamation, National Park Service and Bureau of Land Management.

### **6.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

The purpose of this study is to gather and analyze additional information about lands within the Project area so that appropriate decision making may occur related to Project effects. The study plan defines the procedures for analyzing potential conflicts with land uses within the Lake Powell Pipeline Project (Project). This study plan presents the issues identified during the scoping period, defines the Project study area, defines significance criteria for identifying conflicts, describes the analysis methodology, and discusses existing data and identified data needs.

The study will investigate and define land ownership and property rights information for lands that fall within the Project study area and will provide land use designation information based from land use management plans, zoning codes, comprehensive plans, and Geographic Information System (GIS) data from federal, state, and local agencies and other groups and tribes. This study will provide detailed information about existing land management plans and protections associated with land management designations and will determine where conflicts exist between resource management activities and Project activities.

Information from this study will be made available for use in other licensing resource studies to eliminate redundant efforts by various resource study teams. During the development of this study, the land use study team will provide relevant information to discipline leads responsible for other resource studies associated with the Project. As part of the intent of this study is to gather reference materials, namely management plans in order to identify conflicts, these plans and potential conflicts associated with specific resources will be valuable sources of information for other resource study teams. The completed Land Use Plans and Conflicts study will provide a centralized data set and mapping that can be utilized in coordination with other resource disciplines so that all resource teams can benefit from the identified potential land conflicts that span across multiple resource disciplines.

Sources identified in the land use analysis pertaining to development and growth will be utilized in the socioeconomics study as well as other resource area studies evaluating project effects on growth.

Land use information related to design and development of power transmission lines and facilities will be evaluated as part of this analysis and be distributed as appropriate to the transmission design team as well.



### ***6.2.1 Study Area***

The Land Use and Conflicts Study Plan study area will consist of all areas associated with direct and indirect disturbance from construction, operations, and maintenance pertaining to the Project alignment and will include ancillary features that may provide services or utilities to the project such as construction work areas, borrow pits, access roads and transmission lines.

If Project alignment or ancillary feature location modifications or revisions are made, then the study will incorporate appropriate updates to facilitate those changes and dispatch such new information to the other resource disciplines.

### **6.3 Resource Management Goals (§5.11(d)(2))**

The applicant's management goals for the Project include avoiding, reducing, and mitigating conflicts with designated land uses. Resource management goals of agencies with jurisdiction are defined in existing management plans for various regions; consultation with Federal, State and local agencies as well as Tribes and private landowners is ongoing to further identify management goals of lands proposed to be occupied by the Project. Some resource management goals of agencies with jurisdiction are defined in the PAD in Sections 5.8 and 6.8. The Land Use Plans and Conflicts study will expand upon the goals outlined in the PAD to identify where conflicts exist within the Project study area. Where avoidance or mitigation strategies are infeasible to resolve a land use/land management inconsistency regarding project facilities, amendments to existing resource management plans may be necessary to accommodate LPP. If conflicts between plans are identified during the study, further coordination with respective agencies will be undertaken to clarify any issues with resource managers.

#### ***6.3.1 Resource Management Issues Identified During Initial Scoping Period***

In addition to goals that are defined in management and land use plans, zoning codes, and in other documents, the following resource management issues were identified during the scoping process. The issues and methodology for addressing identified issues are as follows.

##### **6.3.1.1 Waste Disposal**

The BLM Arizona Strip Field Office has raised concerns regarding waste disposal within and outside of the proposed Project easement. BLM asked for clarification as to what types of waste would be deposited and where and how waste deposition would occur. The Land Use Plans and Conflicts study will gather information on the types and quantities of waste produced via construction, operations, and maintenance. The study will identify known sites allocated for waste disposal; and will identify any potential conflicts associated with waste disposal in consultation with respective resource agencies.

##### **6.3.1.1.1 Hazardous Waste**

Land use information related to hazardous waste disposal will be reviewed and addressed as relevant. In the review reference will be made to proposed plans for disposing of such wastes, the types of disposal considerations and practices anticipated. Land and resource management considerations relevant to such wastes within the Project study area will be evaluated.

### 6.3.1.2 Wild Lands

Several individuals and groups during the scoping period expressed general concerns that “wild” land character and roadless areas would be impacted by the Project. Since the pipeline alignment is proposed to mostly be adjacent to U.S. 89 in the congressionally established utility corridor, AZ 389, and in the established utility corridor along the Navajo-McCullough Transmission Line, it is unlikely that designated wild lands would be directly impacted by the Project. However, a mapping analysis of all designated land uses within the project boundary will be performed to determine if there are any inventoried unroaded areas, wild land, wilderness or wilderness study area designations. Project transmission line alignments would also be analyzed for impacts on wild land designations. Coordination will be conducted with other resource disciplines to address the impacts of potential temporary noise impact on the Cockscomb WSA.

### 6.3.1.3 Wild and Scenic Rivers and other Land Use Designations

During scoping, the BLM St. George Field Office indicated that no designated, eligible, or suitable Wild and Scenic River segments are within or adjacent to the proposed alignment within their jurisdiction. The BLM Arizona Strip Field Office requested that discussion of Wild and Scenic Rivers not be contained within the recreation section of the analysis, but rather be included in a “special designations” section of Land Use. Wild and Scenic Rivers, as well as other special designated areas will be addressed as part of the Land Use Plans and Conflicts study. One example of a special land use designations would be that related to cryptogammic soils, which will be identified and impacts further addressed in the geology and soils study plan.

The Wild and Scenic Rivers Act, signed October 2, 1968, strives to balance river development with protection for outstanding free-flowing rivers. The Act prohibits federal support for various actions including dam construction and other in-stream activities that would diminish the river’s free flow or outstanding resource values. The act protects outstanding natural, cultural or recreation values. A literature review has been conducted for all drainages that would be directly impacted by the Project. Although some reaches of rivers in Utah are potentially eligible for Wild and Scenic classification, currently none are designated; in Arizona, only the Verde River, which is outside of the scope of the Project, is classified. In Utah, the Paria and portions of the Virgin River have been determined to be eligible and suitable for designation into the Wild and Scenic Rivers System. These river segments are managed to maintain these qualities and to preserve any “outstandingly remarkable values”. The Project pipeline segments will be evaluated for any conflicts with these designations. Other than these river segments, no other likely constraints associated with Wild and Scenic Rivers designations have been identified within the Project boundary. The following paragraphs discuss the management designations for the Paria River and the Virgin River.

**6.3.1.3.1 Paria River.** The Grand Staircase-Escalante National Monument (GSENM) Management Plan (MMP) considers the location of the Paria River where the Project pipeline crossing would occur to be within the segment named Upper Paria River -2. This 16.9 mile reach has a tentative Wild and Scenic River classification of “recreational.” The river is currently designated as a recreational river by the BLM (BLM 2000). The reach is identified as being eligible for Wild and Scenic River designation due to scenery, recreational attraction, exposed geologic strata and arches, and historic sites. Potential land use impacts on the upper and lower Paria River segments will be reviewed per the guidelines in the GSENM-MMP and the Kanab RMP.

Currently, the Upper Paria River-2 corridor is utilized for several purposes. A private landowner just south of Highway 89 periodically constructs a diversion utilizing his/her water rights; which can result in blocking the flow of the Paria River temporarily. A privately owned and operated gravel pit is located on the north side of Highway 89 adjacent to the Paria River and appears to discharge settled processing water

periodically to the river. There has been motorized use and commercial horseback riding in the river corridor and it is used as a livestock driveway and historic throughway. The GSENM RMP articulates plans to curtail motorized use, enhance southwestern willow flycatcher habitat, enhance deer and other wildlife populations, and close the area to cross-country vehicle use, to manage the area so as to maintain the qualities for which it was found eligible under the Wild and Scenic Rivers Act. If ever designated under the Wild and Scenic Rivers Act, a new river management plan could constrain some uses including some water diversions and livestock driveway uses, as well as add more conditions on maintenance and construction of existing power lines, transportation and other utility corridors. Coordination with GSENM staff will be needed regarding the Project's impact on the river corridor and any potential conflicts or mitigating measures.

**6.3.1.3.2 Virgin River.** The National Park Service National Center for Recreation and Conservation Nationwide Rivers Inventory indicates that the Virgin River reach from Lake Mead to Highway 17 near Hurricane, Utah is not listed as a component of the Wild and Scenic River System, but the 76-mile long corridor was inventoried in 1982 as having outstandingly remarkable values including; scenery, fish, wildlife, and other values (National Park Service 2004). Interstate 15 is a major transportation corridor passing within the Virgin River Gorge between Mesquite, Nevada and St. George, Utah. The reach is described by the National Park Service as containing one of the least disturbed and most unique aquatic and riparian ecosystems in the Colorado River System with unusual blending of bird species, diverse mammalian fauna, especially bats; large numbers of reptilian species and the presence of rare, threatened and endangered species (National Park Service 2004). Review of the Virgin River Management Plan and coordination with appropriate agencies will be performed to determine any conflicts associated with Project activities along the Virgin River, including this reach.

#### **6.3.1.4 Grazing Lands**

Coordination with public and private land owners will be necessary to address temporary affects on livestock grazing management during construction and operation of the Project. The following are potential constraints and issues associated with livestock grazing management that will require analysis and coordination:

- Access to grazing allotments during construction,
- Impacts to access roads during and following construction,
- Impacts to grazing facilities (i.e. fences, water pipelines and corrals),
- Potential disruption to current grazing rotations,
- Loss of potential forage resulting from pipeline construction and access,
- Loss of potential forage at reservoir sites,
- Potential compensation to livestock operators for loss of forage,
- Water availability for livestock use, and
- Potential need for rest period to allow disturbed areas to be rehabilitated.

All parcels within the Project boundary that are designated for grazing use have been identified via GIS mapping. The Land Uses and Conflicts study will identify Project activities anticipated to occur within each parcel that is designated for grazing. Coordination with private land owners and public land managers will be needed to further identify specific constraints associated with individual parcels. The BLM Weed Management Plan shall be used as a source of information regarding proper weed management.

### **6.3.1.5 Rights-of-Way**

During scoping, the BLM provided comment concerning how lands and realty would be addressed, who would have authority over Project easements, and what monitoring and compliance would be required of the right-of-way holder. “Lands and Realty” as viewed by the BLM will be incorporated into the Land Use Plans and Conflicts study to address rights-of-way issues on BLM lands. The study plan will investigate via literature search and via coordination with BLM staff what encompasses “lands and realty” and will address right-of-way issues, compliance needs, and authorizations as applicable. On public land that the Project traverses, an inventory of what types of ROWs are authorized on BLM public lands will be compiled. The inventory will include all authorized and pending ROWs. Existing public land ROW holders will be sent a formal correspondence and this consultation will be documented.

Pending Programmatic Environmental Impact Statements (PEIS’s) will be reviewed to examine protocol on public lands. These PEIS’s will include the solar energy and the wind energy studies currently underway.

The Hurricane Cliffs area, managed by BLM, is currently classified by the St. George BLM Field Office as a Class II Visual Resources Management area (VRM Class II). External installation of LPP facilities at Hurricane Cliffs could potentially require an amendment to the St. George Field Office Resource Management Plan to change the classification status from Class II to Class IV. If an amendment is necessary, the BLM Record of Decision would include a plan amendment along with the decision on a BLM right-of-way permit.

Utah Department of Transportation (UDOT) staff expressed concern at the initial study plan meeting workshops, held in September 2008, about the location of the LPP in relation to UDOT right-of-way. UDOT would prefer LPP to be outside of UDOT right-of-way and wants to ensure that the Project provides sufficient space for UDOT to widen roads in the future. The widths proposed for the LPP construction and permanent right-of-way will be described and evaluated in the study with respect to UDOT plans. This work will be done in conjunction with the Transportation study.

Right-of-ways needed across private land will be documented so that acquisition of private land easements can be obtained. In this documentation, easement owner information will be organized so that public outreach and easement acquisition status can be tracked.

**6.3.1.5.1 Trails and National Historic Trails.** Areas where the Project may cross trails or nationally designed historic trails will be determined so that further evaluation for possible impacts will be identified and consultation with resource agencies including the Utah Department of Natural Resources (UDNR) can be undertaken.

### **6.3.1.6 Areas of Critical Environmental Concern (ACECs)**

Areas of Critical Environmental Concern (ACECs) will be addressed as part of the Land Use Plans and Conflicts study. ACECs are defined in the Federal Land Policy and Management Act (FLPMA), Section 103(a), as areas where special management attention is required to protect and prevent damage to a particular resource. Regulations for implementing ACEC provisions of FLPMA are located in 43 CFR 1610.7-2. ACECs are considered for designation as part of the BLM land use process and must meet certain relevance and importance criteria to be considered for designation. ACEC areas are managed to protect certain resources within an area, but the designation does not automatically prohibit other uses in the designated area.



A literature and mapping review will be conducted to verify the location of all ACECs that are within or adjacent to the boundary of the Project area. Where Project facilities would fall within boundaries of designated ACECs, review of ACEC guidance will be conducted to identify Project constraints and/or conflicts. Coordination with the appropriate BLM field office would occur to resolve conflicts and/or develop appropriate mitigation strategies.

**6.3.1.6.1 Kanab Creek ACEC.** A literature review regarding the Kanab Creek ACEC has been conducted as the south alignment crosses the Kanab Creek ACEC. The Arizona Strip Field Office Resource Management Plan, which was released May 9, 2008, defines Kanab Creek ACEC management criteria for this area. The boundaries of this new ACEC were determined by the Kanab Creek Canyon itself which encompassed riparian resources, endangered bird habitat, and cultural resources in conjunction with the water and canyon walls, and canyon scenery. The ACEC contains significant, regionally important cultural resources vulnerable to vandalism and impacts. The Kanab Creek riparian area has regional significance as it is a natural system that includes rare, endemic plant communities and suitable unoccupied habitat for endangered Southwestern willow flycatcher. The riparian area is described as fragile, irreplaceable, unique and vulnerable to adverse change.

The following management decisions apply to the Kanab Creek ACEC that may have relevance to the Project:

- Motorized and mechanized vehicle use in ACECs will be limited to designated roads or trails. For the purpose of protecting the resources and values of the ACEC, no areas will be authorized for cross-country, off-road vehicular use except for authorized administrative and emergency purposes
- The ACEC is closed to all vegetative product sales
- No new corrals or water developments will be authorized or constructed within the ACEC boundary
- Vegetation diversity will be maintained or improved in accordance with ecosite guides
- ACECs designated for the protection of plants will be closed to the collection of vegetative materials
- New mineral material disposal sites are not authorized
- Boundary adjustments may be refined based on acquired data following cultural inventories
- Individual land use authorizations (ROWs, permits, easements) will be evaluated on a case-by-case basis in accordance with RMP provisions and NEPA compliance
- New land use authorizations will be discouraged in ACEC, lands supporting listed species, national historic trails, riparian areas, and allowed in such areas only when no reasonable alternative exists and impacts to these sensitive resources can be mitigated
- New ROWs will be routed away from high-density listed species populations and cultural sites, and along the edges of avoidance areas
- The use of designated ROW corridors/sites and existing ROW use areas will be encouraged to the extent possible but, depending on site-specific needs, actual locations may vary. Such variances shall be considered consistent with other RMP provisions, provided such locations and uses are consistent with selection criteria, and goals and objectives for ROW corridors and ROW use areas
- The BLM will work with the Utah Division of Water Resources to determine the best route for the proposed water pipeline from Lake Powell to Sand Hollow Reservoir, Utah, and to authorize use of BLM-administered land for that route and a portion of the proposed flood control reservoir at Fort Pearce in Utah, in accordance with other plan provisions and with NEPA and ESA compliance.

The BLM has developed goals and measures for protection of the Southwestern willow flycatcher that may be applicable to the Project and will require coordination with BLM. Goals and measures are as follows and will be further evaluated in the Special Status Wildlife Species and Habitat studies:

- Maintain “no net loss” of riparian habitat
- Suitable Southwestern willow flycatcher habitat shall be managed so that its suitable characteristics are not eliminated or degraded
- Protect occupied Southwestern willow flycatcher habitats
- Increase riparian habitats – promote establishment of areas of slow/backwaters
- Control for invasive and exotic species
- Minimize trash and debris that could attract scavengers, predators and brown-headed cowbirds (parasitism issues)
- Limit pesticide use
- Avoid developing access roads that result in fragmentation or reduction in habitat quality
- Close and rehabilitate all roads necessary for project implementation
- Regeneration of native species will be promoted in regenerating riparian habitats
- Habitat restoration in riparian areas shall not include planting or seeding of nonnative plants
- Actions that degrade riparian habitat or reduce the potential of the area to support riparian vegetation will be modified, restricted, or prohibited
- Restoration and vegetation treatments will be authorized only where doing so will result in benefits for resources
- No new corrals or water developments will be authorized or constructed within the ACEC boundary
- Riparian areas will be managed to achieve or maintain proper functioning condition
- Vegetation treatment projects in occupied or un-surveyed suitable habitat will only be conducted when Southwestern willow flycatchers are not present (October 1 to March 31)

Specific construction, operation and maintenance activities that would occur within the Kanab Creek ACEC will be identified; coordination with BLM Arizona Strip Field Office staff would occur to identify constraints and mitigation needs as appropriate.

The Project features would have impacts through existing communities, towns and cities, including Big Water, Colorado City, Hildale City, Hurricane, La Verkin, and Tropic. The land use plans for these communities, towns and cities will need to be collected, reviewed, analyzed and incorporated into the study of impacts on land use plans and land uses.

#### **6.3.1.8 Geographic Information Systems (GIS)**

Several comments from agencies were made during scoping regarding methods that should be utilized for displaying maps and providing GIS data within the NEPA document. The Project has a GIS work plan as identified in Appendix A of the PAD. Any conflicts regarding use of GIS data or inconsistencies in requests where different agencies request differing GIS formats will be resolved as part of the Land Uses and Conflicts Study.

#### **6.3.1.9 Growth Trends Analysis**

A growth trend analysis will be prepared for populations that have the potential to be end users of the Project water and energy transmission. The growth trend analysis will be developed in coordination with the water resource economics, socioeconomics resources study plan and other study plans as appropriate.

The growth trend analysis will focus on where growth has occurred historically, where growth is currently occurring and where growth has the potential to occur in the future as a result of delivering LPP water.

GIS analysis and GIS modeling will be the primary tools used for performing the growth trend analysis. The input for the GIS map models will be derived from the most up-to-date general plans, resource management plans, zoning ordinances and zoning maps, and land ownership layers. The growth trend analysis will include evaluation of:

- Historic Growth
  - historic aerial photography
  - historic photos of development and developed area
  - past land use and zoning maps
  - Past census tract and minor civil divisions (MCDs) data,
- Current Growth
  - Analysis of current zoning maps
  - Analysis of current land use data and maps
  - Analysis of current growth and development plans
  - Analysis of where approved developments and developments proposed.
  - Analysis of the most recent aerial photographs
- Future Growth Potential
  - Future growth lands will be identified by modeling currently undeveloped or low density private lands using published criteria, where available for land suitability factors such as slope, streams, riparian zones, critical habitat or other habitat designations, and policies found in adopted or proposed relevant comprehensive plans. These criteria will determine where there is a suitable land base for future growth and identify likely locations of future growth.
  - Using the information derived from documenting current growth levels, an analysis of the potential for in-filling previously developed areas will be undertaken based on published county and city comprehensive plan or growth plan policies or related guidance.

The results of the growth trend analysis will be made available to the different resource disciplines for further analysis of indirect effects of the Project as well as for use in the cumulative impacts analyses.

To the extent possible, the growth analysis will rely and be documented based upon published plans and policies addressing growth issues. It is recognized that the types of growth and how and where growth will occur will be a result of current and future land use ordinances, building and zoning codes that get formally adopted through State, county, and municipal general and comprehensive planning processes.

#### **6.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

The applicant has compiled a list of all owners, agencies, districts, organizations, Tribes, individuals and groups that have jurisdiction or ownership of land within the Project area. A general summary and map of existing land ownership and use information is provided in section 3.2 Major Land Uses of the Project Pre-Application Document (PAD) (UBWR 2008). The UDWR is currently conducting research to further identify and verify land ownership and land use in the Project area. Existing land use and zoning data and information relevant to the Project that are available in current published reports, maps, and literature is being identified. GIS mapping data is being compiled that shows parcel boundaries and zoning and special designation data for land within the Project area.

Section 5.8.1 of the PAD provides an overview of all the managed lands the Project would occupy. Management plans, land use plans, zoning code, regional plans, resource management plans, and other documents provide insight regarding land use constraints. Appendix A provides a current inventory of the various managed lands the project would occupy and identified planning and mapping documentation associated with the land. The inventory provides indication as to whether or not more information is needed for analysis.

Section 5.8.1 of the PAD provides an overview of all the lands the Project would occupy. Management plans, land use plans, zoning code, regional plans, resource management plans, and other documents provide insight regarding land use constraints. Refer to Section 6.10 for a listing of information resources such as planning and zoning documents and maps associated with the various jurisdictions in the project vicinity. These documents have been identified as relevant and have been obtained to support the study. Table 6-1 provides a list of information sources that have not yet been verified or obtained from jurisdictions but that have been identified as potential sources of information relevant for study plan analysis.

<b>Table 6-1</b> <b>Information Sources With Potential Relevance to the Land Use Plans and Conflicts Study Plan</b> <b>Not Yet Obtained</b>		
Page 1 of 2		
<b>Jurisdiction Name</b>	<b>Document Type</b>	<b>Planning Document Name</b>
Apple Valley, UT	Planning Document or Mapping	Unknown
Arizona State Lands Department	Management Plan	Unknown
Big Water, UT	Planning Document or Mapping	Unknown
BLM	Management Plan	Weed Management Plan
Cedar City, UT	Planning Document or Mapping	Cedar City General Plan 2008
Colorado City, AZ	Planning Document or Mapping	Unknown
Dixie Metropolitan Planning Organization, St. George	Planning Document or Mapping	Unknown
Five County Association of Governments, St. George	Planning Document or Mapping	Unknown
Fredonia, AZ	Planning Document or Mapping	Unknown
Hildale, UT	Planning Document or Mapping	Unknown
Hurricane, UT	Master Trail Plan	Hurricane Master Trail Plan
Hurricane, UT	ROW Application	Hurricane Road ROW application to BLM or plans for Hurricane Road along Cedar City Alignment

**Table 6-1**  
**Information Sources With Potential Relevance to the Land Use Plans and Conflicts Study Plan**  
**Not Yet Obtained**

**Page 2 of 2**

<b>Jurisdiction Name</b>	<b>Document Type</b>	<b>Planning Document Name</b>
Iron County, UT	Planning Document or Mapping	Unknown
Kanarraville, UT	Planning Document or Mapping	Unknown
Kane County Recreation and Transportation Special Services District	Planning Document or Mapping	Unknown
Mohave County, AZ	Map	Mohave County Zoning Map
Navajo Nation	Planning Document or Mapping	Unknown
Northern Arizona Council of Governments, Flagstaff	Planning Document or Mapping	Unknown
NPS- Pipe Springs National Monument	Statement of Management	Pipe Springs Monument Statement of Management
Page, AZ	Planning Document or Mapping	Unknown
Paiute Indian Tribe of Utah	Planning Document or Mapping	Unknown
Three Rivers Trail Community Partnership	Trail Plan	Confluence Park Three Rivers Trail Plan
Virgin, UT	Planning Document or Mapping	Unknown
Washington County, UT	General Plan	Washington County General Plan
Washington County Water Conservation District	ROW Application	Ash Creek Pipeline ROW Application to BLM - or plans for Ash Creek Pipeline location
Washington County/ St. George City Interlocal Agency	Planning Document or Mapping	Unknown
Western Arizona Council of Governments, Kingman	Planning Document or Mapping	Unknown



## **6.5 Nexus to Project (§5.11(d)(4))**

Project construction, maintenance, and operations will involve activities that could conflict with current and/or proposed land uses and management within the Project study area. The study will evaluate direct and indirect impacts on land within the Land Use Plans and Conflicts study area. The study area will include the following:

- Corridors along the area directly affected by pipelines and associated features, access roads and staging areas, waste disposal areas, pump stations, substations and power lines, power generations facilities and reservoirs
- Any stream or river and associated corridor that could be subject to water deliveries or alterations in flow resulting from the Project
- Existing or new rock and mineral quarries that may need to be excavated to provide construction materials for the Project

Corridor and buffer widths for the purpose of delineating the project area will need to be determined on a resource by resource basis.

## **6.6 Study Methodology (§5.11(d)(5))**

### ***6.6.1 Data Collection***

The study team will continue to gather relevant management plans, zoning criteria, resource management plans, regional planning reports, and other documentation to best understand all land management constraints associated with the Project area. Maps and digital GIS mapping information will also be collected. Where maps are not available in digital format, the study team will scan in and digitize information so that it can be analyzed in GIS. The digitized information would show the geographic location of zones, physical constraints, and special designations. Where utilization of GIS is infeasible, on-the-ground coordination with property owners and those having jurisdiction over the land would be performed to identify constraints.

Field reconnaissance will include a physical inspection of the Project area. Where applicable, field reconnaissance teams will obtain permission to enter any private, sensitive, or restricted lands during the field reconnaissance. Particular attention will be given to locations and features identified in the land use and zoning literature review that may be affected by Project construction or operation. Any additional features identified in the field that are not included in the literature or mapping will be documented and a preliminary description will be prepared.

Where needs for additional information are identified, the study team will coordinate with Federal, State, and local agencies and jurisdictions, Tribes, property owners, and others to obtain necessary information and mapping for understanding constraints associated with each parcel of land that will be occupied by Project facilities.

### ***6.6.2 Analysis Techniques***

The Land Use Plans and Conflicts analysis will be two-fold. First, GIS will be utilized as a tool to identify within what designated zones and managed areas the Project study area is situated. The study area for the Project will be delineated using GIS. The Project study area will then be compared to each mapping layer to identify any features, constraints, or designated land uses that interface with the Project delineation. The result of the GIS analysis will be a data set listing each management zone, special designation, and

constraint that the project will intersect with. The GIS analysis will also provide spatial mapping showing the location of each zone, special designation and constraint within the Project area.

The second step in the analysis would be as follows. The data set would be matched to the associated literature resources gathered. The literature sources would then be evaluated to understand what types of activities and facilities are allowable within the zones, special designations, and constraints listed in the mapped data set. Constraints would be measured by reviewing the existing land use plans and zoning ordinances and comparing them to features and actions that are proposed to occur under the proposed action of the Project. This comparison would identify where any proposed features or actions would be in conflict with existing management prescriptions or ordinances. Data used in the analysis will consist of the existing land use plans, comprehensive plans, resources management plans, and zoning ordinances.

Where conflicts are identified, coordination with the group or individual having jurisdiction over the land would be consulted to evaluate how conflicts might be resolved. If construction, operation or maintenance activities would result in any of the following conditions, the issue would be considered a conflict:

- Changes in land ownership are made
- Access to land is altered or restricted
- Amendments to existing management plans, or zoning ordinance are made resulting from the LPP project (i.e. if project activities are inconsistent with designated land use purposes, the project activity would be considered a significant impact)

### ***6.6.3 Study Report***

The study report will: 1) describe the analysis goals and objectives; 2) build on information already in the PAD to describe existing conditions; 3) present the methods used to identify land uses and conflicts; 4) describe the constraints associated with specific areas; and 5) show the locations of constraints and conflicts using GIS-based maps and accompanying summary tables. The study report will discuss any measures that may be needed to resolve any identified conflicts. This study methodology is based on best professional judgment and experience with previous projects and is consistent with generally accepted practice in land use analysis studies.

## **6.7 Schedule and Level of Effort (§5.11(d)(6))**

Study activities are anticipated to take one year to complete and will commence in February, 2009 and be completed by February 2010. Analysis is not field-season dependant, and thus is not restricted to seasonal activity scheduling. The study will require a high level of effort for GIS mapping, data collection, and synthesis analysis. It is anticipated that the total cost of the study would be approximately \$84,000 dollars.

## **6.8 Progress Reporting (§5.11(b)(3))**

The final product from the study will serve as the only report produced by the Land Use Plans and Conflicts Study.

## **6.9 Dependencies on Other Resource Analyses**

The Land Use Plans and Conflicts analysis would not be directly dependent on other resource analyses; however, the studies would be performed with input from and coordination between other resource disciplines.

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## **Study Plan 7: Noise**

### **7.1 Introduction**

This study plan documents the methods for determining analyzing noise impacts resulting from the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Document 1 and 2, as well as those provided in the September and October study plan meetings in Salt Lake City and St. George, Utah. This study plan presents an approach for advancing knowledge and understanding of noise conditions as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan also addresses study requests identified by FERC, EPA, Kaibab Tribe and other reviewers in their comments on the PAD and Scoping Document No. 1.

### **7.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

This study plan describes goals and objectives, provides a study area description, describes the Project nexus, presents the methodology for the proposed study activities, presents staffing and equipment requirements, provides a budget for activities associated with the noise portion of the study, and provides a generalized project schedule. The study will identify potential impacts of the Project on noise conditions during Project construction and operation, and identify measures to mitigate noise impacts resulting from Project construction, operation and maintenance activities. The study plan also addresses safety issues associated with noise from construction or operation.

#### ***7.2.1 Goals and Objectives***

The goals of the noise study plan are to identify and determine noise impacts resulting from Project construction and operation. Information regarding potential noise impacts is needed to guide decisions in the Project design, construction, operation and maintenance that would minimize effects from the noise generated by the project.

Specific noise related objectives include determination of how noise from the construction of the project and the operation of the facilities will affect the local and regional environment along the alternative alignments. Following are the primary objectives of the noise study.

- Define receptors and identify who the receptors are early in the plan development as coordinated with cultural resource
- Identify noise limits within the Project area
- Estimate historical ambient noise for the Project area (differentiate ambient versus background)
- Determine background noise from ambient and Project contributions
- Determine extent to which sounds will reach sensitive noise receptors
- Quantify construction activities and the associated noise levels generated from the activities
- Quantify operation activities and the associated noise levels generated from the activities
- Identify areas of potential impacts from Project construction noise
- Identify areas of potential impacts from Project operation noise

- Use decibel contouring to show impacts from construction and operations
- Analyze cumulative impacts of noise within the Project area from construction and operation noise
- Identify areas of greatest impact and identify risks associated with the Project noise contribution including potential impacts on local plant, animal and human environments
- Evaluate whether noise from the project along the alternative alignments can be mitigated by design, construction, or O&M practices
- Identify what, if any, mitigation measures would be necessary to protect human safety and other environmental resources at locations that may be affected by Project noise
- Prepare a complete corridor-wide noise analysis that includes a map showing the Project noise footprint once in operation including points at which Project noise is not distinguishable from background and ambient noise
- Determine indirect effects on noise from ancillary structures in study area (not just in pipeline right-of-way)

### **7.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. The various agencies will be contacted to gather information regarding their goals with respect to noise. These goals will be incorporated into the studies.

### **7.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

#### ***7.4.1 Background Description***

The noise in the study area has been evaluated on a large, general scale using regional studies. Limited information is available about local effect from noise.

The description of noise in the study area is that it is typical of most rural regions. Several publications with regard to airplane traffic and associated noise within Zion National Park have been noted (Watson 2004 and NPS 2001).

#### ***7.4.2 Study Area Definition***

The study area would include the entire length of the alternative alignments; particular attention will be required for the following:

- Culturally sensitive areas
- Tourist use areas
- Environmentally sensitive areas
- Areas containing endangered species
- Sensitive wildlife habitats
- Locations of great economic or perceived aesthetic value
- Relatively dense population areas
- National monuments (wilderness areas, wilderness study areas, etc.)

The pipeline alignments and alternatives, including ancillary facilities and temporary construction areas will be identified. If study areas are redefined the plans will be adjusted accordingly.

### ***7.4.3 Issues and Data Needs***

The noise analyses will include the following:

- Verification of historical ambient noise levels
- Investigation of background noise levels resulting from construction (Leq's)
- Peak construction Average Daily Traffic data (ADT)
- Noise modeling
- Historic and projected population data
- Expected methods of pipe excavation and construction
- Data on Project features and the noise emissions from them
- Noise limits within the study area
- Culturally sensitive areas
- Environmentally sensitive areas
- Economically important areas

## **7.5 Nexus to Project (§5.11(d)(4))**

The Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, air release and pipeline blow-off equipment, and other features to convey water from Lake Powell to the St. George area and continuing on to the Cedar Valley. The pipeline and facilities will require installation through native soils and rocks. Noise generated from Project construction could be generated from backhoe excavation, truck traffic, compaction activities, blasting, jack hammering, or other construction activities. The noise generated from operations could include increased traffic, pumps, generators, hydraulics, transmission lines, and other equipment. The noise generated by these activities may affect or alter Project construction, operations, or maintenance, or all three. FERC licensing, other federal agency permits, and Utah State Engineer approval of the Project design would require demonstration that potential adverse impacts from noise conditions have been identified and avoided or mitigated in such a way that impacts are minimized.

## **7.6 Proposed Study Methodology (§5.11(d)(5))**

### ***7.6.1 Introduction and Overall Approach***

A substantial number of documents, including technical reports, scientific and engineering journal publications, and other literature were previously reviewed and information compiled. This information was presented in the PAD. Additional review of literature on noise effects will be performed by identifying and reviewing available technical reports and literature that may not have been identified previously, to determine what is known of the noise conditions regionally and at specific locations along the alignment. Preparation of a summary report documenting these findings and providing recommendations for supplemental characterization will be provided if needed.



## ***7.6.2 Methods for Preliminary Analysis and Preliminary Design***

Methods pertaining to evaluation of noise conditions that may affect preliminary engineering analysis and preliminary design are identified in this section.

### **7.6.2.1 Task 1 - Review of Existing Noise Literature**

Previous review of existing literature has uncovered some information on a broad scale. A more detailed review of existing noise data and information relevant to the Project that are available in current published reports, studies, and literature will be performed. The literature review will include information from established agency sources such as the EPA, State of Utah, State of Arizona, Natural Resources Conservation Service, Bureau of Land Management, Bureau of Reclamation, affected counties, cities, the Kaibab Tribe, and other to-be-determined sources. Previous preliminary investigation work performed by engineering and scientific consultants and organizations will be obtained and reviewed for relevant noise data and information.

### **7.6.2.2 Task 2 - Field Investigations**

Previous investigations have included a broad, general inspection of field conditions along the pipeline alignment. Field investigations will include a detailed physical inspection of the alternative alignments. Particular attention will be given to locations and features identified as sensitive noise receptor areas such as culturally, economically, and environmentally sensitive areas. Field investigations will be in accordance with commonly accepted field investigation practices. The following field activities are anticipated:

- Physical inspection and video recording of the alternative alignments
- Identification of sensitive noise receptor areas
- Measurement of baseline noise levels at selected points along the alternative alignments
- Review of potential Project construction methods to identify types of excavation or blasting expected to occur and how noise will transmit from these locations

### **7.6.2.3 Task 3 - Data Analyses**

Data collected from the literature review and field investigations will be compiled and evaluated by experienced, licensed engineers. Data evaluations will focus on satisfying the goals and objectives identified; specifically, determining the noise generated from Project construction activities and operations. Construction noise will be analyzed following procedures for projects not yet under construction in “Highway Construction Noise: Measurement, Prediction and Mitigation” (FHWA 1977). Noise emission levels will be obtained from government and industry standard publications for construction equipment and activities, traffic, and buildings (EPA 1971, EPA 1974, DB Engineering 2003, Michael Baker Corporation 2001, FHWA 1998). Sound levels will be analyzed in “A-weighted” decibels or dBA and simulated using the decibel addition rules. The noise levels estimated for Project construction and operations will be provided to other resource disciplines for use in evaluating impacts on resources such as wildlife, recreation and socioeconomics. Based upon the results of literature research, field investigations analyses will be performed to evaluate mitigation techniques, (if needed). Mitigation measures regarding impacts on tribal land will be determined in consultation with the Kaibab Band of Paiute Indians. All other mitigation measures will be determined in conjunction with Federal, state and local authorities and the appropriate statutes and regulations.

#### 7.6.2.4 Task 4 – Report Preparation

A technical memorandum will be prepared to document the literature review, field investigations, and data analyses. It will present project goals and objectives and describe the study area, document the literature review, and note general and specific conditions that pertain to noise conditions in the study area. Field investigation activities and methods will be described, and data analyses and results will be presented. Results will be discussed with a focus on the study objectives. The technical memorandum will include mitigation measures to reduce significant noise impacts resulting from the Project. The conclusions may include recommendations that could affect Project design.

### 7.7 Schedule and Level of Effort (§5.11(d)(6))

The research into local and regional impacts from the project noise will require professionals with appropriate experience to conduct the field investigations and data analyses identified above. Each professional performing literature research, field investigation, and data analyses will provide their own field equipment, sheets and notes for documentation of activities, data and information. Total study costs are estimated to be approximately \$45,000.

An approximate schedule for performance of the study is shown in Table 7-1. The study can be completed within a one-year period.

<b>Table 7-1 Noise Proposed Study Schedule</b>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review of Noise Literature	Ongoing	February 2009	-
2	Field Investigations	March 2009	June 2009	10
3	Data Evaluation	July 2009	September 2009	30
4	Final Report Preparation	October 2009	November 2009	45

### 7.8 Progress Reporting (§5.11(b)(3))

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009 and August 2009. The final report will be submitted in November 2009.

### 7.9 Dependencies on Other Resource Analyses

The noise analysis would not be primarily dependent on the analyses results of other resource discipline studies.

### 7.10 References

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## **Study Plan 8: Paleontological Resources**

### **8.1 Introduction**

This study plan documents the methods for determining paleontological resource impacts from the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on the PAD and Scoping Documents 1 and 2, as well as those provided in the September and October study plan meetings in Salt Lake City and St. George, Utah. This study plan presents an approach for advancing knowledge and understanding of paleontological resources as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan also addresses study requests made by FERC, other federal, state and tribal agencies, and the public in their comments on the PAD and Scoping Documents 1 and 2, and in comments filed with FERC as part of the study plan development process.

### **8.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

This study plan describes goals and objectives, provides a study area description, describes the Project nexus, presents the methodology for the proposed study activities, presents staffing and equipment requirements, provides a budget for activities associated with the paleontological resource portion of the study, and provides a generalized project schedule. The study will identify potential impacts of the Project on paleontological resources during Project construction, operation and maintenance activities.

#### ***8.2.1 Goals and Objectives***

The goals of the paleontological resource study plan are to identify and determine impacts on paleontological resources resulting from Project construction and operation. Information regarding potential paleontological resource impacts is needed to guide decisions in the Project design, construction, operation and maintenance that would minimize the effect of the Project on these resources.

Specific paleontological resource related objectives include determination of how Project construction and operation will affect paleontological resources along the alternative alignments. Following are the primary objectives of the paleontological resource study. Additional objectives that arise during the analysis will be added and addressed.

- Identify paleontological localities within the Project area
- Identify vertebrate and other fossils within the Project area
- Identify paleontologically sensitive formations within the Project area
- Analyze cumulative impacts on paleontological resources within the Project area from construction and operation activities

### **8.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. Specific agency resource management goals have been identified for paleontological localities and paleontologically sensitive formations.

### **8.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

#### ***8.4.1 Background Description***

Paleontological resources are the fossilized remains of animals (vertebrates and invertebrates) and plants or traces or evidence of prehistoric animals. Information on paleontological resources within the Project area is available from a variety of sources. Existing information on fossiliferous formations, known localities and previous paleontological resource projects are available from BLM field offices and Grand Staircase-Escalante National Monument, National Park Service, Office of the State Paleontologist at the Utah Geological Survey, Arizona State Museum and other published sources. Information is also available at the geology departments at Brigham Young University and the University of Utah. The Kaibab Tribal office will be contacted for information on known fossil occurrences, concerns, and permission to survey on the Kaibab Indian Reservation.

#### ***8.4.2 Study Area Definition***

The study area would include the entire length of the alternative alignments; particular attention will be required for the following:

- Any area directly affected by Project feature construction or operations
- Any stream or river and associated corridor that would be subject to water deliveries or alterations in flow

#### ***8.4.3 Issues and Data Needs***

The paleontological resource analyses will include the following:

- Assessing geologic maps showing the geologic formations, compilation of background research and information known for the Project area
- Performing field inventory and recording paleontological resources within the Project area

### **8.5 Nexus to Project (§5.11(d)(4))**

The Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, air release and pipeline blow-off equipment, and other features to convey water from Lake Powell to the St. George area and continuing on to the Cedar Valley. The pipeline and facilities will require installation through native soils and rocks, potentially disturbing paleontological resources. The potential paleontological resources impacted by these activities may affect or alter Project construction, operations, or maintenance, or all three. FERC licensing, other federal agency permits, and Utah State Engineer approval of the Project design would require



demonstration that potential adverse impacts on paleontological resources have been identified and avoided or mitigated in such a way that resources are not adversely affected.

## **8.6 Proposed Study Methodology (§5.11(d)(5))**

### ***8.6.1 Introduction and Overall Approach***

The analysis of impacts on paleontological resources will involve identifying geologic formations containing scientifically significant fossils, known fossil localities or isolated fossil finds within the Project area, defining the characteristics of each fossil locality or find that contribute to the significance, and determining the effect of the alternatives and cumulative impacts on each fossiliferous formation, fossil locality or isolated find. The analysis will be in compliance with the following federal legislation: Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225; 16 U.S.C. 432, 433) and the National Environmental Policy Act of 1969 (NEPA)(P.L. 91-190; 83 Stat. 852; 42 U.S.C. 4321-4327). Applicable Utah State legislation consists of the Antiquities Protection Act of 1993 (U.C.A. Sec. 9-8-101-806). Applicable Arizona State legislation consists of A.R.S. § 15-1631 and 41-841 ET SEQ, The Arizona Antiquities Act. Additional review of literature on paleontological resources will be performed by identifying and reviewing available technical reports and literature that may not have been identified previously, to determine what is known of the paleontological resources along the alternative alignments. A summary report will be prepared to document the study findings.

### ***8.6.2 Methods for Preliminary Analysis***

Methods pertaining to analysis of paleontological resources are described in the following sections.

#### **8.6.2.1 Task 1 – Review of Existing Paleontological Resource Literature**

Previous review of existing literature has uncovered some information on a broad scale. A more detailed review of existing paleontological resource data and information relevant to the Project that are available in current published reports, studies, and literature will be performed. The literature review will include information from established agency sources such as the BLM, National Park Service, Office of the State Paleontologist at the Utah Geological Survey, Arizona State Museum, Brigham Young University, University of Utah, Kaibab Tribal office and other available sources. Previous preliminary investigation work performed by engineering and scientific consultants and organizations will be obtained and reviewed for relevant paleontological resource data and information.

#### **8.6.2.2 Task 2 – Field Investigations**

At this time, it is not known to what extent the Project area has been previously inventoried and whether those inventories are adequate for the purposes of this study. Additionally, it is not known how many fossil localities within or near (two wide corridor) the project area have been previously recorded. As such, only general methodological guidance for the field portion of the project is described here.

Geologic units of Class 5 and 4 sensitivity (as described below) will be examined wherever exposures occur within the Project area (250 foot corridor). Geologic units of Class 3 sensitivity (as described below) will be examined at known localities and spot surveyed and sampled within the Project area (250 foot corridor). New localities will be recorded on Paleontological Locality Data Forms.

### 8.6.2.3 Task 3 – Data Analyses

#### **Classification of paleontologically sensitive geologic units.**

The PFYC or Potential Fossil Yield Classification System will be used. The following description of PFYC is from BLM Instructional Memorandum No. 2008-009, 09/30/2007.

Occurrences of paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. Therefore, geologic mapping can be used for assessing the potential for the occurrence of paleontological resources.

Using the Potential Fossil Yield Classification (PFYC) system, geologic units are classified based on the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher class number indicating a higher potential. This classification is applied to the geologic formation, member, or other distinguishable unit, preferably at the most detailed mappable level. It is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment.

The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis, and should be used to assist in determining the need for further mitigation assessment or actions.

The descriptions for the classes below are written to serve as guidelines rather than as strict definitions. Knowledge of the geology and the paleontological potential for individual units or preservational conditions should be considered when determining the appropriate class assignment. Assignments are best made by collaboration between land managers and knowledgeable researchers.

**Class 1 - Very Low.** Geologic units that are not likely to contain recognizable fossil remains.

- Units that are igneous or metamorphic, excluding reworked volcanic ash units.
- Units that are Precambrian in age or older.

(1) Management concern for paleontological resources in Class 1 units is usually negligible or not applicable.

(2) Assessment or mitigation is usually unnecessary except in very rare or isolated circumstances.

The probability for impacting any fossils is negligible. Assessment or mitigation of paleontological resources is usually unnecessary. The occurrence of significant fossils is non-existent or extremely rare.

**Class 2 - Low.** Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.

- Vertebrate or significant invertebrate or plant fossils not present or very rare.
- Units that are generally younger than 10,000 years before present.
- Recent aeolian deposits.

- Sediments that exhibit significant physical and chemical changes (i.e., diagenetic alteration).

(1) Management concern for paleontological resources is generally low.

(2) Assessment or mitigation is usually unnecessary except in rare or isolated circumstances.

The probability for impacting vertebrate fossils or scientifically significant invertebrate or plant fossils is low. Assessment or mitigation of paleontological resources is not likely to be necessary. Localities containing important resources may exist, but would be rare and would not influence the classification. These important localities would be managed on a case-by-case basis.

**Class 3 - Moderate or Unknown.** Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential.

- Often marine in origin with sporadic known occurrences of vertebrate fossils.
- Vertebrate fossils and scientifically significant invertebrate or plant fossils known to occur intermittently; predictability known to be low.
- (or)
- Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.

**Class 3a - Moderate Potential.** Units are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil locality is low, but is somewhat higher for common fossils.

**Class 3b - Unknown Potential.** Units exhibit geologic features and preservational conditions that suggest significant fossils could be present, but little information about the paleontological resources of the unit or the area is known. This may indicate the unit or area is poorly studied, and field surveys may uncover significant finds. The units in this Class may eventually be placed in another Class when sufficient survey and research is performed. The unknown potential of the units in this Class should be carefully considered when developing any mitigation or management actions.

(1) Management concern for paleontological resources is moderate; or cannot be determined from existing data.

(2) Surface-disturbing activities may require field assessment to determine appropriate course of action.

This classification includes a broad range of paleontological potential. It includes geologic units of unknown potential, as well as units of moderate or infrequent occurrence of significant fossils. Management considerations cover a broad range of options as well, and could include pre-disturbance surveys, monitoring, or avoidance. Surface-disturbing activities will require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action, and whether the action could affect the paleontological resources. These units may contain areas that

would be appropriate to designate as hobby collection areas due to the higher occurrence of common fossils and a lower concern about affecting significant paleontological resources.

**Class 4 — High.** Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases.

*Class 4a* - Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two acres. Paleontological resources may be susceptible to adverse impacts from surface disturbing actions. Illegal collecting activities may impact some areas.

*Class 4b* - These are areas underlain by geologic units with high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity.

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than two contiguous acres.
- Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources.

- (1) Management concern for paleontological resources in Class 4 is moderate to high, depending on the proposed action.
- (2) A field survey by a qualified paleontologist is often needed to assess local conditions.
- (3) Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered.
- (4) Class 4 and Class 5 units may be combined as Class 5 for broad applications, such as planning efforts or preliminary assessments, when geologic mapping and appropriate scale is not available. Resource assessment, mitigation, and other management considerations are similar at this level of analysis, and impacts and alternatives can be addressed at a level appropriate to the application.

The probability for impacting significant paleontological resources is moderate to high, and is dependent on the proposed action. Mitigation considerations must include assessment of the disturbance, such as removal or penetration of protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access resulting in greater looting potential. If impacts to significant fossils can be anticipated, on-the-ground surveys prior to authorizing the surface disturbing action will usually be necessary. On-site monitoring or spot-checking may be necessary during construction activities.

**Class 5 - Very High.** Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation.

*Class 5a* - Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two contiguous acres. Paleontological resources are highly susceptible to adverse impacts from surface disturbing actions. Unit is frequently the focus of illegal collecting activities.

*Class 5b* - These are areas underlain by geologic units with very high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has very high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity.

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than two contiguous acres.
- Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources.

(1) Management concern for paleontological resources in Class 5 areas is high to very high.

(2) A field survey by a qualified paleontologist is usually necessary prior to surface disturbing activities or land tenure adjustments. Mitigation will often be necessary before and/or during these actions.

(3) Official designation of areas of avoidance, special interest, and concern may be appropriate.

The probability for impacting significant fossils is high. Vertebrate fossils or scientifically significant invertebrate fossils are known or can reasonably be expected to occur in the impacted area. On-the-ground surveys prior to authorizing any surface disturbing activities will usually be necessary. On-site monitoring may be necessary during construction activities.

#### **Sensitivity classification of fossil localities.**

A sensitivity classification of fossil localities modified from the Committee on Guidelines for Paleontological Collecting (Committee) (1987) will be used. The classification system for defining the paleontological sensitivity of fossil localities consists of the following from Committee (1987:174):

Class 1. Critical - reference locality for holotype or critical paleontological material, or any type section of geological strata needed for future study. All vertebrate fossil sites fall within this category.

Class 2. Significant - any locality that produces rare, well-preserved, or critical fossils usable for taxonomic, evolutionary, stratigraphic, paleoenvironmental, or paleoecological studies.

Class 3. Important - any locality that produces common, abundant fossils useful for stratigraphic or population variability studies.

Class 4. Insignificant - any locality with poorly preserved, common, or stratigraphically unimportant fossil material.

Class 5. Unimportant - any locality intensively surveyed and determined to be of minimal scientific interest.

Paleontological resources baseline conditions will be defined by determining which geological formations are present and each formation's paleontological sensitivity. Baseline conditions also will be defined by determining what fossil localities are already known in or near the impact areas.

Impacts on paleontological resources will be considered significantly adverse if project implementation results in adverse effects on Class 5, 4 and some Class 3 paleontologically sensitive geological units or in adverse effects on Class 1, 2, or 3 paleontologically sensitive fossil localities as described above.

Ultimately, the significance of paleontological localities and fossil finds will be determined by the lead federal agency in consultation with the federal land owning agency (if applicable), the Utah State Paleontologist (USP) and the Director of the Arizona State Museum. The lead federal agency, in consultation with the federal land owning agency (as applicable), and the USP, determines the significance of impacts and treatment planning related to these resources. Impacts on paleontological resources are considered significant if either of the following were to occur:

- Disturbance of paleontological resources, including geologic formations containing fossils, fossil localities, or isolated fossil finds that are on file with the USP's Office.
- Alteration of paleontological resources, including geologic formations containing fossils, fossil localities, or isolated fossil finds that are on file with the USP's Office.

The paleontological resources cumulative impacts analysis will address the combined impacts of the Project and any past or future proposed or planned actions that have or are likely to affect the paleontological resources in the Project area. The following inter-related projects may be analyzed for cumulative impacts.

- Proposed St. George Airport
- Proposed Southern Corridor Highway, St. George to Hurricane Highway

The analysis of impacts on paleontological resources will be based on the standard operating procedures and measures to avoid or reduce impacts. The significance criteria for paleontological resources will then be applied to determine if any impact would be significant. Mitigation measures would then be developed to offset significant impacts. The mitigation measures will be based on applicable state and Federal statutes and regulations, past experience and best professional judgment to either satisfy a legal requirement or to satisfy the public interest requirement. In some cases significant impacts may not be able to be mitigated. All reasonably foreseeable mitigation options will be evaluated by the Federal Energy Regulatory Commission, Bureau of Land Management, and other responsible federal agencies and factored into the respective decision documents.

If critical, significant or important (Class 1, 2, or 3) paleontological resources are discovered during the field survey, any of the following options could apply:



Sampling – During the field survey, material could be sampled to facilitate further analyses to determine significance. Frequently fossil taxa are not sufficiently well known to allow the determination of significance in the field.

Salvage – Salvage might be suggested or required if the fossil discovery is of scientific interest and if the proposed development will destroy the site. This must be cost effective and time effective. Some fossil material is small and can be quickly collected. Often, once the material from a particular site had been collected and properly recorded, then its significance as far as a need for protection ceases. Medium to large animals, if found fairly complete, would be an expensive and time consuming project. Rerouting might be the more appropriate action.

Rerouting (avoidance) – A reroute or relocation might be suggested if critical or significant fossil material is discovered directly on the route or proposed development site and it is more cost and time effective than salvage. Rerouting or relocation may also be requested if the locality is scientifically very important and should be left undisturbed for subsequent scientific evaluation.

Monitoring – If critical or significant fossil material is likely to be encountered during the proposed development, monitoring would be recommended. There are two types of monitoring (BLM Instructional Memorandum No. 2009- 011): 1) on-site, performed during ongoing operations, and 2) spot-checks, performed during or after disturbance, or at key times during the progress of the project. The need for monitoring and the type of monitoring would be determined from the evaluation of the field survey discoveries.

A “Discovery Stipulation” regarding accidental paleontological discoveries should be included in the construction authorization. It could be similar to the following:

“The operator shall immediately bring any paleontological resources discovered as a result of operations under this authorization to the attention of the BLM authorized officer. The operator shall suspend all activities in the vicinity of such discovery until notified to proceed by the authorized officer, and shall protect the site from damage or looting. The authorized officer will evaluate, or will have evaluated, such discoveries as soon as possible but not later than five working days after being notified. Appropriate measures to mitigate adverse effects to significant paleontological resources will be determined by the authorized officer after consulting with the operator. The operator is responsible for the cost of any investigation necessary for the evaluation and for any mitigation measures. There is no need to suspend operations if the operator can avoid further impacts to a discovered site, however, the discovery shall be brought to the attention of the authorized officer as soon as possible and protected for damage or looting.”

#### **8.6.2.4 Task 4 – Report Preparation**

A technical report will be prepared to document the literature review, field investigations, and data analyses. It will present project goals and objectives and describe the study area, document the literature review, and note general and specific conditions that pertain to paleontological resources in the study area. Field investigation activities and methods will be described, and data analyses and results will be presented. Results will be discussed with a focus on the study objectives. The technical report will include mitigation measures to reduce significant paleontological resource impacts resulting from the Project. The conclusions may include recommendations that could affect Project design.

## 8.7 Schedule and Level of Effort (§5.11(d)(6))

The research into the existence of paleontological resources within the Project area and potential impacts will require professionals with appropriate experience to conduct the field investigations and data analyses identified above. Each professional performing literature research, field investigation, and data analyses will provide their own field equipment, sheets and notes for documentation of activities, data and information. Total study costs are estimated to be approximately \$50,000.

An approximate schedule for performance of the study is shown in Table 8-1. The study can be completed within a one-year period.

<b>Table 8-1 Paleontological Resources Proposed Study Schedule</b>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review of Paleontological Resources Literature	Ongoing	February 2009	-
2	Field Investigations	March 2009	August 2009	20
3	Data Evaluation	September 2009	November 2009	60
4	Final Technical Report Preparation	December 2009	February 2010	45

## 8.8 Progress Reporting (§5.11(b)(3))

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009, August 2009 and November 2009. The final report will be submitted in February 2010.

## 8.9 Dependencies on Other Resource Analyses

The paleontological resources analysis would not be primarily dependent on the analyses results of other resource discipline studies.

## 8.10 References

- Chan, M.A. and A.W. Archer (2000). *Cyclic Eolian Stratification on the Jurassic Navajo Sandstone, Zion National Park: Periodicities and Implications for Paleoclimate*. Geology of Utah's Parks and Monuments. Publication 28. D.A. Sprinkel, T.C. Chidsey, Jr., and P.B. Anderson, editors.
- Cobban, W.A., T.S. Dyman, G.L. Pollock, K.I. Takahashi, L.E. Davis, and D.B. Riggin (2000). *Inventory of Dominantly Marine and Brackish-Water Fossils from Late Cretaceous Rock in and near Grand Staircase-Escalante National Monument, Utah*. Geology of Utah's Parks and Monuments. Publication 28. D.A. Sprinkel, T.C. Chidsey, Jr., and P.B. Anderson, editors.

Santucci, Vincent L. 2000. *A Survey of the Paleontological Resources from the National Parks and Monuments in Utah*. Geology of Utah's Parks and Monuments. Utah Geological Association Publication 28. D.A. Sprinkel, T.C. Chidsey, Jr., and P.B. Anderson, editors.

U.S. Bureau of Land Management (BLM). 1987. *General procedural guidance for paleontological resource management*. BLM manual H-8270-1.

## **Study Plan 9: Recreation Resources**

### **9.1 Introduction**

This study plan documents the methods for determining impacts to recreation resources resulting from the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and comments made at the September and October 2008 study plan meetings. This study plan responds to comments received on the PAD, Scoping Document No. 1, and Scoping Document No. 2. This study plan presents an approach for advancing knowledge and understanding of recreation resource issues as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan also addresses study requests made by FERC, other federal, state and tribal agencies, and the public in their comments on the PAD, Scoping Document No. 1, and Scoping Document No. 2.

### **9.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

This study plan describes goals and objectives, provides a study area description, describes the Project nexus, presents the methodology for the proposed study activities, presents staffing and equipment requirements, provides a budget for activities associated with the recreation resource portion of the study, and provides a generalized project schedule. The study will identify potential direct and indirect impacts of the Project on recreation resources during Project construction and operation, and identify measures to mitigate recreation resource impacts resulting from Project construction, operation and maintenance activities.

#### ***9.2.1 Goals and Objectives***

The goals of the recreation resources study plan are to identify and determine recreation resource impacts resulting from Project construction and operation. Information regarding potential recreation resource impacts is needed to guide decisions in the Project design, construction, operation and maintenance so that impacts on recreation resources may be minimized.

Specific recreation-related objectives include determination of how the Project construction, operation and maintenance of Project facilities would affect local, regional and statewide recreation resources along the alternative alignments. Following are the primary objectives of the recreation resource study.

- Identify recreation resources within the Project Area
- Identify potential impacts from Project construction on Utah and Arizona State Comprehensive Outdoor Recreation Plans (SCORPs), National Park Service plans, and Bureau of Land Management plans within and surrounding the Project area
- Identify potential impacts from Project operations on Utah and Arizona State Comprehensive Outdoor Recreation Plans (SCORPs), National Park Service plans, and Bureau of Land Management plans within and surrounding the Project area
- Evaluate cumulative recreation resource impacts from Project construction and operation
- Evaluate whether recreation resource impacts from the Project along the alternative alignments can be mitigated by design, construction, or O&M practices

### **9.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied.

### **9.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

#### ***9.4.1 Background Description***

Existing and future recreation needs within and adjacent to the Project area are currently undefined.

#### ***9.4.2 Study Area Definition***

The study area would include the entire length of the alternative alignments, locations of ancillary facilities and construction work areas, with particular attention for the following:

- Culturally sensitive areas
- Special Recreation Management Areas (SRMA)
- Tourist use areas
- Environmentally sensitive areas
- Sensitive wildlife habitats
- Locations of perceived aesthetic value
- Reservoirs, waterways and surrounding area (e.g. Lake Powell and Sand Hollow Reservoir)
- National Recreation Areas and Monuments (e.g. Glen Canyon National Recreation Area, Grand Staircase-Escalante National Monument)

#### ***9.4.3 Issues and Data Needs***

The data needed to perform the recreation resource demand and needs analyses include the following:

- Recreation Opportunity Spectrum Settings
- SRMA recreation management strategies, settings, benefits, and experiences
- Recreation Management Zone targeted niche and outcomes (experiences, activities, and benefits)
- Extensive Recreation Management Areas
- Recreation opportunities as defined by specific Travel Management Areas
- Results of LPP Visual Resource Studies
- Existing Publicly Managed Recreation Site and Condition Information
- Proposed Publicly Managed Recreation Site Information
- Special Recreation Permitting Information
- Recreation Visitation
- Recreation Activities
- Off-Highway Vehicle Use
- Recreation Sections of all Relevant Resource Management Plans
- Season of Use and Type of Use at Each Recreation Site
- Amount of Dispersed Recreation Use and Type
- Amount of Hunting and Fishing
- Amount of Boating Use Not Associated with Fishing
- State Comprehensive Outdoor Recreation Plans (SCORPs)
- Existing Private/Tribal Recreation Sites, Conditions, and Use

- Proposed Private/Tribal Recreation Sites

Much of the data required to complete the recreation demand and need analysis can be acquired from the following identified and existing sources:

- Bureau of Land Management's (BLM) Arizona Strip Final EIS
- BLM Arizona Strip Field Office Resource Management Plan (2008)
- BLM Kanab Field Office Area of Critical Environmental Concern Draft Report
- BLM Kanab Resource Management Plan
- BLM San Juan Resource Area Management Plan (1991)
- BLM Grand Staircase-Escalante National Monument (GSENM) Management Plan (2000)
- Glen Canyon National Recreation Area (GCNRA) Strategic Plan (2007-2011)
- Arizona SCORP (2003)
- Utah SCORP (2003)
- National Park Service (NPS) Director's Orders 10A, 10B, 12, 25, 28, 28a, 14, 47, 50c, 53, 75, and 77; and associated manuals
- NPS General Management Plan for Zion National Park (2001)

The following data will be required in addition to that described above:

- Field Reconnaissance
- Meetings with Resource Agency Personnel
- Results of Project Recreation Demand and Needs Analysis Studies
- Results of Project Visual Resource Studies
- Results of Project Traffic Studies
- Results of Project Botanical Resource Studies
- Results of Project Soils Studies
- Results of Project Economics Studies
- Results of Project Wildlife Studies
- Results of Project Aquatic Resources Studies
- Results of Project Land Management Studies
- Recreation GIS data (data layers) from BLM's St. George, Kanab, GSENM, Arizona Strip, and Monticello Field Offices
- Special Permitting Information
- Recreation Visitation
- Recreation Activities
- Off-Highway Vehicle Use
- Season of Use and Type of Use at Each Recreation Site
- Amount of Dispersed Recreation Use and Type
- Amount of Hunting and Fishing
- Amount of Boating Use Not Associated with Fishing
- Existing Private/Tribal Recreation Sites, Conditions, and Use
- Proposed Private/Tribal Recreation Sites
- Utah Atlas and Gazetteer (DeLorme)
- Arizona Atlas and Gazetteer (DeLorme)



## **9.5 Nexus to Project (§5.11(d)(4))**

The Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, air release and pipeline blow-off equipment, and other features to convey water from Lake Powell to the St. George area and continuing on to the Cedar Valley. The pipeline and facilities will require installation through native soils and rocks. Project construction could have direct and indirect effects on recreation resources within and adjacent to the Project area resulting from excavation, truck traffic, compaction activities, blasting, or other construction activities. Project operations could impact recreation resources by increasing traffic and altering water levels through additional deliveries. The Project may also provide beneficial access to natural open space areas for a variety of recreation purposes. The recreation resource impacts generated by these activities may affect or alter Project construction, operations, or maintenance, or all three. FERC licensing, other federal agency permits, and Utah State Engineer approval of the Project design may require demonstration that potential adverse impacts on recreation resources have been identified and avoided or mitigated.

## **9.6 Proposed Study Methodology (§5.11(d)(5))**

### ***9.6.1 Introduction and Overall Approach***

Management goals for the Project include avoiding, reducing, and mitigating conflicts with existing recreational resources. Resource management goals for agencies with jurisdiction over lands to be affected by the Project are defined in existing management plans. Consultation with Federal, State and local agencies, as well as Tribes and private landowners, is ongoing to further identify resource management goals for lands associated with the Project. Agency resource management goals are defined in sections 5.8 and 6.8 of the PAD. The recreation impact assessment will expand upon the goals outlined in the PAD to identify impacts within the study area.

### ***9.6.2 Methods for Preliminary Analysis and Preliminary Design***

Methods pertaining to analysis of recreation resource impacts are described in this section.

#### **9.6.2.1 Task 1 - Review of Existing Recreation Resource Literature**

Previous review of existing literature has uncovered some information on a broad scale. A more detailed review of existing recreation resources data and information relevant to the Project that are available in current published reports, studies, and literature will be performed. The literature review will include information from established agency sources such as the NPS, BLM, State of Utah, State of Arizona, Bureau of Reclamation, and other undetermined sources. Previous preliminary investigation work performed by engineering and scientific consultants and organizations will be obtained and reviewed for relevant recreation resources data and information.

#### **9.6.2.2 Task 2 - Field Reconnaissance**

Previous investigations have included a broad, general inspection of field conditions along the pipeline alignment. The field reconnaissance will include a physical inspection of existing recreation facilities and use patterns specific to areas along the alternative alignments to determine and verify recreation amenities as related to likely user experiences and common travel routes and access. Because impacts during construction could impact recreation user experience, a inventory of facilities in close proximity to Project facilities and construction workspace areas will be undertaken.

A great deal of current recreation use information is available in the existing recreation resource literature. Additional current recreation use information is believed to be available in agency files. Therefore, the collection of additional recreation use information is not proposed as part of this field effort.

### **9.6.2.3 Task 3 - Data Analyses**

Data collected from the literature review and field reconnaissance will be compiled and evaluated by experienced professionals. Data evaluations will focus on satisfying the goals and objectives identified; specifically, determining the recreation resource impacts generated from Project construction activities and operations, such as access to recreational facilities and areas.

A recreation impact assessment will be performed. Recreation baseline conditions will be defined relative to the following impact topics:

The recreation impact topics include the following:

- Recreation Opportunity Spectrum (ROS)
- Recreation Management Areas (RMAs)
- Existing and Proposed Recreation Sites
- Special Recreation Permitting (with linkage to socioeconomic effects and study)
- Recreation Visitation and Visitor Experience
- Recreation Activities
- Operation of Existing and Proposed Recreational Facilities

Information concerning these impact topics will be obtained from available literature, management plans, GIS data (data layers), field reconnaissance, and meetings with resource agency personnel. Information related to impacts on local businesses or tour operators will be provided to the socioeconomic study team to include in its analysis.

Impacts on recreation will be analyzed for each of the alternatives, relative to baseline conditions for each of the impact topics. The amount of change between baseline conditions and conditions under the alternatives will be documented as impacts.

Determination of impacts on recreation resources will involve identifying the Recreation Opportunity Spectrum (ROS) settings, Recreation Management Areas (RMAs), Recreation Sites, Special Recreation Permits, and other recreation resources in the immediate area of the Project, as well as those that exist along the transportation routes that will be used during Project construction and operation. Changes to these resources will then be evaluated using best professional judgment and past experience to determine if they would result in any impacts on the recreation resource. Potential impacts from changes in traffic flows on existing recreation resources will be evaluated to determine what effect they may have on the existing sites and their use. Estimates of potential population changes will be used to determine any increase in recreation resources use. A ratio of amount of recreation resources use and population levels will be developed from data presented in the Utah and Arizona SCORPs. Data used in the analysis will consist of recreation resources site data as well as recreation resources use data.

Impacts on recreation are considered significant if construction, operation or maintenance activities would result in any of the following conditions:

- Changes to ROS settings
- Changes to RMAs and ROS settings within RMAs

- Changes to existing and proposed recreation sites
- Changes to Special Recreation Permitting
- A reduction or increase in recreation visitation at existing recreation sites during construction or extending beyond the construction period
- Changes in the overall operation of existing and proposed recreational facilities

Cumulative impact analysis will be based on the list of other projects that may occur in the future. These will be examined to determine what impacts on recreation resources may occur that would cause a cumulative impact with the impacts projected to occur from the Project. If there are changes to a Special Recreation Management Area (SMRA) as a result of the Project, the BLM will be consulted to determine if a plan amendment would be needed or if the changes are such that they are not or could be minimized to not be significant.

Mitigation measures will be developed to offset significant impacts. The mitigation measures will be based on applicable state and Federal statutes and regulations, past experience and best professional judgment to either satisfy a legal requirement or to satisfy the public interest requirement. In some cases significant impacts may not be able to be mitigated. All reasonably foreseeable mitigation options will be evaluated by the FERC, BLM, NPS, Reclamation and other responsible agencies and factored into the respective decision documents.

#### **9.6.2.4 Task 4 – Report Preparation**

A technical report will be prepared to document the literature review, field reconnaissance, and data analyses. It will present Project goals and objectives of the study, describe the study area and the methodologies used in data collection, and name the sources of information used in the analysis. The technical report will also document the assumptions, analysis and results of the recreation impact assessment. It will conclude by identifying mitigation measures to reduce any impacts from the Project.

### **9.7 Schedule and Level of Effort (§5.11(d)(6))**

The research into recreation resource impacts resulting from the Project will require professionals with appropriate experience to conduct the field investigations and data analyses identified above. Each professional performing literature research, field reconnaissance, and data analyses will provide their own field equipment, sheets and notes for documentation of activities, data and information. Total study costs are estimated to be approximately \$70,000.

An approximate schedule for performance of the study is shown in Table 9-1. The study can be completed within a one-year period.

<b>Table 9-1 Recreation Resources Proposed Study Schedule</b>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review of Recreation Resources Literature	Ongoing	February 2009	-
2	Field Reconnaissance	March 2009	July 2009	10
3	Data Evaluation	August 2009	November 2009	60
4	Final Report Preparation	December 2009	February 2010	45

## 9.8 Progress Reporting (§5.11(b)(3))

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009, August 2009 and November 2009. The final report will be submitted in February 2010.

## 9.9 Dependencies on Other Resource Analyses

The recreation analysis may be primarily dependent on the analysis results of the following resource analyses:

- Noise
- Socioeconomics
- Wildlife Resources
- Aquatic Resources

## 9.10 References

Bureau of Land Management (BLM). 2000. Grand Staircase-Escalante National Monument Approved Management Plan and Record of Decision. February 2000.

Bureau of Land Management (BLM), Washington County Water Conservancy District (WCWCD), and Utah Division of Parks and Recreation (UDPR). 2001. Sand Hollow Recreation Area Recreation Management Plan. September 2001.

National Park Service (NPS). 2001. Zion National Park General Management Plan. August 2001.

Trimmer, \_\_. 2007. Utah State Parks Visitation data in 2006 and 2007. Utah Division of Parks and Recreation. Salt Lake City, Utah.

Utah Department of Parks and Recreation (UDP&R) and Utah Department of Natural Resources (UDNR). 2004. Coral Pink Sand Dunes State Park Draft General Management Plan. Available from: [http://stateparks.utah.gov/docs/CoralPink\\_GMP\\_Draft.pdf](http://stateparks.utah.gov/docs/CoralPink_GMP_Draft.pdf)

Utah National Parks. 2007. *Zion National Park* Website: <http://www.utah.com/nationalparks/zion.htm>

Utah Outdoors. 2007. Your Resource to Utah Outdoors Recreation [Internet]. [Cited 2007 October 17]; Available from: <http://www.utahoutdoors.com/maps/UtguideAK.htm>

Utah Travel Industry. 2007. *Quail Creek State Park*. Website: [http://www.utah.com/stateparks/quail\\_creek.htm](http://www.utah.com/stateparks/quail_creek.htm)

## **Study Plan 10: Water Resource Economics/Socioeconomics**

### **10.1 Introduction**

This study plan documents the methods for analyzing impacts to the water resource economics and socioeconomic resources for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on the PAD Scoping Document No. 1, and initial drafts of this study plan, including comments received from the September-October 2008 study plan meetings in Salt Lake City and St. George, Utah.

The study plan presents an approach for advancing knowledge and understanding of water resource economics and socioeconomic conditions, as they pertain to the Project's alternatives, including the south alternative (also has been labeled the preferred alignment in previous documents), existing highway alignment alternative, and the no action alternative. The study plan will be adapted to address new alternatives, if they are developed during the review process. The intent is that all reasonable alternatives will be evaluated on an equivalent basis.

### **10.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

This study plan describes goals and objectives, presents a study area description, describes the Project nexus, presents the methodology for the proposed study activities, presents staffing and equipment requirements, provides a budget for activities associated with the water resource economics and socioeconomic portion of the broader study activity, and provides a general project schedule. FERC guidelines, and other federal agency guidelines for water resources management, identify the requirements to prepare project water resource economics and socioeconomic impact analyses. These analyses will focus on Project impacts for direct net economic benefits and costs, cost-effectiveness, national economic development accounting (NED), regional economic development accounting (RED), and other social effects. The analyses will determine national, regional, and local impacts during Project construction, operation and maintenance and identify measures to mitigate these impacts, where necessary. The impacts of the no action alternative (i.e., future without the Project) will be included in the study as well.

The other social effects, related to the NED and RED analyses, to be examined include: 1) changes to regional population growth and periodic rates of growth; 2) population growth and its relationship to economic activity for the project area; 3) information on economic development perspectives for the local area (what types of development or economic activity are being encouraged to locate in the area); 4) available information on general growth perspectives for the local area (such as information from the Vision Dixie process, and other public involvement or survey research sources); and 5) available information related to public perspectives toward the use of Colorado River supplies, if available.

#### ***10.2.1 Primary Goals and Objectives***

The primary goals/objectives of the water resources economics and socioeconomic study plan are to identify and determine the range and magnitude of impacts resulting from Project construction and operation under the preferred alternative, existing highway alternative and no action alternative.

The following are primary water resources agency management goals/objectives that will be addressed in the study.

Water Resource Economics:

- Ensure water resources agency compliance with the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, and agency modifications thereof.
  - Ensure that NED analyses for water and power impacts are appropriately applied and integrated.
  - Ensure that RED analyses for water and/or power impacts are appropriately applied and integrated.
- Provide a clear picture of Project economic benefits and costs, including: 1) a comparison to Project alternatives; and 2) reviewing the economics of conservation measures and available water right changes/transfers from irrigated agriculture or other water supply sources, as designated by the water supply study.
- Determine the cost-effectiveness of the Project, and compare the relative costs of new water supplies for the alternative configurations; describe the costs and cost-effectiveness of the baseline condition.
- Determine Project (and alternatives) marginal costs and cost allocations to the Water Conservancy Districts.
- Identify an efficient allocation of water resources, for high value beneficial use in Kane, Washington, and Central Iron counties, Utah; ensure that the supply curve reflects cost-effectiveness analysis.

Population, Regional Economic, and Fiscal Impacts:

- Define and explain the relationship of the Project to regional water demand needs (compare and interpret population and economic demand forecasts relative to new supplies); make the relationship transparent between growth and with/without Project development.
- Identify specific potential population and economic growth impacts, with/without the Project, including baseline growth conditions.
- Clarify the regional economic impacts associated with Project construction and development; identify services impacts.
- Describe any economic impacts, or mitigation needs, related to resource management on the Kaibab Indian Reservation relative to the existing highway alternative; with specific attention to the agency guidelines outlined under Executive Order 12898 for Environmental Justice compliance.



### 10.3 Agency Resource Management Goals (§5.11(d)(2))

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. All federal and state water resource management agencies inherently adopt the goal of optimizing water resources allocation through a careful review of cost-effectiveness and identifying benefits-costs surrounding proposed actions. This study plan adopts this management perspective toward the optimization of water resources management; and specifically focuses on ensuring federal water resources agency compliance to the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, and agency modifications thereof.

Additionally, more specific water resources management objectives include determining how the construction and operation of the Project alternative alignments would affect the local and regional economies. The following are further resource management objectives for the water resources economics and socioeconomic study.

#### Water Resource Economics:

- Confirm the supply and cost-effectiveness of Project (and alternatives) at meeting the demand for new water resources within the three county area (Kane, Washington, and central Iron counties).
- Ensure Project consistency with state and regional water resource planning efforts.
- Determine the supply and cost-effectiveness of water conservation and management programs that may be developed, with and without the Project.
- Determine the marginal costs of water and water delivery.
- In terms of new supply options and marginal costs, consider the general economic impacts to the Districts and to the state; clarify the likely fiscal impacts.
- Identify the net economic impacts associated with the loss of power generation at Glen Canyon Dam; including any fiscal impacts to the regional power system (CRSP power rates).
  - Impact estimates will cover any power losses at the power plant from energy/peaking power losses and the costs of replacement power.
  - Impact estimates will be determined for water system pumping and distribution.

#### Population, Regional Economic, and Fiscal Impacts:

- Quantify the Project impacts on local and regional socioeconomic resources from construction and operation (and alternatives).
- Quantify the impact on population growth without the Project, but with available substitute water supplies considered.
- Identify potential impacts/constraints to local services affected by the Project development.

- Identify any specific Project-induced factors affecting Environmental Justice considerations.
- Identify whether regional acceptance or rejection of new water supplies from Colorado River is an issue of public concern.
- Provide an accounting of the state's Colorado River water rights allocation assigned to the Project; determine whether the state perceives other allocation (water right use) options separate from the Project.

Additional objectives that arise during the continued scoping process, or during the preparation of the analysis, will be added and addressed.

## **10.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

### ***10.4.1 Background Description***

Southwestern Utah and northwestern Arizona historically have had a predominantly resourced-based economy, relying on agriculture, cattle ranching, and some mining to support ways-of-life. Throughout the 20<sup>th</sup> century, establishing national parks, constructing Interstate 15, and paving Arizona Highways 389 and 389A have made Utah and Arizona increasingly known for their unique natural beauty and recreation opportunities. Today, southwestern Utah and northwestern Arizona still maintain agricultural and other resource-based land uses, and much land is dedicated to public use. However, in recent years, these regions have increasingly become a destination for suburban and urban people to reside and retire (Utah Division of Water Resources 2007). Tourism, retirement facilities, information technology, and other entrepreneurial and innovation-based businesses have become common. The many recreational opportunities, pleasant climate, scenic vistas, and growth opportunities in the area have attracted many newer residents to the area.

The Cedar Valley area, located in Iron County, is one of the fastest growing regions in the country and is near St. George, Utah, which is the fastest growing metropolitan area in the country. St. George is located in Washington County, and this county's population has nearly doubled in the last three decades (Utah Division of Water Resources 2007), largely around the greater St. George area, which is locally referred to as "Dixie." Given the mild winters in the Dixie area and throughout southern Utah and northwestern Arizona, the area has become a popular destination for "snow birds" or retirees who live in the area for part of the year to avoid harsh winters elsewhere. Hence, many retiree "residents" in southern Utah and northwestern Arizona are part-time residents who own homes that they use only during winter months. A portion of the southern Utah part-time resident population is comprised of university students who live on or near campuses throughout the school year (Utah Division of Water Resources 2007).

Today, tourism is a major industry in southern Utah and northwestern Arizona with many national parks and other recreational and scenic attractions supporting the industry. Secondary tourism attractions and facilities, such as urban attractions and resort and retiree-based facilities, are becoming more common to make the region more robust and attractive to visitors. Research and service based industries are emerging components of southwestern Utah's and northwestern Arizona's economies. Together, the transitions in the southern Utah economy and population have changed ways of life for many and have spawned more urban-based development (NRCS 2007).

Recent trends indicate that the population within Iron County is increasing particularly along the Interstate 15 corridor. New landowners in this area typically maintain non-agricultural and non-resourced

based ways of life, seeing natural resources in the vicinity as recreational opportunities, not as a direct means for making a living (NRCS 2007). An ability to maintain more traditional ways of life associated with farming and other resource-based livelihoods is diminishing and has created great concerns from resource-based sectors of the population. Areas previously utilized for farming around the greater Cedar City area have begun to be converted to housing and business developments.

The use and distribution of water is changing and becoming more challenging to manage because of the increase in urban populations (Utah Division of Water Resources 2007). For example, water use can be correlated with population and urbanization in southwest Utah. Demands are anticipated to continue with projected population increases and the increased development moving into the sub-basins of the Escalante Valley Basin and the St. George Metropolitan Area. Water use for agriculture in the southwest Utah remains a primary use of basin water and is critical to the economic fabric of the rural communities surrounding the urban developments (NRCS 2007).

### ***10.4.2 Study Area Definition***

The study area will include the following:

- Any area directly or indirectly affected by new Project water supplies, primarily described as the St. George to Cedar City corridor, in southwest Utah. This would include Washington, Iron, and Kane counties and the areas served by their respective Water Conservancy Districts.
- Any area or community directly affected by Project feature construction or operations in Utah and Arizona.
- The Kaibab Indian Reservation.

In assessing socioeconomic impacts, the impact area is generally similar for each of the Project alternatives (and baseline conditions), and relates to economic impact issues for new water supplies for the primary project area, as described below.

- The Project area for construction impacts includes: all communities, towns, and cities along the pipeline corridors from Lake Powell to St. George and Cedar City; the Kaibab Indian Reservation; and communities in northern Coconino and Mohave counties in Arizona along the pipeline corridor. Potential statewide impacts will be considered, as well.
- Construction Project impacts would be related primarily to workforce needs and local population impacts, services needs for construction, and regional economic impacts associated with the direct construction phase (local income and employment impacts—RED type analyses).
- The Project construction would exist within a supply curve of multiple water supply efforts and alternatives (multiple projects, including conservation measures). The construction costs for this Project alternative would be identified and related to the supply curve options and regional demand. This would be expressed in terms of capital dollars per acre-feet of delivered water, and annualized capital costs per acre-feet of delivery (similar to NED type analyses). Relevant cost data and supply need estimates would be concisely discussed here (as they would be covered in more explicit detail within other environmental document sections).
- Some of the key construction related impact issues associated with water resource supply alternatives and planning, noted above, would be addressed, and issues directly related to Project

financing and cost allocation would be reviewed under the Project financing review sections.

- Cost allocation will be reviewed/estimated for the District level, and expressed in \$/acre-ft. and \$/1,000 gallons delivered, to the extent that data/consultations from the Districts' allows; where appropriate, use of the Districts' cost distribution formulas will be applied.
- The Project area for operation impacts includes: the St. George to Cedar City corridor, and the service areas of the Washington, Central Iron, and Kane Counties' Water Conservancy Districts), and the Kaibab Indian Reservation and communities in northern Coconino and Mohave counties in Arizona along the pipeline corridor.
- Operational changes include any direct population, labor force, or services/utilities/energy needs associated with project operations.
- Operational changes affect the Project's impact of providing new water supplies to the local and state economies. This means interpreting the regional economic impacts associated with providing new water supplies, including accommodating new population growth, changes to income and employment, and the likely changes to the composition of the regional economic sectors.

### ***10.4.3 Issues and Data Needs***

The key issues related to the study plan are closely related to the goals and objectives described above. The water resource economics and socioeconomics impact analyses will review several key issues surrounding the Project, Project alternative(s), and no action alternative (and baseline conditions, with and without the Project).

#### **Water Resource Economics:**

- Application of NED and RED economic analyses to the Project area: 1) how should the NED accounts be structured; 2) what is an appropriate role or purpose for direct net (NED) economic values within state level analyses; and 3) how should regional economic impact (RED) assessments be applied, and how should benefits and costs be interpreted for state/local-funded projects.
  - Direct application of NED analyses for federal agency components of the Project (and alternatives) vs. state and district perspective.
- Costs of meeting new water resource needs for the Project area, including conservation and Project alternative costs—assembling the water supply curves; adequately addressing state/local community alternatives for meeting new water resource supplies.
- Availability and costs of new electric power supplies directly related to Project operations; and power supply forecasts for the region under different growth scenarios—integration with NED analyses.
- Following consistently the overall water resources study definitions for Project, Project Alternative(s), No-Action Alternative, and Baseline Conditions (with and without Project).

### Population, Regional Economic, and Fiscal Impacts:

- Ensuring adequate review of forecasts for regional population and economic growth in southwest Utah and the specific project area (St. George to Cedar City corridor, service areas of the Washington, Central Iron, and Kane Counties' Water Conservancy Districts).
  - Population and economic growth forecasts will be reviewed to account explicitly for inter-related technical assumptions and factors affecting growth, such as the dependence of local net immigration on economic forecast components.
    - An explicit review of the key economic assumptions/variable used in the forecasts will be made.
  - Growth is generally assumed to have no infrastructure constraints nor is it tied to any single infrastructure improvement (i.e. a new highway, power supply, sewer treatment plant, or specific water supply).
  - Future build-out constraints will be identified relative to the water needs assessment review.
- Regional economic impacts (income, employment, services, housing-utilities) from water resources development to meet municipal-residential water demands.
- Cost allocations among existing and new water users; including the likely impacts of user costs under different development timing phases—who pays and when.
  - Allocating Project costs to each District.
- Local construction impacts; direct and secondary regional economic impacts.
- Potential fiscal impacts on the State of Utah for funding (bonding) the Project; changes to costs of capital for the state or affect on capital allocation to other major state infrastructure projects.
- Fiscal impacts within each Water Conservancy District.
- Likely socioeconomic impacts for the Kaibab Indian Reservation (prepared with input from the cultural resources study); specific economic impacts on the Kaibab Band of Paiute Indians related to project construction and operations. Perspectives toward the Project—economic development opportunities or potential cultural impacts.
- An accounting of the State's Colorado River water rights allocated to the Project; any potential water right impairment issues.

The data required to complete the water resources economics and socioeconomics analyses can be readily acquired from the following identified and existing sources:

### Water Resource Economics:

- Internal Project team cost data (water supply assessment technical information and plans).

- West-wide data on water development costs and supply curves.
- State agency and Conservancy District water use data and forecasts.
- Federal agency data and information on power costs and associated hydropower impact costs.
- Other water resources data and industry/academic publications.

Population, Regional Economic, and Fiscal Impacts:

- Census, state, and regional population, services, employment, and income data; historical and forecast data/information.
- State and regional impact data and multipliers from the IMPLAN model data analyses.
- Capital Facilities Plans for Washington County Water Conservancy District, Kane County Water Conservancy District, and Central Iron County Water Conservancy District, and service area municipalities.
- Planning documents from local jurisdictions or planning groups that include independent population/economic forecasts, separate from existing state agency or District forecasts.
- Utah State Governor's Office of Planning and Budget (and related state agencies for population and economic activity data); and the Division of Water Resources, as well as USBR data.
- U. S. Census Bureau and Bureau of Economic Analysis agencies (and related federal agencies with socioeconomic data).
- Water Conservancy District compiled data.
- University published reports and data sources, and journal articles.
- Planning information provided from local sources will be reviewed, such as city and county plans, reports and information.

## **10.5 Nexus to Project (§5.11(d)(4))**

The Project is being reviewed per the water resources development needs of the state and local water conservancy districts. It is being considered as well within larger water resources needs for the West, per the Colorado River system. The area is anticipated to receive additional population/economic growth, with or without the pipeline project. The question becomes one of efficient allocation (economic dispatch) of existing water resources for southwest Utah and the West.

The Project is one of several projects and water resources management actions under review to provide future water supplies to southwest Utah, as continued population growth in these areas is anticipated.

The Project would be used to support population and economic stability and growth in southwest Utah and the West, in balance with other future water resources development. There will be additional growth



throughout the West and the Pacific Coast areas.

## **10.6 Proposed Study Methodology (§5.11(d)(5))**

### ***10.6.1 Introduction and Overall Approach***

Impacts related to water resource economics and socioeconomics for the Project will be analyzed by relying on conventional methods used within feasibility studies, environmental assessments, and environmental impact statements. This will primarily include analysis techniques that are commonly used for National Economic Development (NED) assessments, Regional Economic Development (RED) assessments, and some review features contained in Social Impact Assessment (SIA) and demographic analyses.

Also, methods pertaining to evaluation of water resources economics and socioeconomics that may affect preliminary engineering analysis and preliminary design are identified in this section.

Specific methodologies will feature:

#### Water Resource Economics:

- Defining key economic review criteria (Project fiscal life, discount rates, etc.) using the Principles and Guidelines and agency consultations.
- Reviewing existing marginal cost data for West-wide water resources projects, including conservation costs.
- Developing supply curves based on quantity (Qa) supply and marginal costs.
- Preparing a cost-effectiveness analyses, with supply curve frontiers and quadrant analysis features.
- Preparing benefit/cost analysis structure(s), consistent with NED accounts.
- Preparing Project cost allocations for the Districts—construction and operational costs.

#### Population, Regional Economic, and Fiscal Impacts:

- Population forecast comparison and contrasts; incremental (AARG) rates of growth over select time period, composition comparisons for mortality, birth, and net in-migration rates.
- Population forecast decomposition analysis—disaggregating key variables such as net in-migration.
- Evaluating population forecast variables with economic activity forecasts; changing economic sector growth rates over time.
- Evaluating direct and indirect income/employment growth associated with project development and operation using input-output model multipliers (IMPLAN, state of Utah Economic Model, and BEA regional multipliers).

- Preparing RED accounts for allocating Project benefits and costs at the state-local level.
- Defining new services needs directly related to Project development/construction.

#### **10.6.1 Task 1 - Review of Existing Water Resource Economics and Socioeconomic Impacts Literature**

A detailed review will be performed of existing water resource economics and socioeconomics data and information relevant to the Project that are available in current published reports, studies, and literature. The literature review will include information from established agency sources such as the State of Utah, State of Arizona, Bureau of Reclamation, Water Conservation Districts, U.S. Census Bureau, Tribal agency, Sonoran Institute, and other undetermined sources.

Previous preliminary investigation work performed by engineering and scientific consultants and organizations will be obtained and reviewed for relevant socioeconomic and water resources economic data and information.

Additionally, forecasts and planning information provided from local sources will be reviewed, such as city and county plans, reports and information.

#### **10.6.1.2 Task 2 - Field Investigations**

Significant field investigations will not be required. A field reconnaissance will be performed of the communities where the water would be used and of the alternative alignments to collect data and information for establishing baseline conditions.

Some direct consultations will be conducted with agency staff involved in the development of the above cited population and economic forecast data, and other relevant water resources planning/development materials.

#### **10.6.1.3 Task 3 - Data Analyses**

Data collected from the literature review will be compiled and evaluated by the Project team. Data evaluations will focus on satisfying the goals and objectives previously identified.

Water resource economics and socioeconomic baseline conditions will be defined as:

- Projected (initial 2015) long-term population, employment, and regional income conditions for the project area, consistent with the project development and implementation period; use of multiple forecasts and estimates from agency/university sources.
- Projected (initial 2015) long-term water demand and supply conditions and costs.
- Baseline conditions will assume that identified projects for new water supply in current Capital Improvement Plans are being actively pursued, including conservation and water right transfers already identified by the Water Conservancy Districts.

Impacts on water resource economics and socioeconomics will be analyzed for each of the alternative alignments and the no action alternative. These impacts will be measured by:

#### Water Resource Economics:

- Reviewing the estimated costs of the Project water supply for the Project area.

#### Population, Regional Economic, and Fiscal Impacts:

- Taking into account population and economic growth under the no action alternative, where all potential projects under the water resources supply curve are implemented.
- Potential changes in population, economic activity (employment, income, and economic sector changes), and service and infrastructure needs related to direct Project construction and operations
- Forecast changes to local and southwestern Utah and northwestern Arizona population and economic activity, assuming that potential demand or a portion thereof is met by the Project water supply.

The water resources and socioeconomics cumulative impacts analysis will address the combined impacts of the Project and any past or future proposed or planned (water supply) actions that have or are likely to affect the study area.

Impacts on economics of water resource supply systems and socioeconomics resources are considered significant if construction, operation or maintenance activities would result in any of the following conditions, thus likely inducing the need for additional local services, infrastructure, or mitigation requirements.

#### Water Resource Economics:

- A significant impact would be an acquisition of increasing marginal cost water resources for the Districts.
- A significant impact would be an increase to the capital/operation costs of new water resources delivery greater than 10 percent of the existing water supply delivery costs, to existing residents and municipal water users (District costs); or an increase cost of new water supply delivery that exceeded other new water supply delivery costs within the state by 10 percent, for new residences and municipal water users.
  - Dollar impacts will be expressed in terms of \$/1,000 gallons delivered (to the district), as well as in \$/acre-ft.

#### Population, Regional Economic, and Fiscal Impacts:

- A significant impact would be a 10 percent long-term (permanent) increase to local communities or the southwestern Utah and northwestern Arizona area from population and economic growth facilitated by access to new water supplies in Utah, and other infrastructure and service needs assumed to be made available under population and economic activity forecasts. The 10 percent impact level suggests that some community infrastructure, services, and utilities would need to be expanded or require some capital improvements.

- A significant impact would be a 10 percent near-term (population) increase to local communities from construction or operation workforce activities. The 10 percent impact level suggests that community infrastructure, services, and utilities would need to be expanded or require some capital improvements.
- A significant change would be a 10 percent near-term increase to the regional and south-state employment base, and associated income impacts, related to construction or operation workforce activities. The 10 percent impact level suggests that community infrastructure, services, and utilities would need to be expanded or require some capital improvements.
- A significant change would be a 10 percent near-term increase to local/regional services/utilities/energy demand directly related to the Project, reflecting capital improvement needs.

The analysis of impacts on water resource economics and socioeconomic resources will be based on the standard operating procedures and measures to avoid or reduce impacts, both of which will be included in the project description chapter of the Project documents. The significance criteria for impacts will then be applied to determine if any impact would be significant. Mitigation measures would then be developed to offset negative significant impacts. The mitigation measures will be based on applicable state and Federal statutes and regulations, past experience and best professional judgment to either satisfy a legal requirement or to satisfy the public interest requirement. In some cases significant impacts may not be able to be mitigated, or the impacts may be determined to be positive in nature. All reasonably foreseeable mitigation options will be evaluated by the Federal Energy Regulatory Commission, Bureau of Land Management, and other responsible federal agencies and factored into the respective decision documents.

#### **10.6.1.4 Task 4 – Report Preparation**

A technical memorandum will be prepared to document the literature review, field investigations, and data analyses. It will present project goals and objectives and describe the study area, document the literature review, and note general and specific conditions that pertain to water resources economics and socioeconomic conditions in the study area. Results will be discussed with a focus on the study objectives. The technical memorandum will include mitigation measures to reduce significant impacts on socioeconomic and water resources economics resulting from the Project. The conclusions may include recommendations that could affect Project design.

The technical memorandum will be prepared in a format similar to an EIS presentation format.

### **10.7 Schedule and Level of Effort (§5.11(d)(6))**

The research into impacts on socioeconomic and water resource economics from the Project will require professionals with appropriate experience to conduct the literature research and data analyses identified above. Total study costs are estimated to not exceed \$150,000

An approximate schedule for performing the study is shown in Table 10-1. The study can be completed within a one-year period.

**Table 10-1**  
**Socioeconomics and Water Resource Economics Proposed Study Schedule**

<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review of Socioeconomic and Water Resource Economics Literature	Ongoing	February 2009	12
2	Field Investigations/Agency Consultations	February 2009	April 2009	10-20
3	Data Evaluation	May 2009	November 2009	80-110
4	Final Report Preparation	December 2009	February 2010	45

### **10.8 Progress Reporting (§5.11(b)(3))**

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009, August 2009 and November 2009. The final report will be submitted in February 2010.

### **10.9 Dependencies on Other Resource Analyses**

The water resources/socioeconomics analysis would be primarily dependent on the analyses results of the following resource discipline studies:

- Land Use Plans and Conflicts
- Water Supply and Climate Change

### **10.10 References**

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## **Study Plan 11: Special Status Aquatic Resource Species and Habitats**

### **11.1 Introduction**

This study plan documents the methods for determining impacts on special status aquatic species and habitats resulting from the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Document 1, and it addresses comments received during the development of this study plan. Special status fish and other aquatic species include federally listed threatened and endangered species, proposed or candidate species and species of concern, state protected species or species of concern, Bureau of Land Management (BLM) special status species and other species designated by the U.S. Fish and Wildlife Service (USFWS), tribal governments, or state or federal agencies. This study plan presents an approach for advancing knowledge and understanding of special status aquatic species and habitat as they pertain to the Project's south alignment, existing highway alignment alternative, and the no action alternative. This study plan also addresses study requests made by FERC, other federal, state and tribal agencies, and the public in their comments on the PAD and Scoping Documents 1 and 2.

The study plan for Federally listed invertebrate and fish species and habitat assessments are described in this section.

### **11.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

The goal of this study plan is to develop additional salient information to supplement the current information necessary to address the potential effects of Project construction, operation and maintenance activities on special status aquatic species and their habitat. The specific information to be obtained is the type, abundance, and general distribution of special status aquatic species within the Project area, required to assess the potential effect of the Project on these species. The information will be used to determine how potential effects can be avoided, minimized, or mitigated. All habitat assessments and study plans would include sufficient detail to support the completion of an Endangered Species Act (ESA) Section 7 Biological Assessment (as required) of the subject species, including potential conservation and mitigation measures necessary to prevent adverse effects. A plan will be prepared as part of the study to address conservation and mitigation measures and concepts, standard construction procedures, standard operating procedures, and best management practices that will be used during project construction and operation to protect and conserve listed aquatic species. All of the construction elements, project facilities and ancillary resources included in the project will be identified and the direct and indirect effects on aquatic species of special concern will be analyzed and documented.

### **11.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. Specific management objectives for the aquatic resources of the two major drainages (Virgin and Paria River) are

found in the Virgin River Management Plan (6/1999) and the Paria River Management Directives (various).

The objective of the agencies, with regard to special status species, is to protect populations and habitats to preclude Federal listing, recover listed populations and avoid, minimize or mitigate and adverse impacts and promote activities that have a positive effect on listed species or species of concern. This would include current and proposed management plans and future adaptive conservation and management proposal.

## **11.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

### ***11.4.1 Background Description***

Significant special status aquatic species and habitat resources within the Project vicinity are generally known; however, site-specific information along the Project alternative alignments is currently undefined.

### ***11.4.2 Study Area Definition***

The study area would include the entire length of the Project alternative alignments; particular attention will be required for the following:

- Environmentally sensitive areas
- Sensitive wetland and riparian habitats
- Sensitive aquatic habitats
- Reservoirs, rivers, streams and other waterways and surrounding areas
- Virgin River from confluence with Quail Creek Diversion Dam to Washington Fields Diversion with a focus on the critical habitat identified in the Virgin River Resource Management and Recovery Plan

### ***11.4.3 Issues and Data Needs***

FERC, in consultation with other federal, state, tribal, and local entities, must decide whether to issue a license to the Utah Board of Water Resources for the Project. Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a Project is located, and what conditions should be placed on any license that may be issued. In making its license decision, the Commission must equally consider the environmental, recreational, fish and wildlife, and other non-developmental values of the Project, as well as power and developmental values. Any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.

Special status species are of particular interest because of their rarity and/or ecological functions. Ensuring that environmental measures pertaining to these resources are considered in a reasoned way is relevant to the Commission's public interest determination. Additionally, this information may be needed to ensure compliance with the ESA.

The Bureau of Land Management, Bureau of Reclamation and National Park Service (the cooperating agencies) also must comply with the ESA, and these agencies will work closely with FERC and the Fish and Wildlife Service to prepare the Biological Assessment and Evaluation for the Project based upon the information developed through this Plan of Study.

Table 11-1 summarizes the special status aquatic species listed by the USFWS under the ESA that are potentially affected by the Project pipeline or transmission line alignments. Listed species background information, including habitat, distribution, Recovery Actions and habitat assessment are considered separately below for each species. Please note that the species accounts and distribution information is for information to help define the need for further investigation into the biology of these (and potentially other) species. The proposed study will delve into the characteristics and specifics of species of concern that may potentially be impacted by the project. The Study Plan may well need to be adapted or amended as more information is developed.

<b>Table 11-1</b> <b>Federally Listed Special Status Aquatic Species by State</b>			
<b>Common Name</b>	<b>Scientific Name</b>	<b>Listing Status<sup>1</sup></b>	<b>State</b>
Woundfin Minnow	<i>Plagopterus argentissimus</i>	E	Utah, Arizona, Nevada
Virgin River Chub	<i>Gila seminuda</i>	E	Utah, Arizona, Nevada
Razorback Sucker	<i>Xyrauchen texanus</i>	E	Utah, Arizona
Flannelmouth Sucker	<i>Catostomus latipinnis</i>	S	Utah, Arizona
Bluehead Sucker	<i>Catostomus discobolus</i>	S	Utah, Arizona
Speckled Dace	<i>Rhinichthys osculus</i>	S	Arizona
Arizona Toad*	<i>Bufo microscopis</i>	S	Arizona, Utah
Virgin Spinedace	<i>Lepidomeda mollispinis mollispinis</i>	S	Utah
Desert Sucker	<i>Catostomus clarkii</i>	S	Utah, Arizona
Humpback Chub	<i>Gila cypha</i>	E	Utah, Arizona
Colorado Pikeminnow	<i>Ptychocheilus lucius</i>	E	Utah, Arizona, Nevada
<b>Notes:</b> <sup>1</sup> E = Endangered S = Sensitive *See Wildlife			

#### 11.4.3.1 Woundfin Minnow

The Woundfin minnow (*Plagopterus argentissimus*) is federally listed as endangered and is a small, silver minnow that inhabits shallow runs and riffles. The historic distribution of the species is from Pah Tempe Hot Springs, near La Verkin, UT, downstream to Lake Mead; however, in recent years the only self-sustaining wild population was in Utah between Pah Tempe Hot Springs and Washington Fields Diversion. Acute and chronic issues in this reach have resulted in the need to implement intensive management in this reach, including stocking large numbers of hatchery-reared woundfin to avoid the

extinction of the species. Critical habitat for the species is the Virgin River from its confluence with La Verkin Creek downstream to Halfway Wash in Nevada. Recovery efforts for the Woundfin minnow are addressed through the Virgin River Resource Management and Recovery Program, which was established in 2002 to implement actions to recover, conserve, enhance and protect native species in the Virgin River Basin and to enhance the ability to provide adequate water supplies for sustaining human needs (Utah Department of Natural Resources, 2002). The Recovery Actions include: describe baseline conditions, provide and protect instream flows, protect and enhance habitat, protect and enhance native species communities, maintain genetically appropriate brood stocks, determine ecological factors limiting abundance of native species, monitor habitat conditions and populations, and improve education and communication on resource issues (UDNR 2002).

#### **11.4.3.2 Virgin River Chub**

The Virgin River chub (*Gila seminuda*) is federally listed as endangered and is a silvery, medium-sized minnow that averages 12 inches in length. The chub is endemic to the Virgin River in southwest Utah, northwest Arizona and southeast Nevada (UDWR 2005). Virgin River chub prefer deep, protected areas of swift water. The Virgin River Resource Management and Recovery Program was established in 2002 to implement actions to recover, conserve, enhance and protect native species, including the Virgin River chub, in the Virgin River Basin and to enhance the ability to provide adequate water supplies for sustaining human needs (Utah Department of Natural Resources, 2002). The Recovery Action Plan includes objectives including: describe baseline conditions, provide and protect instream flows, protect and enhance habitat, protect and enhance native species communities, maintain genetically appropriate brood stocks, determine ecological factors limiting abundance of native species, monitor habitat conditions and populations, and improve education and communication on resource issues (UDNR, 2002).

#### **11.4.3.3 Razorback Sucker**

The Razorback sucker (*Xyrauchen texanus*) is one of the largest suckers in North America and was federally listed as endangered in 1991. It has been protected in the State of Utah since 1973. Small numbers of Razorback sucker have been found in Lake Powell, typically at the mouths of the Colorado, Dirty Devil, and San Juan Rivers. In the upper Colorado River Basin, Razorback sucker typically spawn between mid-April and mid-June and reportedly migrate long distances to spawn and congregate in relatively large aggregations for spawning activity. Habitats required by adults in rivers include deep runs, eddies, backwaters, and flooded off-channel or wetland environments. Razorback sucker young require nursery environments with quiet, warm, shallow water such as tributary mouths or backwaters. Threats to the species include streamflow alterations, habitat modification, predation by nonnative fish, and chemical pollutants (USFWS 2002b).

#### **11.4.3.4 Paria River Sensitive Fish Species**

The Paria River provides habitat for the Flannelmouth sucker (*Catostomus latipinnis*) and Bluehead sucker, (*Catostomus discobolus*), which are listed in Utah and Arizona as sensitive. The Bluehead sucker feeds on bottom of stream substrate and algae and typically inhabits large rivers and mountain streams in variable turbidity and temperature. The Flannelmouth sucker is also a bottom feeder, consuming algae, other fragmented vegetation, seeds and invertebrates. Flannelmouth sucker live within moderate to large rivers and are typically threatened by nonnative species, hybridization, habitat alteration and blockage of migration routes. Speckled dace (*Rhinichthys osculus reliquus*) is listed only in Arizona as a state sensitive species and inhabits the lower Paria River in Arizona. The Speckled dace is a minnow common in many western waters. It is a bottom-dwelling species and is an important forage fish.

#### 11.4.3.5 Desert Sucker

The desert sucker, *Catostomus clarkii*, is a freshwater species of fish in the sucker family that resides in the Great Basin and the Colorado River basin.

The desert sucker occurs in the lower Colorado River basin, below the Grand Canyon, particularly in the Gila River, and in streams in the Virgin River basin, the White River basin and others. Their total range area is estimated at 128,000 km<sup>2</sup> (49,000 sq mi).

Desert sucker prefer riffles, rapids and flowing streams with gravelly bottoms. Desert sucker are benthic (bottom dwelling) fish that primarily eat algae, although insects and other invertebrates are also occasionally consumed. Members of the species almost always occur in streams, where spawning occurs in riffles during the winter and spring.

In Utah, the species occurs only in the Virgin River system in the southwestern corner of the state. In addition to its limited distribution, primary threats to the species in Utah include dewatering of the Virgin River (UDWR 2005) system for development and agriculture, pollution, and the introduction of exotic turtles and fishes (which can impact the desert sucker through predation and/or competition).

#### 11.4.3.6 Flannelmouth Sucker

The flannelmouth sucker, *Catostomus latipinnis*, are endemic to the Colorado River Basin. Within the general study area there are populations in western Colorado and south-central Wyoming, but few of these populations are located on government lands. The flannelmouth sucker and the bluehead sucker are both protected under the Conservation Agreement (UDWR 2006).

The primary threats to the flannelmouth sucker are generally human-induced activities that divert water and change the flow regime in both tributary and mainstem streams. Specific threats include (a) construction of passage barriers (e.g., diversion dams and reservoirs) that disconnect habitats and cause habitat fragmentation and (b) introduction of non-native species that are both predators on and competitors with the flannelmouth sucker. Other threats include modification of streambeds through channelization, landscape changes resulting from land use, and local degradation of riparian zones that reduces the natural functions of the stream ecosystem (UDWR 2005).

#### 11.4.3.7 Virgin Spinedace

The Virgin spinedace, *Lepidomeda mollispinus*, is a cyprinid fish endemic to the Virgin River, a tributary of the Colorado River in the United States.

Habitat is clear water about 1 meter (3 ft) deep, preferably close to cover, such as overhanging shrubs or banks, near vegetation, and over sand or gravel. They prefer slow water in areas that do not experience heavy flooding. They can tolerate water temperatures of 85 degrees F or higher, a useful adaptation in the summer when the river becomes intermittent and the fish must crowd into isolated pools.

Populations are known at various locations in the Virgin River system, including the North Fork and East Fork of the Virgin River in Zion National Park, the Santa Clara River, Beaver Dam Creek, Ash Creek, and so forth. Although the species has a very restricted range, most of the critical habitat has been protected under a conservation agreement, and it is not currently listed as endangered, but is protected under the Conservation Agreement (UDWR 2006).

#### **11.4.3.7 Tribal Resources**

Special status species lists maintained by tribes within the Project Impact Area will be evaluated and documented.

### **11.5 Nexus to Project (§5.11(d)(4))**

All of the endangered or sensitive fish species could be affected by the introduction of Colorado River water into the Project area and/or the construction of the Project pipeline. While the risk of a direct impact as a result of the water diversion or construction is slight, the potential impact as a result of the inadvertent introduction of an invasive species is higher.

### **11.6 Proposed Study Methodology (§5.11(d)(5))**

#### ***11.6.1 Introduction and Overall Approach***

This study will address aquatic species of special concern to determine types, numbers, location, distribution and status using existing information collected from various sources. No detailed field surveys, data collection, or sampling are proposed because sufficient information is available to develop a thorough understanding of the characteristics of the area and what effects and impacts the Project would have on special status aquatic species and habitats. The same approach is to be taken with the investigation and evaluation of the Project in relationship to the species of special concern.

#### ***11.6.2 Study Methods***

The study methods pertaining to analysis of special status aquatic resource species and habitats are described in following subsections.

##### **11.6.2.1 Task 1 - Review of Existing Special Status Aquatic Species and Habitat Literature**

A detailed and intensive data compilation and review effort will be performed. The compiled information will be used to evaluate the proposed Project and alternatives with regard to status risk for these species. It is anticipated that much of the information regarding the species of special concern will come from coordination with agency personnel who specialize in threatened and endangered species and from agency files. Access to the key biologists and their files will be critical in completing the assessment of existing conditions and potential impacts.

##### **11.6.2.2 Task 2 - Field Investigations**

No field investigations are proposed at this time.

##### **11.6.2.3 Task 3 - Data Analyses**

The Project is not expected to negatively affect these special status species as a result of constructing facilities or the actual transfer of water under the proposed Project operating scenario. The potential for adverse effects will be evaluated further as part of the study. The Project has the potential to aide in management and recovery of some of the Virgin River species through release of Virgin River water presently diverted into the Hurricane pressure irrigation system in exchange for LPP water to operate the Hurricane pressure irrigation system. The issue of potentially introducing invasive species will involve

addressing their potential for affecting aquatic indigenous (current) species of special concern as a specific part of this study.

The study will require the analysis of proposed biota transfer control methods and the reliability and effectiveness of those methods. The effects of potentially introducing an invasive species on special status aquatic resources will require careful analysis. That analysis may indicate that a higher level of management and control are warranted to provide enhanced species conservation measures and/or significant project-related mitigation measures to be developed during the study.

Information will be developed to specifically evaluate the effects of the proposed project on 1) survival and recovery of listed species, 2) Virgin River critical habitat and potential effects on the species; and 3) effects and possible mitigation for special status fish and other aquatic species. Methodologies will be developed in concert with resource management agencies to prepare a comprehensive and documented analysis of all significant effects and necessary mitigative actions.

#### **11.6.2.4 Task 4 – Report Preparation**

A technical report will be prepared to: 1) identify the status of the species of special concern, 2) address the current and reasonably foreseeable future condition(s) of those species under non-project conditions, 3) evaluate the effect of the Project and alternative alignments on the status and viability of those species, and 4) provide an analysis of conservation measures to ameliorate Project effects and protect or enhance those identified at-risk species. Variances from the study plan will be summarized and documented in the final study report. A conservation measures and mitigation plan will be prepared as part of the technical report to identify conservation measures for avoiding adverse effects on special status aquatic species. Appropriate documentation and analysis for each special status aquatic species will be prepared for incorporation into a Biological Assessment and Evaluation as part of informal consultation with the USFWS.

### **11.7 Schedule and Level of Effort (§5.11(d)(6))**

The research into special status aquatic resource species and habitat impacts resulting from the Project will require professionals with appropriate experience to conduct the data analyses identified above. Total study costs are estimated to be approximately \$45,000.

An approximate schedule for performance of the study is shown in Table 11-2. The study can be completed within a one-year period.



**Table 11-2**  
**Special Status Aquatic Resource Species and Habitats Proposed Study Schedule**

<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date (Draft to Agency)</b>	<b>Duration (Days)</b>
1	Review of Special Status Aquatic Species and Habitats Literature	Ongoing	February 2009	-
2	Field Investigations*	-	-	-
3	Data Evaluation	March 2009	May 2009	60
4	Final Report Preparation	June 2009	August 2009	60
5	Biological Assessment (BA)	June 2009	September 2009	90
*Detailed field inventories or field studies are not anticipated.				

### **11.8 Progress Reporting (§5.11(b)(3))**

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009. The final report will be submitted in August 2009.

### **11.9 Dependencies on Other Resource Analyses**

The special status aquatic species analysis may be primarily dependent on the analyses results of the following resource studies:

- Surface Water Hydrology
- Surface Water Quality
- Wetlands and Riparian Resources
- Aquatic Resources

### **11.10 References Cited**

Holden, P.J., M.E. Golden, and P.J. Zucker. 2001. An Evaluation of Changes in Woundfin (*Plagopterus argentissimus*) Populations in the Virgin River, Utah, Arizona, and Nevada, 1976-1999. PR-735-1. Prepared for the U.S. Fish and Wildlife Service.

United States Fish and Wildlife Service (USFWS). 1990. Biological Opinion for the Arizona Strip Resource Management Plan. U.S. Fish and Wildlife Service, Phoenix, AZ, 10pp.

\_\_\_\_\_. 2002b. Razorback sucker (*Xyrauchen texanus*) Recovery Goals: amendment and supplement to the Razorback Sucker Recovery Plan. U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, CO

\_\_\_\_\_. 2009. Humpback Chub Recovery Plan (in progress).

Utah Division of Wildlife Resources. (2002 Revised) Virgin Spinedace.

\_\_\_\_\_. 2005. Biotics Database

- \_\_\_\_\_. 2005. Distribution and Abundance of Fish in the Virgin River Between the Washington Fields Diversion and Pah Tempe, Utah, 2005. Final Report. December 2005.
- \_\_\_\_\_. 2006. Virgin River Basin, 2004 – 2005 Temperature and Flow Monitoring. Final Report. June 2006. Publication No. 06-09.
- \_\_\_\_\_. 2008. Virgin River Fishes Population Response Stations 2007. Final Report. February 2008. Publication No. 08-09.

## **Study Plan 12: Special Status Plant Species and Noxious Weed Assessment Study Plan**

### **12.1 Introduction**

This study plan documents the methods for field surveys to identify special status plant species and noxious weeds, and for analyzing impacts on special status vegetation species for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. This plan addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as draft study plan review comments received during study plan meetings and filed with FERC. This study plan presents an approach for advancing knowledge and understanding of special status plant species and noxious weeds as they pertain to the project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan addresses study requests made by FERC; other federal, state, and tribal agencies; and the public.

The proposed project would consist of constructing and operating a water conveyance system that includes approximately 186 miles of buried pipeline, water intake facilities at Lake Powell, buried and surface water storage reservoirs, irrigation system turnout, in-line hydro stations, hydro-electric generation facilities, and transmission lines on federal, state, private and possibly tribal lands in Kane, Washington, and Iron counties in Utah; and Coconino and Mohave counties in Arizona. The alternative alignments under consideration include the existing highway alignment that would cross the Kaibab Indian Reservation along Arizona Highway 389 and the south alignment bypassing the Reservation to the south.

The Utah-Arizona borderland region includes a variety of soil types and biogeographic patterns that have resulted in the presence of many unique plant species that are limited in their distribution, including several that have been listed under the Endangered Species Act (ESA) or have otherwise received special management status from state or federal land and resource management agencies. In addition, the presence of invasive and noxious plant species has been increasing throughout the region, resulting in deleterious impacts on natural ecological systems. Documenting the occurrence of special status plant species and invasive weeds within the proposed pipeline corridor and transmission line corridors is necessary for the analysis and quantification of project-related impacts. Conducting surveys for special status plant species within the proposed project area was proposed by the Utah Board of Water Resources in the Pre-Application Document (PAD) submitted to FERC on March 4, 2008. Agency comments received from the Arizona Game and Fish Department (AGFD), the National Park Service (NPS), Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), and the Kaibab Band of Paiute Indians in response to Scoping Document 1, released by FERC on May 5, 2008, included related issues that will be addressed in this study.

### **12.2 Study Description and Objectives (§5.11(d)(1))**

This special status plant study will investigate the occurrence of special status species at locations where they could be affected by project construction, operation, and maintenance activities. Impacts on special status plants caused by indirect or secondary effects from urban development in the St. George metropolitan area will be based on existing data and assessed on the extent that such development is

related to growth made possible by the proposed project. Special-status plant species include federally listed threatened and endangered species, proposed species, and candidate species under the ESA; BLM sensitive species; NPS species of concern; state protected species; Natural Heritage Program watch-list species; and tribal designated species of concern. The extensive number of species considered as plants of cultural concern by the Kaibab Band of Paiute Indians will be reconsidered by the Tribe to include only those species of particular importance and interest to the Tribe that are not ubiquitous or abundant. Other plant species of cultural interest may be addressed as part of the vegetation community mapping study or other means as determined in coordination with the Tribe. Plant surveys will provide baseline information about existing conditions as well as detailed distribution and abundance information on each special status plant species within the proposed project corridor to be used in impact analyses and identification of potential protection and conservation measures, and to coordinate management activities with various land and resource management agencies. A plan will be prepared as part of the study to address conservation measures and concepts, standard construction procedures, standard operating procedures, and best management practices that will be used during project construction and operation to protect and conserve listed plant species.

A noxious weed is any plant designated by a federal, state, or county government as injurious to public health, agriculture, recreation, wildlife, or property. The noxious weed and invasive non-native plant study is intended to collect information about weed type, abundance, and general distribution, as well as to evaluate factors that lead to weed invasion, persistence, and spread. The results of field surveys will be used as the basis for developing a weed management plan for the project. The study results will also be used to identify whether project operation affects weed occurrence on NPS, BLM, or Kaibab Band of Paiute Indian lands, and if so, to coordinate management activities with those entities.

The information generated about special status species and noxious weeds will contribute to a greater understanding of the overall environmental values of the project, which is relevant to FERC's public interest determination.

### **12.3 Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. The proposed project would be constructed on or adjacent to lands managed by various federal, state, and tribal agencies. Each agency generally has specific goals related to special status species protection, noxious weed control, and land use related to vegetation communities/habitat management that are identified in their land and resource management plans. These goals will be incorporated into the special status plant species and noxious weed/invasive species surveys study. This study will provide an analytical tool to address land and resource management agency goals and project-related concerns, and will include ongoing consultation with each agency to assure applicability to and consistency with existing land and resource management plans.

Comments received from land and resource management agencies which, in part, may be addressed through plant surveys are as follows:

- The BLM states that all potential pipeline routes should be surveyed for special status species and all potential impacts identified
- The AGFD states that impacts from traffic and increased access as a consequence of maintenance roads and failed reclamation of temporary roads should be considered as they pertain to the

spread of invasive weeds. As such, the effects should be addressed by a monitoring plan for the spread and treatment of weeds on a regular basis.

- The NPS will require an Invasive Species Control Plan for their approval. The NPS has great concern about possible spread of invasive species along the proposed project corridor and would like a meeting of all affected land managing agencies as well as any private land owners to be held to develop corridor-wide mitigation measures.
- All construction work within the Arizona Department of Transportation rights-of-way will need to adhere to the Arizona Department of Agriculture's Protected Plant Species Program (i.e., compliance with the Arizona Native Plant Law), which includes specific treatment requirements for protected native plants
- USFWS has provided a series of best management practices (BMPs) that could help reduce potential adverse effects to listed, candidate, and sensitive plant species. These practices should be incorporated into design as coordination with USFWS Field Offices. USFWS states that the presence of noxious and invasive plant species in the construction areas should be investigated and the potential for spread should be considered. Control measures should also be considered. USFWS states that the project team should work with USFWS field offices to develop and implement protective measures for listed plants. Federal and state agencies should be consulted.
- USFWS develops and implements recovery plans for ESA-listed species. These documents provide species-specific guidance on impact assessment and management direction for ESA-listed plants in the project area. The USFWS agency goal is the implementation of these plans.
- The Kaibab Band of Paiute Indians states that the list of plants of cultural concern to the Tribe should be included in the description and characterization of the existing environment and in the analysis of impacts to the plants. The Kaibab Tribe has indicated that the Tribe should be relied upon as a source of information and should be consulted, and that their lands be included in the scope of analysis.
- A concern voiced at one of the public scoping meetings by an individual who is a professional botanist was that although there may be little direct impact on an endangered species, the overall impact on the natural landscape may affect several species such as the Holmgren milkvetch, dwarf bear poppy, and impact many other threatened species.

## 12.4 Existing Information and Additional Information Needs (§5.11(d)(3))

Federal and state land and resource management agencies maintain lists of special status plant species. In compliance with federal and state regulations and policies, these species are to be considered in management decisions.

The USFWS lists the following plant species in the counties that may be affected by the proposed project pipeline:

- Iron County, Utah: none
- Kane County, Utah: Jones cycladenia (*Cycladenia jonesii*) (threatened), Kodachrome bladderpod (*Lesquerella tumulosa*) (endangered), Navajo sedge (*Carex specuicola*) (threatened), Siler

pincushion cactus (*Pediocactus sileri*) (threatened), and Welsh's milkweed (*Asclepias welshii*) (threatened).

- Washington County, Utah: Dwarf bear poppy (*Arctomecon humilis*) (endangered), Shivwitz milk-vetch (*Astragalus ampullarioides*) (endangered), Siler pincushion cactus (*Pediocactus sileri*) (threatened), and Holmgren milk-vetch (*Astragalus holmgreniorum*) (endangered).
- Coconino County, Arizona: Brady pincushion cactus (*Pediocactus bradyi*) (endangered), Fickeisen plains cactus (*Pediocactus peeblesianus* var. *fickeiseniae*) (candidate species), Navajo sedge (*Carex specuicola*) (threatened), San Francisco Peaks groundsel (*Senecio franciscanus*) (threatened), Sentry milk-vetch (*Astragalus cremnophylax* var. *cremnophylax*) (endangered), Siler pincushion cactus (*Pediocactus sileri*) (threatened), Welsh's milkweed (*Asclepias welshii*) (threatened), and Jones cycladenia (*Cycladenia jonesii*) (threatened).

Mohave County, Arizona: Arizona Cliff-rose (*Purshia subintegra*) (endangered), Fickeisen plains cactus (*Pediocactus peeblesianus* var. *fickeiseniae*) (candidate species), Holmgren milk-vetch (*Astragalus holmgreniorum*) (endangered), Jones Cycladenia (*Cycladenia jonesii*) (threatened), and Siler pincushion cactus (*Pediocactus sileri*) (threatened). BLM's Sensitive Plant Species:

- For Kane and Washington Counties, Utah: Lori's columbine (*Aquilegia loriae*), gumbo milkvetch (*Astragalus ampullarius*), escarpment milkvetch (*Astragalus striatiflorus*), Baird camissonia (*Camissonia bairdii*), slender evening primrose (*Camissonia exilis*), Diamond Valley suncup (*Camissonia gouldii*), Virgin thistle (*Cirsium virginense*), smooth catseye (*Cryptantha semiglabra*), Nevada willowherb (*Epilobium nevadense*), Paria spurge (*Euphorbia nephradenia*), Cataract gilia (*Gilia latifolia* var. *imperialis*), PineValley goldenbush (*Haplopappus crispus*), Paria iris (*Iris pariensis*), Cliff jamesia (*Jamesia americana* var. *zionis*), Claron pepperplant (*Lepidium montanum* var. *claronense*), Clark's lomatium (*Lomatium graveolens* var. *clarkia*), Cutler's spurred lupine (*Lupinus caudatus* var. *cutleri*), Murdock's evening primrose (*Oenothera murdockii*), Barneby breadroot (*Pedimelum aromaticum* var. *barnebyi*), Kane breadroot (*Pedimelum epipsilum*), sandloving penstemon (*Penstemon ammophilus*), pinyon penstemon (*Penstemon pinorum*), Parry petalonyx (*Petalonyx parryi*), Cronquist phacelia (*Phacelia cronquistiana*), Atwood's pretty phacelia (*Phacelia pulchella* var. *atwoodii*), chia (*Salvia columbariae* var. *argillacea*), globemallow (*Sphaeralcea grossulariifolia* var. *fumariensis*), Kanab thelypody (*Thelypodopsis ambigua* var. *erecta*), and tropic goldeneye (*Viguiera soliceps*).
- Arizona Strip (Mohave and Coconino counties, Arizona): Marble Canyon milkvetch (*Astragalus cremnophylax* var. *hevronii*), cliff milkvetch (*Astragalus cremnophylax* var. *myriorrhaphus*), three-cornered milkvetch (*Astragalus geyeri* var. *triquetrus*), Diamond Butte milkvetch (*Astragalus toanus* var. *scidulus*), silverleaf sunray (*Enceliopsis argophylla*), sticky wild buckwheat (*Eriogonum viscidulum*), September 11 stickleaf (*Mentzelia memorabilis*), Kaibab pincushioncactus (*Pediocactus paradinei*), Mt. Trumbell beardtongue (*Penstemon distans*), Sheep Range beardtongue (*Penstemon petiolatus*), Grand Canyon rose (*Rosa stellata* var. *abyssa*), Paria Plateau fishhook cactus (*Sclerocactus sileri*), Black Rock daisy (*Townsendia smithii*), and three hearts (*Tricardia watsonii*).

The Kaibab Band of Paiute Indians' list of Plants of Cultural Concern contains 72 species; the list of species to be addressed by species-specific surveys will be narrowed in coordination with the Tribe to include those species of particular importance and interest to Tribal members.

BLM and FWS botanists identified several additional species of concern potentially impacted by project-

related activities. These include: *Eriogonum mortonianum*, *Eriogonum thompsonae* var. *atwoodii*, *Spheralcea gierischii*, *Penstemon laevis*, *Dalea flavesens* var. *epica*, and *Spiranthes diluvialis*.

Various invasive plant species designated as restricted noxious weeds have been identified as likely occurring within the project area. These include Russian knapweed (*Acroptilon repens*), camelthorn (*Alhagi maurorum*), globe-podded hoary cress/whitetop (*Cardaria draba*), diffuse knapweed (*Centaurea diffusa*), spotted knapweed (*Centaurea maculosa*), halogeton (*Halogeton glomeratus*), three-lobed morning glory (*Ipomoea triloba*), and scotch thistle (*Onopordum acanthium*).

Iron County, Utah has declared the poison western whorled milkweed (*Asclepias subverticillata*) to be a noxious weed in their county. According to the NRCS Rapid Watershed Assessment for Iron County, the following weeds were officially designated and published as noxious for the State of Utah, as per the Utah Noxious Weed Act. These identified species may occur within the proposed project area:

- Bermudagrass (*Cynodon dactylon*)
- Canada thistle (*Cirsium arvense*)
- Diffuse knapweed (*Centaurea diffusa*)
- Dyers woad (*Isatis tinctoria*)
- Field bindweed (*Convolvulus arvensis*)
- Hoary cress (*Cardaria draba*)
- Johnsongrass (*Sorghum halepense*)
- Leafy spurge (*Euphorbia esula*)
- Medusahead (*Taeniatherum caput-medusae*)
- Musk thistle (*Carduus mutans*)
- Perennial pepperweed (*Lepidium latifolium*)
- Perennial sorghum (*Sorghum halepense* & *Sorghum album*)
- Purple loosestrife (*Lythrum salicaria*)
- Quackgrass (*Agropyron repens*)
- Russian napweed (*Centaurea repens*)
- Scotch thistle (*Onopordum acanthium*)
- Spotted knapweed (*Centaurea maculosa*)
- Squarrose knapweed (*Centaurea squarrosa*)
- Yellow starthistle (*Centaurea solstitialis*)

The USFWS has identified additional non-desirable non-native plants to be included as invasive species within habitats occupied by ESA-listed plants. These are:

- Red brome (*Bromus rubens*)
- Cheatgrass (*Bromus tectorum*)
- African mustard (*Brassica tournefortii*)
- Stork's bill (*Erodium cicutarium*)

In addition, the states of Utah and Arizona maintain lists of noxious weed species, many of which occur in the proposed project area.

Site-specific occurrence information for special status plant species is documented within the state Natural Heritage Programs for Utah and Arizona. In addition, land management agencies also maintain records of special species and noxious weed/invasive species occurrences.

Abundant rain in winter 2007 and spring 2008 provided an opportunity for preliminary field surveys to locate spring-blooming special status plant species within the proposed project area. Project biologists



consulted with BLM, USFWS and Grand Staircase-Escalante National Monument (GSENM) botanists to identify the special status plant species most likely to occur within the proposed project area. The fourteen high-priority species included: dwarf bear-poppy (*Arctomecon humilis*), Welsh's milkweed (*Asclepias welshii*), Shivwitz milkvetch (*Astragalus ampullarioides*), gumbo milkvetch (*Astragalus ampullarius*), Holmgren milkvetch (*Astragalus holmgreniorum*), escarpment milkvetch (*Astragalus striatiflorus*), slender evening primrose (*Camissonia exilis*), Jones cycladenia (*Cycladenia humilis* var. *jonesii*), Paria iris (*Iris pariensis*), Cutler's spurred lupine (*Lupinus caudatus* var. *cutleri*), Fickeisen plains cactus (*Pediocactus peeblesianus* var. *fickeiseniae*), Siler pincushion cactus (*Pediocactus sileri*), Kane breadroot (*Pediomelum epipsilum*), and globemallow (*Sphaeralcea grossulariifolia* var. *fumariensis*). Approximately 15 miles of the pipeline corridor were surveyed for the high-priority species. Project biologists located 1,317 plants of Kane breadroot and three plants of slender evening primrose.

The PAD provides a discussion of existing information gleaned from agency publications and databases. There is limited information, however, concerning the rare plant species that may be present, their relative abundance, habitat associations, locations, or information on the possible effects of project construction and operation on these populations. There are no comprehensive surveys to identify the type, abundance, and general distribution of special-status plant species or noxious weed species within the proposed project area. Further, there is currently no information available to determine the species or numbers of noxious weeds in the proposed project area, or their effects on native plant diversity and habitat quality.

### **12.4.1 Study Area**

The study area consists of the approximately 186-mile, 300-foot wide pipeline corridor (150 feet to each side of the corridor center-line) extending from the west side of Lake Powell in Coconino County, Arizona, to Cedar Valley, Iron County, Utah; and transmission line corridors to provide power to the pumping stations. The south alternative alignment would generally follow the U.S. Highway 89 transportation corridor in Utah and Arizona, the State Highway 389 corridor in Arizona, the State Route 59 corridor in Utah, the I-15 corridor in Utah, and the Navajo-McCullough Transmission Line corridor in Arizona. Also included in the study area are associated project facilities including a combined conventional peaking and pumped storage hydro station; five conventional in-line hydro stations; a forebay reservoir, tunnel/shaft facility, and afterbay reservoir at the Hurricane Cliffs; and an infiltration reservoir west of Cedar City and Quichapa Lake.

The existing highway alternative alignment would cross the Kaibab Indian Reservation adjacent and parallel to Arizona State Highway 389. This alternative alignment will be addressed in this study, as well as the south alternative alignment.

## **12.5 Nexus to Project (§5.11(d)(4))**

Project construction, operation, and maintenance activities have the potential to adversely affect special-status plant species and spread noxious weeds in the proposed project area. This study will assist in identifying special-status plants and noxious weeds within the proposed project area, provide baseline information from which to evaluate project alternatives and/or develop and evaluate specific proposals for protection, mitigation, and enhancement of rare plant populations and their habitats, and control of noxious weeds.

## **12.6 Proposed Study Methodology (§5.11(d)(5))**

The special status plant species study will provide the data on the occurrence and abundance of these species within the pipeline corridor as required for analysis of project-related impacts and to address

various issues identified in the scoping process. Noxious weed/invasive species surveys will document existing distribution of these species in the proposed project area in order to develop measures to limit the spread of these species due to project implementation.

The study will consist of the following four tasks:

### ***12.6.1 Task 1 – Office Review***

The overall list of special status plants species based on county of occurrence will be evaluated to identify those species that potentially occur in the proposed project area. The list will be refined based on: (1) literature and database reviews and consultation with knowledgeable agency, tribal, and other biologists; (2) habitat preferences and known occurrences of the species; and (3) availability of potentially suitable habitat to support the species based on habitat mapping (e.g., soils, vegetation community, and elevation) and/or aerial photographs. On an annual basis until the completion of all construction activities, each land and resource management agency will be contacted to review and modify (e.g., remove or add) the list of special status plant species being considered for project impact assessment. If new species are added to the list, the potential for impacts will be evaluated consistent with other species, and potentially suitable habitat within the study area will be identified.

A list of noxious weed species will be developed based upon information from the Utah Department of Agriculture and Food's noxious weed list and Washington and Iron Counties list; Arizona Department of Agriculture's list of noxious weeds; BLM's list of noxious species; and other sources, and after consultation with the stakeholders.

### ***12.6.2 Task 2 – Field Surveys***

Field surveys for special status plants will be conducted in appropriate habitats based on a species-specific assessment of general habitat characteristics within the proposed project area (see Task 1). Systematic surveys will be conducted during appropriate survey periods (generally blooming periods) throughout the proposed project corridor where potentially suitable habitat is expected to occur. Multiple surveys will be conducted in priority areas to locate special status species. Special status plant occurrences will be documented with photographs and GPS locations at sub-meter accuracy. Larger, contiguous stands of each species may be quantified and delineated as polygons. The area affected by the proposed project includes lands impacted by: (1) direct alteration and loss of habitat from lands cleared or altered by construction of the pipeline, transmission lines, access roads, hydropower facilities and reservoirs, pumping stations, and other facilities; (2) lands used for construction staging and equipment storage; and (3) lands adjacent to construction that may be affected by dust, erosion, etc. The area will also include alternative routes and facilities being considered. If new species are added to the special status plant list, potentially suitable habitat that may be impacted by project-related activities will be surveyed for the presence of that species during the next appropriate survey period. Based on habitat and survey occurrence data, suitable habitat for priority species (e.g., ESA-listed species) will be identified, and additional surveys will be conducted at these priority areas within 3 years of anticipated construction.

Noxious weed surveys will identify noxious weed occurrence and distribution and may be conducted in conjunction with the special status plant surveys. The entire corridor will be evaluated for the presence of noxious weeds; however, pedestrian surveys will be limited to areas identified under the stratified sampling protocol and to delineate areas of noxious weed infestations. To gain a general sense of the current extent of weed infestations throughout the project area, and the species present and their relative abundance, surveys will be conducted based on stratified sampling of the study area. Surveys will include belt transects disturbed across the project area using a stratified sampling protocol based on vegetation

communities, land use patterns that influence noxious weed distribution (e.g., highway corridor, roadway intersection, grazing by livestock, transmission line corridor, existing pipeline corridor), land ownership, and where invasive species have been previously documented or observed as part of other survey efforts (e.g., special status species surveys and vegetation community mapping). Multiple surveys will be performed in priority areas, as necessary, to address the phenology (e.g., spring or late summer blooming periods) of target noxious weed species. An appropriate number of transects for each sampling stratification will be performed to achieve statistically valid results. Noxious plant occurrences will be documented with photographs and locations geo-referenced using global positioning system (GPS) technology, generally at sub-meter accuracy; large, contiguous stands of noxious weeds may be quantified and delineated as polygons.

### ***12.6.3 Task 3– Draft Report Preparation***

The project biologists will prepare a draft report that includes the results of the surveys and mapping efforts, and identifies, describes, and assesses the extent to which project-related actions and activities may affect special-status plants and the distribution of noxious weeds/invasive species. The distribution of each special status plant species within the proposed project will be documented and presented on maps showing the extent of the surveyed habitat and the relationship to proposed project features. The report will document the dates and times of the surveys and methods used, provide brief descriptions of the life history of each species and habitats (e.g., vegetation community types) occupied, and present maps showing the area surveyed, species locations, numbers of individuals found, area of occupied habitat, habitat description, phenology, condition, and threats to the population. Some special status plant occurrence information that is considered sensitive data may need to be restricted. Rationale will be provided if it is determined that no potential habitat is present for any of the special status species (e.g., out of elevation or geographic range). Additional maps will present the distribution of identified locations of noxious weeds and invasive species. Recommendations and conservation measures plan, as appropriate, will be included regarding measures to avoid or reduce potential adverse effects to special status plants and to control the spread of noxious weeds (conservation measures are to include restrictions on construction activities in occupied rare plant habitats during the flowering period, and monitoring of rare plant occurrences near construction activities during and following construction or a minimum of 3 years). A list of all plant species observed during surveys will be included as part of the vegetation community mapping study. Any variances from the study plan will be summarized and documented in the draft report.

### ***12.6.4 Task 4– Prepare Final Study Report***

The product of this study will be a final report that: 1) describes the survey goals and objectives; 2) builds on information already compiled in the PAD to describe existing conditions; 3) presents the methods used to identify suitable habitat for special status species and areas with a high likelihood of supporting weeds, select survey areas, and collect the data; 4) describes the habitat characteristics of surveyed areas; 5) details the results of the survey in terms of special status plants observed, noxious weeds and invasive non-native plants observed, and their habitat associations; and 6) shows the survey areas and any special status plant or noxious weed sightings using GIS-based maps and accompanying summary tables. The study report will analyze the effects of project operations and/or project-related activities, if any are identified, and discuss any measures that may be needed to protect or enhance special status plant populations or to prevent or reduce the risk of weed establishment and spread. Variances from the study plan will be summarized and documented in the final study report. Appropriate documentation and analysis for each plant species will be provided for incorporation into the Biological Assessment and Evaluation.

## **12.7 Level of Effort and Cost (§5.11(d)(6))**

Costs would be minimized by focusing efforts on high-probability areas and sites where project effects could occur, rather than performing a broad-level inventory of all project lands. It is anticipated that the pre-field activities, gathering of existing data, and general coordination among agencies and with the project team will cost approximately \$57,000; field surveys for special status plants and noxious weeds, \$230,500; and the analysis of data, transfer of data to GIS, preparation of maps, and drafting of reports including portions of the BA&E, will cost \$66,000. The total cost for the rare plant and noxious weed surveys and reports are estimated at \$358,000.

## **12.8 Schedule (§5.11(b)(2))**

The pre-field activities (compilation and review of existing information, selection of survey sites and survey dates, preparation of field forms and base maps) will be completed by April 2009. Field surveys will be conducted during the 2009 growing season. A brief initial report describing the 2009 field effort and any problems or deviations of the methodology will be distributed in December 2009, and the final report on 2009 surveys will be completed and distributed in March 2010.

## **12.9 Progress Reporting (§5.11(b)(3))**

The annual survey report, described above, will serve as the progress report.

## **12.10 Dependencies on Other Resource Analyses**

The special status plant and noxious weed assessment analysis will be primarily dependent on the analyses results of the following resources:

- Wetlands and Riparian Areas
- Vegetation Community Mapping
- Land Use Plans and Conflicts

## **12.11 References**

Bureau of Land Management. 2007. *Kanab Proposed Resource Management Plan/FEIS*.

Bureau of Land Management. 2008. *Arizona Strip Field Office Resource Management Plan Record of Decision*.

California Native Plant Society. June 2001. *Botanical Survey Guidelines*.

Kearney, Thomas H. and Robert H. Peebles. 1960. *Arizona Flora*. University of California Press.

National Park Service. Director's Order No. 75: *Natural Resources Inventory and Monitoring Guideline*.

U.S. Forest Service, Rangeland Management Staff, Washington, DC. March 2005. *Threatened, Endangered and Sensitive Plants Surveys – field guide*.

Utah Board of Water Resources. March 2008. *Lake Powell Hydroelectric System Notice of Intent to File an Application for Original License Pre-Application Document*.

Welsh, S.L. et al. 1987. *A Utah Flora*.

Arizona noxious weeds list available on the Worldwide Web at [http://ag.utah.gov/plantind/nox\\_utah.html](http://ag.utah.gov/plantind/nox_utah.html)

Arizona riparian areas in ArcView GIS format available on the Worldwide Web at:  
<http://sdrsnet.snr.arizona.edu/index.php?page=datamenu&lib=0&sublib=5>

Arizona Strip Threatened and Endangered Species descriptions and distribution available from the Arizona Strip FEIS, available on the Worldwide Web at:  
[http://www.blm.gov/az/LUP/strip/strip\\_plan.htm](http://www.blm.gov/az/LUP/strip/strip_plan.htm)

BLM Grand Staircase – Escalante National Monument GIS files, available on the Worldwide Web at:  
<http://www.ut.blm.gov/monument/gis-data-library.php>

Ecological range site descriptions available on the Worldwide Web at:  
[www.websoilsurvey.nrcs.usda.gov](http://www.websoilsurvey.nrcs.usda.gov)

Soils data for Utah and Arizona from the NRCS Soil Data Bank available on the Worldwide Web at:  
<http://soildatamart.nrcs.usda.gov/USDGSM.aspx>

U.S. Fish and Wildlife Service Threatened and Endangered Species of Arizona, available on the Worldwide Web at: <http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm>

USFS Threatened and Endangered Species for Utah available on the Worldwide Web at  
<http://www.fws.gov/mountain-prairie-endspp/countylists/utah.pdf>

Utah noxious weeds list available on the Worldwide Web at <http://www.azada.gov/PSD/quarantine5.htm>

Vegetation landcover mapping available on the Worldwide Web at: <http://earth.gis.usu.edu/swgap/>

## **Study Plan 13: Special Status Wildlife Species and Habitat**

### **13.1 Introduction**

This study plan documents the methods for determining impacts on special status wildlife species and habitat resulting from the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. This plan addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those provided in the September and October study plan meetings in Salt Lake City and St. George, Utah. Special status wildlife species include federally listed threatened and endangered species, proposed or candidate species and species of concern, state protected species or species of concern, Bureau of Land Management (BLM) special status species and other species designated by Tribal authorities or state or federal agencies. Wildlife species not designated as having special status are discussed in Study Plan 21, Wildlife Resources. This study plan presents an approach for advancing knowledge and understanding of special status wildlife species and habitat as they pertain to the Project's south alignment, existing highway alignment alternative, and the no action alternative. This study plan also addresses study requests made by FERC; other federal, state and tribal agencies; and the public in their comments made during the study plan development process.

The proposed Project would consist of constructing and operating a water conveyance system that includes approximately 186 miles of buried pipeline, water intake facilities at Lake Powell, buried and surface water storage reservoirs, irrigation system turnout, in-line hydro stations, hydro-electric generation facilities, and transmission lines on federal, state, private and possibly tribal lands in Kane, Washington, and Iron counties in Utah; and Coconino and Mohave counties in Arizona. The alternative alignments under consideration include the existing highway alignment that would cross the Kaibab Indian Reservation along Arizona Highway 389 and the south alignment bypassing the Reservation to the south.

Modifications to proposed alignments or new proposed alignments, including access roads, staging areas and ancillary facilities, will be incorporated into the study plans. Analyses will include direct and indirect effects of Project construction and maintenance.

The study plans for federally listed wildlife species and habitat assessments are described in Part A of this section. The study plans for State, Tribal and agency wildlife species of concern and habitat assessments are described in Part B of this section.

### **Part A: Federally Listed Species**

#### **13.2 Goals and Objectives (§5.11(d)(1))**

The goal of this study plan is to develop additional information to supplement the existing information necessary to address the potential effects of Project construction, operation and maintenance activities on the presence of special-status wildlife species and their habitat. The specific information to be obtained is the type, abundance, and general distribution of special-status wildlife species within the Project area, required to assess the potential effect of the Project on these species. The information will be used to

determine how potential effects can be avoided, minimized, or mitigated. All habitat assessments and study plans would include sufficient detail to support the completion of an Endangered Species Act (ESA) Section 7 Biological Assessment of the subject species, including potential mitigation measures necessary to prevent adverse effects. A report will be prepared detailing proposed study plans, incorporating a plan detailing recommended mitigation and conservation measures.

### 13.3 Resource Management Goals (§5.11(d)(2))

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, species recovery and management goals of the Fish and Wildlife Service, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied.

### 13.4 Public Interest Considerations (§5.11(d)(3))

FERC must decide whether to issue a license to the Utah Board of Water Resources for the Project. Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a Project is located, and what conditions should be placed on any license that may be issued. In making its license decision, the Commission must equally consider the environmental, recreational, fish and wildlife, and other non-developmental values of the Project, as well as power and developmental values. Any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.

Special-status species are of particular interest because of their rarity and/or ecological functions. Ensuring that environmental measures pertaining to these resources are considered in a reasoned way is relevant to the Commission's public interest determination. Additionally, this information may be needed to ensure compliance with the ESA.

### 13.5 Background and Existing Information (§5.11(d)(3))

Table 13-1 summarizes the special status wildlife species listed by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA) for the counties affected by the Project pipeline or transmission line alignments or access roads and staging areas. Listed species background information, including habitat, distribution, study plan and habitat assessment, Project nexus (§5.11 (d)(4)), need for further study and methods (§5.11 (d)(5)) and estimated level of effort and cost (§5.11 (d)(6)) are considered separately below for each species. Species that become listed after approval of the final study plan will be analyzed in addenda to this document.

All field surveys and habitat assessments, including aerial surveys or videography, on the Kaibab Reservation of the Kaibab Band of Paiute Indians will require permission from the Tribe.

<p style="text-align: center;"><b>Table 13-1</b> <b>Federally Listed Special Status Wildlife Species by County</b></p>				
Page 1 of 2				
Common Name	Scientific Name	Listing Status <sup>1</sup>	State	County
California condor	<i>Gymnogyps californianus</i>	E, EXPN	Utah Arizona	Iron, Kane, Washington Coconino, Mohave



**Table 13-1  
Federally Listed Special Status Wildlife Species by County**

**Page 2 of 2**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Listing Status<sup>1</sup></b>	<b>State</b>	<b>County</b>
Mexican spotted owl	<i>Strix occidentalis lucida</i>	T	Utah Arizona	Iron, Kane, Washington Coconino, Mohave
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	E	Utah Arizona	Iron, Kane, Washington Coconino, Mohave
Utah prairie dog	<i>Cynomys parvidens</i>	T	Utah	Iron, Kane, Washington
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	C	Utah Arizona	Iron, Kane, Washington Coconino, Mohave
Coral Pink Sand Dunes tiger beetle	<i>Cicindela limbata albissima</i>	C	Utah	Kane
Mohave Desert tortoise	<i>Gopherus agassizii</i>	T	Utah Arizona	Washington Mohave
Relict leopard frog	<i>Rana onca</i>	C	Arizona	Mohave
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	E	Arizona	Mohave
Kanab Ambersnail	<i>Oxyloma haydeni kanabensis</i>	E	Utah Arizona	Kane Coconino
Peregrine falcon	<i>Falco peregrinus anatum</i>	DM	Utah Arizona	Coconino, Mohave Iron, Kane, Washington
Bald eagle	<i>Haliaeetus leucocephalus</i>	DM	Utah Arizona	Coconino, Mohave Iron, Kane, Washington

**Notes**

<sup>1</sup> T = threatened, E = Endangered, EXPN = Experimental, Non-Essential; C = Candidate, DM = Delisted, Monitored

Source: FERC Staff Study Requests, Staff Comments on Studies, and Request for Additional Information, Lake Powell Hydroelectric Project, July 7, 2008

### ***13.5.1 California Condor***

The California condor is listed as endangered (32 FR 4001, 1967 March 11) with critical habitat (41 FR 41914, 1976 September 24), except where nonessential experimental (Northern Arizona) (61 FR 54043 54060, 1996 October 16). A California condor Recovery Plan was completed April 25, 1996. (USFWS 2008) Severe condor population declines prompted captive breeding programs in the late 1970s and all remaining wild birds were brought into captivity in 1987. As captive breeding programs developed adequate numbers of young condors, reintroduction programs were initiated with one site located on the Vermillion Cliffs in northern Arizona. About 300 condors now exist in the world, with half of them flying free. By the end of 2007, the total population in Arizona and southern Utah numbered 61 (Peregrine Fund 2008a). Non-essential experimental habitat for California condor is present in northern Arizona and southern Utah.

California condors require suitable habitat for nesting, roosting, and foraging. The recent range was restricted to chaparral, coniferous forests, and oak savannah habitats in southern and central California. The species formerly occurred more widely throughout the Southwest and also fed on beaches and large

rivers along the Pacific coast. Nest sites are located in cavities in cliffs, in large rock outcrops, or in large trees. Traditional roosting sites are maintained on cliffs or large trees, often near feeding sites. Foraging occurs mostly in grasslands, including potreros within chaparral areas, or in oak savannahs (USFWS 2008a).

Potential threats to condors in the wild include illegal poaching, lead poisoning from eating contaminated hunting carcasses, collisions with electrical transmission lines and habituation to humans and dependence on human sources of food.

Condors released in Arizona are radio and GPS monitored. In the past several years, condors have regularly traveled to the Kolob Plateau region of Utah in Zion National Park, crossing the south and alternative pipeline alternatives (Peregrine Fund 2008b, UDWR 2005).

#### **13.5.1.1 Project Nexus (§5.11(d)(4))**

California condors may be injured from new or upgraded transmission lines constructed in utilized habitat or across migration routes. Condors may be attracted to construction sites in search of food. Direct condor injury or mortality from on-ground Project construction and maintenance activity would be unlikely.

#### **13.5.1.2 Proposed Study and Methodology (§5.11(d)(5))**

The primary method of study of condors in the Project area would be close coordination with the Peregrine Fund condor monitoring team for tracking of potential condor locations near construction activity and development of a protocol for worksite trash control and management of any condors that approach construction locations. Established condor conservation measures recommended by the USFWS would be followed during construction. All new or upgraded transmission lines should conform to the most current edition of the Avian Protection Plan (APP) Guidelines by the Edison Electric Institute (EEI 2008). A map would be prepared showing the locations of condor nests and roosts, regularly visited feeding areas and corridors of travel across Project alignments. A formal coordination report and condor encounter protocol would be prepared.

#### **13.5.1.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

The effort for establishing a coordination and management plan and condor location map is estimated at two person days and estimated cost of \$2,000. Ongoing coordination and monitoring during Project construction would be included in the Project construction budget. The study would be completed within one field season.

### ***13.5.2 Mexican Spotted Owl***

The USFWS listed the Mexican spotted owl on March 16, 1993 (58 FR 14248) without critical habitat, effective April 15, 1993. A final rule designating critical habitat for the owl was published on June 6, 1995 (60 FR 29914). As a result of several court rulings, the Service removed critical habitat designation for the owl on March 25, 1998 (63 FR 14378). On March 13, 2000, the Service was again ordered to propose critical habitat within four months of the court order and to complete a final designation by January 15, 2001. The Service designated approximately 4.6 million acres of critical habitat for the owl in Arizona, Colorado, New Mexico and Utah on Federal lands. (66 FR 8530, February 1, 2001). The critical habitat designation was revised with a final rule published on August 31, 2004 (69 FR 53181), effective September 30, 2004.

Mexican spotted owls nest, roost, forage, and disperse in a diverse assemblage of biotic communities. Mixed-conifer forests are commonly used throughout most of the range which may include Douglas-fir and/or white fir, with co-dominant species including southwestern white pine, limber pine, and ponderosa pine. Over most of their range, spotted owls nest and roost primarily in closed-canopy forests or canyons. They nest in these areas on cliff ledges, in stick nests built by other birds, on debris platforms in trees, and in tree cavities (USFWS 2008b). Forests used for roosting and nesting often contain mature or old-growth stands with complex structure, are typically uneven-aged, multistoried, and have high canopy closure. A wider variety of trees are used for roosting, but again Douglas-fir is the most commonly used species. (USFWS 2008c). The understory often contains the above coniferous species as well as broadleaved species such as Gambel oak, maples, box elder, and/or New Mexico locust. Mexican spotted owls are also found in canyon habitat dominated by vertical-walled rocky cliffs within complex watersheds including tributary side canyons (Gutierrez and Rinkevich 1991).

In the northern part of the range, including southern Utah, southern Colorado, and far northern Arizona and New Mexico, owls occur primarily in rocky canyons or “slot” canyons, often with minimal vegetation. (USFWS 2008c).

Critical Mexican spotted owl habitat is designated in northern Arizona in the Kaibab National Forest, Grand Canyon National Park and Marble Canyon National Monument (Habitat Unit CP-10) (USFWS 2008c). All of these areas are south of the south and alternative Project alignments. Critical Mexican spotted owl habitat is designated in Utah in the Grand Staircase-Escalante National Monument (Habitat Unit CP-12) and in an area including and surrounding Zion National Park (Habitat Unit CP-11). The south and alternative Project alignments do not cross these habitat units. The Cedar Valley Pipeline component of the Project alignment parallels the western boundary of CP-11, but would be constructed within the Interstate 15 highway corridor that does not contain the species requisite closed canopy habitat or slot canyons.

#### **13.5.2.1 Project Nexus (§5.11(d)(4))**

The south pipeline alignment and alternative do not cross designated Mexican spotted owl critical habitat units and do not appear, from analysis of aerial and video photography, to contain the closed canopy forest habitat or deep, steep-walled slot canyons utilized by the owl. However, because of some recent sightings of spotted owls or sign in smaller slot canyons, review of these habitats would be required.

#### **13.5.2.2 Proposed Study and Methodology (§5.11(d)(5))**

Aerial and video photography of pipeline construction corridor crossings of stream or slot canyons and the Hurricane Cliffs area would be reviewed by a qualified biologist in consultation with appropriate agency specialists to evaluate potential spotted owl habitat and the need for field habitat review or species field surveys. If office or field analysis finds that field surveys for spotted owls are necessary, these would be performed by biologists holding a valid Section 10 permit for Mexican spotted owl surveys at the time of the field studies. Survey methodology would conform to the Mexican spotted owl survey protocol (USFWS 2003), including four surveys each year within suitable habitat during the breeding and fledging season (March through August) and within a 0.5-mile buffer of suitable habitat. Surveys in two consecutive years are recommended to determine if a site is occupied.

#### **13.5.2.3 Estimated Level of Effort and Cost. (§5.11(d)(6))**

Office habitat analysis would require one person day at a cost of \$500. Field habitat review and surveys would require four person days per site at a cost of \$500 each; estimated total cost would not exceed \$5,000 per year. Studies could be completed within two field seasons.

### 13.5.3 Southwestern Willow Flycatcher

The southwestern willow flycatcher is listed as endangered (60 FR 10694, February 27, 1995) with critical habitat (50 CFR 60886, October 19, 2005) (swwf 1).

The southwestern willow flycatcher nests and forages in dense riparian habitats along streams, rivers, lakesides, and other wetlands. Some of the more common plant species used for nesting are: willow, boxelder, tamarisk, Russian olive, buttonbush, cottonwood, and mesquite. Nests are found in dense thickets of these and other plants species that about 13-23 feet in height. Migration habitat is believed to primarily occur along riparian corridors. Utilized habitat occurs at elevations below 8,500 feet (USDFWS 2008d).

Critical southwestern willow flycatcher habitat has been designated along the Virgin River in northwestern Arizona and Southwestern Utah (Virgin Management Unit). According to the southwestern willow flycatcher Recovery Plan (USFWS 2008e): *“currently suitable habitat (hereafter “suitable habitat”) is defined as a riparian area with all the components needed to provide conditions suitable for breeding flycatchers. These conditions are generally dense, mesic riparian shrub and tree communities 0.1 ha or greater in size within floodplains large enough to accommodate riparian patches at least 10 m wide (measured perpendicular to the channel); see Appendix D for more details. Currently, this definition of suitability is Southwestern Willow Flycatcher Recovery Plan August 2002 based solely on habitat characteristics, not on measures of flycatcher productivity or survival. Suitable habitat may be occupied or unoccupied; any habitat in which flycatchers are found breeding is, by definition, suitable. Occupied suitable habitat is that in which flycatchers are currently breeding or have established territories. Unoccupied suitable habitat appears to have physical, hydrological, and vegetation characteristics within the range of those found at occupied sites, but does not currently support breeding or territorial flycatchers. Some sites that appear suitable may be unoccupied because they may be missing an important habitat component not yet characterized. Other sites are currently suitable but unoccupied because the southwestern willow flycatcher population is currently small and spatially fragmented, and flycatchers have not yet colonized every patch where suitable habitat has developed. Potentially suitable habitat (= “potential habitat”) is defined as a riparian system that does not currently have all the components needed to provide conditions suitable for nesting flycatchers (as described above), but which could – if managed appropriately – develop these components over time. Regenerating potential habitats are those areas that are degraded or in early successional stages, but have the correct hydrological and ecological setting to be become, under appropriate management, suitable flycatcher habitat. Restorable potential habitats are those areas that could have the appropriate hydrological and ecological characteristics to develop into suitable habitat if not for one or more major stressors, and which may require active abatement of stressors in order to become suitable. Potential habitat occurs where the flood plain conditions, sediment characteristics, and hydrological setting provide potential for development of dense riparian vegetation. Stressors that may be preventing regenerating and restorable habitats from becoming suitable include, but are not limited to, de-watering from surface diversion or groundwater extraction, channelization, mowing, recreational activities, overgrazing by domestic livestock or native ungulates, exotic vegetation, and fire.”*

#### 13.5.3.1 Project Nexus (§5.11(d)(4))

The south and alternative Project alignments do not cross designated southwestern willow flycatcher critical habitat. The northern boundary of the Virgin River designated critical habitat unit is at the Washington Fields Diversion from the Virgin River; no Project features would be constructed across the designated critical habitat. Southwestern willow flycatchers have been documented in survey sites near the confluence of Beaver Dam Wash with the Virgin River, but that site is approximately 35 miles from any potential Project construction. The Project is intended to be a consumptive use culinary water project

without significant land application or return flows and would not materially impact instream flows in the Virgin River below the Washington Fields Diversion and would not significantly affect the existing designated critical habitat along the river below that diversion. The Project has the potential to aide in management and recovery of some of the Virgin River species through release of Virgin River water presently diverted into the Hurricane pressure irrigation system in exchange for LPP water to operate the Hurricane pressure irrigation system. The additional instream flows could slightly enhance future riparian habitat in this reach.

The USFWS has commented on the Lake Powell Pipeline PAD that little is known of southwestern willow flycatchers in Kanab Creek and the Paria River and that habitat assessments and surveys would be needed if Project construction would cause surface disturbance.

The USFWS has requested analysis of potential effects on southwest willow flycatcher riparian habitat along the Colorado River below Glen Canyon Dam from diversion of Project water. The Biological Assessment (BA) for the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead (Reclamation 2007) determined that the Guidelines Proposed Action may affect and is likely to adversely affect the southwest willow flycatcher in the reach between Glen Canyon Dam and Lake Mead because of possible dessication of existing flycatcher habitat by reduced flows under shortage conditions. The BA also determined that these adverse effects would be temporary and unlikely to “substantively affect the abundance or distribution” of southwest willow flycatchers in that reach of the Colorado River. This conclusion was confirmed in the USFWS Biological Opinion for the Guidelines (USFWS 2008q).

#### **13.5.3.2 Proposed Study and Methodology (§5.11(d)(5))**

It is proposed that four sites be assessed for southwest willow flycatcher habitat and possible field survey. Those sites are:

- Paria River crossing by the south alignment
- Kanab Creek crossing by the south alignment
- Kanab Creek crossing by the alternative alignment
- Virgin River crossing by the Cedar Valley Pipeline

The studies would be performed in two phases. The first phase would be an assessment by a qualified biologist of suitable or potential flycatcher habitat within 0.25 miles on either side of the proposed construction corridor center line, using the criteria cited above in the flycatcher Recovery Plan and additional criteria from Appendix D of the Plan. Documentation of each site would include aerial photography (color, if available), GPS delineation of the area of any current or potential habitat present, photographs of typical features of the site, evidence of site hydrology (active flow, bank full flow margins, soil saturation, etc.) and a list of vegetation species present on the site. Maps of each site with current or potential habitat would be prepared containing the GPS data acquired on site.

If suitable or potential flycatcher habitat is found at any site, a phase two field survey would be performed. The field surveys would be conducted by a qualified biologist who had completed southwest willow flycatcher survey training and would follow the most current survey protocol and data recording requirements of the Southwest Biological Services Center (SBSC), Colorado Plateau Research Station Southwestern Willow Flycatcher status and distribution project (SBSC 2008; Sogge 1997). The protocol requires a minimum of five site visits for Project-related surveys with the following schedule (Sogge et al. 1997):

First survey period: May 15 to May 31, one survey

Second survey period: June 1 to June 21, one survey

Third survey period: June 22 to July 17, three surveys at least five days apart

The basic survey technique is a taped flycatcher call playback with observations every 20 to 30 meters along the habitat to be surveyed. If a target habitat is 100 meters in length a minimum of four call playback sites would be surveyed. See Sogge, et al., 1997 for details. Flycatcher locations would be recorded by GPS in addition to completion of the approved survey form. GPS locations of flycatcher occurrences would be added to the habitat map of the site. All surveys would be performed by biologists holding a valid Section 10 permit for Southwestern willow flycatcher surveys at the time of the field studies.

Because the Colorado River between Glen Canyon Dam and Lake Mead has been extensively surveyed for southwest willow flycatchers and because potential Project diversions on river flows below Glen Canyon Dam would be minor, less than 2 percent flow reduction of maximally reduced flows imposed by the Guidelines, no field surveys for southwest willow flycatcher are proposed for the Colorado River.

#### **13.5.3.3 Estimated Level of Effort and Cost (\$5.11(d)(6))**

The phase one habitat assessment would require two person days to document the four sites at an estimated cost of \$4,000. Each site qualifying for a phase two survey would require six person days for site visits, completion of survey forms, maps and reports. Estimating that two sites would require phase two study, total cost would be \$12,000. The study could be performed within one field season.

#### ***13.5.4 Utah Prairie Dog***

The Utah prairie dog was listed as an endangered species on June 4, 1974 (38 FR 14678). On November 5, 1979, the Utah Division of Wildlife Resources petitioned the U.S. Fish and Wildlife Service to remove the Utah prairie dog from the U.S. List of Endangered and Threatened Wildlife. The Service found that this petition contained substantial data and on May 29, 1984 (49 FR 22330), the species was reclassified from endangered to threatened with a special rule to allow regulated take of the species on agricultural lands. The special rule was amended on June 14, 1991 (56 FR 27438) to increase the amount of regulated take throughout the species' range. On February 21, 2007, the USFWS denied a petition to reclassify the Utah prairie dog as endangered ((72FR 7843) and initiated a 5-year review. There are numerous habitat conservation plans (HCP) and agreements for the Utah prairie dog, including the Iron County HCP submitted in June 1998 (USFWS 2008f).

The Utah prairie dog is a burrowing member of the *Sciuridae* family of rodents with a limited range in central and southwestern Utah, including Iron, Garfield, Beaver, Piute Sevier, Wayne, Washington and Kane Counties. Five primary factors influence the suitability of habitat for the Utah prairie dog: soils, vegetative height and density, vegetative moisture availability, vegetation quantity and vegetation quality (Environmental Defense Fund 2008). They require well-drained soils with a water table below three feet to enable burrowing for protection and insulation from environmental extremes (USFWS 2008f). Utah prairie dogs prefer swale-type formations where moist herbaceous vegetation is available even during drought periods. Moisture in plants is highly correlated with Utah prairie dog abundance (Collier 1975). Grasses and forbs are preferred food items during all seasons, and there are indications that prairie dogs select particular forage species rather than choosing foods based on availability (Crocker-Bedford and Spillet 1981). Vegetation quality and quantity are important in helping Utah prairie dogs survive hibernation, lactation and high nutrient demand times (Environmental Defense Fund 2008). Plant species richness is correlated with increased weight gain, higher juvenile to adult ratios and higher animal

densities (Crocker-Bedford and Spillet 1981, Ritchie and Cheng 2001). Utah prairie dogs will avoid areas where brushy species dominate and will eventually decline or disappear in areas invaded by brush (Collier 1975, Player and Urness 1982). Open habitats are important for foraging, for visual surveillance, to escape predators and for intraspecific interactions (Player and Urness 1982). Utah prairie dogs generally hibernate during the late fall through spring (October to March), although some above-ground activity may occur in all months, depending on weather (USFWS 2008f).

#### **13.5.4.1 Project Nexus (§5.11(d)(4))**

The Cedar Valley Pipeline and water delivery alternatives traverse Utah prairie dog habitat included in the Iron County HCP. Prairie dog colonies have been recorded proximate to the pipeline alignment just north of the Iron County boundary adjacent to the Interstate 15 corridor (colony 0100A, colony 0100G). There is potential for Utah prairie dog occurrence in other areas of the proposed Cedar Valley Pipeline corridor and associated transmission lines; current location data will be required from Utah Division of Wildlife Services to establish colony sites and suitable Utah prairie dog habitat potentially affected by project construction and maintenance.

#### **13.5.4.2 Proposed Study and Methodology (§5.11(d)(5))**

Surveys for Utah prairie dog colonies are proposed for the Cedar Valley Pipeline and its branches in Iron County, terminal water delivery features and facilities within or near Cedar City and construction corridors for any new or upgraded electrical transmission lines and substations. Additional areas may be surveyed as needed for Utah prairie dog colony locations potentially affected by Project construction and maintenance outside of Iron County.

Considerable data exists from local and regional monitoring of Utah prairie dog populations as part of HCPs and conservation agreements in the Cedar City area, including the Cedar City Golf Course and the Paiute Tribal Lands HCP (USFWS 2008g). This latter specifies a survey protocol for spring surveys of Utah prairie dogs, including dates, time of day, weather conditions and approach to colonies. Utah prairie dog surveys in areas impacted by the Cedar Valley Pipeline System would be coordinated with regional management agencies to establish the locations and specific methods of survey to be used (including protocols for linear projects), data recording requirements including GPS, and map and report formats. Utah prairie dog surveys are valid only for one year; additional surveys will be required immediately prior to any construction activity in potentially occupied habitat.

#### **13.5.4.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

Because the final configuration of the Cedar Valley Pipeline System, water delivery features and electrical facilities have not been determined, a specific level of effort and cost for Utah prairie dog surveys can not be estimated at this time. Assuming that existing data and local expertise on the species would expedite the survey process, the study would cost approximately \$12,000 and could be performed within one field season.

### ***13.5.5 Yellow-billed Cuckoo***

The yellow-billed cuckoo in the western United States was accorded candidate species status in July 2001 (66 FR 38611, July 25, 2001). The USFWS determined that although the listing was warranted, it was precluded by higher priority listing actions. There is no critical habitat designated for the yellow-billed cuckoo (66 FR 54807, October 30, 2001).



West of the Rocky Mountains, its breeding range is spotty and restricted to riparian areas with specific habitat characteristics of a tall overstory of mature trees, particularly cottonwoods (*Populus sp.*) and willows (*Salix sp.*), and a dense understory of shrubs and small trees (Sibley 2001, Wiggins 2005). Ideally, riparian habitat should provide a contiguous area of at least 15 acres (Wiggins 2005) to 25 acres (Sibley 2001) with overstory from 5 to 30 meters and understory of 1 to 6 meters in height. The current distribution of yellow-billed cuckoos in Utah is “poorly understood, though they appear to be an extremely rare breeder in lowland riparian habitats statewide” (UCDC 2008).

#### **13.5.5.1 Project Nexus (§5.11(d)(4))**

The Utah Bird Records Committee lists “two recent breeding areas known: near Ouray [and] Uintah Counties...and [the] Virgin River Valley” for yellow-billed cuckoos (Utah Birds 2008) with no further details given. Analysis of aerial photography and videography of Project south and alternative alignments reveals no obvious cuckoo habitat (i.e., tall overstory trees) at the Paria River (south alignment crossing), Kanab Creek (south and alternative alignment crossings) and Virgin River (Cedar Valley Pipeline crossing). There are no other riparian areas crossed by the Project alignments that would provide the requisite cuckoo habitat. USFWS requests habitat analysis and yellow-billed cuckoo surveys at potential southwest willow flycatcher survey locations because there is potential for cuckoo occurrence at these sites.

The USFWS has requested analysis of potential effects on riparian habitat along the Colorado River below Glen Canyon Dam from diversion of Project water. The Biological Assessment (BA) for the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead (Reclamation 2007) determined that the yellow-billed cuckoo does not occur in this reach of the Colorado River (Section R.2.4.2).

The Project is intended to be a consumptive use culinary water project without significant land application and would not materially impact instream flows in the Virgin River below the Washington Fields Diversion and would not significantly affect the existing riparian habitat along the river below that diversion. The Project has the potential to aide in management and recovery of some of the Virgin River species through release of Virgin River water presently diverted into the Hurricane pressure irrigation system in exchange for LPP water to operate the Hurricane pressure irrigation system. The additional instream flows could slightly enhance future riparian habitat in this reach.

#### **13.5.5.2 Proposed Study and Methodology (§5.11(d)(5))**

Field surveys for yellow-billed cuckoos would be conducted simultaneously with surveys for southwestern willow flycatchers at the locations described in Section 13.5.3.2. Survey methodology would be standard taped call-back techniques.

No field surveys are proposed for the yellow-billed cuckoo on the Colorado River between Glen Canyon Dam and Lake Mead.

#### **13.5.5.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

There would be minimal additional cost for yellow-billed cuckoo studies, primarily preparation of reports and mapping. This is estimated to cost \$1,000.

### ***13.5.6 Coral Pink Sand Dunes Tiger Beetle***

The Coral Pink Sand Dunes tiger beetle is listed as a candidate species under the Endangered Species Act (59 FR 47293, Sept. 19, 1994) and is subject to a conservation agreement for protection of the species (62 FR 23785, May 1, 1997).

This tiger beetle is found in sand dune habitat in only one location in the world, the Coral Pink Sand Dunes State Park in Kane County, Utah (UCDC 2008).

#### **13.5.6.1 Project Nexus (§5.11(d)(4))**

The south and alternative Project alignments do not cross locations of populations or approach the known habitat of the Coral Pink Sand Dunes Tiger Beetle. There are no other areas of suitable habitat for this species within the south or alternative alignments. Construction or maintenance of the Project would not have direct, indirect or cumulative effects on the species.

#### **13.5.6.2 Proposed Study and Methodology (§5.11(d)(5))**

No habitat assessments or field surveys are proposed for the Coral Pink Sand Dunes Tiger Beetle.

#### **13.5.6.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

None.

### ***13.5.7 Mohave Desert Tortoise***

The Mohave population of the desert tortoise is listed as threatened (55 FR 12178, April 2, 1990) with critical habitat designated in 1994 (59 FR 5820, February 28, 1994). A recovery plan was adopted in June 1994 and a draft revision has been released for comment in 2008 and is scheduled for completion in 2009 (USFWS 2008h). Washington County, Utah contains the Upper Virgin River Recovery Unit. A Washington County Habitat Conservation Plan (Washington County Commission 1995) was submitted in December 1995.

The Mohave desert tortoise occurs in the creosote/shadscale, blackbush, and Joshua tree series of Mojave desert scrub, cactus, shadscale and Joshua tree series of Mojave desert scrub. The Mojave population generally occupies desert scrub communities in basins and bajadas but is also found on rocky slopes. (USFWS 2008h) The tortoise requires soils that it can excavate for burrows and in the Upper Virgin River Recovery Unit, tortoises may use the same burrow for several years (USFWS 1996).

#### **13.5.7.1 Project Nexus (§5.11(d)(4))**

Potential Mohave desert tortoise habitat occurs from the base of the Hurricane Cliffs at the Hurricane Cliffs Hydro facility along the Project corridor to the crossing of the Virgin River, a distance of approximately nine miles. The Cedar Valley Pipeline alignment through the Hurricane area passes close to the eastern boundary of the Red Cliffs Desert Preserve, a part of the designated Mohave desert tortoise critical habitat. This area of the Reserve is called Hurricane Cinder Knolls and is the location of a number of Mohave desert tortoise occurrences contained in the Utah Conservation Data Center (UCDC) database (UCDC 2008). The occurrences are mainly within the Preserve close to a topographical feature called East Cinder Knoll; however, a number of tortoise sightings appear to be east of the Preserve boundary.

The Cedar Valley Pipeline corridor is within the proposed revised Mohave desert tortoise Upper Virgin River Recovery Unit (USFWS 2008h).

The Cedar Valley Pipeline construction corridor is aligned on existing roads and through developed areas for most of the route from the Hurricane Cliffs to the Virgin River; much of this area would not be high quality tortoise habitat. However, there are less intensely developed segments of the corridor that pass through agricultural land and open areas, especially south and west of the Hurricane airport and adjacent to the Desert Preserve.

The main Project pipeline corridor from the Hurricane Cliffs Hydro facility to Sand Hollow Reservoir is approximately 3.5 miles in length across undeveloped lands. The UCDC database does not record any occurrences of Mohave desert tortoise in this corridor (UCDC 2008). This corridor does not cross designated Mohave desert tortoise critical habitat, but is close to the southern margin of the proposed revised Mohave desert tortoise Upper Virgin River Recovery Unit (USFWS 2008h).

#### **13.5.7.2 Proposed Study and Methodology (§5.11(d)(5))**

Surveys for Mohave desert tortoise occurrences and sign, such as shells, burrows and scat, are proposed for the segment of the Cedar Valley Pipeline construction corridor from the site of the Hurricane Cliffs Hydro facility north to the pipeline crossing of the Virgin River at Confluence Nature Park and for the main pipeline corridor from the Hurricane Cliffs Hydro facility to Sand Hollow Reservoir. The specific area to be surveyed would be determined through consultation with the USFWS and the Washington County wildlife manager; however, the surveys would be focused on less developed areas adjacent to undisturbed habitat and along the boundary of the Desert Preserve.

Survey methodology would conform to the most current update of the Field Survey Protocol for Any Federal Action That May Occur Within the Range of the Desert Tortoise (USFWS 1992) and would include the entire width of the construction corridor and the “zone of influence” as defined by the protocol and in consultation with the USFWS and regional tortoise management agencies. The survey method would be “presence-or-absence” and would be conducted during the period of maximum tortoise activity between March 25 and May 31 (USFWS 1992). All surveyors would meet USFWS qualifications for identification of Mohave desert tortoises and their sign. If required by the USFWS, all surveys would be performed by biologists holding a valid Section 10 permit for Mohave desert tortoise surveys at the time of the field studies. Study plans and management recommendations for the Mohave desert tortoise will incorporate the revised Recovery Plan when it becomes approved.

The survey protocol prescribes “100 percent” surveys of the area of construction disturbance in belt transects 30 feet wide and transects parallel to the construction corridor at 100, 300, 600, 1,200 and 2,400 feet from the Project boundary in the zone of influence, depending on proximity to other developments and habitat status (USFWS 1992). All tortoises observed and all tortoise sign would be recorded on the specified tortoise survey field forms and recorded by GPS for mapping. Tortoises encountered would not be touched by surveyors and photographs, GPS recordings and estimates of size and sex should be done with the least possible disturbance to the tortoise. A map would be prepared showing locations of all Mohave desert tortoises, burrows and tortoise sign as recorded by GPS. A report would be prepared summarizing the survey methods, survey results and estimates of tortoise health for all tortoises that were encountered.

#### **13.5.7.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

Assuming an average cross-section of 300 feet for direct construction disturbance (excavation, roadways, placement of spoils), 10 transects of 5,200 feet would be required for full survey of one mile of the

construction zone, a total of 52,800 feet. Because the pipeline alignment abuts developed areas along its perimeter, it is likely that only two zone of influence transects would be feasible on each side of the construction corridor, at 100 and 300 feet for a total of four transects and a total of 21,200 feet of survey per mile of the zone of influence. Total transect distance would be 74,000 feet or approximately 14 miles per linear mile of construction corridor surveyed. Assuming a pace of one mile per hour for surveyors, each mile would require 14 man-hours of field survey.

It is estimated that the survey would require two person days in the field and two person days for mapping, data compilation and report completion per linear mile of construction corridor and zone of influence. Total cost is estimated at \$1,600 per mile of corridor. Pending results of consultation, preliminary map survey indicates that approximately 10 miles of corridor survey may be necessary for an estimated total cost of \$16,000. The study could be completed within one field season.

### ***13.5.8 Relict Leopard Frog***

The relict leopard frog is a candidate species under the ESA (67 FR 40657; June 13, 2002).

Relict leopard frogs inhabit permanent streams, springs and spring-fed wetlands below approximately 1,968 feet. Adults may prefer relatively open shorelines where dense vegetation does not dominate. Breeding habitat includes pools or slow moving side areas of streams, with or without emergent vegetation. The historical distribution of this species is not well documented. The distribution has historically been characterized as springs, streams, and wetlands within the Virgin River drainage from the vicinity of Hurricane, Utah to the Overton Arm of what is now Lake Mead, Nevada, and along the Muddy River in Nevada. The species may have once been present on the Colorado River mainstem. Populations in Utah appear to have been extinct since the 1950's. (USFWS 2008o). Recent surveys have revealed extant populations at seven sites in four general areas: Surprise Canyon in lower Grand Canyon, and Sycamore Spring, Arizona (Mohave County); springs near the Overton Arm of Lake Mead, Nevada; and springs in Black Canyon below Hoover Dam, Nevada. The population at the smallest known site, Corral Spring, went extinct in 1995. Frogs were last seen at a wetland near Littlefield, Arizona in 1998. The species was introduced to Sycamore Spring in 2003. (USFWS 2008o). A Conservation Agreement for the relict leopard frog was finalized in July 2005 (USFWS 2008o).

#### **13.5.8.1 Project Nexus (§5.11(d)(4))**

The closest historic (now extirpated) occurrence of relict leopard frogs at Reber Springs near Littlefield, NV, close to the confluence of Beaver Dam Creek with the Virgin River, is approximately 35 miles southwest of Sand Hollow Reservoir. The relict leopard frog Conservation Agreement Potential Management Zone (PMZ) extends upstream in the Virgin River drainage to Hurricane (USFWS 2008o), including the presumed historic range of the species; the PMZ overlaps parts of the main pipeline corridor to Sand Hollow Reservoir and the Cedar Valley Pipeline.

The Project south and alternative alignments do not cross locations of or approach the known current populations of the relict leopard frog. Construction or maintenance of the Project would not have direct, indirect or cumulative effects on the species. The Mitigation Protocol for Surface-Disturbing Construction Projects of the Conservation Agreement would be adhered to within the PMZ and would generally conform to construction procedures for prevention of disturbance to wetlands and riparian areas. Coordination with the Relict Leopard Frog Conservation Team should be established for notification of potential relocation of relict leopard frogs to sites within the Project construction corridor.

#### **13.5.8.2 Proposed Study and Methodology (§5.11(d)(5))**

No habitat assessments or field surveys are proposed for the relict leopard frog.

#### **13.5.8.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

None.

### ***13.5.9 Yuma Clapper Rail***

The Yuma clapper rail is listed as endangered (32 FR 4001, March 11, 1967) without critical habitat.

This species inhabits freshwater or brackish stream-sides and marshlands under 4,500 feet elevation. It is associated with dense riparian and marsh vegetation. It requires a wet substrate, such as a mudflat, sandbar, or slough bottom that supports cattail and bulrush stands of moderate to high density adjacent to shorelines. (USFWS 2008p) The Yuma clapper rail has been observed at the confluence of Beaver Dam Wash with the Virgin River (BLM 2007).

#### **13.5.9.1 Project Nexus (§5.11(d)(4))**

The nearest recorded location of the Yuma clapper rail on the Virgin River is approximately 35 miles southwest of Sand Hollow Reservoir at the confluence with Beaver Dam Creek. The Project is intended to be a consumptive use culinary water project without significant land application or return flows and would not materially impact instream flows in the Virgin River below the Washington Fields Diversion and would not significantly affect rail habitat along the river below that point. The Project has the potential to aide in management and recovery of some of the Virgin River species through release of Virgin River water presently diverted into the Hurricane pressure irrigation system in exchange for LPP water to operate the Hurricane pressure irrigation system. The additional instream flows could slightly enhance future riparian habitat in this reach.

If hydrologic analysis determines that potential new rail habitat would be created or existing habitat significantly affected, a Yuma clapper rail study plan would be submitted as an addendum to this document..

#### **13.5.9.2 Proposed Study and Methodology (§5.11(d)(5))**

No habitat assessments or field surveys are proposed for the Yuma clapper rail.

#### **13.5.9.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

None.

### ***13.5.10 Kanab Ambersnail***

The Kanab ambersnail is listed as endangered (57 FR 13657, April 17, 1992) without critical habitat. A Recovery Plan was published in 1995 (USFWS 1995). The species is currently undergoing a five-year status review.

Kanab ambersnails are terrestrial land snails with a restricted distribution in Kane County, Utah and Coconino County, Arizona. The species inhabits perennially wet environments in seeps and springs

draining sandstone or limestone cliffs with semi-aquatic vegetation (USFWS 2008q). The currently known distribution of the Kanab ambersnail is restricted to three locations, two springs within the Grand Canyon and springs located at Three Lakes approximately six miles north of Kanab, Utah (USFWS 2008q). The Kanab location is within Three Lakes Canyon in Sections 19 and 30, Township 42 South, Range 6 West (USFWS 1995).

#### **13.5.10.1 Project Nexus (§5.11(d)(4))**

The Project south and alternative alignments would not disturb the known distribution of the Kanab ambersnail. The closest Grand Canyon location at Vasey's Paradise is over 40 miles from the Project corridors and the Three Lakes site is approximately six miles from the water delivery corridor to Kanab and over 10 miles from the main alternative corridors.

The USFWS has requested analysis of potential effects on riparian habitat along the Colorado River below Glen Canyon Dam from diversion of Project water. The primary risk to Kanab ambersnail habitat is inundation by high Colorado River flows exceeding 17,000 cfs (Reclamation 2007). The LPP would not increase baseline releases or releases under shortage conditions from Glen Canyon Dam.

The Project would not alter the local hydrology of currently inhabited habitats. Construction or maintenance of the Project would not have direct, indirect or cumulative effects on the species.

#### **13.5.10.2 Proposed Study and Methodology (§5.11(d)(5))**

No habitat assessments or field surveys are proposed for the Kanab ambersnail. Consultation with the Kanab ambersnail recovery team should be established in case future relocation of ambersnail populations would be planned within Project corridors.

#### **13.5.10.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

None.

### ***13.5.11. Peregrine Falcon***

The peregrine falcon was removed from the federal list of threatened and endangered species in August 1999 (64 FR 46542, August 25, 1999). The peregrine falcon is an Arizona Game and Fish Department species of wildlife concern for the Arizona Strip and a USFWS bird of conservation concern and remains under post-delisting monitoring.

The peregrine falcon is found in Arizona wherever sufficient prey is found near cliffs. Optimum peregrine habitat is generally considered to be steep, sheer cliffs overlooking woodlands, riparian areas or other habitats supporting avian prey species in abundance. As Arizona's population grows, peregrines seem to be breeding in less optimal habitat; either small broken cliffs in ponderosa pine forest or large, sheer cliffs in very xeric areas. The presence of an open expanse is critical (AZNHP 2008). Multiple occurrences are recorded for northern Coconino and Mohave Counties.

#### **13.5.11.1 Project Nexus (§5.11(d)(4))**

Peregrine falcons would be at risk at nest locations, where construction activity and human presence could interrupt mating, nesting and rearing of young. The most likely location of peregrine falcon nests would be at the Hurricane Cliffs.

#### **13.5.11.2 Proposed Study and Methodology (§5.11(d)(5))**

Coordination with Utah Division of Wildlife Resources would be initiated to identify any known peregrine falcon nests potentially affected by Project construction and to identify any areas recommended for field surveys. Targeted field surveys in peregrine nesting habitat would be by visual observation on at least two occasions during the nesting season.

#### **13.5.11.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

Each potential peregrine falcon nest site would require one person day (one-half day for each observation) at a cost of \$500. Survey costs, including report preparation, should not exceed \$3,000.

### ***13.5.12 Bald Eagle***

The bald eagle was removed from the federal list of threatened and endangered species in July 2007 (72 FR 37346, July 7, 2007). The bald eagle remains protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act and remains under post-delisting monitoring.

Bald eagle is a Utah species of concern for Iron, Kane and Washington Counties and an Arizona Game and Fish Department species of wildlife concern for the Arizona Strip.

Bald eagles inhabit coastal areas, estuaries, unfrozen inland waters, and some arid areas of the western interior and southwestern portion of the U.S. They like areas with high water-to-land edge, and areas with unimpeded views including both horizontal and vertical aspects. Areas selected for as wintering habitat will have an adequate food supply, and have open water such as river rapids, impoundments, dam spillways, lakes, and estuaries (AZNHP 2008). Bald eagles are rare nesters in Utah (UCDC 2008); Utah GAP analysis mapping shows potential wintering habitat in Iron, Kane and Washington Counties. Occurrences recorded in Arizona are generally in the central region of the state (AZNHP 2008).

#### **13.5.12.1 Project Nexus (§5.11(d)(4))**

There are no known bald eagle nests in the Project area. Potential winter roost sites may exist within 0.25 miles (the standard bald eagle disturbance buffer) of the Project construction corridors.

#### **13.5.12.2 Proposed Study and Methodology (§5.11(d)(5))**

Coordination with Utah Division of Wildlife Resources would be initiated to identify any known winter roosts potentially affected by Project construction and to identify any areas recommended for field surveys. Targeted field surveys would be performed by visual observation at potential roosts on at least two occasions during the winter roosting season. Field monitoring studies would conform to the Utah Field Office Guidelines for Raptor Protection From Human and Land Use Disturbances (USFWS 2008r).

#### **13.5.12.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

Each potential winter roost site would require one person day (one-half day for each observation) at a cost of \$500. Survey costs, including report preparation, should not exceed \$3,000.



### ***13.5.13 Summary of Study Plan for Federally Listed Special Status Wildlife***

Table 13-2 summarizes the proposed study plan and estimates of study cost for federally listed special status wildlife.

<b>Table 13-2 Summary of Habitat Assessments and Study Plans for Federally Listed Special Status Wildlife</b>		
<b>Species</b>	<b>Habitat Assessment or Study Plan Proposed</b>	<b>Estimated Cost</b>
California condor	No (Coordination only)	\$2,000
Mexican spotted owl	Yes	\$10,000
Southwestern willow flycatcher	Yes	\$16,000
Utah prairie dog	Yes	\$12,000
Yellow-billed cuckoo	Yes	\$1,000
Coral Pink Sand Dunes tiger beetle	No	-
Mohave desert tortoise	Yes	\$16,000
Relict leopard frog	No	-
Yuma clapper rail	No (Addendum if needed)	-
Kanab ambersnail	No	-
Peregrine falcon	Yes	\$3,000
Bald eagle	Yes	\$3,000
<b>Total</b>		<b>\$63,000</b>

Some species may require additional surveys immediately prior to construction in order to provide clearance of individuals or populations from the construction corridor or to establish construction scheduling to prevent disturbance during critical breeding or rearing activities. Recommendations for those additional studies will be included in the draft and final study reports.

### ***13.5.14 Draft Study Report Preparation***

The project biologists will prepare a draft report that includes the results of the surveys and study efforts, and identifies, describes, and assesses the extent to which project-related actions and activities may affect special-status wildlife and their habitat. The distribution of each special status wildlife species within the proposed Project will be documented and presented on maps showing the extent of the surveyed or studied habitat and the relationship to proposed Project features. The report will document the dates and times of the surveys and methods used, provide brief descriptions of the life history of each species and habitats (e.g., vegetation community types) occupied, and present maps showing the area surveyed, species locations, numbers of individuals found, area of occupied habitat, habitat description, condition, and threats to the population. Some special status wildlife occurrence information that is considered sensitive data may need to be restricted. Rationale will be provided if it is determined that no potential habitat is present for any of the special status species (e.g., out of habitat or geographic range). Recommendations and conservation measures plan, as appropriate, will be included regarding measures to avoid or reduce potential adverse effects on special status wildlife and their habitats. A list of all

wildlife species observed during surveys will be included as part of the study. Any variances from the study plan will be summarized and documented in the draft report.

#### ***13.5.15 Prepare Final Study Report***

The product of this study will be a final report that: 1) describes the survey goals and objectives; 2) builds on information already compiled in the PAD to describe existing conditions; 3) presents the methods used to identify suitable habitat for special status species, select survey areas, and collect the data; 4) describes the habitat characteristics of surveyed areas; 5) details the results of the survey in terms of special status wildlife observed, and their habitat associations; and 6) shows the survey areas and any special status wildlife sightings using GIS-based maps and accompanying summary tables. The study report will analyze the effects of Project operations and/or Project-related activities, if any are identified, and discuss any measures that may be needed to protect or enhance special status wildlife species and habitats that could be disturbed. Variances from the study plan will be summarized and documented in the final study report. Appropriate documentation and analysis for each plant species will be provided for incorporation into the Biological Assessment and Evaluation.

#### ***13.5.16 Interdisciplinary Dependencies***

Special Status Wildlife Species studies may be dependent on the results of the Vegetative Community Mapping, Surface Water Resources, Wetlands and Riparian Resources and Noise analyses.

Vegetative Community Mapping data will be analyzed to identify potential habitat utilized by listed species.

Surface water resources data will be utilized to analyze potential impacts of Project water return flows into the Virgin River or other riparian areas that might affect habitat for listed species.

Wetlands and Riparian Resources data will be used to identify potential habitats for riparian-related listed species.

Noise data will be used to analyze potential for reduced utilization of habitat adjacent to the pipeline corridor by special status wildlife species during Project construction and maintenance.

### **Part B: State, Tribal and Agency Sensitive Species and Species of Concern**

#### **13.6 Goals and Objectives (§5.11(d)(1))**

Goals and objectives are the same as described in Section 13.1.

#### **13.7 Resource Management Goals (§5.11(d)(2))**

Resource management goals are the same as described in Section 13.2

#### **13.8 Public Interest Considerations (§5.11(d)(3))**

Public interest considerations are the same as described in Section 1.3.

### 13.9 Background and Existing Information (§5.11(d)(3))

Table 13-3 summarizes State and agency sensitive species and species of concern with ranges that encompass the Project south and existing highway alignments and the Cedar Valley Pipeline System or have been recorded in counties crossed by proposed Project facilities. In compliance with Presidential Executive Order 13186 (66 FR 3853, January 10, 2001) mandating conservation of migratory birds, Partners in Flight (PIF) Watch List priority species that may potentially nest in southwestern Utah and northwestern Arizona are included.

<p style="text-align: center;"><b>Table 13-3</b> <b>State and Agency Sensitive Species and Species of Concern</b></p> <p style="text-align: right;"><b>Page 1 of 3</b></p>		
<b>Common Name</b>	<b>Scientific Name</b>	<b>Status<sup>1</sup></b>
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	USPC
Western red bat	<i>Lasiurus blossevillei</i>	USPC
Allen's big-eared bat	<i>Idionycteris phyllotis</i>	USPC
Spotted bat	<i>Euderma maculatum</i>	USPC
Big free-tailed bat	<i>Nyctinomops macrotis</i>	USPC
California leaf-nosed bat	<i>Macrotus californicus</i>	BLM-S, AGFD-WSC
Small-footed myotis bat	<i>Myotis ciliolabrum</i>	BLM-S, AGFD-WSC
Fringed myotis	<i>Myotis thysanodes</i>	USPC
Long-eared myotis bat	<i>Myotis evotis</i>	BLM-S
Big free-tailed bat	<i>Nyctinomops macrotis</i>	AGFD-WSC
Pygmy rabbit	<i>Brachylagus idahoensis</i>	USPC
House Rock Valley chisel-toothed kangaroo rat	<i>Dipodomys microps leucotis</i>	BLM-S, AGFD-WSC
Dark kangaroo mouse	<i>Microdipodops megacephalus</i>	USPC
Kit fox	<i>Vulpes macrotis</i>	USPC
Black swift	<i>Cypseloides niger</i>	USPC, BCC
Burrowing owl	<i>Athene cunicularia</i>	USPC, BCC
Ferruginous hawk	<i>Buteo regalis</i>	USPC, BCC
Greater sage-grouse	<i>Centrocercus urophasianus</i>	USPC, BCC
Lewis's woodpecker	<i>Melanerpes lewis</i>	USPC, BCC
Long-billed curlew	<i>Numenius americanus</i>	USPC, BCC
Northern goshawk	<i>Accipiter gentilis</i>	CS
Short-eared owl	<i>Asio flammeus</i>	USPC, BCC
American three-toed woodpecker	<i>Picoides tridactylus</i>	USPC
American white pelican	<i>Pelecanus erythrorhynchos</i>	USPC
Bobolink	<i>Dolichonyx oryzivorus</i>	USPC, BCC
Mountain plover	<i>Charadrius montanus</i>	USPC
American bittern	<i>Botaurus lentiginosus</i>	AGFD-WSC
Fulvus whistling Duck	<i>Dendrocygna bicolor</i>	BLM-S
Loggerhead shrike	<i>Lanius ludovicianus</i>	BLM-S, BCC
White-faced Ibis	<i>Plegadis chihi</i>	BLM-S
Common chuckwalla	<i>Sauromalus ater</i>	USPC

**Table 13-3**  
**State and Agency Sensitive Species and Species of Concern**

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<b>Common Name</b>	<b>Scientific Name</b>	<b>Status<sup>1</sup></b>
Northern sagebrush lizard	<i>Sceloporus graciosus graciosus</i>	BLM-S
Zebra-tailed lizard	<i>Callisaurus draconoides</i>	USPC
Western banded gecko	<i>Coleonyx variegatus</i>	USPC
Western threadsnake	<i>Leptotyphlops humilis</i>	USPC
Speckled rattlesnake	<i>Crotalus mitchellii</i>	USPC
Sidewinder	<i>Crotalus cerastes</i>	USPC
Desert night lizard	<i>Xantusia vigilis</i>	USPC
Desert iguana	<i>Dipsosaurus dorsalis</i>	USPC
Mojave rattlesnake	<i>Crotalus scutulatus</i>	USPC
Gila monster	<i>Heloderma suspectum</i>	USPC
Great plains toad	<i>Bufo cognatus</i>	USPC
Arizona toad	<i>Bufo microscaphus</i>	USPC
Western toad	<i>Bufo boreas</i>	USPC
Western grasshopper sparrow	<i>Ammodrammus savannarum perpallidus</i>	AGFD-WSC
Belted kingfisher	<i>Ceryle alcyon</i>	AGFD-WSC
Olive-sided flycatcher	<i>Contopus cooperi</i>	AGFD-WSC
Sage thrasher	<i>Oreoscoptes montanus</i>	AGFD-WSC
Red-naped sapsucker	<i>Sphyrapicus nuchalis</i>	AGFD-WSC
Greater western mastiff bat	<i>Eumops peroti californicus</i>	AGFD-WSC
Dwarf shrew	<i>Sorex nanus</i>	AGFD-WSC
Utah milk Snake	<i>Lampropeltis triangulum taylori</i>	AGFD-WSC
American avocet	<i>Recurvirostra americana</i>	BCC
Black-throated gray warbler	<i>Dendroica nigrescens</i>	BCC
Brewer's sparrow	<i>Spizella breweri</i>	BCC
Gunnison sage-grouse	<i>Centrocercus minimus</i>	BCC
Marbled godwit	<i>Limosa fedoa</i>	BCC
Snowy plover	<i>Charadrius alexandrinus</i>	BCC
Wilson's phalarope	<i>Phalaropus tricolor</i>	BCC
Bell's vireo	<i>Vireo bellii</i>	BCC
Bendire's thrasher	<i>Toxostoma bendirei</i>	BCC
Crissal thrasher	<i>Toxostoma crissale</i>	BCC
Flammulated owl	<i>Otus flammeolus</i>	BCC
Golden eagle	<i>Aquila chrysaetos</i>	BCC
Grace's warbler	<i>Dendroica graciae</i>	BCC
Gray vireo	<i>Vireo vicinior</i>	BCC
Northern harrier	<i>Circus cyaneus</i>	BCC
Pinyon jay	<i>Gymnorhinus cyanocephalus</i>	BCC
Prairie falcon	<i>Falco mexicanus</i>	BCC
Sage sparrow	<i>Amphispiza belli</i>	BCC
Swainson's hawk	<i>Buteo swainsoni</i>	BCC
Virginia's warbler	<i>Vermivora virginiae</i>	BCC
Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>	BCC

**Table 13-3**  
**State and Agency Sensitive Species and Species of Concern**

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Common Name	Scientific Name	Status <sup>1</sup>
Blue grouse	<i>Dendragapus obscurus</i>	PIF
Band-tailed pigeon	<i>Columba fasciata</i>	PIF
White-throated swift	<i>Aeronautes saxatalis</i>	PIF
Lucy's warbler	<i>Vermivora luciae</i>	PIF
Black-chinned sparrow	<i>Spizella atrogularis</i>	PIF
Abert's towhee	<i>Pipilo aberti</i>	PIF
Leconte's thrasher	<i>Toxostoma lecontei</i>	PIF
Calliope hummingbird	<i>Stellula calliope</i>	PIF

**Notes:**

<sup>1</sup> USPC = Utah Species of Concern; CS = Species with Conservation Agreements; AFGD – WSC = Arizona Fish and Game Department Wildlife Species of Concern; BLM-S = BLM Sensitive Species; BCC = USFWS Birds of Conservation Concern; PIF = Partners in Flight Watch List  
Sources: Utah Conservation Data Center; Bureau of Land Management, Arizona Strip Field Office Proposed Plan/FEIS, 2007; USFWS Birds of Conservation Concern, 2002; Arizona Game and Fish Department Natural Heritage Program and Comprehensive Wildlife Conservation Strategy; Partners in Flight (PIF 2008)

### **13.9.1 Species Without Project Nexus (§5.11(d)(4))**

The following species do not regularly occur within or near the Project south or alternative alignments or do not have suitable habitat that would be affected by Project construction or maintenance. Habitat assessments and field studies (§5.11(d)(5)) are not proposed for these species. There would be no level of effort or cost associated with these species (§5.11(d)(6)).

#### **13.9.1.1 Black Swift**

The black swift nests in steep mountain canyons and prefers sites behind or adjacent to waterfalls (UCDC 2008). There is no breeding habitat for black swifts or recorded nesting occurrence in or near the Project corridors.

#### **13.9.1.2 American Bittern**

The American bittern is a marsh bird that is associated with dense tall stands of cattails (*Typha spp.*) (UCDC 2008). The species not recorded as nesting in Arizona and is considered a rare transient through the state (BLM 2007); the bittern is considered uncommon in Utah (UCDC 2008).

#### **13.9.1.3 Fulvus Whistling Duck**

The fulvus whistling duck is an occasional visitor to southern Arizona (AZNHP 2008) and has been recorded only four times in Utah (Utah Birds 2008).

#### **13.9.1.4 White-faced Ibis**

The white-faced ibis is a marsh bird that has not been recorded as breeding in Arizona (AZNHP 2008) and is considered as a migratory transient only. In Utah, there are large breeding concentrations around the Great Salt Lake and the species is found along the Colorado River and other large water bodies, but there is no suitable habitat in or near the Project alignments in southern Utah.

#### **13.9.1.5 Greater Sage Grouse**

The greater sage grouse ranges widely throughout Utah in sagebrush habitats. Its mapped brooding and winter ranges are north of the Project south and alternative alignments and the Project would not cross the known distribution of the species (UCDC 2008).

#### **13.9.1.6 American Three-toed Woodpecker**

In Utah, three-toed woodpecker nests and winters in coniferous forests, generally above 8,000 feet elevation; preferred habitats are Engelmann spruce, sub-alpine fir, Douglas fir, grand fir, ponderosa pine, tamarack, aspen, and lodgepole pine forests (UCDC 2008). The Project would not be constructed at the elevation and in the habitats of this species.

#### **13.9.1.7 Bobolink**

Bobolinks do not breed in most of Utah. They occur in low abundance and in isolated patches primarily in the northern half of the state. Bobolinks have been found consistently and are likely to breed or have bred near Logan, Brigham City, Kamas, Heber, Morgan, Mountain Green, Huntsville, West Layton, Provo and at the south end of Bear Lake (UCDC 2008). The Project would not cross the known breeding range of bobolink in Utah.

#### **13.9.1.8 Mountain Plover**

The mountain plover is typically associated with shortgrass prairie habitat, composed primarily of blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*) (UCDC 2008). In Utah it has been recorded as a casual migrant in Box Elder, Weber, Salt Lake, and Daggett counties. There are six documented historical sightings in the Uinta Basin (UCDC 2008). There have been three remote records from Washington County in 1965 – 1966, but none in that area since (Utah Birds 2008). It is unlikely that the mountain plover nests in the Project construction corridor in Washington County.

#### **13.9.1.9 Dark Kangaroo Mouse**

The dark kangaroo mouse inhabits the West Desert of Utah, but potential habitat is not recorded for the southern Utah counties through which the Project alignments pass.

#### **13.9.1.10 Spotted Bat**

Spotted bats may be found in a variety of habitats, ranging from deserts to forested mountains; they roost and hibernate in caves and rock crevices (UCDC 2008). Although they may occur state-wide, the Utah GAP Analysis does not show significant value habitat near the Project alternative alignments (UCDC 2008).

#### **13.9.1.11 California Leaf-nosed Bat**

The California leaf-nosed bat occurs widely throughout the southern half of Arizona, with one occurrence recorded in the northwest corner of Mohave County (AZNHP 2008). Mostly found in the Sonoran desertscrub; its primary summer and winter range are essentially the same. It primarily roosts in mines, caves, and rock shelters (AZNHP 2008). The mapped occurrences of this species are not near the Project south or alternative alignments (AZNHP 2008).

#### **13.9.1.12 Big Free-tailed Bat**

This bat is primarily an inhabitant of rugged, rocky country and riparian areas. Big free-tailed bats have been recorded in Mohave and Coconino Counties, but the mapped locations are not near the Project south or alternative alignments (BLM 2007).

#### **13.9.1.13 House Rock Valley Chisel-toothed Kangaroo Rat**

This kangaroo rat has been recorded only within the House Rock Valley of Coconino County, south and east of the Project south and alternative alignments (BLM 2007).

#### **13.9.1.14 Desert Night Lizard**

The desert night lizard is found in Utah only in the far southwest corner of Washington County and in San Juan County east of the Colorado River. The mapped potential habitats of this species are not near the Project south or alternative alignments (UCDC 2008).

#### **13.9.1.15 Desert Iguana**

The desert iguana occurs only in the extreme southwest corner of Washington County. The mapped potential habitats of this species are not near the Project south or alternative alignments (UCDC 2008).

#### **13.9.1.16 Mojave Rattlesnake**

The Mojave rattlesnake occurs only in the extreme southwest corner of Washington County. The mapped potential habitats of this species are not near the Project south or alternative alignments (UCDC 2008).

#### **13.9.1.17 Speckled Rattlesnake**

The speckled rattlesnake occurs only in the extreme southwest corner of Washington County. The mapped potential habitats of this species are not near the Project south or alternative alignments (UCDC 2008).

#### **13.9.1.18 American Avocet**

The American avocet is a ground-nesting marsh foraging shorebird that nests in northern Utah and is only transient in the rest of the state (Utah Birds 2008).

#### **13.9.1.19 Gunnison Sage-grouse**

The Gunnison sage-grouse's primary range is in Colorado; in Utah it has been sighted only in San Juan County (Utah Birds 2008).

#### **13.9.1.20 Marbled Godwit**

The marbled godwit is a large long-billed shorebird. It is a migrant in Utah (UCDC 2008) but is not recorded as nesting in the Project area (Utah Birds 2008).

#### **13.9.1.21 Snowy Plover**

The snowy plover is a tiny shorebird that nests on beaches and inland playas; in Utah the primary nesting range is adjacent to Great Salt Lake (Utah Birds 2008, Page et al. 1991). Snowy plover is not recorded as breeding in the Project area (Page et al. 1991).

#### **13.9.1.22. Wilson's Phalarope**

Wilson's phalarope is a small shorebird that nests in freshwater wetlands. It breeds in northern Utah, mainly in Great Salt Lake, but not in the project area (UCDC 2008, Utah Birds 2008).

#### **13.9.1.23 Grace's Warbler**

Grace's warbler nests in ponderosa and mixed pine forests, usually 20 to 60 feet above ground (UCDC 2008, Utah Birds 2008). Project facilities will not be constructed in this habitat.

#### **13.9.1.24 Flammulated Owl**

The flammulated owl nests in ponderosa pine and sub-alpine forests (Utah Birds 2008); Project facilities will not be constructed in this habitat.

#### **13.9.1.25 Williamson's Sapsucker**

Williamson's sapsucker nests in sub-alpine conifer or aspen forests (Utah Birds 2008); Project facilities will not be constructed in this habitat.

#### **13.9.1.26 Olive-sided Flycatcher**

The olive-sided flycatcher nests in sub-alpine conifer and ponderosa pine forests (Utah Birds 2008). Project facilities will not be constructed in this habitat.

#### **13.9.1.27 Western Toad**

The western toad inhabits high montane habitats and GAP analysis mapping does not show any predicted habitat in the Project area (USGS 2008, UCDC 2008).

#### **13.9.1.28 Blue Grouse**

Blue grouse Open stands of conifer or aspen with an understory of brush are preferred habitat. Winters are spent in dense fir trees, usually at higher elevations. In spring, birds move to lower meadow, brush, or open timber stands for mating. After breeding some males move back to higher elevations. Others wait until late summer or fall and gradually return to higher elevations with the hens and young. Blue grouse are found in most mountainous areas of the state; however, the greatest densities occur in the northern Wasatch Range (UCDC 2008). In Arizona, blue grouse inhabit higher elevations on the Kaibab Plateau (USGS 2008). Project facilities would not be constructed in blue grouse habitats.



#### **13.9.1.29 Band-tailed Pigeon**

Band-tailed pigeons nest in ponderosa pine and mixed conifer habitats (Utah Birds 2008); typical habitat is coniferous forests. Main nesting concentrations in Utah are in the southern pine forests from the Pine Valley Mountains in the west to the La Sal and Blue Mountains in the east. The band-tailed pigeon is migratory and only limited breeding populations occur in southern Utah (UCDC 2008). In Arizona, band-tailed pigeons nest in higher elevations of the Kaibab Plateau. Project facilities would not be constructed in band-tailed pigeon habitats.

#### **13.9.1.30 Calliope Hummingbird**

The calliope hummingbird nests in montane forests and is an uncommon summer resident in Utah (UCDC 2008). Project facilities would not be constructed in calliope hummingbird nesting habitat.

### ***13.9.2 Species with Potential Project Nexus (§5.11(d)(4))***

The following species have been recorded within or adjacent to the Project south or alternative alignments or have potential utilized habitat within or adjacent to the Project south or alternative alignments. Species are grouped according to taxonomic class because habitat assessments and field surveys would utilize similar methodology for the taxon. Habitat assessments and field studies (§5.11(d)(5)) and level of effort and cost (§5.11(d)(6)) associated with these species are described for each taxonomic group.

#### **13.9.2.1 Amphibians**

##### ***13.9.2.1.1 Arizona Toad***

The Arizona toad is listed as a Utah species of concern in Iron, Kane and Washington Counties (UCDC 2008). This species inhabits streams, washes, irrigated crop lands, reservoirs, and uplands adjacent to water. It is inactive in cold weather, and adults are mainly nocturnal, whereas the newly metamorphosed young are active during daylight hours (UCDC 2008). Potential habitat is sparse and scattered through southwestern Utah (UCDC 2008). The UCDC database has records of the Arizona toad in Kane County along the alignment of the Cedar Valley Pipeline.

##### ***13.9.2.1.2 Great Plains Toad***

The Great Plains toad is listed as a Utah species of concern for Kane County. In Utah, the Great Plains toad occurs in scattered areas throughout the state, where it prefers desert, grassland, and agricultural habitats. In cold winter months, the Great Plains toad burrows underground and becomes inactive. This species breeds in shallow water after rains during spring and summer months (UCDC 2008). Potential substantial to high value habitat is present throughout much of Kane County (UCDC 2008).

##### ***13.9.2.1.3 Project Nexus (§5.11(d)(4))***

The Arizona toad could occur in riparian and irrigated areas along the Project south and alternative alignments and the Cedar Valley Pipeline. The Great Plains toad could occur in appropriate habitats along the south and alternative alignments in Kane County.

#### ***13.9.2.1.4 Proposed Study and Methodology (§5.11(d)(5))***

It is proposed that amphibian habitat assessments would be done in two phases. First, an amphibian biologist, in consultation with the appropriate agency biologists, would perform an analysis of available maps, videography and orthophotographic data and historical occurrence records to determine potential habitat locations for the Arizona toad and Great Plains toad along the Project alignment corridors (stream crossings, highway runoff ditches, irrigated lands, ponds). Second, these locations would then be “ground truthed” to determine whether adequate toad habitat exists at any of the sites. Field surveys would then be performed at potential toad habitat locations using standard methods for determining amphibian presence or absence (nocturnal call surveys, egg mass identification, visual encounter surveys) during the species’ mating seasons. Locations of toads or sign would be recorded by GPS and entered on maps of surveyed locations.

#### ***13.9.2.1.5 Estimated Level of Effort and Cost (§5.11(d)(6))***

It is estimated that a minimum of five person days would be required for office habitat surveys, field habitat confirmation, field species surveys and mapping for each of the two amphibian species described in this section. Estimated cost for the study is \$10,000. The study could be completed within one field season.

### **13.9.2.2 Reptiles**

#### ***13.9.2.2.1 Common Chuckwalla***

The common chuckwalla is a Utah species of concern in Iron, Kane and Washington Counties and a BLM sensitive species in the Arizona Strip.

The chuckwalla is predominantly found near cliffs, boulders or rocky slopes where they use rocks as basking sites and rock crevices for shelter. They can be found in rocky desert, lava flows, hillsides and outcrops. Creosote bush occurs throughout most of range. The common chuckwalla potential habitat range is predominantly in the far southwest corner of Washington County and adjacent Mohave County (UCDC 2008, AZNHP 2008). The UCDC database has records of common chuckwallas in Kane County along the alignment of the Cedar Valley Pipeline (UCDC).

#### ***13.9.2.2.2 Gila Monster***

The Gila monster is a Utah species of concern in Washington County. The banded gila monster is a BLM sensitive species in the Arizona Strip.

In Utah, preferred habitats for the gila monster include large rocky shelves, sandy areas, and creosote-sagebrush areas. Gila monsters in Utah are most active during the spring and summer months, although they do spend about 95% of the active season in burrows or under rocks (UCDC 2008), making them hard to locate in surveys. In Arizona, the banded gila monster occurs primarily in the Sonoran Desert and extreme western edge of Mohave Desert, is less frequently found in desert-grassland and rare in oak woodland, to 5,000 feet. It is most common in undulating rocky foothills, bajadas and canyons and less frequent or absent on open sandy plains (AZNHP 2008). The potential habitats of the gila monster and banded gila monster are in the southwest corner of Washington County and adjacent Mohave County (UCDC 2008, AZNHP 2008); GAP analysis mapping shows predicted habitat along the base of the Hurricane Cliffs and near Sand Hollow Reservoir.

#### **13.9.2.2.3 Sidewinder**

The sidewinder is a Utah species of concern in Washington County.

Sidewinders prefer sandy open terrain. They are mainly nocturnal, avoiding the extreme heat of the day, and are also inactive during cold weather. When inactive, sidewinders take refuge in the burrows of tortoises or small mammals (UCDC 2008). Their potential habitat range is southwestern Washington County.

#### **13.9.2.2.4 Western Threadsnake**

The western threadsnake is a Utah species of concern in Washington County.

The western threadsnake is a secretive burrowing species, often living in moist loose soil. Because the species spends so much time under the ground, the western threadsnake's eyes are vestigial, meaning that they no longer function (UCDC 2008). Their potential habitat range is southwestern Washington County (UCDC 2008).

#### **13.9.2.2.5 Zebra-tailed Lizard**

The zebra-tailed lizard is a Utah species of concern in Washington County.

The zebra-tailed lizard prefers sparsely vegetated desert areas with hard packed soils (UCDC 2008). Their potential habitat range is southwestern Washington County.

#### **13.9.2.2.6 Northern Sagebrush Lizard**

The northern sagebrush lizard is a BLM sensitive species in the Arizona Strip.

The species is chiefly a ground-dweller, usually found near bushes, brush heaps, logs, or rocks and occasionally in trees. A sagebrush habitat lizard over much of its range, it also occurs in manzanita and ceanothus brushland, pinyon-juniper woodlands, pine and fir forests of canyon bottoms, and boulder fields within oak thickets. Northern sagebrush lizards are sometimes found abundantly in association with prairie dog towns (AZNHP 2008). Its range includes northern Coconino County.

#### **13.9.2.2.7 Western Banded Gecko**

The western banded gecko is a Utah species of concern in Washington County.

Banded Geckos are abundant in the deserts, occupying a wide range of habitats, especially rocky or sandy desert and semiarid locales into oak and pinyon-juniper woodlands up to 5,000 feet (Desert USA 2008). Their mapped critical habitat covers much of Washington County (UCDC 2008).

#### **13.9.2.2.8 Utah Milk Snake**

The Utah milksnake is an Arizona Game and Fish Department wildlife species of concern (Category 1b).

A subspecies of *Lampropeltis triangulum*, the Utah milk snake is found in a variety of habitats including grasslands, desert scrub, pinyon-juniper and scrub oak (Utah Herps.info 2008). Their potential habitat occurs in the Project area.

#### ***13.9.2.2.8 Project Nexus (§5.11(d)(4))***

The described reptile species are potentially occurring in and near the Project south alignment in northern Coconino and Mohave Counties and southwestern Washington County, with the common chuckwalla also potential in Iron and Kane Counties. Reptiles could be killed or injured by construction activity or traffic and nests and eggs could be destroyed during construction or maintenance of Project features.

#### ***13.9.2.2.9 Proposed Study and Methodology (§5.11(d)(5))***

Phased habitat assessment and field survey methodology for reptiles would be similar to those described for amphibians in Section 2.4.2.2.1.4, with the exception that visual encounter surveys would be the primary field technique. The studies would be performed in consultation with appropriate agency biologists by a herpetologist familiar with the habitats and potential species of the Project alignment areas. Field surveys would be conducted to coincide with the maximum period of activity of the target species. Maps would be prepared for all habitats surveyed with GPS locations of all target species.

#### ***13.9.2.2.10 Estimated Level of Effort and Cost (§5.11(d)(6))***

It is estimated that a minimum of five person days would be required for office habitat surveys, field habitat confirmation, field species surveys and mapping for each of the nine reptile species described in this section. Estimated cost for the study is \$35,000. The study could be completed within one field season.

### **13.9.2.3 Birds**

#### ***13.9.2.3.2 Burrowing Owl***

The burrowing owl is a Utah species of concern for Iron, Kane Washington Counties, a BLM sensitive species, a USFWS bird of conservation concern and an Arizona Game and Fish Department species of wildlife concern for the Arizona Strip.

In Utah, it is uncommon during summer in proper habitat throughout the state. Its habitats are open grassland and prairies, but it also utilizes other open situations, such as golf courses, cemeteries, and airports. The nest is in a mammal burrow, usually that of a prairie dog, ground squirrel, badger, or armadillo; if a mammal burrow is not available the owls will sometimes excavate their own nest burrow (UCDC 2008). Utah GAP analysis mapping shows critical value habitat throughout much of the state (UCDC 2008). In Arizona, it has been reported in northern Coconino and Mohave Counties (AZNHP 2008).

#### ***13.9.2.3.3 Ferruginous Hawk***

The ferruginous hawk is a Utah species of concern for Iron, Kane Washington Counties, a BLM sensitive species, a USFWS bird of conservation concern and an Arizona Game and Fish Department species of wildlife concern for the Arizona Strip.

Ferruginous hawk nest substrates vary throughout range and shows great flexibility from trees and shrubs (49% of 2,119 nests), cliffs (21%), utility structures (12%), and ground outcrops (10%). Locally use haystacks, abandoned buildings, or ground. Bulky sticks (e.g., sagebrush) are used for nest construction and through time nests become very large (e.g., almost 1.5 m in diameter) (UCDC 2008). In general, the ferruginous hawk breeds in open areas with little topographic relief. Hunting areas are typically open grasslands, preferably those dotted with suitable low hills or short trees which serve as perches. In

Arizona, the open scrublands and woodlands, grasslands, and semidesert grassland in the northern and southeastern parts of the state are the potential habitat of breeding ferruginous hawks. During winter, they select the same areas, along with agricultural areas statewide; it does not use cultivated lands for nesting. The species avoids high elevation, forest interior, and narrow canyons (AZNHP 2008).

Potential critical value habitat for ferruginous hawks is widespread in Iron, Kane and Washington Counties (UCDC 2008); it Arizona range includes the southern areas of Coconino and Mohave Counties (AZNHP 2008).

#### ***13.9.2.3.4 Lewis's Woodpecker***

Lewis's woodpecker is a Utah species of concern for Iron and Washington Counties and a USFWS bird of conservation concern.

The major breeding habitat for Lewis's woodpecker consists of open park-like ponderosa pine forests. Lewis's woodpecker is attracted to burned-over Douglas-fir, mixed conifer, pinyon-juniper, riparian, and oak woodlands, but is also found in the fringes of pine and juniper stands, and deciduous forests, especially riparian cottonwoods. Areas with a good under-story of grasses and shrubs to support insect prey populations are preferred. Dead trees and stumps are required for nesting. Wintering grounds are over a wide range of habitats, but oak woodlands are preferred (UCDC 2008). High to critical value potential habitat is sparsely present in Iron and Washington Counties.

#### ***13.9.2.3.5 Long-billed Curlew***

The long-billed curlew is a Utah species of concern for Iron and Washington Counties and a USFWS bird of conservation concern.

Long-billed curlews have four essential nesting habitat requirements in the northwestern United States: (1) short grass (less than 30 cm tall), (2) bare ground components, (3) shade, and (4) abundant vertebrate prey. They seem to be most successful nesting in mixed fields with adequate, but not tall, grass cover and fields with elevated points. Uncultivated rangelands and pastures support most of the continental long-billed curlew breeding population (UCDC 2008). Potential primary and secondary breeding habitat are mapped by the Utah GAP analysis in northern Washington County and Iron County (UCDC 2008).

#### ***13.9.2.3.6 Northern Goshawk***

The northern goshawk is a Utah species of concern for Iron, Kane Washington Counties and an Arizona Game and Fish Department species of wildlife concern for the Arizona Strip.

The northern goshawk prefers mature mountain forest and riparian zone habitats. Nests are constructed in trees in mature forests (UCDC 2008). In Arizona, goshawk's nest most commonly in ponderosa pine forests along the Mogollon Rim and on the Kaibab Plateau, and in Arizona pine and ponderosa pine forests in the southeastern mountains (AZNHP 2008). Potential habitat is sparsely present in Utah; in Arizona, there are concentrations of northern goshawk observations in northwestern Coconino County.

#### ***13.9.2.3.7 Short-eared Owl***

The short-eared owl is a Utah species of concern for Iron and Washington Counties.

The short-eared owl, is a medium-sized owl that frequently flies during daylight, especially at dusk and dawn, as it forages for rodents. This owl is usually found in grasslands, shrublands, and other open

habitats. It is nomadic, often choosing a new breeding site each year, depending on local rodent densities (UCDC 2008). Potential high to critical value habitat is mapped for Washington and Iron Counties (UCDC 2008).

#### ***13.9.2.3.8 Loggerhead Shrike***

The loggerhead shrike is a BLM sensitive species for the Arizona Strip.

Loggerhead shrikes utilize open country with scattered trees and shrubs, savanna, desert scrub and occasionally open woodland (AZNHP 2008).

#### ***13.9.2.3.9 Western Grasshopper Sparrow***

The western grasshopper sparrow is an Arizona Game and Fish Department wildlife species of concern (Category 1b).

*Ammodrammus savannarum* has a number of subspecies; western subspecies generally inhabit grasslands, as their name would imply. They are ground nesters (Utah Birds 2008) and could occur in habitats crossed by Project construction.

#### ***13.9.2.3.10 Belted Kingfisher***

The belted kingfisher is an Arizona Game and Fish Department wildlife species of concern (Category 1b).

Belted kingfishers are primarily piscivores, although they will also take small amphibians and invertebrates (Sibley 2001); because of this their habitat is dependent on perennial water. Kingfishers nest in burrows excavated from vertical sandy banks (Sibley 2001). They could occur near on streams crossed by Project facilities, especially the Virgin River.

#### ***13.9.2.3.11 Sage Thrasher***

The sage thrasher is an Arizona Game and Fish Department wildlife species of concern (Category 1b).

As their name implies, the sage thrasher inhabits sagebrush communities in low deserts (UCDC 2008). They are potential nesters throughout much of the Project area.

#### ***13.9.2.3.12 Black-throated Gray Warbler***

Black-throated gray warbler is a USFWS bird of conservation concern.

Black-throated gray warblers nest in pinyon-juniper and mountain shrub habitats and are found in both southern Utah and northern Arizona in the Project area (Utah Birds 2008).

#### ***13.9.2.3.13 Brewer's Sparrow***

Brewer's sparrow is a USFWS bird of conservation concern.

The Brewer's sparrow nests in shrub-steppe and high desert scrub habitats on both sides of the Utah-Arizona border in the Project area.

#### ***13.9.2.3.14 Bell's Vireo***

Bell's vireo is a USFWS bird of conservation concern.

Bell's vireos are a riparian-nesting species and have been recorded nesting in small numbers in northern Arizona and southern Washington County in Utah (Utah Birds 2008).

#### ***13.9.2.3.15 Bendire's Thrasher***

Bendire's thrasher is a USFWS bird of conservation concern.

Bendire's thrasher nests in low desert scrub habitat in Utah and has been observed in Washington County near Sand Hollow Reservoir (Utah Birds 2008).

#### ***13.9.2.3.16 Crissal Thrasher***

Crissal thrasher is a USFWS bird of conservation concern.

Crissal thrashers nest in low desert scrub and riparian areas (Utah Birds 2008). Their nesting range includes Washington County, Utah and northwestern Mohave County, Arizona.

#### ***13.9.2.3.17 Golden Eagle***

The golden eagle is a USFWS bird of conservation concern.

Golden eagles nest on cliffs near open country (UCDC 2008) and in high desert scrub (Utah Birds 2008). High value habitat is located widely through southern Utah and northern Arizona (UCDC 2008, Utah Birds 2008).

#### ***13.9.2.3.18 Gray Vireo***

The gray vireo is a USFWS bird of conservation concern.

Gray vireos nest in pinyon-juniper and oak habitats on both sides of the Utah-Arizona border (Utah Birds 2008).

#### ***13.9.2.3.19 Northern Harrier***

Northern harrier is a USFWS bird of conservation concern.

Harriers are ground-nesters in marshes, fields, grasslands and desert scrub (UCDC 2008, Utah Birds 2008). It is an uncommon nester in southern Utah.

#### ***13.9.2.3.20 Pinyon Jay***

The pinyon jay is a USFWS bird of conservation concern.

Pinyon jays nest in pinyon-juniper and conifer habitats (Utah Birds 2008); they are fairly common across the Utah-Arizona border in the Project area.

#### ***13.9.2.3.21 Prairie Falcon***

Prairie falcon is a USFWS bird of conservation concern.

Prairie falcons nest on cliffs in high desert scrub habitats; they are potential but uncommon in the Project area in southern Utah and northern Arizona (Utah Birds 2008).

#### ***13.9.2.3.22 Sage Sparrow***

The sage sparrow is a USFWS bird of conservation concern.

Sage sparrows nest in shrublands, grasslands and desert habitats, often on the ground (UCDC 2008). They nest on both sides of the Utah-Arizona border in the Project area (Utah Birds 2008).

#### ***13.9.2.3.23 Swainson's Hawk***

Swainson's hawk is a USFWS bird of conservation concern.

Swainson's hawks nest in shrub, grassland and juniper habitats (UCDC 2008); they would be uncommon in the Project area as nesters, but potential winter habitat is located throughout southern Utah and northern Arizona (UCDC 2008, Utah Birds 2008).

#### ***13.9.2.3.24 Virginia's Warbler***

Virginia's warbler is a USFWS bird of conservation concern.

Virginia's warbler nesting habitat includes chaparral and pinyon-juniper and scrub oak (UCDC 2008); they may breed in small numbers in northwest Arizona and southwest Utah (Utah Birds 2008).

#### ***13.9.2.3.25 Red-naped Sapsucker***

Red-naped sapsucker is an Arizona Game and Fish Department wildlife species of concern.

The red-naped sapsucker nests in coniferous or deciduous woodlands, especially aspens, and is found in Utah in summer in mid-elevation woodlands and riparian areas (UCDC 2008, Utah Birds 2008). USGS GAP mapping shows widespread predicted species distribution across the Project area.

#### ***13.9.2.3.26 White-throated Swift***

The white-throated swift is a Partners in Flight watch list species. (PIF 2008).

Preferred habitats of the white-throated swift include rocky cliffs and canyons in mountainous areas (UCDC 2008). GAP analysis mapping shows predicted species occurrence in southern Utah and northern Arizona near the Project alignments (USGS 2008).

#### ***13.9.2.3.27 Black-chinned Sparrow***

The black-chinned sparrow is a Partners in Flight watchlist species. (PIF 2008).

The black-chinned sparrow inhabits arid brushlands, such as sagebrush and chaparral, at lower elevations on rugged mountain slopes. Migratory populations utilize similar habitats, but often at even lower



elevations (UCDC 2008). Breeding survey maps show small populations on both sides of the Utah-Arizona border in the Project area (Utah Birds 2008).

#### ***13.9.2.3.28 Lucy's Warbler***

Lucy's warbler is a Partners in Flight watch list species. (PIF 2008).

Lucy's warbler nests in mesquite and desert brush habitats and in riparian areas with willow and cottonwoods (UCDC 2008). Breeding survey maps show its range extending into northwestern Arizona and southwestern Utah (Utah Birds 2008).

#### ***13.9.2.3.29 Abert's Towhee***

Abert's towhee is a Partners in Flight watch list species. (PIF 2008).

Abert's towhee was formerly a year-round resident of the brushy under-story of cottonwood-willow riparian habitat and mesquite bosques along stream sides below 1,220 m (4,000 ft) elevation. Most of this habitat has been modified or eliminated, and Abert's towhees are now found in cottonwood-willow remnants, exotic vegetation such as salt cedar, and mixed exotic/native habitat. In Utah, Abert's towhees are found in salt cedar/willow riparian habitats along the Virgin River drainage south of LaVerkin (UCDC 2008). It's breeding range includes northwestern Arizona (Audubon 2008).

#### ***13.9.2.3.30 Le Conte's Thrasher***

Le Conte's thrasher is a Partners in Flight watch list species. (PIF 2008).

Le Conte's thrashers are birds of desert scrub habitat. In Utah, it is known only from the Beaver Dam Slope area in the extreme southwestern corner of the state, where it occurs in small numbers (UCDC 2008, Utah Birds 2008). Its breeding range extends into northwestern Arizona (Utah Birds 2008).

#### ***13.9.2.3.13 Project Nexus (§5.11(d)(4))***

The greatest period of risk for bird species is during mating, nesting and fledging. Potential disturbance from construction activity, noise and blasting, and human presence could disrupt mating behaviors, destroy nests, interrupt incubation and cause death or injury to eggs and young birds before they are able to fly. Adult birds would be at lesser risk of direct injury or death; however raptors could be at risk from power line collisions. All new and upgraded transmission lines should conform to the most current edition of the Avian Protection Plan (APP) Guidelines by the Edison Electric Institute (EEI 2008).

#### ***13.9.2.3.14 Proposed Study and Methodology (§5.11(d)(5))***

Phased habitat assessments would be performed by an experienced ornithologist for each species, in consultation with appropriate agency biologists, concentrating on nesting habitat, using available maps, videography and orthophotographic data and analysis of historic occurrence data followed by ground verification of suitable habitat.

Much of the Proposed and Alternative Alignments are located within disturbed areas of highway right-of-ways, agricultural fields or developed urban or suburban communities. Vegetative Community Mapping data would be used to locate appropriate potential nesting habitats for the target species. Field surveys would be carried out in areas of confirmed suitable nesting habitat using standard methods such as point counts, transects, call back studies and nest identification. For raptor nest surveys and bald eagle winter

roost surveys, aerial survey by helicopter may be used, if deemed the most efficient method. All habitat surveyed would be mapped with GPS locations of all species identified.

#### ***13.9.2.3.15 Estimated Level of Effort and Cost (§5.11(d)(6))***

Estimated level of effort and costs for habitat assessment would be similar to those described in previous sections. The total cost would depend on the number of potential habitat assessment sites evaluated and the number of field surveys required. It is estimated that a minimum of five person days would be required for office habitat surveys, field habitat confirmation, field species surveys and mapping for each of the 11 bird species described in this section. Estimated cost for the study is \$40,000. The study could be completed within one field season.

### **13.9.2.4 Mammals**

#### ***13.9.2.4.1 Fringed Myotis Bat***

The fringed myotis is a Utah species of concern in Iron, Kane and Washington Counties and a BLM sensitive species in the Arizona Strip.

Fringed myotis occur primarily in middle elevation habitats ranging from deserts, grasslands, and woodlands. They are most frequently captured in oak-pinyon woodlands and other open, coniferous, middle-elevation forests but have also been captured in high-elevation habitats and at sea level in coastal areas. Roost sites have been found in caves, mine tunnels, in large snags, under exfoliating bark, and in buildings (AZNHP 2008). The species is widely distributed throughout Utah, but is not very common in the state; in Utah fringed myotis inhabits caves, mines, and buildings, most often in desert and woodland areas (UCDC 2008). Utah GAP analysis mapping shows substantial to high values habitat in Washington and Kane Counties (UCDC 2008). It has been recorded in northern Coconino and Mohave Counties (AZNHP 2008).

#### ***13.9.2.4.2 Allen's Big-eared Bat***

Allen's big-eared bat is a Utah species of concern in Iron and Kane Counties and a BLM sensitive species in the Arizona Strip.

Preferred habitats for the species include rocky and riparian areas in woodland and scrubland regions. Little is known about the breeding activity of the species, but females have been found with single young during the late spring and early summer (UCDC 2008). Most Arizona specimens have been taken from the southern Colorado Plateau, the Mogollon Rim and adjacent mountain ranges (AZNHP 2008). Utah GAP analysis mapping shows substantial value habitat scattered through Washington and Kane Counties (UCDC 2008). It has been recorded in northern Coconino and Mohave Counties (AZNHP 2008).

#### ***13.9.2.4.3 Big Free-tailed Bat***

The big free-tailed bat is a Utah species of concern in Washington and Kane Counties and a BLM sensitive species in the Arizona Strip.

The big free-tailed bat prefers rocky and woodland habitats, where roosting occurs in caves, mines, old buildings, and rock crevices in Utah (UCDC 2008). Arizona habitats are primarily rugged, rocky country and riparian areas (AZNHP 2008). It has been recorded in northern Coconino and Mohave Counties. Utah GAP analysis mapping shows substantial value habitat scattered through Washington, Kane and Iron Counties (UCDC 2008).

#### ***13.9.2.4.4 Western Red Bat***

The western red bat is a Utah species of concern in Washington County.

The species is extremely rare in Utah, being known from only a few locations in the state. Western red bats are normally found near water, often in wooded areas (UCDC 2008). Utah GAP analysis mapping shows potential critical values habitat in higher elevations areas of Kane and Washington counties (UCDC 2008).

#### ***13.9.2.4.5 Small-footed Myotis Bat***

The small-footed myotis is a BLM sensitive species in the Arizona Strip.

The small-footed myotis generally inhabits desert, chaparral, western coniferous forest, badland and semiarid habitats, more mesic habitats in southern part of range. In Arizona, it is known from deserts, chaparral, riparian areas and oak-juniper forests (AZNHP 2008). It hibernates in caves and old mines, summers in crevices, cracks, holes, snags, hollow trees, under rocks and in buildings. The species generally tolerates colder and dryer hibernacula than other small bats. It has been recorded in northern Coconino and Mohave Counties (AZNHP 2008).

#### ***13.9.2.4.6 Long-eared Myotis Bat***

The long-eared myotis is a BLM sensitive species in the Arizona Strip.

Long-eared myotis inhabits ponderosa pine or spruce-fir forests of Arizona. During the summer months these bats roost in small groups of 12 to 30 individuals in rock outcroppings, tree cavities, under peeling bark, in stumps, caves, mines, sink holes, lava tubes, or in abandoned buildings. Large diameter trees and snags seem to be the preferred tree roost sites. During winter it is likely that they use caves and abandoned mines as hibernacula. Long-eared myotis are most often captured in mixed coniferous forests but also occur in higher elevation forests, pinyon-juniper woodlands, sagebrush steppe, and in riparian desert scrub habitats (AZNHP 2008). It has been recorded from northern Coconino County.

#### ***13.9.2.4.7 Townsend's Big-eared Bat***

Townsend's big-eared bat is a Utah species of concern in Iron, Kane and Washington Counties.

Townsend's big-eared bats utilize caves and mine shafts near forested areas for roosting and hibernation; they may also roost in abandoned buildings (UCDC 2008, AZNHP 2008). Foraging is thought to be more gleaning from vegetation than in-air hawking; a water source near the roost site is important (Gruver and Keinath 2006). Townsend's big-eared bats occur widely in Utah and Arizona (UCDC 2008, AZNHP 2008).

#### ***13.9.2.4.8 Greater (Western) Mastiff Bat***

The greater western mastiff bat is an Arizona Game and Fish Department wildlife species of concern (Category 1b).

This largest North American bat is found in lower and upper Sonoran desertscrub near cliffs, preferring the rugged rocky canyons with abundant crevices. They prefer crowding into tight crevices a foot or more

deep and two inches or more wide (AZNHP 2008). The species has been found in northern Coconino County (AZNHP 2008).

#### ***13.9.2.4.9 Kit Fox***

The kit fox is a Utah species of concern in Iron, Kane and Washington Counties.

Although the species is not overly abundant in Utah, it does occur in the western, east-central, and southeastern areas of the state (UCDC 2008). Kit fox habitat is usually sparsely vegetated flat areas in the desert. Common range plants such as grey molly, greasewood, shadescale and seepweed are abundant in these areas (UDWR 2008). Kit foxes live in dens dug in the desert soil. Kit foxes have definite preferences and permanent ties to specific den sites. They tend to select sites in barren areas with silty, clay soil that are higher than the surrounding terrain. (UDWR 2008). Utah GAP analysis mapping shows high to substantial value habitat in Washington and Iron Counties (UCDC 2008).

#### ***13.9.2.4.10 Pygmy Rabbit***

The pygmy rabbit is a Utah state species of concern in Iron and Washington Counties.

The pygmy rabbit prefers areas with tall dense sagebrush and loose soils (UCDC 2008). Utah GAP analysis mapping shows critical to high value habitat in Iron County along the Cedar Valley Pipeline corridor.

#### ***13.9.2.4.11 Dwarf Shrew***

The dwarf shrew is an Arizona Game and Fish Department wildlife species of concern (Category 1b). It lives throughout the southern and central Rocky Mountains and adjacent plains, in habitats from alpine [tundra](#) to arid short-grass prairie (Smithsonian 2008). Specific data on locality of occurrence, habitat and biology are lacking because field trapping has been limited by the small size of this shrew - too small and light to trigger many traps used in surveys (Smithsonian 2008). In Utah, although potential habitat is widespread, it is known from only two locations: the Uinta Mountains and Abajo Mountains (UCDC 2008). USGS GAP mapping shows predicted dwarf shrew habitat on both sides of Highway 89 west of the Cockscomb to the point where the South Alternative leaves the highway (USGS 2008). From that point west to Kanab on the Existing Highway Alternative alignment, GAP mapping shows potential habitat on the north side of the Project corridor (USGS 2008). In northern Arizona, GAP mapping shows potential habitat only on upper elevations of the Kaibab Plateau (USGS 2008).

#### ***13.9.2.4.9 Project Nexus (§5.11(d)(4))***

The primary risk factor for bat species that may occur in the Project alignment corridors would be disturbance of roost sites by construction activity, noise and vibrations and human presence. Free-flying bats would not be at risk of death or injury to individuals. It is anticipated that potential roost sites would be located mainly near the Hurricane Cliffs segment of the south alignment.

Pygmy rabbits could be killed or injured by construction equipment, traffic or blasting; pygmy rabbit burrows could be destroyed by construction activities and human presence, noise and vibrations could disrupt pygmy rabbit activity patterns such as feeding, breeding, rearing of young or resting. Pygmy rabbit habitat for foraging could be temporarily disturbed during construction until the construction corridor was reclaimed and habitat restored to baseline conditions.

The primary risk factor for kit foxes would be disturbance or destruction of dens within the Project construction corridors and mortality of young pups still in the den. Adult and juvenile kit foxes would be able to relocate from the construction zone and would be at less risk for direct construction mortality. Fox activity patterns such as foraging, breeding, rearing of young, or resting could be disrupted by human presence, noise and vibrations. Kit fox habitat for foraging could be temporarily disturbed during construction until the construction corridor was reclaimed and habitat restored to baseline conditions.

Dwarf shrews would be vulnerable to mortality from construction activity that would crush individuals or den sites and from human activity that would disrupt activity patterns such as feeding, breeding or rearing of young.

#### ***13.9.2.4.10 Proposed Study and Methodology (§5.11(d)(5))***

Phased habitat assessments and field studies similar to those described in previous sections would be performed for bat species and the pygmy rabbit and kit fox.

An experienced bat specialist, in consultation with appropriate agency biologists, would analyze existing data on bat roost locations and potential habitats from available maps, videography and orthophotographic data and historic occurrence data to determine sites for field habitat assessment, followed by targeted species presence or absence surveys. Specific field methods (acoustic survey, mist netting) would be selected by the specialist appropriate to the target species and field location characteristics.

An experienced mammalogist, in consultation with appropriate agency biologists, would perform similar map and field habitat assessments and analysis of historic occurrence data to target potential dwarf shrew and pygmy rabbit habitats and kit fox denning sites for follow-up field surveys, using transect sampling appropriate for the habitat location and area being studied. The current method of choice of field survey for dwarf shrews is pitfall can traps (Smithsonian 2008).

Maps of potential and surveyed habitat would be prepared and GPS locations of all recorded species would be entered on the maps.

#### ***13.9.2.4.10 Estimated Level of Effort and Cost (§5.11(d)(6))***

Estimated level of effort and costs for habitat assessment would be similar to those described in previous sections. It is estimated that a minimum of five person days would be required for office habitat surveys, field habitat confirmation, field species surveys and mapping for each of the eight mammal species described in this section. Estimated cost for the study is \$30,000. The total cost would depend on the number of potential habitat assessment sites evaluated and the number of field surveys required. The study could be completed within one field season.

#### ***13.9.2.4.11 Summary of Cost for State and Agency Sensitive Wildlife Species***

Table 13-4 summarizes costs estimated in previous sections for state and agency sensitive wildlife species studies.

<p style="text-align: center;"><b>Table 13-4</b> <b>Summary of Costs for State and Agency</b> <b>Sensitive Wildlife Species Studies</b></p>
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<b>Taxon</b>	<b>Estimated Cost</b>
Amphibians	\$10,000
Reptiles	\$35,000
Birds	\$40,000
Mammals	\$30,000
<b>Total</b>	<b>\$115,000.00</b>

### ***13.9.3 Tribal Wildlife Species of Cultural Concern***

The Kaibab Band of Paiute Indians of Northern Arizona has submitted a list of wildlife species of cultural concern, summarized in Table 13-5.

<b>Table 13-5</b> <b>Kaibab Band of Paiute Indians Wildlife Species of Cultural Concern</b>			
Mule Deer	Lizards	Rabbits	Gophers
Cotton Tails	Owls	Chipmunks	Morning Doves
Coyotes	Crickets	Fox	Grasshoppers
Badgers	Bighorn sheep	Squirrels (Flying and Non Flying)	Buffalo
Eagles	Wood peckers	Mice/Rats	Antelope
Porcupine	Ducks	Bats	Mountain Lions
Crows/Ravens	Bobcats/Lynx	Snakes (All)	Hawks (all)
Condors	Prairie Dogs	Skunks	Frogs
Raccoons			

#### **13.9.3.1 Project Nexus (§5.11(d)(4))**

The Kaibab Band of Paiute Indians has commented on the Lake Powell Pipeline Project PAD that plants and animals identified by the Tribe as having special importance for cultural and religious purposes must be protected under the provisions of the American Indian Religious Freedom Act, 42 U.S.C. § 1996, and that the work plan must include those plants and animals in its analysis of impacts.

#### **13.9.3.2 Proposed Study and Methodology (§5.11(d)(5))**

Wildlife species of concern listed by the federal government, states and agencies include several of the categories of wildlife of tribal cultural concern and proposed habitat assessments, field studies and methodology for these species has been described in previous sections. The Kaibab Band of Paiute Indians' list of Wildlife of Cultural Concern contains multiple species; the list will be narrowed by the Tribe to include those species of particular importance and interest to Tribal members.

Other categories of tribal species of cultural concern are not listed by the federal government, states or agencies as being at current risk and are not proposed for habitat assessments or field surveys. Measures to protect wildlife species in general and to minimize impacts on wildlife, including wildlife species of cultural concern, from Project construction and maintenance will be described in the study report and Project environmental document.

### **13.9.3.3 Estimated Level of Effort and Cost (§5.11(d)(6))**

None.

### ***13.9.4 Draft Study Report Preparation***

The project biologists will prepare a draft report that includes the results of the surveys and study efforts, and identifies, describes, and assesses the extent to which project-related actions and activities may affect special-status wildlife and their habitat. The distribution of each special status wildlife species within the proposed Project will be documented and presented on maps showing the extent of the surveyed or studied habitat and the relationship to proposed Project features. The report will document the dates and times of the surveys and methods used, provide brief descriptions of the life history of each species and habitats (e.g., vegetation community types) occupied, and present maps showing the area surveyed, species locations, numbers of individuals found, area of occupied habitat, habitat description, condition, and threats to the population. Some special status wildlife occurrence information that is considered sensitive data may need to be restricted. Rationale will be provided if it is determined that no potential habitat is present for any of the special status species (e.g., out of habitat or geographic range).

Recommendations and conservation measures plan, as appropriate, will be included regarding measures to avoid or reduce potential adverse impacts on special status wildlife and their habitats. A list of all wildlife species observed during surveys will be included as part of the study. Any variances from the study plan will be summarized and documented in the draft report.

### ***13.9.5 Prepare Final Study Report***

The product of this study will be a final report that: 1) describes the survey goals and objectives; 2) builds on information already compiled in the PAD to describe existing conditions; 3) presents the methods used to identify suitable habitat for special status species, select survey areas, and collect the data; 4) describes the habitat characteristics of surveyed areas; 5) details the results of the survey in terms of special status wildlife observed, and their habitat associations; and 6) shows the survey areas and any special status wildlife sightings using GIS-based maps and accompanying summary tables. The study report will analyze the effects of Project operations and/or Project-related activities, if any are identified, and discuss any measures that may be needed to protect or enhance special status wildlife species and habitats that could be disturbed. Variances from the study plan will be summarized and documented in the final study report.

### ***13.9.6 Interdisciplinary Dependencies***

Special Status Wildlife Species studies are dependent on the results of the Vegetation Community Mapping, Surface Water Resources, Wetlands and Riparian Resources and Noise analyses.

Vegetation Community Mapping data will be utilized to determine potential habitat locations for special status species and to direct field studies to those most likely to be occupied by the target species.

Surface water resources data will be utilized to analyze potential impacts of Project water return flows into the Virgin River or other riparian areas that might affect habitat for state, agency or tribal species.

Wetlands and Riparian Resources data will be used to identify potential habitats for riparian-related state, agency or tribal species.

Noise data will be used to analyze potential for reduced utilization of habitat adjacent to the pipeline corridor by state, agency or tribal species during Project construction and maintenance.

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<b>Acronyms and Abbreviations</b>	
<b>Acronym/Abbreviation</b>	<b>Meaning</b>
AFGD-WSC	Arizona Fish and Game Department Wildlife Species of Concern
APP	Avian Protection Program
AZNHP	Arizona Natural Heritage Program
BA	Biological Assessment
BCC	Bird of Conservation Concern
BO	Biological Opinion
BLM	Bureau of Land Management
BLM-C	BLM Sensitive Species
C	Candidate
CS	Species with Conservation Agreements
CFR	Code of Federal Regulations
DM	Delisted, Monitored
E	Endangered
EEI	Edison Electric Institute
ESA	Endangered Species Act
EXPN	Experimental, Non-essential
FERC	Federal Energy Regulatory Commission
FR	Federal Register
GPS	Global Positioning System
HCP	Habitat Conservation Plan
PAD	Pre-Application Document
PIF	Partners in Flight
PMZ	Potential Management Zone
§	Section
SBSC	Southwest Biological Services Center
UCDC	Utah Conservation Data Center
UDWR	Utah Division of Wildlife Resources
USA	United States of America
USFWS	U.S. Fish & Wildlife Service
U.S.C.	United States Code
USPC	Utah Species of Concern

## **Study Plan 14: Transportation**

### **14.1 Introduction**

This study plan documents the methods for determining impacts to transportation resulting from the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Preliminary Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those received during the study plan development process including the September and October study plan meetings in Salt Lake City and St. George, Utah. This study plan presents an approach for advancing knowledge and understanding of transportation conditions as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan also addresses study requests identified by FERC, EPA, Kaibab Tribe and other reviewers in their comments on the PAD and Scoping Document No. 1.

### **14.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

This study plan describes goals and objectives, provides a study area description, describes the Project nexus, presents the methodology for the proposed study activities, presents staffing and equipment requirements, provides a budget for activities associated with the transportation portion of the study, and provides a generalized project schedule. The study will identify potential impacts of the Project on transportation during Project construction and operation, and identify measures to mitigate transportation impacts resulting from Project construction, operation and maintenance activities. The study plan also addresses safety issues associated with transportation activities.

#### ***14.2.1 Goals and Objectives***

The goals of the transportation study plan are to identify and determine transportation impacts resulting from Project construction and operation. Information regarding potential transportation impacts is needed to guide decisions in the Project design, construction, operation and maintenance that would minimize the effect of the Project on transportation.

Specific transportation related objectives include determination of how traffic (road, air, rail and trail) will be affected by Project construction and operation along the alternative alignments. Following are the primary objectives of the transportation study.

- Identify baseline traffic information without the Project
- Identify off road trails that may be impacted by the Project
- Identify requirements of Arizona strip plan for noxious weed control and incorporate into plan
- Determine increased traffic resulting from Project construction traffic
- Determine increased traffic resulting from Project facilities operation
- Identify rights of way along proposed impacted roads
- Identify access to Project construction sites
- Quantify length of new roads to be constructed for construction and operational access
- Identify potentially impacted roads and highways
- Analyze cumulative impacts to transportation within the Project area

- Identify increased hazards resulting from altered traffic
- Evaluate potential to mitigate impacts to traffic from the Project along the alternative alignments through design, construction, or O&M practices
- Prepare a preliminary Traffic Management Plan for NPS review and approval as coordinated with local, State and Federal agencies
- Note any items to be accounted for in future construction such as coordination with new roads and requiring wash down areas to minimize mud and construction dust on roadways as coordinated with air quality resource
- determine indirect effects on transportation quality from ancillary structures in study area (not just in pipeline right-of-way)

### **14.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the States of Utah and Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies or counties, cities, and Indian tribes with jurisdiction over the resources to be studied. The various agencies will be contacted to gather information regarding their goals with respect to transportation. These goals will be incorporated into the studies. Specifically, as appropriate, the tribal statutes and regulations and the Bureau of Indian Affairs regulations will be addressed as applicable.

### **14.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

#### ***14.4.1 Background Description***

Transportation in the study area has been evaluated on both a large, general scale and a more site specific scale in population areas via regional traffic studies and local traffic analysis.

Transportation resources within the Project area are primarily comprised of existing federal, state, county, city, and private roads. Interstate 15 (I-15) is the primary north-south interstate highway in Utah. It passes through the St. George metropolitan area as well as Cedar City; the Project's CVP would parallel I-15 from the Quail Creek Reservoir area to the Cedar City area.

The Project would parallel U.S. Highway 89, Arizona State Highway 389 and Utah State Highway 59. It would cross U.S. Highway 89A and State Highway 237. The Project is proposed to be constructed outside of the running surface of the roads and within the established road rights-of-way. Although U.S. Highway 89 predominantly runs north-south, the section within the Project area is oriented mostly east-west. U.S. Highway 89, along with Arizona and Utah state highways, functions as a main transportation route between Lake Powell and the St. George metropolitan area and provides a transportation corridor through the Grand Staircase-Escalante National Monument.

Commercial air travel is fairly limited in the Project vicinity. The closest international airport is located in Las Vegas, approximately 160 miles from the Project area. The second closest international airport is in Salt Lake City, approximately 290 miles from the Project area. St. George Municipal and Cedar City Regional Airports are closer to the Project area and provide commuter airline service. A large regional airport is anticipated to be completed in 2010 to serve the rapidly growing population in the St. George metropolitan area. Page, Arizona has a small, municipal airport approximately 5 miles from Glen Canyon Dam that provides scheduled air service to Denver, Colorado and Phoenix, Arizona.

No existing off-street trail systems have been identified within the Project area. There are a number of existing 4-wheel drive roads and trails within the Project area.

No rail or water transportation is available within the Project area. St. George and Cedar City have local bus companies that serve these metropolitan areas.

#### ***14.4.2 Study Area Definition***

The study area would include the entire length of the alternative alignments; particular attention will be required for the following:

- State and Federal highways
- Local roads and access to essential facilities
- Cultural or historically sensitive areas (use and effects on historic and recreation trails will be addressed in the Recreation study and cultural resources study as appropriate)
- Air traffic
- Road closures
- Tourist use areas
- Areas containing endangered species
- Sensitive wildlife habitats
- River and stream crossings
- Locations of great economic or perceived aesthetic value
- Relatively dense population areas

The pipeline alignments and alternatives, including ancillary facilities and temporary construction areas will be identified. If study areas are redefined, the plans will be adjusted accordingly.

#### ***14.4.3 Issues and Data Needs***

The transportation analyses will include the following:

- Coordinate potential use or effects of and on existing Rights of Way with NPS, BLM, UDOT and ADOT personnel
- Review RS 2477 regarding county road control
- Compliance needs associated with the Highway Beautification Act
- Identify all specially designated or proposed Scenic highways
- Review all Federal Land Policy and Management Act (FLPMA) land uses
- Identification of additional significant impact criteria
- Baseline, historic (20 years), and projected Average Annual Daily Traffic (AADT) and percentage of AADT occurring during peak traffic times for affected roads from Utah Department of Transportation (UDOT), Arizona Department of Transportation (ADOT) and affected counties
- Baseline level of service (LOS) categorizations for affected roads from UDOT, ADOT and affected counties
- Minimum acceptable LOS categorizations for different road types from UDOT, ADOT and affected counties
- Rights-of-way along potentially impacted roads. The State will consult with the Kaibab Tribe regarding rights-of-way issues on the Reservation.
- Length of new roads to be constructed

- Field survey of baseline roadway conditions including number of lanes, presence of shoulders, surfacing material, road condition, and level of development along the road corridor
- Cultural, environmental and economically sensitive areas
- Projected and historic population data from the socioeconomics resource study

## **14.5 Nexus to Project (§5.11(d)(4))**

The Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, air release and pipeline blow-off equipment, and other features to convey water from Lake Powell to the St. George area and continuing on to the Cedar Valley. The pipeline and facilities will require installation through native soils and rocks. Transportation along the alternative pipeline alignments may be affected by Project construction, operation and maintenance activities. These possible traffic impacts may affect or alter project construction, operations, or maintenance, or all three. FERC licensing and Utah State Engineer approval of design will require demonstration that these potential adverse impacts on transportation have been identified and avoided or mitigated in such a way that potential impacts to the environment, local and visiting traffic have been minimized. Mitigation measures regarding impacts to transportation on tribal lands will be made in consultation with the Kaibab Band of Paiute Indians.

## **14.6 Proposed Study Methodology (§5.11(d)(5))**

### ***14.6.1 Introduction and Overall Approach***

A substantial number of documents, including technical reports, transportation agencies and engineering journal publications, and other literature were previously identified, reviewed and information compiled. This information was presented in the PAD. Additional review of literature on transportation conditions will be performed by identifying and reviewing available literature that may not have been identified previously, to determine what is known of the transportation conditions regionally and at specific locations along the alignment. Preparation of a summary report documenting these findings and providing recommendations for supplemental characterization will be provided if needed.

### ***14.6.2 Methods for Impact Analysis and Preliminary Design***

Methods pertaining to evaluation of transportation that may affect preliminary engineering analysis and preliminary design are identified in this section.

#### **14.6.2.1 Task 1 - Review of Existing Transportation Literature**

Previous review of existing literature has uncovered some information on a broad scale. A more detailed review of existing transportation data relevant to the Project that are available in current published reports, studies, and literature will be performed. The literature review will include information from established agency sources such as the U.S. Department of Transportation, state departments of transportation (UDOT and ADOT) (UDOT 2003), county and local agencies. Previous preliminary investigation work performed by engineering and scientific consultants and organizations will be obtained and reviewed for relevant transportation data and information. Information regarding construction activities and its effect on transportation will be reviewed as well.



#### **14.6.2.2 Task 2 - Field Investigations**

Previous investigations have included a broad, general inspection of field conditions along the pipeline alignment. Field investigations will include a detailed physical inspection of the alternative alignments. Particular attention will be given to highway and roadway local access, access to construction areas not on existing roadways, areas that may require lane closures, and locations and features identified as sensitive areas such as culturally, economically, and environmentally sensitive areas. Field investigations will be in accordance with commonly accepted field investigation practices. The following activities are anticipated:

- Physical inspection and video recording of the alternative alignments
- Field survey of baseline roadway conditions including number of lanes, presence of shoulders, surfacing material, road conditions, and level of development along the road corridor
- Identification of rights of way
- Identification of trails and other non automotive transportation routes
- Identification of areas of potential road closures
- Identification of areas for access to pipeline construction that is not along an existing roadway
- Evaluation of identified borrow sources for transportation considerations.

#### **14.6.2.3 Task 3 - Data Analyses**

Data collected from the literature review and field investigations will be compiled and evaluated by experienced, licensed engineers. Data evaluations will focus on satisfying the goals and objectives identified; specifically, determining how Project construction, operation and maintenance will affect traffic and transportation resources, and identify measures mitigate the effects on transportation infrastructure. Based upon the results of literature research, field studies, and data analyses resulting in impact determinations, mitigation measures will be identified and developed to mitigate significant impacts.

The analysis will examine construction and operations and maintenance traffic impacts. For major roads, base year AADT will be compared with peak construction year AADT and peak operations and maintenance AADT. The percentage increase in AADT will be calculated for each and the significance criteria applied to determine if significant impacts would occur. Base year LOS will be compared with peak construction year LOS and peak operations and maintenance year LOS. The change in LOS will be compared with the significance criteria to determine if significant impacts would occur. For minor roads, estimating the maximum construction and operations and maintenance trips per day and comparing them to baseline trips per day will determine significant impacts. If these trips would result in more than a 10-percent increase in AADT or a decrease in LOS, then the impacts will be determined significant. In addition, anticipated vehicular travel delays, re-routing of emergency vehicles, required detours, and any accelerated roadway deterioration and maintenance costs will be assessed for impacts from construction and operations and maintenance traffic.

#### **14.6.2.4 Task 4 – Report Preparation**

A technical report will be prepared to document the literature review, field investigations, and data analyses. It will present project goals and objectives and describe the study area, document the literature review, and note general and specific conditions that pertain to transportation in the study area. Field investigation activities and methods will be described, and data evaluations and results will be presented. Results will be discussed with a focus on the study objectives. Conclusions, where warranted, will be

provided, and will address measures to mitigate potential transportation impacts from the Project. These conclusions may include recommendations that could affect Project facilities design.

#### **14.7 Schedule and Level of Effort (§5.11(d)(6))**

The research into local and regional transportation will require professional engineers with appropriate experience to conduct the field investigations and data analyses identified above. Each professional performing literature research, field investigation, and data analyses will provide their own field equipment, sheets and notes for documentation of activities, data and information. Total study costs are estimated to be approximately \$70,000.

An approximate schedule for performance of the study is shown in Table 14-1. The study can be completed within a one-year period.

<b>Table 14-1 Transportation Proposed Study Schedule</b>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review of Transportation Literature	Ongoing	February 2009	-
2	Field Investigations	March 2009	June 2009	10
3	Data Evaluation	July 2009	August 2009	45
4	Final Report Preparation	September 2009	November 2009	60

#### **14.8 Progress Reporting (§5.11(b)(3))**

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009 and August 2009. The final report will be submitted in November 2009.

#### **14.9 Dependencies on Other Resource Analyses**

The transportation analysis will be primarily dependent on the analysis results of the water resources economics/socioeconomics study.

#### **14.10 References**

Arizona Department of Transportation (ADOT)

U.S. Department of Transportation (USDOT)

Utah Department of Transportation (UDOT). 2003. Utah's automatic traffic recorders 2002, traffic volume map Utah 2001, annual average daily traffic, Map enlargements average annual daily traffic. Available from World Wide Web <<http://www.udot.utah.gov/progdev/traffic/>>

## **Study Plan 15: Vegetation Community Mapping**

### **15.1 Introduction**

This study plan documents the methods for field surveys to identify and map vegetation communities and for assessing impacts on vegetative communities for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those provided in the September and October study plan meetings in Salt Lake City and St. George, Utah.. This study plan presents an approach for advancing knowledge and understanding of vegetation communities as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan addresses study requests made by FERC, other federal, state and tribal agencies, and the public. It responds to written comments filed with FERC on the Proposed Study Plan.

The proposed project would consist of constructing and operating a water conveyance system that includes approximately 186 miles of buried pipeline, water intake facilities at Lake Powell, buried and surface water storage reservoirs, irrigation system turnout, in-line hydro stations, hydro-electric generation facilities and transmission lines on federal, state, private and possibly tribal lands in Kane, Washington, and Iron counties in Utah; and Coconino and Mohave counties in Arizona. The alternative alignments under consideration include the existing highway alignment that would cross the Kaibab Indian Reservation along Arizona Highway 389 and the south alignment bypassing the Reservation to the south.

Identification and mapping of the vegetation communities present along the proposed project corridor is an important component of characterizing the existing environment, and the analysis and quantification of project-related impacts. Delineation of vegetation communities within the project area was proposed by the Utah Board of Water Resources in the PAD. Agency comments received from the Arizona Game and Fish Department (AGFD), the National Park Service (NPS), Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), and the Kaibab Band of Paiute Indians in response to Scoping Document 1, issued by FERC on May 5, 2008, included related issues that will be addressed in this study.

### **15.2 Study Description and Objectives (§5.11(d)(1))**

This study will characterize the baseline vegetation characteristics present in the project corridor to delineate the geographic extent of each vegetation community type, identify the potential presence of unique vegetation communities or habitat types and other sensitive areas, and provide for analysis of project-related impacts and comparison of alternatives in context with the surrounding landscape. The study will also provide useful information for the planning of other resource studies to be conducted in support of the licensing effort and contribute to a greater understanding of the overall environmental impacts of the project, which is relevant to FERC's public interest determination

This study will consist of the compilation of existing relevant information, and field surveys to identify and classify the vegetation communities in the project area, including all wetland and riparian community types, to provide a detailed Geographic Information System (GIS) based vegetation map showing the location, distribution, and abundance of the plant communities occurring within a minimum of 0.5-mile of the pipeline corridor and associated project facilities. Vegetation community classification and

terminology will be consistent with the multi-state, USGS-sponsored Southwest Regional Gap Analysis project (SWReGAP). A mitigation plan will be prepared as part of the study and incorporated into the study report to address mitigation measures and concepts, standard construction procedures, standard operating procedures, and best management practices that will be used during project construction and operation to mitigate adverse impacts on vegetative communities.

### **15.3 Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. Each agency generally has specific goals related to special status species protection, noxious weed control, and land use related to vegetation communities/habitat management that are identified in their land and resource management plans. These goals will be incorporated into the vegetation community mapping study. This study will provide an analytical tool to address land and resource management agency goals and project-related concerns, and will include ongoing consultation with each agency to assure applicability to and consistency with existing land and resource management plans.

Comments received from land and resource management agencies which, in part, may be addressed through vegetation community mapping, are as follows:

- The AGFD stated that the analysis of the pipeline effects should consider the cumulative effects of temporary roads, as they are likely to become permanent without an aggressive effort
- The NPS will require a revegetation plan for their approval
- All construction work within the Arizona Department of Transportation rights-of-way will need to adhere to the Arizona Department of Agriculture's Protected Plant Species Program (i.e., compliance with the Arizona Native Plant Law), which includes specific treatment requirements for protected native plants
- All pipeline corridors in Glen Canyon National Recreation Area (NRA) will need to be successfully re-vegetated with a species mix specifically designed for the local soil and climate regime, and revegetation plans need to be approved by NRA's botanist
- The Kaibab Band of Paiute Indians must be included among all fish and wildlife agencies that are consulted in the analysis of vegetation resources. The Kaibab Band of Paiute Indians requires that the development of any mitigation measures regarding impacts on vegetation conditions on tribal lands be made in consultation with the Tribe.

### **15.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

The PAD included a general description of the types of vegetative communities that occur in the project vicinity and a preliminary map identifying the locations of wetland and riparian areas based on information available primarily from the Bureau of Land Management, as well as incorporating other data relevant to the distribution of vegetation (e.g., soils and precipitation). SWReGAP vegetation land cover maps were developed primarily from remote imaging. However, no comprehensive vegetation mapping effort of the entire project area has been previously conducted at a scale and resolution that is sufficient to provide for a constant analysis of current vegetation conditions.

### ***15.4.1 Study Area***

The study area consists of the approximately 186-mile, 300-foot wide pipeline corridor (150 feet to each side of the corridor center-line) extending from the west side of Lake Powell in Coconino County, Arizona, to Cedar Valley, Iron County, Utah. The south alternative alignment would generally follow the U.S. Highway 89 transportation corridor in Utah and Arizona, the State Highway 389 corridor in Arizona, the State Route 59 corridor in Utah, the I-15 corridor in Utah, and the Navajo-McCullough Transmission Line corridor in Arizona. Also included in the study area are associated project facilities including a combined conventional peaking and pumped storage hydro station; five conventional in-line hydro stations; a forebay reservoir, tunnel/shaft facility, afterbay reservoir at the Hurricane Cliffs; transmission line corridors to provide power to pump stations and transmit power from hydroelectric stations; and an infiltration reservoir west of Cedar City and Quichapa Lake.

The existing highway alternative alignment would cross the Kaibab Indian Reservation adjacent and parallel to Arizona State Highway 389. This alternative alignment will be addressed in this study, as well as the south alternative alignment.

### **15.5 Nexus to Project (§5.11(d)(4))**

Project construction, operation, and maintenance activities would result in removing and modifying vegetation communities in the project area. The AGFD has concerns that the project would include extensive road networks (both temporary access roads for construction and permanent access roads used for maintenance activities) adjacent to the pipeline. Closing and revegetating temporary-use roads is expected to be extremely challenging because of the increase in off-highway vehicle (OHV) activity over the last few years throughout the project area. Vegetation community mapping will provide base-line documentation from which to assess the extent of direct project-related impacts as well as to evaluate potential changes in vegetation communities over time that may be associated with project activities. Vegetation community mapping may help identify suitable habitat for various special-status species of plants and animals.

### **15.6 Proposed Study Methodology (§5.11(d)(5))**

The vegetation community mapping study will provide the data required for analyzing project-related impacts and will address various issues identified in the scoping process. The completed vegetation community map will incorporate classification standards and terminology consistent with SWReGAP, providing improvements to existing land cover maps based on additional on-the-ground information about actual land cover components and spatial patterns.

The study will consist of the following four tasks:

#### ***15.6.1 Task 1: Review of Existing Information***

A GIS database will be compiled that includes aerial photography, digital elevation models, stream coverage, wetland (National Wetland Inventory) mapping, precipitation patterns, soils distribution, and vegetation mapping as completed by others. Vegetation cover classification descriptions will be developed.

#### ***15.6.2 Task 2: Preliminary Vegetation Mapping***

Photo imagery will be analyzed by a botanist/plant ecologist to identify vegetation cover types throughout the project area. Vegetation types will be delineated and added into the GIS database. Vegetation

communities will be mapped to a minimum scale of 2 acres.

### ***15.6.3 Task 3: Field Checking/Verification***

Preliminary maps of vegetation cover types will be verified in the field by a botanist/plant ecologist. This work will be completed, in part, simultaneous with special status plant species and invasive plant surveys.

Additional data, based on line-intercept transects at representative sites, will be collected to describe the characteristics of each mapped cover type including species composition, stand structure, existing impacts, and land use. Information collected will include:

- Plant species composition, including the dominant and more prominent associated species in each vegetation layer (tree, shrub and herbaceous layers);
- Structural data, including estimates of average heights and aerial cover of each vegetation layer/dominant species;
- Predominant land use(s) associated with each cover type;
- Rare, unique, and particularly high quality vegetation/habitat will be noted; and
- Plant species of cultural interest to the Kaibab Band of Paiute Indians that are common regionally may be addressed as part of the vegetation community mapping study, as determined in coordination with the Tribe.

Any unique habitats or features, such as springs, caves, cliffs, and rock outcrops not previously identified during the aerial photographic interpretation will be added to the vegetation/cover type map during the field surveys.

The State of Utah must obtain permission from the Kaibab Band of Paiute Indians to conduct field research and collect data on the Reservation or take aerial photographs above the Reservation for the development of a baseline for vegetation conditions and analysis of impacts on vegetation resources from the construction and operation of the proposed pipeline.

### ***15.6.4 Task 4: Final Mapping of Existing Vegetation***

The preliminary vegetation community map will be modified to address new information gained during the field verification. GIS-based analysis will be used to quantify plant community distribution and abundance and quantify potential project-related impacts.

### ***15.6.5 Task 5: Prepare Study Report***

The product of this study will be a report that: 1) describes the survey goals and objectives; 2) builds on information already compiled in the PAD to describe existing conditions; 3) presents the methods used to identify vegetation types, select survey areas, and collect the data; 4) describes vegetative characteristics of surveyed areas; 5) details the results of the survey in terms of plant species composition and stand structure; 6) identifies the presence of rare, unique, or particularly high quality vegetation/habitat; and 7) shows the survey areas using GIS-based maps and accompanying summary tables. Maps will show existing habitat in relation to project facilities and activities including data on the amount of different vegetation cover types affected by project facility, construction activity, and corridor alignment alternative. The final report will include an analysis of the effects of project implementation, and discuss any measures that may be recommended to minimize project-related effects based on vegetative

communities. The study report will incorporate a mitigation plan to document mitigation measures identified to avoid, minimize or reduce impacts on vegetative communities. Variances from the study plan will be summarized and documented in the study report.

### **15.7 Level of Effort and Cost (§5.11(d)(6))**

The estimated cost of vegetation mapping and general coordination among agencies and with the project team is approximately \$141,000.

### **15.8 Schedule (§5.11(b)(2))**

The pre-field activities (compilation and review of existing information, selection of survey sites and survey dates, preparation of field forms and base maps) will be completed by the end of March 2009. Field surveys will be conducted during the April – September 2009 growing seasons. A brief initial report describing the 2009 field effort and any problems or deviations of the methodology will be distributed in mid-October 2009, and the final report will be completed and distributed in early December 2009.

### **15.9 Progress Reporting (§5.11(b)(3))**

The annual survey report, described above, will serve as the progress report.

### **15.10 Dependencies on Other Resource Analyses**

The vegetative community mapping analysis will be primarily dependent on the analyses results of the following resource studies:

- Surface Water Hydrology
- Land Use Plans and Conflicts

### **15.11 References**

Bureau of Land Management. 2007. *Kanab Proposed Resource Management Plan/FEIS*.

Bureau of Land Management. 2008. *Arizona Strip Field Office Resource Management Plan Record of Decision*.

Kearney, Thomas H. and Robert H. Peebles. 1960. *Arizona Flora*. University of California Press.

National Park Service. 2005. *Navajo Generating Station Water Intake Project Environmental Assessment*. Glen Canyon National Recreation Area, Arizona-Utah.

Utah Board of Water Resources. March 2008. *Lake Powell Hydroelectric System Notice of Intent to File an Application for Original License Pre-Application Document*.

Welsh, S.L. et al. 1987. *A Utah Flora*.

Bureau of Land Management, Arizona Strip District – Paria Canyon/vermilion Cliff. Available on the worldwide web at <https://www.blm.gov/az/asfo/paria/wildlife.htm>

Ecological range site descriptions available on the Worldwide Web at:

[www.websoilsurvey.nrcs.usda.gov](http://www.websoilsurvey.nrcs.usda.gov)

Soils data for Utah and Arizona from the NRCS Soil Data Bank available on the Worldwide Web at:  
<http://soildatamart.nrcs.usda.gov/USDGSM.aspx>

Vegetation landcover mapping available on the Worldwide Web at: <http://earth.gis.usu.edu/swgap/>



## **Study Plan 16: Visual Resources**

### **16.1 Introduction**

This study plan documents the methods for assessing impacts on visual resources for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those provided in the September and October study plan meetings in Salt Lake City and St. George, Utah. This study plan presents an approach for advancing knowledge and understanding of visual resources as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and no action alternative. This study plan addresses study requests made by FERC, other federal, state and tribal agencies, and the public. It responds to comments made during the study plan development process and filed with FERC in November 2008.

The proposed Project would consist of constructing and operating a water conveyance system that includes approximately 186 miles of buried pipeline, water intake facilities at Lake Powell, buried water storage reservoirs, irrigation system turnout, in-line hydro stations, transmission lines, and hydro-electric generation facilities on federal, state, private and possibly tribal lands in Kane, Washington, and Iron counties in Utah; and Coconino and Mohave counties in Arizona. The alternative alignments under consideration include the existing highway alignment that would cross the Kaibab Indian Reservation along Arizona State Route (SR) 389 and the south alignment bypassing the Reservation to the south.

Based on the review of existing information, consultation with agencies and comments received during public scoping, the need for a study to evaluate the potential effect of the proposed Project on sensitive visual resources in the proposed Project area has been identified. The evaluation will be developed through the study plan described in this section. The study is designed to identify culturally and visually sensitive landscapes in the proposed Project area and to identify Project features or on-going operations that have the potential to affect sensitive landscapes. Proposed Project construction and on-going operations that affect sensitive scenic/visual resources in the Project area may affect the experience of visitors and residents using project lands. If significant Project-related effects on sensitive landscapes and/or the user experience are identified, potential alternatives or mitigation measures for minimizing these effects (and the general feasibility of these potential alternatives) will be identified.

Studies related to visual resources but described under a different resource discipline include Recreation Resources and Cultural Resources.

### **16.2 Study Description and Objectives (§5.11(d)(1))**

#### ***16.2.1 Goals and Objectives***

The goals of this study are to assess the visual resources in the proposed Project vicinity and to identify potential effects on those resources from the proposed Project construction and operations. Specific objectives of the study are as follows:

- Describe the visual character of the surrounding landscape and the proposed Project components
- Identify visually sensitive areas within the proposed Project area and adjacent lands

- Identify and map key observation points and other locations that have visually sensitive areas and/or the potential to provide enhanced viewing opportunities of the proposed Project area by the public
- Assess visible Project features and on-going Project operations for consistency with the scenic landscape and visual resource goals and policies of land management agencies
- Identify potential adverse effects of proposed Project features and operations on visually sensitive areas
- Describe the general feasibility of potential options and enhancement opportunities to mitigate potential adverse effects of the proposed Project, where appropriate

## ***16.2.2 Study Area***

The proposed Project corridor extends from the Lower Lake Powell watershed incorporating a portion of Lake Powell adjacent to Glen Canyon Dam in Coconino County, Arizona to the Virgin River watershed and Sand Hollow Reservoir in Washington County, Utah. The Cedar Valley Pipeline System would extend north from the Hurricane Cliffs into the upper Ash Creek basin in Iron County, Utah.

The study area will include the entire proposed Project corridor, especially any area directly affected by Project feature construction or operations where there could be a change in the existing character of the landscape setting. The study area will include any area visible within 5 miles of project feature construction or operations or other areas from which Project facilities and disturbance from construction can be seen from sensitive viewpoints that are within and outside the proposed Project corridor.

The south alternative alignment would generally follow the U.S. Highway 89 transportation corridor in Utah and Arizona, the State Route 59 corridor in Utah, the I-15 corridor in Utah, and the Navajo-McCullough Transmission Line corridor in Arizona. The existing highway alternative alignment would follow the State Route 389 corridor in Arizona across the Kaibab Indian Reservation.

The Bureau of Reclamation-managed land includes about 34 acres adjacent to Lake Powell and immediately north of Glen Canyon Dam; this land is used for construction material storage and is managed for controlled access. The National Park Service-administered land along the proposed Project alignment is managed for open space, recreation, transportation, and wildlife habitat.

## **16.3 Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. The study will be developed to incorporate the goals of the agencies and maintain consistency with their current land management plans and policies, and by maintaining on-going consultation with all agencies to assure consistency with current planning. Initial research has identified the goals described below that relate to or in some way affect visual resources.

### ***16.3.1 Agency Goals***

#### **16.3.1.1 Bureau of Land Management (BLM) Kanab Field Office Resource Management Plan**

- Manage public lands for multiple uses of public resources within the framework of applicable laws, regulations, and agency policies
- Use adaptive management to meet resource objectives

- Implement ecosystem management in an open, cooperative, responsive atmosphere to involve agencies, groups, and individuals in monitoring and addressing resource issues on public lands—issues that often span administrative and ownership boundaries
- Maintain, improve, and restore (where needed) healthy ecosystems and habitat to support viable populations of fish, plants, and wildlife species while reducing habitat loss and fragmentation
- Protect and enhance cultural and natural resources and values using the diversity of tools available to the BLM
- Provide a variety of recreational, educational, and interpretive opportunities for people to experience public land resources and values
- Recognize the unique cultural, historical, and social values of the decision area in developing a plan that manages the land and protects the heritage it engenders
- Plan, modify, and implement resource management activities in a manner that would minimize impacts on visual resources
- Manage the diversity of landscapes in the decision area for a desired level of change consistent with and giving consideration to other resource values and uses

#### **16.3.1.2 BLM St. George Field Office Resource Management Plan**

BLM's objective is to manage the public lands in such a way as to preserve those scenic vistas which are deemed to be most important:

- in their impact on the quality of life for residents and communities in the area,
- in their contribution to the quality of recreational visitor experiences,
- and in supporting the regional tourism industry and segments of the local economy dependent on public land resources.

Moreover, BLM will seek to complement the rural, agricultural, historic, and urban landscapes on adjoining private, state, and tribal lands by maintaining the integrity of background vistas on the public lands.

#### **16.3.1.3 BLM Arizona Strip Field Office Resource Management Plan**

- Public lands will be managed in a manner, which will protect the quality of the scenic (visual) values of these lands.
- Esthetically pleasing surroundings will be assured for all Americans
- The region's scenic beauty, open space landscapes, and other high-quality visual resources will be maintained within the Arizona Strip Field Office.
- The existing "footprint" of cultural landscapes (facilities, projects, and improvements) will generally be maintained.
- Dark night sky conditions that are affected primarily by natural light sources will be maintained.

#### **16.3.1.4 BLM Grand Staircase – Escalante National Monument Management Plan**

BLM's objective is to preserve the spectacular scenic assets in "this high, rugged, remote region where bold plateaus and multi-hued cliffs run for distances that defy human perspective..." (Proclamation 6920, 1996).

### **16.3.1.5 National Park Service Glen Canyon National Recreation Area and Rainbow Bridge National Monument:**

The Mission of National Park Service at Glen Canyon National Recreation Area and Rainbow Bridge National Monument is:

- To provide for public outdoor recreation use and enjoyment of Glen Canyon National Recreation Area and Rainbow Bridge National Monument and preserve and protect the scenic, scientific, and historic features therein while providing a significant understanding to visitors of the scientific and cultural importance of objects, sites, populations, beliefs, and habitats of the past and future.
- To promote the diversity of both water and land-based recreational opportunities within Glen Canyon National Recreation Area.

### ***16.3.2 Tribal Goals***

Specific tribal goals and objectives for visual resources have not been identified. The visual resources study team will work in close consultation with the appropriate tribal governments in the Project area to identify sensitive cultural landscapes and assess potential visual impacts on those areas.

## **16.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

### ***16.4.1 General Setting and Land Uses***

The proposed project traverses an area of southern Utah and northern Arizona that is well known for its majestic landforms including cliffs, canyons, large rock monoliths, and its wide open vistas of the surrounding desert and extensive topographic relief. The area attracts a large number of tourists and recreation users. The proposed Project has multiple areas where elements would be visible from roadways, trails and other potentially sensitive viewpoints. In many areas the south and alternative pipeline alignments would be located within or adjacent to inter- and intrastate highway rights-of-way.

The proposed Project is located within designated recreation areas including the Glen Canyon National Recreation Area and Grand Staircase – Escalante National Monument. The existing recreation areas, state and national parks and monuments offer many varieties of unique scenic beauty and the concentration of visitors potentially increases the sensitivity of the views of the proposed Project from those viewpoints in or near those areas and on the primary travel routes to them. The Visual Resources study will be coordinated with the Recreation study to assure potential changes in the visual settings and recreation experiences associated with identified recreation features such as trails (including National Historic or Scenic Trails), campgrounds, and special recreation areas are considered in the analysis of the proposed Project.

The proposed Project alignment crosses two designated scenic road/byways; one in Arizona, the Fredonia-Vermilion Cliffs Scenic Road and one in Utah, the Zion Park Scenic Byway. The Smithsonian Butte Backcountry Byway is close to the project area as the alignment follows Utah SR 59. The byway will be considered in the analysis if the final proposed alignment is visible from the byway and could affect the visual setting of the byway. Utah SR 12, A Journey Through Time Scenic Byway, is out of the project area as are SR 14, Markaguant High Plateau Scenic Byway, SR 143, Brianhead-Panguitch Lake Scenic Byway and US 89, Mt Carmel Scenic Byway.

The land in the proposed Project area is federally, state or privately owned and offers a wide variety of natural landscape settings ranging from desert grasslands to pinyon-juniper forests and extensive cliffs

and rock landforms. The majority of the land uses, both public and private, can be characterized predominantly as open space, recreation, transportation/utility rights-of-way, and grazing land uses. Based on available information the proposed Project alignment does not enter into any Wilderness Areas or Wilderness Study Areas.

Existing reservoirs within the proposed Project area are used by many recreation visitors. The reservoirs are a visual contrast with the surrounding desert landscape and other visitors consider them out of place as they are not part of the natural desert environment. The visual analysis will consider impacts of the reservoirs as the project may change the visual setting of the surrounding landscape for visitors to the area.

### ***16.4.2 Visual Resources Management***

The primary land management agency in the proposed Project area is BLM. BLM utilizes a Visual Resource Management (VRM) system to classify and manage visual resources. Current BLM Resource Management Plans provide an inventory of the visual resources on BLM lands according to established classes shown below, as well as identify general goals outlined in Section 1.3 of this study plan. The south alternative and existing highway alternative alignments traverse through VRM Class 2, 3 and 4 areas; there are no VRM Class 1 areas along these alignments. Following are descriptions of VRM classes with specific management prescriptions to manage and protect visual resources:

- Class I Objective: To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention. Class I provides for natural ecological change and limited management activity.
- Class II Objective: To retain the existing character of the landscape. The level of change to the characteristic landscape should be low and any changes should repeat the basic elements found in the natural features of the landscape – form, line, color, & texture. Management activities may be seen but should not attract the attention of the casual observer.
- Class III Objective: To partially retain the existing character of the landscape. The level of change to the characteristic landscape can be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Any changes should repeat the basic elements found in the natural landscape – form, line, color, & texture.
- Class IV Objective: To provide for management activities which require major modification of the characteristic landscape. The level of change to the landscape can be high. Management activities may dominate the view and be the major focus of attention, but impacts should still be minimized through location and design by repeating form, line, color, and texture.

The Interstate 15 (I-15) corridor on the western end of the proposed Project is under the jurisdiction of the Utah Department of Transportation and Federal Highway Administration (FHWA). FHWA's *Visual Impact Assessment for Highway Projects* will be used for determining impacts in this corridor.

The assessment of potential impacts on the two designated scenic routes will be based on the guidelines and criteria set forth by the FHWA's National Scenic Byway Program and by the Arizona and Utah Departments of Transportation. Close coordination with the agencies will be maintained to assure consideration of the visual resources associated with any planned scenic road designations.

## **16.5 Nexus to Project (§5.11(d)(4))**

Proposed Project elements and effects from on-going Project-related operations may affect the visual character and visual quality of the surrounding landscape. Proposed Project facilities such as hydro stations, pump stations and transmission lines may be seen from multiple sensitive viewpoints along the corridor because so many people visit the area for recreation and scenic viewing experiences. The changes in the visual setting for recreation activities could diminish the experience of visitors as well as through travelers. Proposed Project facilities may also be seen from non-stationary viewpoints including along the roads and highway corridors where much the Project would be located, area trails and the scenic routes.

Other potential impacts on visual resources in the Project vicinity may include road cuts along Project-related roads and use of the proposed Project corridor to expand wildcat trails in undisturbed areas and borrow pits used as a source of construction material. These impacts could affect the visual setting and experience of recreation users seeking a back country experience.

## **16.6 Proposed Study Methodology (§5.11(d)(5))**

The study will analyze the potential Project impacts to address issues identified during formal and informal scoping and assess compliance with the visual resource objectives of land management and tribal agencies. Visual resources-related issues and concerns identified during the formal scoping process include:

- incorporating tribal consultation in development of impact assessment and mitigation
- assessing impacts on the region's wildland character
- potential disruption of visitor experience
- assessing impacts on the night sky of the proposed project area
- assuring development of a methodology and description of baseline conditions consistent with the needs of the various land management agencies

Related questions raised during the informal scoping process included general issues such as:

- impacts on visual resources from construction and operation of the proposed pipeline
- the magnitude of changes in visual character along the proposed project alignment
- the visibility of proposed project facilities and landscape modifications
- compliance with the scenic management plan objectives of other federal and state resource management agencies

The assessment of impacts will include an evaluation of the overall significance affects on the visual landscape as well as an assessment of the impacts of individual project components, such as hydro stations, transmission lines and construction access roads as well as other project related impacts such as lighting disturbance of the night sky and site erosion. Impacts on visual resources are considered significant if construction, operation or maintenance activities would result in any of the following conditions:

- Magnitude of change from existing visual character to post-project visual character that is considered to be substantial within the foreground distance zone (within 0.75 miles of project)
- Project feature construction or operations visible within the foreground distance zone from an area of high visual sensitivity attracting attention away from existing landscape conditions and

- resulting in a fundamental and visually incompatible change in the existing setting
- High level of landscape modification visible within the foreground distance zone from an area of high visual sensitivity, e.g., residence, non-motorized trail, Traditional Cultural Properties, or high volume roadway
- Change in BLM's VRM Classes that would result in a lower classification, e.g., Class II to Class III
- Non-compliance with other agencies' scenic management plans, e.g., loss of scenic route designation
- Landscape modification that adversely affects the traditional use of TCPs or other high visual sensitivity areas identified by tribal entities.

### ***16.6.1 Methods***

Visual resources will be analyzed by describing qualitatively the existing visual character of the proposed Project area and evaluating the magnitude of change in the visual character for post-project conditions. Initial steps will include extensive field work to identify areas of high, moderate, and low levels of visual sensitivity, areas of high, moderate, and low landscape modification, and evaluate the visibility of the proposed Project and associated components from the foreground/middleground zones

Visual contrast ratings of the proposed Project construction or operations from key observation points and simulations of project and associated components will be used to evaluate impacts and visibility, especially of the proposed Project and associated components from areas of high levels of visual sensitivity. The evaluation will also include describing qualitatively the potential change in visual quality within the seen area of influence from designated scenic routes.

To evaluate the landscape modification, the USDA Forest Service's *National Forest Management- Roads* methodology will be used to quantify areas of modification based on heights of slopes, visibility, angle of view, and duration of view. This Forest Service landscape modification evaluation process was developed specifically to assess the visual impacts created by linear facilities in the landscape. The assessment of impact on the two designated scenic road/byways will be based on the guidelines and criteria set forth by the FHWA's National Scenic Byway Program and by the Arizona and Utah Departments of Transportation.

### ***16.6.2 Definition of Baseline Conditions***

Visual resources baseline conditions will be defined by a qualitative assessment of the existing landscape's visual character or the general patterns of the natural and built elements present in the landscape. The character of the existing visual resources in the proposed Project area varies because of the changes in the landscape elements and their patterns. Changes in the pattern elements are associated with the visual attributes of objects – form, line, color, and texture. The ability to discern these elements is primarily a function of distance. The following distance zone definitions will be used: foreground up to 0.5 miles, middleground includes the visible landscape from 0.5 to 5 miles, and background distance is visible landscape greater than 5 miles.<sup>1</sup>

Baseline conditions for BLM managed lands will be based on using existing BLM's Visual Resource Inventory (BLM's Manual H-8410-1) of the Project area. Baseline conditions on tribal and National Park

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<sup>1</sup> The distance zones are based on those identified in the FHWA's Visual Impact Assessment for Highway Projects because of the linear nature of the proposed Project and the placement of large portion of the alignment along existing highways.

Service lands with regard to visual resources will be determined in consultation with the tribes/agency and incorporation of existing visual resource management policies, goals, and objectives. Baseline conditions for designated scenic road/byways will be based on visual quality ratings from the appropriate scenic application report or scenic corridor management plans.

Visual sensitivity level baseline conditions will be based on existing and planned land use from approved local, state, tribal and federal management plans including residential, parks, trails, recreation, and designated open space areas. Specific consultation with the Kaibab Band of Paiute Indians and other tribal entities will be performed by appropriate agencies to determine sensitivity levels of cultural landscapes identified as TCPs.

### ***16.6.3 Alternatives Analysis***

Impacts on visual resources will be analyzed for the south alignment and the existing highway alignment that would cross the Kaibab Indian Reservation. The following describe the approach to the impact assessment for proposed Project features as well as the overall Project.

#### **16.6.3.1 Magnitude of Change in Landscape Character**

Visual resources impacts will be measured by the magnitude of the change in visual character as expressed by a qualitative measurement of subtle, noticeable, substantial or severe.

- **Subtle** project elements of form, line, color, and texture are generally compatible with the visual setting, scale and continuity of the landscape.
- **Notable/Moderate** - project would be a readily visible addition to the landscape, but would be only somewhat compatible with the visual setting. Project can be highly visible, but would generally be recognized as a normal component in the landscape.
- **Substantial** project would be a fundamental change in the visual setting, and its forms, lines, colors, and textures would generally be incompatible with the surrounding area.
- **Severe** project would become the dominant element in the landscape and its forms, lines, colors, and textures would be highly incompatible with the visual setting. The project would strikingly contrast with adjacent landforms and uses in terms of scale and continuity.

#### **16.6.3.2 Visibility of Project**

The overall visibility of the proposed project and associated components for the alternatives will be evaluated using Arc GIS for seen area within 5 miles. The evaluation will be based on existing contour information with the assumption of a bald landscape, i.e., no vegetation or structures.

To identify areas of specific areas of visual concern within the proposed project area, areas of visual sensitivity will be determined. Visual sensitivity levels are a measure of public and/or agency/tribal concern for scenic quality. High, moderate, or low visual sensitivity levels will be determined based on analyzing the general indicators of the level of public concern based on type of land use, known sensitive resources, and volume of users associated with these land uses.

The visibility of the proposed Project will be evaluated for areas considered to have high level of visual sensitivity that are visible within the foreground and middleground distance zones of the Project. The



Project impact will be determined by a qualitative measurement of subtle, noticeable, substantial or severe based on the compatibility of the proposed project and operations. This visibility analysis from areas of high level of visual sensitivity will be completed at up to 38 locations along the south alternative and existing highway alternative alignments. The initial set of key observation points is based upon 17 proposed Project feature locations, plus 21 locations along the south alignment alternative and the existing highway alternative. The 21 locations represent a point for approximately every 10 mile segment of the alternatives (16 along the south alignment and 5 along the existing highway alignment). The final selection of points for evaluation will be determined based on input from land management agencies, the project team and the results of the field survey performed by the visual resource specialists.

#### **16.6.3.3 Visibility of Landscape Modifications**

The areas of the landscape modifications will be identified based on the heights of the cut and fill slopes, angle of view, and duration of view, and distance zone. Viewer orientation is defined as head-on or tangential views from the direction of view. The duration of view is based on the rate of traveling depending on the mode of travel, e.g., hiking versus car. The exact criteria would be determined based on field conditions for the landscape modification visibility. Approximately 15 miles of landscape modifications associated with the proposed pipeline will be evaluated

#### **16.6.3.4 Simulations**

Computer generated simulations will also be prepared at each of the 21 key observation points and at the 17 locations of the project features for a total of 38 simulations. The area will be photographed along with any existing facilities and structures for inclusion into the simulations. Each vantage point will have at three illustrations at an appropriate scale to depict actual visibility conditions as closely as possible. The first illustration will depict the existing condition, and the second illustration (simulation) will depict the proposed changes. The final simulation will be done to depict the visual conditions approximately 5 to 10 years after construction. The simulations will be prepared using digital computer imaging, coloring, and “cutting and pasting” techniques to depict the proposed conditions.

Video simulations may be required for certain segments of the proposed Project based on input from land management agencies and team evaluation of the visual conditions of specific location. However, video simulations are probably not necessary. Still simulations should be entirely adequate considering they would most likely be viewed as “before” and “after” shots in a public meeting display.

#### **16.6.3.5 Compliance with BLM’s VRM Objectives**

Visual contrast ratings will be completed from key observation points of the proposed project that are located along the proposed and alternative alignments. The locations of the key observation points will be confirmed during a field visit. The contrast rating will be completed by determining the degree of contrast (i.e., strong, moderate, weak, or none) based on BLM’s *Manual 8431 - Visual Resource Contrast Rating*. To assess whether or not the project will be in compliance with the VRM class, a comparison of the contrast ratings with the objectives for the approved VRM Class will be done.

#### **16.6.3.6 Compliance with Scenic Route Designation**

For the designated scenic road/byways, a determination of the change in scenic quality from existing conditions to post-project conditions will be made at those locations where each of the alternatives is visible within the foreground/middleground distance zones. The visual quality of landscape will be rated in terms of vividness, intactness, and unity as previously defined for each of the scenic routes. The determination of compliance with the scenic route designation will be made based on whether or not the

required threshold of a moderately high visual quality rating for designation will be maintained after the Project construction.

#### **16.6.3.7 Analysis of Cumulative Impacts**

The visual resources cumulative impacts analysis will address the combined impacts of the alternatives and any past or future proposed or planned actions that have or are likely to affect the visual resources in the impact area. The inter-related projects will be identified during the study to analyze the cumulative impacts.

#### **16.6.3.8 Mitigation Measures**

The analysis of impacts on visual resources will be based on the standard operating procedures and measures to avoid or reduce impacts, both of which will be included in the proposed Project description chapter of the draft visual resources study. The significance criteria for visual resources will then be applied to determine if any impact would be significant. Mitigation measures would then be developed to offset significant impacts. The mitigation measures will be based on applicable, Kaibab tribe and other tribal, state and Federal statutes and regulations, past experience and best professional judgment to either satisfy a legal requirement or to satisfy the public interest requirement. In some cases significant impacts may not be able to be mitigated. All reasonably foreseeable mitigation options will be evaluated by the Federal Energy Regulatory Commission (FERC), BLM, BIA, the Kaibab Tribe and other tribal agencies, and other responsible agencies and factored into the respective Record of Decision documents.

#### ***16.6.4 Data Collection***

The data required to complete the visual resources analysis can be acquired from identified and existing sources including federal, tribal and state agencies. Mapping data acquired will be coordinated with the project standard GIS data system. Extensive field surveys and mapping will be required to identify the existing landscape character for assessment of modifications and identification of key observation points and other sensitive visual settings. A preliminary list of data required that should be readily available includes:

- BLM Visual Resources Inventory data
- BLM Visual Resources Management Classes data
- Relevant federal, tribal, state, and local management plans
- Scenic byways and roads application reports and related corridor management plans
- Existing and planned recreation areas e.g., campgrounds, picnic areas, and trails within the proposed project areas
- Existing and planned wilderness areas
- Existing Traditional Cultural Properties identified by tribal government that may be affected
- Existing and planned development (extent of populated areas)
- Land ownership (public [federal, state, local] versus private) and land jurisdiction
- Existing and planned roads
- Alternatives information including cross sections (every 100 feet where slope is greater than 6 percent), profile, alignment location, structure type and size,
- Digital elevation model for proposed project area
- Agency (BLM, National Park Service) contact information for the visual resources specialist

### ***16.6.5 Field Investigations***

The following data will be required in addition to the data described in Section 16.1: (description of new data from field study, acquired from new demographic surveys, or from other resource field study, modeling, etc.)

- On-site field work to document existing visual character and conditions, complete photographic record of landmarks and special features, verify areas of visual sensitivity, and verify results of visibility analysis. The State will obtain tribal permission to conduct on-site field work on tribal lands for visual resource impact analysis.
- On-site field work for simulation photographs
- On-site field work to complete post-project visual quality analysis for designated scenic routes

### ***16.6.6 Consistency with Accepted Practice***

The approach to the analysis of potential impacts is based upon current accepted methods of the various land management agencies with jurisdiction over proposed project area lands. The final analysis and assessment of visual resources will be developed with and approved by the agencies to assure consistency with their most current guidelines and any techniques or methods developed on a project specific basis.

### ***16.6.7 Study Reports***

The following study reports will be prepared for the visual resources study:

- Draft study report
- Final study report

Draft and final study reports will be submitted to Utah Board of Water Resources, FERC, and land management agencies for technical review and input per the study schedule described below. All final mapping and analysis data will be provided in electronic format to the Utah Board of Water Resources and land management agencies as directed for future use in the management of visual resources.

## **16.7 Level of Effort and Cost (§5.11(d)(6))**

The anticipated cost for conducting the field work, analyses and preparing the draft and final study reports is approximately \$263,000. Three professionals are expected to spend a total of 8 to 10 days in the field and GIS and graphic designers will collect and manage data from the field and prepare project mapping. The planners, landscape architects and GIS/graphic staff would take approximately 75 to 90 days to prepare the detailed analysis of the alternatives including the high sensitivity, landscape character, and landscape modification visibility analyses as well as the contrast ratings, seen area analysis and visual simulations. The visual resources study report is expected to be approximately 75 pages of description and analysis, not including appendices for contrast rating forms, visual simulations and other support material. The draft and final reports will take approximately 45 to 60 days to prepare. This estimated level of effort includes completion of the technical work and documents and all necessary team and agency coordination.

## **16.8 Schedule (§5.11(b)(2))**

The study will be conducted from 2009-10. The schedule in Table 16-1 depicts approximate timeframes for major tasks and is based on a calendar year.

**Table 16-1**  
**Visual Resources Proposed Study Schedule**

Task/Activity	2009				2010			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Project kick-off and Data Collection								
Field Survey								
Preliminary Analysis								
Draft Visual Resources Study								
Final Visual Resources Study								

## 16.9 Progress Reporting (§5.11(b)(3))

The draft and final study reports, as well as interim work products and progress reports, will be made available for stakeholder review and comment per the schedule described above. Prior to release of the draft and final study reports, the visual resources project team will meet with agencies, tribes, and other stakeholders to discuss the study results.

## 16.9 Dependencies on Other Resource Analyses

Completion of the draft and final study reports will be primarily dependent on the input from other resource studies including but not limited to the following:

- **Recreation:** Existing and planned recreation, park, designated open space, and trail facilities information
- **Ethnographic Resources:** TCP locations and other high sensitivity areas
- **Land Use Plans and Conflicts:** Existing and planned land use

As information from this study is collected and analyzed, baseline conditions, preliminary findings, potential impacts and implications for design and construction will be shared with researchers conducting other resource studies (particularly recreation and cultural studies). Early information sharing will allow discussion of potential conflicts among different resources, and the ability to ensure that adequate information is collected to examine potential impacts on those other resources. Describing those impacts will require the integration of information from this study with information from other studies.

## 16.10 References

- U.S. Department of the Interior Bureau of Land Management, *Visual Resource Management Program*. Washington D.C., 1980.
- U.S. Department of the Interior Bureau of Land Management, *Manual 8431 – Visual Resource Contrast Rating*. Washington D.C.
- U.S. Department of Agriculture Forest Service, *Landscape Aesthetics: A Handbook for Scenery Management*. Washington, D.C., December 1995.

U.S. Department of Agriculture Forest Service, *National Forest Landscape Management Volume 2, Chapter 1 The Visual Management System*. Washington D.C., April 1974.

U.S. Department of Transportation Federal Highway Administration, *Visual Prioritization Process – User’s Manual*. Washington, D.C., July 1994.

## **Study Plan 17: Surface Water Quality**

### **17.1 Introduction**

This study plan documents the methods for planning and preliminary design of factors affected by impacts on surface water quality for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those received during the study plan development process in the September and October study plan meetings in Salt Lake City and St. George, Utah. This study plan presents an approach for advancing knowledge and understanding of surface water quality as it pertains to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. It addresses study requests and comments made by FERC, other federal, state and tribal agencies, and the public, and incorporates written comments on the study plans filed with FERC.

### **17.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

The study plan describes goals and objectives, provides a description of the study area, describes the Project nexus, presents the proposed methodology, presents staffing and equipment requirements, provides a budget for activities associated with the surface water quality portion of the study, and provides a generalized project schedule. The study will identify potential impacts and measures to protect surface water quality from potentially adverse effects associated with the Project. The study will address surface water quality conditions that might reasonably be affected by Project construction, operations, and maintenance. A mitigation plan will be prepared as part of the study to address mitigation measures and concepts, standard construction procedures, standard operating procedures, and best management practices.

#### ***17.2.1 Goals and Objectives***

The goals of the surface water quality study are to determine potential impacts on surface water quality and identify measures to protect surface water quality to the extent that it may be affected by Project construction, operation, and maintenance.

Specific water quality-related objectives include determining how Project construction and operations may affect the water quality within the study area. The primary objectives of the study with regard to surface water quality are:

- Identify what impacts could occur to water quality in lakes and streams, including surface water quality downstream of Glen Canyon Dam, from Project construction, operation, and/or maintenance
- Determine what impacts, if any, may occur on Lake Powell water quality
- Determine how groundwater resources would be quantitatively impacted by recharge associated with Project operation
- Evaluate how water quality and water use would be balanced for hydropower generation, consumption and environmental purposes

- Determine whether any impacts on groundwater quality (addressed in a separate study plan section for groundwater resources) would affect surface water quality
- Identify measures for mitigating impacts on surface water quality

### **17.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied.

### **17.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

#### ***17.4.1 Background Description***

Existing surface water quality conditions have been generally evaluated in portions of the Project. The findings of these studies are documented in various reports prepared by the U.S. Geological Survey (USGS), the Utah Geological Survey (UGS), and the Utah Department of Environmental Quality, among others. A summary of surface water quality is included in the PAD. These information sources, as well as additional information obtained from field reconnaissance and studies performed during Phase 1 investigations, are documented in a technical memorandum prepared by MWH (2008). The surface water quality conditions as documented by these studies and reports are briefly summarized below.

#### ***17.4.2 Surface Water Sources***

Surface water is made available by means of localized streamflow diversions but is primarily captured by reservoirs. Major reservoirs in the Project vicinity include Quail Creek Reservoir, Sand Hollow Reservoir, and Lake Powell.

#### ***17.4.3 Quail Creek Reservoir***

Quail Creek Reservoir is operated by the Washington County Water Conservancy District. The reservoir is supplied with water that gravity flows from Quail Creek, but most of the water in the reservoir is pumped from the nearby Virgin River. It has a full-pool surface area of 590 acres and a capacity of 40,325 acre-feet. The Quail Creek watershed area is 592,577 acres and has an annual average inflow of 22,000 acre-feet. The maximum depth of the reservoir is 190 feet and is sustained by two dams. The reservoir supplies drinking water to the St. George area and is treated at an on-site water treatment plant. Excess flows are released to Virgin River downstream of the larger of the two dams (Biek 1999; Utah DEQ-DWQ 2007a). The Project is not proposed to involve the use of Quail Creek Reservoir and would have no direct or indirect impacts on surface water quality in Quail Creek Reservoir.

#### ***17.4.4 Sand Hollow Reservoir***

Sand Hollow Reservoir is operated by Washington County Water Conservancy District. The full-pool surface area is approximately 1,300 acres and the reservoir has a capacity of 50,000 acre-feet (USGS 2005). Water in the reservoir originates from the Virgin River via Quail Creek Reservoir and is conveyed by means of a pipeline from Quail Creek Reservoir to Sand Hollow Reservoir. Therefore, the Sand Hollow Reservoir watershed is the same as the Quail Creek Reservoir watershed. Sand Hollow Reservoir is filled on-demand from Virgin River water and therefore does not have excess discharge.

### ***17.4.5 Lake Powell***

Lake Powell is the largest reservoir in Utah. The reservoir has a full-pool surface area of 160,784 acres and a total capacity of 26,214,861 acre-feet. Lake Powell is stored behind the Glen Canyon Dam, built on the Colorado River two miles south of the Utah-Arizona border, with a Colorado River watershed of 65,800,000 acres. The dam is operated by the U.S. Bureau of Reclamation. The watershed above Glen Canyon Dam includes most of eastern and southern Utah, western Colorado, and southwestern Wyoming, as well as relatively smaller areas in the Central/Southern Rocky Mountains in northeastern Arizona and northwestern New Mexico. The watershed area is largely high desert of the Colorado Plateau but derives much of its runoff from the west slopes of the Central Rocky Mountains, as well as the Uintah Mountains along the Utah-Wyoming border and the Wind River Mountains in western Wyoming. Average inflow is approximately 11,000,000 acre/feet per year (Utah DEQ-DWQ 2007b).

### ***17.4.6 Existing and Proposed Use of Water***

Both surface and groundwater are used for potable (municipal and household domestic) supplies, for industrial applications, for irrigation of crops and for stock watering. Stream, river, lake, and reservoir water supports aquatic life and recreational activities such as boating, fishing, swimming, etc. In addition, Glen Canyon Dam is operated for water storage and hydropower generation on the Colorado River.

The current uses of water would continue under all alternatives. Water delivered by the pipeline would be treated in the water treatment plant and distributed through pipelines in the communities to which water would be delivered.

### ***17.4.7 Existing Instream Flow Uses***

Instream flows on the Colorado and Virgin Rivers are used for recreational fisheries. Hydropower generation from Glen Canyon Dam is an important in-stream use of Colorado River water and is relied upon for power in several southwestern states. Water discharged from Glen Canyon Dam is regulated to provide flood control, aquatic habitat, and to deliver water from the Upper Colorado River basin to the Lower Colorado River basin.

### ***17.4.8 Surface Water Quality Standards***

In Utah, water quality protection standards are based on designated state beneficial uses, which are defined and classified in the Utah Administrative Code R317-2. Use designations are provided in R317-2-6 and include the classifications shown in Table 17-1.



**Table 17-1**  
**Beneficial Use Protection Classifications for Surface Waters of the State of Utah**  
**UAC R317-2-6**

<b>Classification</b>	<b>Definition</b>
1C	Raw water source for domestic purposes with prior treatment
2A	Primary contact recreation such as swimming
2B	Secondary contact recreation such as boating, wading, and similar uses
3A	Cold water species of game fish and cold water aquatic life
3B	Warm water species of game fish and warm water aquatic life
3C	Nongame fish and other aquatic life
3D	Waterfowl, shore birds and other water-oriented wildlife
3E	Severely habitat-limited waters
4	Agricultural uses including irrigation and stock watering
5	Special category for the waters of the Great Salt Lake

Beneficial use protection classifications for major rivers and reservoirs in the vicinity of the pipeline alignment alternatives are provided in Table 17-2. Note that no specific designation is assigned to Sand Hollow Reservoir in UAC R317-2, although it is used or may be used for groundwater recharge and for the purposes designated in Table 17-1 as 1C, 2A, 2B, 3B, 3D, and 4.

**Table 17-2**  
**Beneficial Use Protection Classifications Designated for Major Rivers and Reservoirs in the**  
**Vicinity of the Lake Powell Pipeline Alternative Alignments**  
**UAC 317-2-13**

<b>Water Body</b>	<b>Classifications</b>
Colorado River	1C, 2B, 3B, 4
Virgin River (above Quail Creek Diversion)	1C, 2B, 3C, 4
Virgin River (below Quail Creek Diversion)	2B, 3B, 4
La Verkin Creek	2B, 3B, 4
Ash Creek	2B, 3B, 4
Kanab Creek (lower)	2B, 3C, 4
Paria River	2B, 3C, 4
Lake Powell	1C, 2A, 2B, 3B, 4

Surface water quality numerical standards for the various protection classifications are specified in UAC R317-2-14.

Arizona surface water quality standards will be incorporated into the studies for analyzing the Project's potential impacts on water quality in Arizona streams, rivers and reservoirs.

#### ***17.4.9 Study Area Definition***

The study area would include the alternative alignments along the Lake Powell Pipeline and Cedar Valley Pipeline and transmission line corridors (to provide power to the pumping stations and to transmit power away from the proposed generating stations); particular attention will be required for the following:

- Lake Powell
- Sand Hollow Reservoir
- Rivers and streams, particularly perennial rivers and streams including the Virgin River, La Verkin Creek, Ash Creek, Kanab Creek, the Paria River, and other surface water streams where pipeline crossings or blowoff drainage may affect water quality
- Rivers and streams along transmission line corridors that could be affected by construction activities

#### ***17.4.10 Issues and Data Needs***

The surface water quality specific analyses will include the following:

- Existing surface water quality physical parameters, including cations/anions, TDS, pH, conductivity, turbidity, and temperature
- Surface water quality trends
- Projected surface water quality changes associated with discharge of Lake Powell water at Sand Hollow Reservoir
- Potential surface water quality changes downstream of Glen Canyon Dam
- Potential for impacts associated with blowoff discharges and drainage discharges that may drain to rivers, streams, and lakes
- Potential for impacts on surface water bodies associated with construction activities

### **17.5 Nexus to Project (§5.11(d)(4))**

The proposed Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, transmission lines, and other features to convey water from Lake Powell to the St. George area via Sand Hollow Reservoir and from the St. George area to proposed recharge basins in southwestern Cedar Valley. One primary objective of the Project will be to provide water to the St. George area that would be stored in Sand Hollow Reservoir, recharged into the Navajo Sandstone aquifer in the vicinity of Sand Hollow Reservoir, and drawn from Sand Hollow Reservoir to meet St. George metropolitan area water demands. The pipeline will include blowoff valves and drains that could discharge water to locally constructed ponds on an annual basis or more often. Design of these facilities will require careful investigation of containments of all ancillary releases (blowoffs, pit ports, etc.) to make sure this water is fully contained and not allowed to runoff into local drainages. Furthermore, construction activities will require pipeline crossings at rivers and streams and intakes and outlets that will be exposed to surface lakes and reservoirs, particularly at Lake Powell and Sand Hollow Reservoir. Finally, water would be pumped from Lake Powell at multiple depths that may affect the stratification of water quality in Lake Powell. All of these activities may potentially result in water quality impacts on surface water quality. Potential impacts associated with the Project may require mitigation of construction, operations, or maintenance, or all three. FERC licensing, other federal agency permits, and Utah State Engineer approval of the Project design will require demonstration that these potential adverse impacts on surface water quality have been identified and avoided or mitigated in such a way that surface water quality is not adversely affected.

## **17.6 Proposed Study Methodology (§5.11(d)(5))**

### ***17.6.1 Introduction and Overall Approach***

Several documents, including technical reports, scientific and engineering journal publications, and other literature were previously reviewed and information consolidated. This information was documented in technical memoranda and presented in the PAD. Additional review of literature presenting surface water quality conditions will be performed by identifying and reviewing available technical reports and literature not identified previously, to determine what is known of the water quality conditions regionally and at specific, potentially problematic locations along the alignment; performing field investigations to verify and improve on information obtained from the literature review; collect and analyze surface water quality samples at selected locations; analyze field investigation data; prepare surface water mixing (mass balance) models; and prepare a summary report documenting these findings.

### ***17.6.2 Methods for Preliminary Analysis and Preliminary Design***

The proposed methods for analyzing impacts on surface water quality are identified in this section.

#### **17.6.2.1 Task 1 - Review of Existing Water Quality Literature and Records**

Previous reviews of existing literature have identified surface water quality information and data, primarily in Lake Powell, Sand Hollow Reservoir, Quail Creek Reservoir, and the Virgin River. A more detailed review of existing water quality data and information relevant to the LPP Project that are available in current published reports, maps, aerial photography, and literature will be performed. This literature review will include information from established agency sources such as the U.S. Geological Survey, the Utah Geological Survey, the Utah Department of Environmental Quality, and similar sources. Previous preliminary investigation work performed by engineering and scientific consultants and organizations will be obtained and reviewed. Knowledgeable surface water scientists and managers associated with the above-referenced agencies and organizations, cities, and others will be contacted to obtain other relevant data and information.

#### **17.6.2.2 Task 2 - Field Investigations**

Field investigations will be performed to collect field data where deficiencies in surface water quality data may exist. The locations for collection, if any, will be determined after completion of Task 1. This would include water quality sampling in potentially affected streams and rivers. The U.S. Bureau of Reclamation (Reclamation) will be contracted to perform water quality analyses in Lake Powell, and potentially in the Colorado River downstream from Glen Canyon Dam, pending the outcome of hydrologic modeling they are now performing for the Utah Division of Water Resources on Lake Powell and the Colorado River with the Lake Powell Pipeline project depletions. The Reclamation preliminary hydrologic modeling results will be available in December 2008. Reclamation will then recommend the locations for field data collection based on their previously available data and the potential scope of hydrologic impacts with the Lake Powell Pipeline project depletions. Currently, the Lake Powell forebay is sampled monthly and the rest of the reservoir is sampled quarterly. Reclamation will identify the necessary water quality data, sampling locations, and propose a field data collection plan to Utah Division of Water Resources. The field data collection plan, including sampling locations, methods, protocols, and data reporting, will be provided to interested participants. The water samples would be analyzed in the field (pH, conductivity, turbidity, and temperature) and in a laboratory for basic physical water quality parameters (cations/anions, iron, pH, TDS, conductivity, and turbidity).

The locations of stream and river crossings, and elevationally low points in the pipeline near surface water bodies where drainage or blowoffs may be located, will be examined for conditions that would limit the ability to prevent or mitigate water quality problems. This would include potentially unstable or unconsolidated soils near points of discharge or crossings, sparse vegetation on soils, and other factors to be identified by field reconnaissance.

The locations of springs and seeps that may be affected by groundwater recharge would be identified and inspected. Wetland locations and riparian areas that may be influenced by shallow groundwater will be identified, if those areas are (1) close to the pipeline and may be affected by pipeline trench dewatering during construction, or (2) close to anticipated pipeline blowoff features and may receive substantial inflows during annual pipeline inspections. The affected springs and seeps would be determined based on modeling performed under other study plans. Wetland and riparian areas would be identified during Task 1 and from pipeline reconnaissance performed under other study plans.

#### **17.6.2.3 Task 3 – Surface Water Steady-State Modeling**

Surface water quality modeling of TDS will be performed at Lake Powell and at Sand Hollow Reservoir. It is assumed that Sand Hollow Reservoir water quality will eventually be consistent with Lake Powell water as the existing water from the Virgin River is replaced.

The Bureau of Reclamation will perform simulations of long-term TDS in Lake Powell using the Lake Powell two-dimensional water quality model (CE-QUAL-W2) and the Colorado River Simulation System (CRSS) run in Riverware.

#### **17.6.2.4 Task 4 - Data Evaluation**

Data collected from the literature review and field investigations will be compiled and evaluated by experienced, licensed engineers and by water quality scientists. Data evaluations will focus on satisfying the goals and objectives identified in Section 1.2.1; specifically, determining how the Project construction, operations, and maintenance will affect surface water quality conditions. Based upon the results of field and laboratory testing, analyses will be performed to supplement existing surface water data.

Data evaluation will be performed with the recognition that other disciplines may utilize the evaluation results. Specifically, pipeline construction may encounter groundwater in trenches, shafts, and tunnels that would be discharged to the surface and may run off into surface water bodies. To the extent that information developed during evaluation of surface water quality may be used to assist in other studies, it will be utilized. Conversely, the surface water quality evaluation may be affected by aquifer recharge where recharge promotes increased discharges to springs and seeps, and quantitative and qualitative conclusions associated with groundwater resources would be considered and incorporated as appropriate.

#### **17.6.2.5 Task 5 – Report Preparation**

A technical report will be prepared that documents the findings of the literature review, field investigations, and surface water quality data evaluation. The report will present project goals and objectives and describe the study area, document the literature review, describe and document input for surface water quality mass-balance modeling, and note general and specific surface water quality conditions that may be affected by the Project. Field investigation activities and methods will be described, and data evaluations and results will be presented. Results will be discussed with a focus on the study objectives. Mitigation measures will be documented in a mitigation plan incorporated as a section of the technical report. Conclusions, where warranted, will be provided, and will address prevention or mitigation of potential impacts to surface water quality. These conclusions will include recommendations

that would affect Project design. If appropriate, recommendations for additional, site-specific investigations and data collection will be made. Any variances from the study plan will be summarized in the technical report.

### **17.7 Schedule and Level of Effort (§5.11(d) (6))**

The surface water quality studies will require qualified water quality scientists with appropriate experience to conduct the field investigations and data evaluations identified above. A licensed water quality laboratory will be contracted for surface water sample analyses (if performed). Required licenses shall be valid in the state in which work is performed (Utah and/or Arizona).

Equipment requirements will include water sample collection devices.

Each professional scientist and each contractor will provide his/her own sheets and notes for documentation of activities and findings. Field investigation equipment (binoculars, compasses, maps, cameras, etc.) will be provided by the field personnel involved.

Total study costs are estimated to be approximately \$80,000.

An approximate schedule for performance of the study is shown in Table 17-3. The study can be completed within a one-year period.

<b>Table 17-3 Surface Water Quality Proposed Study Schedule</b>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review Existing Literature	Ongoing	February 2009	--
2	Field Investigations	February 2009	June 2009	120
3	Water Quality Modeling	March 2009	June 2009	90
4	Data Evaluation	May 2009	August 2009	120
5	Final Report Preparation	September 2009	November 2009	90

### **17.8 Progress Reporting (§5.11(b)(3))**

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009 and August 2009. The final report will be submitted in November 2009.

### **17.9 Dependencies on Other Resource Analyses**

The surface water quality analysis will be primarily dependent on the analyses results of the following resources:

- Surface Water Hydrology
- Groundwater Resources (Groundwater Hydrology and Groundwater Quality)

## 17.10 References

Biek, R.F. 1999. The Geology of Quail Creek State Park. Public Information Series 63. Utah Geological Survey, Division of Department of Natural Resources, Salt Lake, Utah.

MWH. 2008. Lake Powell Pipeline Phase I – Preliminary Engineering and Environmental Studies, Task 5 – Develop and Analyze Alternatives, Technical Memorandum 5.13A, Review of Water Quality and Treatment Issues.

Utah Department of Environmental Quality, Division of Water Quality (UDWQ). 2007a. Utah Watershed Management and Planning Program, Lakes Rpt., Quail Creek Reservoir.  
<http://www.waterquality.utah.gov/watersheds/lakes/QUAILCR.pdf>

\_\_\_\_\_. 2007b. Utah Watershed Management and Planning Program, Lakes Rpt., Lake Powell.  
<http://www.waterquality.utah.gov/watersheds/lakes/LAKEPOWL.pdf>

## **Study Plan 18: Surface Water Resources**

### **18.1 Introduction**

This study plan documents the methods for planning and analysis of surface water resources for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 and September 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those received during the study plan development process including the September and November study plan meetings and written comments on the study plan filed with FERC. This study plan presents an approach for advancing knowledge and understanding of water resources. The plan addresses study requests made by FERC, other federal, state and tribal agencies, and the public.

This study plan describes goals and objectives, provides a description of the study area, describes the Project nexus, presents the proposed methodology, presents staffing and equipment requirements, provides a budget for activities associated with the surface water resources portion of the study, and provides a generalized project schedule. Ground water and water quality issues are addressed in separate study plans.

### **18.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

#### ***18.2.1 Study Description***

The study will identify potential impacts of the Project on surface water resources during construction, operation, and maintenance.

#### ***18.2.1 Goals and Objectives***

Surface water resources-related objectives include determining how Project construction and operations may affect surface water resources within the study area. An estimate of potential effects on streamflow and reservoir levels will be made for water bodies within the study area. For the purposes of this study plan, effects will include direct effects (those directly attributable to the proposed Project), indirect effects (those attributable to the Project but removed in time or space), and cumulative effects (those that would occur as a result of future reasonably foreseeable activities besides the proposed Project). Examples of cumulative effects are those that could result from land development and urbanization associated with population growth. The primary objectives of the study with regard to surface water resources are:

- Determine effects of the proposed Project on streamflow and river stage within the study area
- Determine effects of the proposed Project on downstream water users
- Estimate effects of the proposed Project on reservoir storage and water levels within the study area
- Summarize potential effects of construction and operation of the proposed Project on stream channels within the study area
- Determine effects of the proposed Project on flooding within the study area

- Determine which Standard Construction Procedures (SCPs) should be adopted to protect crossings of streams and washes

### **18.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. The BLM has established resource management goals applicable to surface water resources for the study area, and the goals are documented in BLM resource management plans. The following specific agency resource management goals apply to surface water resources that would be addressed by this study plan.

- Maintain and/or restore overall watershed health and reduce erosion, stream sedimentation, and salinization of water, with particular emphasis on the Colorado River System (BLM 2008a).
- Maintain and/or restore natural hydrologic functions of watersheds, including the capability to capture, store, and beneficially release water (BLM 2008a).
- Reduce flood-related damage to infrastructure and downstream private lands (BLM 2008a).
- Improve watershed conditions on eroding sites and on other sensitive watershed areas, such as riparian areas (BLM 2008a).
- Preserve suitable rivers, or segments of rivers, and their immediate environments in their freeflowing condition for the protection of their outstandingly remarkable values (ORV) and for the benefit and enjoyment of present and future generations, giving consideration to other resource values and uses (BLM 2008a).
- BLM's objectives for soil and water resources will be to work with municipalities, state and local agencies, and other interested parties to (BLM 1999):
  - Protect community watersheds and sources of culinary water;
  - Reduce erosion, stream sedimentation, and salinization;
  - Ensure water availability for the maintenance of key natural systems and human enjoyment; and
  - Where necessary to meet essential community needs, identify environmentally suitable sites for water storage and routes for water transport.
- Surface water availability at seeps and springs will be appropriate for the soil type, climate, and landform (BLM 2008b).
- Ecological functions and processes will be intact at all seeps and springs (BLM 2008b).
- Flowing water systems will provide continuous flowing water and associated riparian vegetative cover, where possible (BLM 2008b).
- The natural hydrologic functions of all watersheds will be intact (BLM 2008b).

In addition to BLM resource management goals described above, the Federal Power Act affects FERC's goals in permitting the proposed Project. The Federal Energy Regulatory Commission must decide whether to issue a license to the Utah Board of Water Resources for the Lake Powell Hydroelectric System Project. Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a project is located, and what conditions should be placed on any license that may be issued. In making its license decision, the Commission must equally consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values. Any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.



The proposal may affect local surface water resources, which is relevant to the Commission's public interest determination.

## **18.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

### ***18.4.1 Background Description***

Existing information that will be used in the surface water resources study includes historical streamflow and reservoir levels from the U.S. Geological Survey (USGS) and other sources. Previously completed studies on streamflow and reservoir levels will be collected and reviewed. Sources of existing information that will be used include the following:

- Monthly streamflow data and peak discharge data for gaged streams in the study area utilizing USGS StreamStats and other sources (Utah DWRe and USGS)
- Storage-area-elevation data and historical records of Quail Creek Reservoir and Sand Hollow Reservoir water levels (Washington County Water Conservancy District), and Lake Powell water levels (U.S. Bureau of Reclamation)
- Published floodplain studies of affected stream channels and regional regression analyses for determining peak discharges (Utah State Floodplain Coordinator and Utah DWRe)
- Topographic, land use, soil type and vegetation cover data for watersheds requiring flood hydrograph modeling (Utah DWRe and County sources)
- Historical data on return flows as a percentage of water deliveries in St. George, Cedar City, Kanab, and typical rural areas (Washington County Water Conservancy District, Kane County Water Conservancy District, and Central Iron County Water Conservancy District)
- Streamflow and reservoir storage data included in the U.S. Bureau of Reclamation's Colorado River Basin hydrology and operations model Colorado River Simulation System (CRSS)

### ***18.4.2 Study Area Definition***

The surface water resources study area includes each of the streams, lakes, and reservoirs that would be affected by the construction or operation of the project alternatives. The areas of potential impact are similar for each of the Project alternatives; each alternative would divert water from the same intake location in Lake Powell and deliver it to roughly the same locations near Kanab, St. George, and Cedar City. The general potential impact areas are listed below. In addition to the impact areas listed below, other areas associated with modifications to the proposed Project (e.g., revised pipeline alignments) will be considered if they become part of the Project.

- Lake Powell
- Existing reservoirs that could serve as terminal storage or regulating storage reservoirs (Sand Hollow Reservoir, Quail Creek Reservoir)
- Proposed terminal storage reservoirs and regulating reservoirs along the pipeline alignment
- All major stream channels and washes that would be crossed by the pipeline, at and immediately downstream of the crossing location, including those in Utah and Arizona
- All major stream channels and washes downstream of new reservoirs and existing reservoirs that would be enlarged or have changed operations as a result of the Project, including those in Utah and Arizona
- All major channels and washes that accept return flows in the water service areas that would receive water from the Project, including those in Utah and Arizona

- Colorado River upstream and downstream of Lake Powell, as simulated by the U.S. Bureau of Reclamation (USBR) CRSS model

### ***18.4.3 Issues and Data Needs***

The surface water resources specific analyses will address the following questions and issues:

- What changes in streamflow would occur in receiving waters affected by return flows from areas receiving Project deliveries? How would the changes in return flows affect downstream users on the Virgin River?
- What impacts would occur on streams and washes during construction, and which channels would be selected for trenchless versus open cut crossings?
- How would pipeline crossings at existing streams and washes be protected? What Standard Construction Procedures (SCPs) would be adopted to protect crossings of streams and washes? What maintenance procedures would be needed to protect stream and wash crosses after completion of the Project? What permits would be needed for each of the stream and wash crossings (e.g., permits for pipelines, culverts, and roads)?
- What impacts would occur on water levels in existing reservoirs that would be integrated into the Project system?
- How would the Project affect Lake Powell reservoir operations, including potential effects on the monthly distribution of Lake Powell releases?
- How would the Project affect streamflow on the Colorado River, and water storage levels within reservoirs on the Colorado River?
- What operating levels would be expected in new reservoirs in the Project system?
- How would the Project affect evaporation losses from existing and proposed reservoirs?
- What benefits would new or enlarged reservoirs have on flood control (effects may occur on on-stream reservoirs and off-stream reservoirs with substantial contributing drainage area)?
- What are the potential impacts of construction across jurisdictional waters of the U.S. and water releases at low points along the pipeline near defined drainages?
- What federal and state permits would be needed for discharging water into jurisdictional waters of the U.S.?
- How would the Project affect streamflow on the Virgin River and its major tributaries, and are there potential flow augmentation or target flows that should be considered to maintain channel integrity and aquatic and riparian habitats?
- How would the Project affect operations of Sand Hollow Reservoir, and would there be any related effects on Virgin River streamflow in the event of changes to reservoir operations?
- What infrastructure would be required to deliver treated water? For example, how would Sand Hollow and Quail Creek reservoirs be utilized, and where would water supply be treated? How would existing infrastructure be affected by the proposed water deliveries?
- How would the gradual increase in pipeline deliveries affect surface water resources? For example, how would Virgin River streamflow change over time as gradual increases in pipeline deliveries may result in a similar increase in return flows to the Virgin River over time?
- How would the Project affect channel stability, including the potential for erosion and sedimentation?
- What depth should the LPP intake structure in Lake Powell be constructed to in order to provide adequate water supply during drought periods?
- How could Project operations potentially affect sedimentation and the effectiveness of existing Virgin River diversion structures?

Data determined to be needed for the tasks described in this Surface Water Resources study plan will be collected using the following procedure.

1. Assess data needs and determine the appropriate agencies from which to request the necessary data.
2. Obtain currently available data (e.g., reservoir levels from the USBR).
3. For data that is not available, determine an appropriate procedure for data collection. Appropriate agencies will be consulted to determine the appropriate data collection procedure. Standard data collection procedures from these agencies will be used where available, and sampling procedures will be developed in coordination with the agencies where existing procedures are not already available. For example, the USBR would be consulted to develop a data collection procedure for additional reservoir storage data if existing storage level data are not adequate to complete the tasks described in this study plan.
4. Available historical data will be combined with additional data collected, and the combined data will be used in the analyses described in this study plan. If no historical data is available, data available for the analyses described in this study plan may be limited to a particular sampling period. In that case, the potential bias of the sampling data will be discussed. For example, the hydrologic condition of the sampling period will be compared to the historical hydrologic record for the area in order to estimate whether the sampling data represent average, dry, or wet conditions.

Additional data collection related to the Surface Water Resources Study Plan may include data needed for the water quality analyses, which are described in Study Plan 17, Surface Water Quality.

## **18.5 Nexus to Project (§5.11(d)(4))**

The availability of water for the pipeline and limitations on streamflow or reservoir levels would affect the ability of the Project to supply water to communities in Utah and to generate hydroelectric power. Therefore, the surface water resources are directly related to the Project's purpose. The Project has the potential to aid in management and recovery of some of the Virgin River species through release of Virgin River water presently diverted into the Hurricane pressure irrigation system in exchange for LPP water to operate the Hurricane pressure irrigation system. The potential flow releases into the Virgin River could change habitat conditions for listed aquatic and riparian fish and wildlife species.

## **18.6 Proposed Study Methodology (§5.11(d)(5))**

### ***18.6.1 Introduction and Overall Approach***

Analysis of surface water resources will be performed by a combination of detailed and approximate methods. A simulation model will be developed for the Project pumping, pipeline and reservoir facilities to simulate hydrologic operations. Results of the surface water resources tasks described below will also be used as input information for analyses described in other study plans that are dependent on surface water resources (e.g., endangered species, Study Plans 11, 12, and 13; water quality, Study Plans 5 and 17; recreation, Study Plan 9; and power, Study Plan 10). There is also close connection between this surface water study plan and the water supply and climate change study plan (Study Plan 19).

### ***18.6.2 Task 1 – Define Baseline Conditions***

The following methods will be used to define surface water baseline conditions (i.e., the affected environment) in the potentially affected study area.

Baseline streamflow in gaged perennial or ephemeral streams will be determined using published or available streamflow data from the Utah Division of Water Resources, U.S. Geological Survey StreamStats, and the Arizona Department of Water Resources, if necessary. Streamflow data will be obtained from the U.S. Geological Survey's National Water Information Website (NWISWeb). The following data analyses will be completed to define baseline streamflow conditions for each of the available streamgage datasets:

- Daily streamflow plotted in a flow-frequency curve (i.e., the frequency of given flows being equaled or exceeded)
- Daily streamflow time series plots
- Average monthly streamflow plots and/or tables
- Average annual streamflow plots and/or tables

Stream stage will also be determined for each of the streamflow datasets where a streamflow-stage rating curve is available. Rating curves will be obtained from the U.S. Geological Survey's NWISWeb, and daily streamflow will be translated to daily stream stage data using the rating curves. Stream stage will be summarized using similar analyses described above for streamflow data.

Baseline peak flow conditions will be determined using published historical instantaneous peak discharge data where such data is available. A historical annual time series plot will be used to show the range of historical peak discharge data. If existing flood studies have been completed to determine the statistical peak flows for various recurrence intervals, these published data will be used. If existing flood studies are not readily available, a statistical analysis of the historical data will be completed to determine the 2-, 10-, 100-, and 500-year recurrence interval peak flows. The Log Pearson Type III distribution and methods suggested by the U.S. Geological Survey (1981) will be used to complete a flood frequency analysis for those areas where previous published flood studies are not available. Where gaged peak flow data are not available, approximate methods such as the use of regional regression equations will be used to estimate peak discharge-frequency values.

Baseline flood stage and width conditions will be determined using published floodplain maps where available. Where previous floodplain maps are not available, flood stage and width will be estimated by obtaining topography data and completing a hydraulic calculation for the 100-year recurrence interval peak flow events described in the previous paragraph. Normal depth hydraulic conditions will be assumed for each of the hydraulic calculations. The best available topography data will be obtained from owners of the streamgages where possible, and may be estimated from topographic maps and/or digital elevation models if topographic data are not available. If more detailed flood analyses are determined to be necessary, flood hydrograph modeling will be performed using the HEC-HMS and HEC-RAS models developed by U.S. Army Corps of Engineers.

Baseline reservoir levels will be determined using data available from reservoir owners and data obtained from the U.S. Geological Survey. Reservoir storage contents will be obtained, and storage-elevation rating curves for each of the reservoirs will be used to translate storage data to reservoir elevation data. Reservoir storage and elevation data will be expressed in terms of a water level-frequency curve. Additionally, time series plots and average monthly reservoir contents plots and/or tables will be used to summarize historical reservoir storage data.

Baseline geomorphic conditions will be determined based on published studies where available. Information on channel stability, existing sediment load, and trends in erosion and sedimentation will be collected to determine a baseline for geomorphic conditions within the study area.

### ***18.6.3 Task 2 – Alternatives Analysis***

The following methods will be used to evaluate surface water impacts associated with the Project alternatives.

The State of Utah has contracted with the U.S. Bureau of Reclamation (USBR) to perform additional simulations with its Colorado River Basin hydrology and operations model (CRSS) to determine the effects of LPP withdrawals at different magnitudes. Various proposed LPP diversions, included in each of the Project alternatives, will be simulated using the CRSS model. Effects of each of the Project alternatives will be simulated using the CRSS model. A No Action Alternative (i.e., no Lake Powell Pipeline) will be modeled using the CRSS model. However, the No Action Alternative will not include detail of where the State of Utah would divert its Colorado River allocation in the absence of a Lake Powell Pipeline. The No Action Alternative will be used in the environmental document prepared for the FERC license application to compare effects of the action alternatives. The CRSS model will be used to simulate effects on the following surface water resources parameters:

- Colorado River streamflow
- Lake Powell storage contents
- Storage contents in other reservoirs determined by the USBR to have potential effects as a result of Project operations (e.g., Lake Mead)

The existing CRSS model will be used to simulate streamflow through 2060 as part of the contract with the USBR in order to be consistent with the LPP Project study period. Extending the model period of record will include estimating other reasonably foreseeable actions (e.g., proposed diversions and changes in streamflow resulting from climate variability). USBR will document its modeling results in a technical report. Pertinent results will be incorporated in the surface water technical report (Task 3).

Seasonal and/or monthly streamflow data will be presented in the alternatives analysis in addition to any annual streamflow summaries. Results of analyses will include an evaluation and summary of trends in streamflow data. Trends in streamflow data will be determined by completing a daily time series of historical streamflow data. Simulated streamflow from Reclamation's CRSS modeling will be used as input to the analysis of trends in streamflow. However, the analysis of trends in flows will be completed independently of the CRSS modeling. Statistical averages will be computed for various time periods to determine whether streamflow has varied over time. If trends in streamflow are found, factors contributing to the changes in streamflow will be summarized. Possible factors affecting trends in streamflow include climate change (discussed in Study Plan 19, Water Supply and Climate Change), additional stream diversions, construction of new reservoirs, and changes in water uses that would affect the amount of water supply that returns to the hydrologic system.

In addition to the surface water modeling that will be completed by USBR for the Colorado River using the CRSS model, a simulation model will be developed for the local water supply systems. The local water supply systems model will simulate infrastructure that will be part of the Project alternatives. The Project infrastructure system, including pipelines, pump stations and reservoirs, will be modeled to simulate storage contents in local reservoirs (e.g., Sand Hollow and Quail Creek reservoirs), flow through proposed pipelines, and demands on water treatment facilities. The model platform may be MODSIM,

which is a water resources simulation model developed by Colorado State University for analysis of rule-based allocation systems. The MODSIM model has been applied to multiple water resources planning projects. A monthly simulation model will be developed to determine flows in pipeline segments and storage and water levels in reservoirs in the Project system. The model will be developed for a historical hydrologic period to be determined based on discussion with Utah Division of Water Resources staff. Annual and monthly demands will be determined from the Water Needs Assessment task described in Study Plan 19, Water Supply and Climate Change. Model results will be summarized for each alternative to describe flow and reservoir level frequency distributions in each Project component. The following simulation results from the local water supply systems model will be summarized:

- Reservoir storage contents
- Municipal water demands
- Water treatment facility flow rates
- Major supply pipeline flow rates
- Return flows through wastewater treatment plants and non-point sources (the portion of imported water deliveries from the Lake Powell Pipeline that are not fully consumed would increase return flows through wastewater treatment plant discharges to local stream channels)

Effects of new or modified reservoirs on downstream flood flows, if anticipated to be significant, will be estimated by routing the inflow hydrograph through storage using HEC-HMS or similar software. Reservoir spillway design information would be used to determine a storage-outflow curve for any reservoirs determined to significantly affect downstream flood flows. Flood routing software such as HEC-HMS would be used to route the inflow hydrograph to the reservoir, and determine the resulting downstream flood flow based on the reservoir spillway storage-outflow curve. Effects on existing off-stream reservoirs (e.g., Sand Hollow Reservoir in Washington County) are expected to be minimal, because off-stream reservoirs typically have minimal effects on flood flows that are routed through stream channels. As a result, the flood flow effects analysis will focus on effects that any proposed on-stream reservoirs, or those with a substantial contributing drainage area, would have on peak flows.

Effects of return flows on flows in streams and washes will be estimated based on current return flow percentages of water deliveries calculated from water application data in the study area, and locations of existing and future development. Water suppliers will be interviewed to obtain estimates of current return flows as a percentage of municipal water supply. Future return flows will be estimated by applying existing return flow percentages to the amount and location of proposed Project deliveries. For example, return flows to the Virgin River in Washington County are expected to increase if additional water supply is imported from Lake Powell. This increase would be estimated by determining the amount of return flows from indoor and outdoor water uses, which will be examined in Phase II of the Water Needs Assessment (described in the water supply and climate change study plan, Study Plan 19). Return flows would include return flows from outdoor lawn watering (non-sewered return flows) and effluent from wastewater treatment plants (sewered return flows).

#### ***18.6.4 Task 3 – Prepare Technical Report***

A technical report will be prepared to document the impact analysis for surface water resources. The technical report will include the following sections:

- Introduction – will include a summary of the proposed Project alternative, issues raised during the scoping process, and impact topics addressed in the surface water resources analysis

- Methodology – will summarize the data used, assumptions made for the analyses, a description of the impact analysis methodology, and a description of model development, calibration, and verification
- Affected Environment – will summarize the baseline surface water resources conditions including the impact area, and the existing conditions for streamflow, reservoirs, stream crossings, and flooding within the impact area
- Environmental Consequences – will summarize the significance criteria used to categorize potential impacts, and the environmental impacts of each of the Project alternatives including the No Action Alternative
- Mitigation and Monitoring – will summarize potential mitigation and monitoring methods for the proposed Project
- Unavoidable Adverse Impacts – will summarize unavoidable adverse impacts that would remain after applying mitigation measures
- Cumulative Impacts – will document any significant cumulative impacts estimated to occur for water resources

### **18.7 Schedule and Level of Effort (§5.11(d)(6))**

The surface water resources studies will require substantial time and effort to gather available data, analyze and summarize data, develop the surface water resources simulation model, coordinate with the USBR on methods and results from the CRSS model, and determine potential effects on streamflow and reservoirs.

Total study costs are estimated to be approximately \$300,000, depending on the availability of existing streamflow and reservoir data that will be needed for the surface water resources simulation model and the cost of modeling work contracted to USBR.

An approximate schedule to perform the study is shown in Table 18-1. The study can be completed within a one year period.

<p align="center"><b>Table 18-1</b> <b>Surface Water Resources Proposed Study Schedule</b></p>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Definition of Baseline Conditions	February 2009	April 2009	90
2	Alternatives Analysis	May 2009	December 2009	245
3	Prepare Technical Report	December 2009	February 2010	75

### **18.8 Progress Reporting (§5.11(b) (3))**

Progress reports will be prepared on a quarterly basis, beginning in March 2009, and will be updated in June and September 2009. The final progress report will be submitted in December 2009.

## 18.9 References

- U.S. Bureau of Land Management (BLM). 1999. St George Field Office Record of Decision and Resource Management Plan. March.
- U.S. Bureau of Land Management (BLM). 2008a. Kanab Field Office Record of Decision and Approved Resource Management Plan. October.
- U.S. Bureau of Land Management (BLM). 2008b. Arizona Strip Field Office Record of Decision and Approved Resource Management Plan. February.
- U.S. Geological Survey. 1981. Guidelines for Determining Flood Flow Frequency. Bulletin # 17B of the Hydrology Subcommittee. Interagency Advisory Committee on Water Data. September.



## **Study Plan 19: Water Supply and Climate Change**

### **19.1 Introduction**

This study plan documents the methods for planning and analysis of water supply and climate change for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 and September 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those provided in the September and November study plan meetings.. This study plan presents an approach for advancing knowledge and understanding of water supply resources and climate change. It addresses study requests made by FERC, other federal, state and tribal agencies, and the public. It responds to written comments made during the study plan development process and filed with FERC.

This study plan describes goals and objectives, provides a description of the study area, describes the Project nexus, presents the proposed methodology, presents staffing and equipment requirements, provides a budget for activities associated with the water supply and climate change resources portion of the study, and provides a generalized project schedule.

### **19.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

#### ***19.2.1 Study Description***

The study will identify potential impacts of the Project on water supply during Project construction, operation, and maintenance, and estimate potential effects of climate change and climate variability on Project operations and water deliveries. For the purposes of this study plan, effects will include direct effects (those directly attributable to the proposed Project), indirect effects (those attributable to the Project but removed in time or space), and cumulative effects (those that would occur as a result of future reasonably foreseeable activities when combined with the proposed Project).

#### ***19.2.2 Goals and Objectives***

Water supply objectives include determining how Project construction and operations may affect the water supply within the study area. An estimate of existing and future water supplies will also be developed and compared with projected M&I water demands to determine the need for additional future water supply. The primary objectives of the study with regard to water supply of the Colorado River Basin are:

- Provide a summary of the long-term water supply to Lake Powell and the potential effects on water supply from climate variation
- Summarize the most recent scientific literature on potential climate change effects in the region and include an analysis of long-term water availability from Lake Powell under various water supply scenarios
- Determine the effects of the LPP diversions on Colorado River water supplies for other water users by evaluating effects on Colorado River streamflow

- Determine the effects of other proposed Colorado River water supply development on the potential yield of the proposed LPP diversions (including reasonably foreseeable projects included in the U.S. Bureau of Reclamation's Colorado River Basin hydrology and operations model Colorado River Simulation System (CRSS))
- Determine how the proposed LPP diversions will affect water supply available for delivery to the Lower Basin States in the Colorado River Basin
- Determine the validity of the participants' water supply requests based on estimates of future supplies and demands
- Determine the likely timing of the need for the LPP supply when integrated with other potential supplies
- Determine potential effects of the Project on water supplies available to surrounding communities
- Provide the groundwork for a Purpose and Need Statement that would be required as part of the National Environmental Policy Act (NEPA) environmental permitting process for the LPP, if the project goes forward

### **19.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. The BLM has established resource management goals applicable to water supply and climate change for the study area, and the goals are documented in BLM resource management plans. The following specific agency resource management goals apply to water supply and climate change that would be addressed by this study plan.

- Maintain and/or restore natural hydrologic functions of watersheds, including the capability to capture, store, and beneficially release water (BLM 2008).
- Work with municipalities, state and local agencies, and other interested parties to (BLM 1999):
  - Protect community watersheds and sources of culinary water;
  - Promote water conservation;
  - Ensure water availability for the maintenance of key natural systems and human enjoyment; and
  - Where necessary to meet essential community needs, identify environmentally suitable sites for water storage and routes for water transport.

In addition to BLM resource management goals described above, the Federal Power Act affects FERC's goals in licensing the proposed Project. The Federal Energy Regulatory Commission must decide whether to issue a license to the Utah Board of Water Resources for the Lake Powell Hydroelectric System Project. Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a project is located, and what conditions should be placed on any license that may be issued. In making its license decision, the Commission must equally consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values. Any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. The available water supply may affect the economics of a proposal which is relevant to the Commission's public interest determination.

## **19.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

### ***19.4.1 Background Description***

Existing information that will be used in the water supply and climate change study includes previous studies on the Project participant's existing and potential future water supply systems. Sources of existing information that will be used include the following:

- Lake Powell Pipeline Study Water Needs Assessment, Phase I Report, Final Draft (MWH 2008)
- Water supply information for Project participants' existing water supplies (Boyle 1998, CICWCD 2007, WCWCD 2006)
- Estimates of existing reliable water supplies for Project participants (DWRe 2007; DWRe 2008)
- Population projections (GOPB 2008)
- Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, Final Environmental Impact Statement (U.S. Bureau of Reclamation 2007)

In particular, the Draft Phase I Report for the Lake Powell Pipeline Study Water Needs Assessment that was recently completed for the Project participants will be used as the primary basis for the study. Preliminary planning and engineering analysis of existing and future water needs for the LPP participants were performed using procedures consistent with those used in previous water needs assessments for the study area, and with methods and data compatible with Utah Division of Water Resources studies. Specific tasks completed for Phase I of the Water Needs Assessment were the following:

- Update and refine population projections - the State of Utah Governor's Office of Planning and Budget was contacted to obtain the latest population projections for the region, individual cities, and unincorporated areas. Particular attention was given to the appropriate means of handling seasonal residents and tourism in population forecasts that were used to estimate water demands.
- Prepare water demand forecast - using the unit water use, demographics, land use information, and population projections obtained from the available sources, municipal and industrial water demand was forecasted through the year 2060. Future water conservation and reuse were estimated as an offset to future growth in water demand. Separate demand forecasts were developed for each Project participant.
- Review capacities of existing supplies – the yield and reliability of existing water supplies were summarized for each of the Project participants. Information that was characterized includes the location of the source water, reliable yield of the water supply, water quality, water rights and other institutional issues, and water treatment.
- Evaluate potential new water supplies – potential new water supplies were characterized based on data from Project participants, including information on the reliable yield, water quality, water rights and other institutional issues, water treatment requirements, and planned timing of implementation for the potential water supplies.
- Evaluate existing and planned conservation programs –historically achieved conservation was estimated based on information from the Utah DWRe on historical water use and information on existing and planned conservation programs from the Project participants. Reasonable future conservation savings were based on the State and local goal of 25 percent conservation between 2000 and 2050. Conservation achieved between 2000 and 2005 was considered in the determination of future conservation needed to achieve the State's goal of 25 percent conservation by 2050.

- Develop potential No Action Alternative – based on discussions with the participants, a preliminary No Action Alternative was identified for each participant to describe the water supplies, demand restrictions, or other methods that would be used to meet future demands if the LPP project was not implemented. The potential No Action Alternative for each Project participant included potential water supplies and/or water demand reduction possibilities that would be needed to meet future demands without the LPP project.
- Draft preliminary Water Needs Assessment – based on the comparison of existing and potential water supplies compared to the interim future demands, a preliminary needs assessment and integrated water resources plan were prepared for each Project participant. Tables and graphs were prepared showing the supplies and demands and the adequacy (or lack thereof) of water supplies between 2005 and 2060. Results of the Draft preliminary Water Needs Assessment indicated that WCWCD would need its full allocation of the LPP water supply (70,000 ac-ft per year), and would still have an unmet demand of about 69,900 ac-ft per year by the year 2060. CICWCD would need about 11,500 ac-ft per year of supply from the LPP to meet its future water demands. Existing water supplies and future development of available ground water supply were determined to be capable of meeting future demands within KCWCD, depending on the water quality of available ground water supply.
- The Draft preliminary Water Needs Assessment will be updated during Phase II of the Water Needs Assessment, described in detail in Section 19.6.2.

### ***19.4.2 Study Area Definition***

The study area will include the service areas for the three Project participants, which includes the following:

- Washington County Water Conservancy District service area
- Central Iron County Water Conservancy District service area
- Kane County Water Conservancy District service area

In addition to the impact areas listed above, other areas associated with modifications to the proposed Project (e.g., revised pipeline alignments) will be considered if they become part of the Project. Portions of the study area are located in areas that are remote relative to the proposed Lake Powell Pipeline alignment. Economic and engineering considerations may limit the ability of the Project participants to supply LPP water to these remote areas. However, these remote areas have little population relative to the remainder of the study area and would not affect the overall projected M&I water demands. As a result, these areas will be left in the study area.

### ***19.4.3 Issues and Data Needs***

The water supply and climate change specific analyses will address the following questions and issues:

- Existing and potential future M&I water supplies for the participants will be summarized.
- Existing per capita water use and projected conservation for the participants will be assessed to estimate future per capita water use.
- Population projections and projected per capita water use will be used to develop M&I water demand projections.
- Previous research into potential climate variability will be summarized relative to its effect on the proposed LPP diversion. Existing research considered will include reputable sources in the

scientific community, such as peer-reviewed research completed by the U.S. Bureau of Reclamation and Western Water Assessment.

- The effects of the long-term drought affecting the Colorado River water supply will be assessed to determine the associated effects on the proposed LPP diversion.
- Potential requirements under Utah State law, such as water rights establishment and water accounting, will be assessed to determine what would be needed for the proposed LPP diversion.
- Colorado River streamflow and proposed LPP diversions will be simulated using the Bureau of Reclamation's existing Colorado River Simulation (CRSS) model to determine the long-term sustainability of the proposed diversion and potential obligations under the Colorado River Compact.
- The Bureau of Reclamation CRSS model will be used to determine potential effects on downstream water rights such as those associated with the Navajo, Ute, Paiute, and Hopi tribes.
- Potential impacts to water supply associated with reasonably foreseeable activities such as other proposed diversions from Lake Powell will be estimated.
- The potential effects of reasonably foreseeable water development projects on the yield of the LPP Project will be determined by simulating streamflow using the Bureau of Reclamation CRSS model (reasonably foreseeable projects will be limited to those incorporated in the CRSS model).
- The potential for additional water reuse and conservation as a means to offset culinary water demands will be assessed.
- Climate change effects on existing and future water supplies in the Virgin River drainage will be addressed.
- Requirements and stipulations for the proposed LPP diversions will be evaluated, including those described in the 1922 Colorado River Compact.
- Cost estimates for other proposed water supplies from water providers in the study area will be collected or generated for use in estimating the costs of various water supply alternatives relative to the cost of the LPP.

## **19.5 Nexus to Project (§5.11(d)(4))**

The availability of water for the pipeline would affect the ability of the Project to supply water to communities in Utah and to generate hydroelectric power. Therefore, the availability of water supply is directly related to the Project's purpose.

## **19.6 Proposed Study Methodology (§5.11(d)(5))**

### ***19.6.1 Introduction and Overall Approach***

Water supply methodology includes two phases of the Lake Powell Water Needs Assessment. The Water Needs Assessment task was divided into two phases. Phase I – Preliminary Water Needs Assessment – used existing available information and analysis to determine a reasonable range of water needs for years between 2010 and 2060 by WCWCD, KCWCD and CICWCD. Phase I of the Water Needs Assessment for the LPP was recently completed for the State of Utah and the Project participants. This report will serve as the basis for the analysis of M&I water supplies and demands for the participants. The tasks completed in Phase I of the Water Needs Assessment are described above in Section 19.4.1, Existing Information and Additional Information Needs. Information from Phase I of the Water Needs Assessment will be the basis for Phase II of the Water Needs Assessment described below.

Climate change methodology will include review of existing literature and use of existing models to determine potential effects of climate change on the availability of water supply for the proposed LPP

diversion and potential effects of the diversion on other water users. Several documents, including technical reports, scientific and engineering journal publications, and other literature were previously reviewed and information compiled. This information was documented in technical memoranda and presented in the PAD. Additional review of literature involving water supply and climate change resource conditions will be performed by identifying and reviewing available technical reports, maps, and literature that may not have been previously reviewed. Meetings will be held with local water providers to assess existing water supplies, and information from these meetings will be used to develop water supply plans. Colorado River streamflow and water supply availability will be simulated by USBR using existing models. Analysis results and model predictions will be incorporated into a summary report documenting the findings.

### ***19.6.2 Task 1 - Water Needs Assessment Phase II***

Phase II of the Water Needs Assessment (Final Water Needs Analysis and No Action Alternative) will have two objectives. First, the potential for water reuse will be evaluated, and a Water Efficiency Study will be performed to carefully document potential future water conservation. Second, preliminary water need forecasts developed in Phase I will be updated based on more detailed information obtained from the communities during the Water Efficiency Study and from evaluation of the potential for water reuse. The updated water need forecasts will be incorporated into the revised water demand forecasts and the resulting integrated water resource plans. The water needs assessment will be updated to incorporate comments received from the public and agencies.

Phase II of the Water Needs Assessment will include the following specific tasks:

#### ***19.6.2.1 Task 1a – Water Efficiency Study (Evaluation of Potential Conservation)***

- Evaluate the conservation potential associated with each of the end uses. Disaggregate municipal and industrial per capita water use data presented in the Phase I Final Draft Water Needs Assessment Report into customer type and end uses, using monthly water use billing data from the local water suppliers and weather data as a basis. Monthly water use data will be used to calculate water use for each customer type: single family residential, multifamily residential, industrial, commercial, institutional (schools), and other (e.g. fire hydrants). Minimum winter and summer water use will be used to segregate historical data into indoor and outdoor use. Minimum winter water use will be assumed to equal indoor water use and outdoor water use will be calculated by subtracting minimum winter water use from total water use. Regional and national studies will be used as a basis for estimating end use consumption (e.g., toilets, laundry, baths/showers, dishwashers, faucets, and landscape irrigation) for each customer type.
- Develop and calibrate three end-use models, one for each of the water conservation districts (Washington, Central Iron and Kane) based on water billing data from St. George, Cedar City, and Kanab. The Least Cost Planning Water Demand Management Decision Support System Model (DSS Model) will be used for this analysis. The DSS Model calculates savings at the end use level, such as the amount of water saved in a single family account per day from installing a new toilet, and has been used to forecast demand and evaluate water conservation benefits and costs in over 150 cities world wide.
- Perform detailed evaluation of potentially feasible and cost-effective water conservation measures, including meetings to incorporate input from local water managers with knowledge of conservation techniques. Conservation measures will be evaluated using a screening process based on the following criteria:
  - Technology/Market maturity. Is the technology commercially available and supported by the necessary service industry?

- Service area match. Is the technology applicable to the climate, building stock, or equipment that is typical in the Project Sponsor's service area territory?
- Customer acceptance/equity. Are customers willing to implement the measure? Is it fair?
- Better measures available. If there is more than one measure that addresses specific inefficiency in water use, is one measure equivalent in function and clearly more cost effective than other(s)?
- Evaluate the effectiveness of the short-list of conservation measures described above using the end-use Decision Support System models. Produce a detailed baseline water demand forecast, a description of short listed conservation measures and the screening criteria used to screen the conservation measures, and the results of the cost-effectiveness evaluation with the DSS Model.
- Create three conservation programs by compiling the best conservation measures. Each program will contain increasing levels of conservation effectiveness and will be characterized as either low, moderate, or high.
- Summarize results of Water Efficiency Study in a technical memorandum.

### ***19.6.2.2 Task 1b – Evaluation of Water Reuse Potential***

- Assess the potential for wastewater reclamation and reuse for potable and/or secondary uses by reviewing:
  - Existing reuse facilities
  - Type and location of existing wastewater treatment facilities that could potentially be retrofitted for the purpose of water reuse
  - Existing water quality of current treated wastewater effluent and the level of treatment that would be required for use of treated wastewater to meet culinary demands (i.e., 500 ppm TDS) and secondary demands (i.e., 1,000 ppm TDS)
  - Layouts of existing recycled water distribution systems
- Assess the feasibility of indirect potable reuse (i.e., wastewater reuse to meet culinary demands), considering limitations associated with treatment technology, treatment cost, regulatory requirements, environmental issues, and public acceptance.
- Visit St. George and Cedar City to assess reuse potential by discussing existing reuse facilities and customers with wastewater treatment and/or water reuse personnel.
- Identify the location of potential sites for reusing water for secondary purposes using growth projections, land use plans, and a survey of potential reuse customers. Potential sites include: large turf areas, such as parks, golf courses, and roadway and common area landscaping; selected industrial uses such as sand and gravel operations, concrete batch plants, crop irrigation (currently using water that could be converted to culinary water), and other existing or planned uses identified by the Districts or prior studies.
- Develop separate water demand forecasts for culinary and secondary water uses based on existing ratio of secondary/culinary use and the survey of potential future reuse customers described above.
- Develop preliminary layouts of additional recycled water distribution systems, including expansion of existing facilities and construction of new water treatment facilities and/or distribution system for sites large enough to warrant reuse service.
- Prepare a Technical Memorandum to summarize the results of the recycled water potential evaluation and estimate the annual reliable yield and cost of potential water reuse/recycling projects that are deemed to be feasible for each of the three water conservancy districts.

### ***19.6.2.3 Task 1c – Revision of the LPP Water Needs Assessment***

- Revise the Phase I Water Needs Assessment Report described above based on updated water reuse and conservation potential, and other issues raised during the Phase II study process.
- Publish revised Phase II Water Needs Assessment, and make it available for public review.

### ***19.6.3 Task 2 – Climate Change Evaluation***

The potential effects of climate change on water supply in the Colorado River Basin will be evaluated through several tasks including the following:

- Review existing Colorado River Basin climate change literature to summarize the current understanding of the magnitudes of potential future systematic changes in long-term precipitation, snowpack and runoff, and their resulting impacts on water supply availability.
- Summarize the effects of the recent long-term drought in the Colorado River Basin on water availability in Lake Powell based on previous studies by the Bureau of Reclamation and others.
- The State of Utah has contracted with the U.S. Bureau of Reclamation (USBR) to perform additional simulations with its Colorado River Basin hydrology and operations model (CRSS) to determine the effects of LPP withdrawals at different magnitudes. The CRSS model will be used to simulate streamflow through 2060 as part of the contract with the USBR in order to be consistent with the LPP Project study period. The CRSS model will simulate effects of the proposed Lake Powell Pipeline diversion, and will also simulate the effects of all reasonably foreseeable projects included in the CRSS model. Results of this modeling will be used to determine effects on Colorado River streamflow, storage levels in reservoirs on the Colorado River, and effects on power production on the Colorado River. Effects of each of the Project alternatives will be simulated using the CRSS model.
- A No Action Alternative (i.e., no Lake Powell Pipeline) will be modeled using the CRSS model. However, the No Action Alternative will not include detail of where the State of Utah would divert its Colorado River allocation in the absence of a Lake Powell Pipeline. Instead, the No Action Alternative will simply not include the proposed diversion from Lake Powell for the Lake Powell Pipeline. This No Action Alternative will be used in the forthcoming NEPA process for comparison of effects of each of the proposed alternatives.
- Potential effects of climate variability will be evaluated using reputable sources in the scientific community, such as the U.S. Bureau of Reclamation and Western Water Assessment. Methods used to evaluate the effects of climate change will be limited to peer-reviewed, accepted scientific methods (e.g., use of the Colorado River Basin hydrology and operations model (CRSS) to simulate effects on Colorado River streamflow).
- Determine a reasonable range of future hydrologic conditions in the Colorado River Basin and Lake Powell, and assess the availability of water for the LPP diversion under these hydrologic conditions. This will include use of the Bureau of Reclamation's CRSS hydrologic simulation model to simulate effects of different hydrologic scenarios on LPP diversions. Various hydrologic scenarios will be determined by USBR by using long-term hydrology generated from tree ring data and input to the CRSS model. The combined effects of dry periods and the proposed LPP diversions on Colorado River streamflow will be evaluated with the CRSS model.
- Potential effects of climate change will be evaluated on a relative basis, with effects on streamflow and water supply associated with climate change being applied to all LPP Project alternatives. For example, changes in streamflow associated with climate change would be included in each of the Project alternatives. Including effects of climate change in all potential alternatives will result in a relative comparison between alternatives where effects of climate change apply equally to each alternative.



- Estimate potential effects on Colorado River streamflow associated with the combined influence of climate change and the proposed LPP diversion. This will include use of the Bureau of Reclamation's CRSS hydrologic simulation model.
- Summarize potential climate change effects in a Climate Change Technical Report. This technical report will include a description of the assumptions made for the Bureau of Reclamation's CRSS modeling. Additionally, CRSS model output will be provided in the technical report.

#### ***19.6.4 Task 3 – Effects on Other Water Users***

The potential effects of the proposed LPP diversion on water supply in the Colorado River Basin will be evaluated through several tasks including the following:

- Use of the U.S. Bureau of Reclamation CRSS model to simulate a range of hydrologic conditions and LPP alternatives.
- Simulated Colorado River streamflow from the CRSS model will be used to estimate potential effects on Colorado River streamflow downstream of Lake Powell and related effects on the potential water supply of other downstream users.
- Background information on the requirements stipulated in the 1922 Colorado River Compact will be described, including consideration of requirements that may affect the proposed Lake Powell Pipeline diversions. This evaluation will be a simple discussion of the proposed Lake Powell Pipeline diversions within the context of the Compact, but detailed legal analyses will not be completed as part of this study plan.
- Determine potential effects on downstream water rights such as those associated with the Navajo, Ute, Paiute, and Hopi tribes.

#### ***19.6.5 Task 4 – Alternative Components Cost Estimates***

Cost estimates for various water supply options, including the Lake Powell Pipeline, will be made using the best available information from water providers in the study area. The following tasks will be completed for the alternatives cost comparison:

- Cost estimates of existing water supplies and potential future water supplies will be collected from water providers in the study area.
- Capital and operation and maintenance cost estimates for infrastructure that would be needed to implement non-potable or potable reuse options deemed to be feasible (e.g., cost estimates for wastewater treatment upgrades, pumping stations, distribution tanks and piping) will be estimated from similar water supply projects.
- Costs will be included for any advanced water treatment that would be necessary to meet culinary or secondary standards, depending on the water quality and planned use for each of the water supplies.
- Costs for various supply components will be adjusted to a consistent basis (e.g., 2009 dollars).
- A cost comparison will be completed for all of the water supply options considered, including options that were rejected as alternatives to the Lake Powell Pipeline.
- Cost estimates developed for each of the supply components will be used in development of potential water supply alternatives, as discussed in Study Plan 22, Alternatives Development.

### **19.6.6 Task 5 – Prepare Draft and Final Reports**

Draft and final technical reports will be prepared and submitted to Utah Board of Water Resources, FERC, and land management agencies for technical review and input per the study schedule described below. All final mapping and analysis data will be provided in electronic format to the Utah Board of Water Resources and land management agencies as requested.

### **19.7 Schedule and Level of Effort (§5.11(d)(6))**

The water supply and climate change studies will require substantial time and effort to gather available data, meet with local water suppliers, summarize potential climate change, coordinate with USBR modelers, and analyze and summarize data. The schedule and budget are highly dependent on the level of detailed analysis that will be required to assess potential impacts associated with climate change and the availability of appropriate Colorado River Basin streamflow models to simulation streamflow and the effects of the proposed LPP diversion.

Total study costs are estimated to be approximately \$250,000 (in addition to costs already expended for completion of the Phase I Water Needs Assessment), depending on the availability of appropriate Colorado River Basin simulation models to estimate potential effects of climate change. USBR modeling costs are not included in this estimate

An approximate schedule to perform the study is shown in Table 19-1. The study can be completed within a one year period.

<b>Table 19-1 Water Supply and Climate Change Proposed Study Schedule</b>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
0	Water Needs Assessment – Phase I	April 2007	Completed	N/A
1	Water Needs Assessment – Phase II	November 2008	January 2010	430
2	Climate Change Assessment	February 2009	January 2010	340
3	Effects on Other Water Users	February 2009	January 2010	340
4	Alternatives Cost Estimate	February 2009	January 2010	340

### **19.8 Progress Reporting (§5.11(b) (3))**

Progress reports will be prepared on a quarterly basis, beginning in March 2009. The final progress report will be submitted in December 2009.

### **19.9 References**

Boyle. 1998. Water supply needs for Washington and Kane Counties & Lake Powell Pipeline Study. Prepared for Washington County Water Conservancy District and Utah State Division of Water Resources. December 1998.

- Central Iron County Water Conservancy District (CICWCD). 2007. Working draft capital facilities plan and impact fee analysis. Prepared by Stanley Group. March 30, 2007.
- U.S. Bureau of Land Management (BLM). 1999. St George Field Office Record of Decision and Resource Management Plan. March.
- U.S. Bureau of Land Management (BLM). 2008. Kanab Field Office Record of Decision and Approved Resource Management Plan. October.
- U.S. Bureau of Reclamation. Colorado River Simulation System, Hydrologic Flow and Salt Database for the Lower Colorado Region. March 1992.
- U.S. Bureau of Reclamation. 2007. Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead. Final Environmental Impact Statement. October.
- MWH Ameriacs, Inc. (MWH). 2008. Lake Lowell Pipeline Study Water Needs Assessment, Phase I Report, Final Draft. Prepared for Utah Department of Natural Resources. August.
- Utah Division of Water Resources (DWRe). 2008. Municipal and industrial water supply and uses in the Kanab Creek/Virgin River Basin (Data collected for the year 2005). February.
- Utah Division of Water Resources (DWRe). 2007. Draft municipal and industrial water supply and uses in the Cedar/Beaver Basin (Data collected for the year 2005). November 2007.
- Utah Governor's Office of Planning and Budget (GOPB). 2008. Detailed Demographic and Economic Projections. Available online at <http://www.governor.utah.gov/dea/projections.html>.
- Washington County Water Conservancy District (WCWCD). 2006. Regional water capital facilities plan and impact fee analysis. Amended October 17, 2006.

## **Study Plan 20: Wetlands and Riparian Resources**

### **20.1 Introduction**

This study plan documents the methods for analyzing impacts on wetlands, riparian areas, and potentially jurisdictional waters (including intermittent and ephemeral drainages) for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Preliminary Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on the PAD and Scoping Documents 1 and 2, as well as those provided in the September and October study plan meetings in Salt Lake City and St. George, Utah. This study plan presents an approach for advancing knowledge and understanding of wetlands and riparian resources conditions as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan addresses study requests identified by FERC, other federal, state and tribal agencies, and the public in their comments on the Proposed Study Plan.

Wetlands are areas that meet the criteria for soils, hydrology, and vegetation as defined in the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (USACE 1987). These are areas that are inundated or saturated by surface or groundwater at a duration and frequency sufficient to support vegetation typically adapted for saturated soil conditions. Wetland areas typically comprise marshes, shallow swamps, lakeshores, wet meadows, and riparian areas and are often along or adjacent to perennial or intermittent water bodies.

Riparian areas are vegetated zones that form a transition between permanently saturated and upland areas and typically exhibit vegetation and physical characteristics associated with permanent sources of surface or subsurface water. These areas may or may not meet all three USACE criteria for wetlands. The Project alternative alignments would cross several riparian areas along, adjacent to, or contiguous with perennial and intermittent rivers or water bodies. Although accounting for a small percentage of the overall Project area, riparian areas are among the most productive and important ecosystems in the Project vicinity; as a general rule riparian areas have a greater diversity of flora and fauna than adjacent uplands. Riparian systems filter and purify water, reduce sediment loads, enhance soil stability, provide microclimatic moderation when contrasted with extremes in adjacent areas, and can contribute to groundwater recharge and base flow.

Wetlands that are determined to be hydrologically connected to "waters of the United States" are considered jurisdictional waters, and permitting is required through the USACE if they are impacted. Ephemeral and intermittent streams or washes, which are common in the study area, often do not exhibit the presence of vegetation dependant on saturated soils and are infrequently considered wetlands under the USACE criteria. However, under the recent Supreme Court ruling in the Rapanos case, these waters may be considered jurisdictional under the Clean Water Act (USEPA and USACE 2007). In non-vegetated area, jurisdiction is determined by the "ordinary high water mark."

Although some riparian areas may not be regulated as wetlands and other jurisdictional waters, they are of interest because they provide important habitat for wildlife, including refuge and forage areas. This is also the case for wetlands that might not be considered jurisdictional waters. Therefore, the study report will evaluate all wetlands and riparian areas found in the study area, regardless of their regulatory status.

## **20.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

This study plan describes goals and objectives, provides a study area description, describes the Project nexus, presents the methodology for the proposed study activities, presents staffing and equipment requirements, provides a budget for activities associated with the wetland and riparian area portion of the study, and provides a generalized project schedule. The study will identify potential impacts of the Project on wetland and riparian areas during Project construction, operation, and maintenance, and identify measures to mitigate these impacts. A mitigation plan will be prepared as part of the study and incorporated into the study report to address mitigation measures and concepts, standard construction procedures, standard operating procedures, and best management practices that will be used during project construction and operation to mitigate adverse impacts on wetlands and riparian areas.

### ***20.2.1 Goals and Objectives***

The goals of the wetland and riparian study plan are to identify and determine impacts to wetlands, riparian areas, and jurisdictional waters from Project construction and operation. Information regarding potential wetland and riparian impacts and concerns identified during the formal scoping process will be used to guide decisions in the Project design, construction, operation and maintenance to minimize impacts from the Project.

Specific wetland and riparian related objectives include determination of how construction of the Project and operation of the Project facilities will affect wetland, riparian and jurisdictional water resources along the alternative alignments. Following are the primary objectives of the wetland and riparian study.

- Evaluate baseline conditions in the study area by mapping and describing wetlands, riparian areas, and other potentially jurisdictional areas (intermittent and ephemeral drainages), and by performing a wetland functions and values assessment.
- Identify and avoid impacts on wetlands from Project construction, operation and maintenance activities
- Determine which “dry” crossings are “jurisdictional waters of the United States” during intermittent flows given the June 2007 Guidance on the Rapanos Decision (USEPA and USACE 2007)
- Identify and minimize construction impacts on riparian areas and other potentially jurisdictional resources (intermittent and ephemeral drainages)
- Identify and minimize indirect hydrologic and water quality impacts to wetlands, riparian areas, and other potentially jurisdictional areas from releases at blowoff valves
- Control the spread of invasive species such as tamarisk as a result of the Project
- Quantify potential temporary or permanent loss of wetland area as a result of the Project
- Evaluate potential changes in the function of wetlands, including changes in plant communities, soils, or hydrology as a result of the Project
- Identify and quantify potential temporary or permanent loss of or impact to non-wetland riparian areas or jurisdictional waters
- Identify and document in a mitigation plan incorporated into the study report mitigation measures and concepts for mitigating adverse impacts caused by Project construction and operation on wetlands and riparian areas

### 20.3 Agency Resource Management Goals (§5.11(d)(2))

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied.

The National Park Service (NPS) Director's Order #77-1 for Wetland Protection (NPS 2003) establishes policies, requirements, and standards for implementing Executive Order (E.O.) 11990: "Protection of Wetlands" (42 Fed. Reg. 26961). Consistent with E.O. 11990, the goal of NPS Director's Order #77-1 is "no net loss of wetlands," with a longer-term goal of a Service-wide net gain of wetlands.

BLM field offices have prepared a number of Resource Management Plans (RMPs) that specify agency resource management goals. RMP goals relevant to wetlands and riparian resources in the study area are summarized below.

The Kanab Field Office RMP (BLM 2008a) contains the following Goals and Objective relevant to wetlands and riparian resources:

#### Water Resources Goals

- Improve watershed conditions on eroding sites and on other sensitive watershed areas, such as riparian areas.

#### Vegetation Goals

- Maintain and/or restore riparian areas to proper functioning condition, or to making significant progress toward proper functioning condition, where BLM-managed or BLM authorized activities have been identified as contributing to riparian impairment.
- Ensure water availability for multiple-use management and functioning, healthy riparian and upland systems.

The Arizona Strip Field Office RMP (BLM 2008b) identifies the desired future conditions relevant to wetlands and riparian resources:

#### Water Management

DFC-WS-05 Flowing water systems will provide continuous flowing water and associated riparian vegetative cover, where possible.

#### Riparian Ecological Zone

- DFC-RP-01 Riparian areas (see Map 2.2) will consist of a diversity of vertical and horizontal structures, vegetative age classes, and endemic species.
- DFC-RP-02 Riparian areas will be protected, enhanced, and/or restored by allowing tools that are necessary and appropriate to mitigate adverse impacts of allowable uses and undesirable disturbances, and contribute to meeting the Arizona Standards for Rangeland Health.
- DFC-RP-03 Ecological functions and processes will be intact with vegetative species composition and cover appropriate to the site.
- DFC-RP-04 Where sites have the potential for over-story vegetation, the canopy cover of over-story and under-story vegetation will be at or approaching maximum density.
- DFC-RP-05 All riparian areas will be in, or moving towards, proper functioning condition.
- DFC-RP-06 All surface water will meet, or be improving towards, Arizona State water quality standards.

- DFC-RP-07     Flowing water systems will provide contiguous water and associated riparian vegetative cover, where possible.
- DFC-RP-08     Availability of surface water at seeps and springs will be appropriate for the soil type, climate, and landform and will support a diverse population of endemic plant and wildlife species.
- DFC-RP-09     A sufficient quantity of water with safe access for wildlife will be available, where appropriate.
- DFC-RP-10     Riparian communities will provide habitat for common species such as rush, cottonwood, willow, and yellow-breasted chat, as well as rare species such as southwestern willow (SW) flycatcher, common black hawk, Lucy's warbler, and speckled dace where consistent with site potential.
- DFC-RP-11     Invasive plants and animals such as tamarisk, Russian olive, and brown-headed cowbird will be reduced or eliminated.

Riparian Dependent Special Status Birds

- DFC-TE-33     No net loss will occur in the quality and quantity of suitable habitat for riparian-dependent special status bird species within the Arizona Strip FO.
- DFC-TE-34     Occupied habitats will be protected as a first priority.
- DFC-TE-35     Riparian areas will be in proper functioning condition and be of sufficient quantity and quality to provide adequate foraging areas for SW flycatcher, Yuma clapper rail, yellow-billed cuckoo, and other special status birds.
- DFC-TE-36     SW flycatcher and Yuma clapper rail will be recovered and delisted.
- DFC-TE-37     Riparian areas that can physically support SW flycatcher habitats due to floodplain width and gradient will attain the vegetation structure, plant species diversity, density, and canopy cover to be suitable habitat.
- DFC-TE-38     Riparian vegetation will be sufficiently dense and structurally complex to minimize or eliminate the effects of SW flycatcher predators and preclude brown-headed cowbirds from finding SW flycatcher nests.
- DFC-TE-39     Cattail and dense marsh habitats will be abundant and provide habitat for Yuma clapper rails.
- DFC-TE-40     Cottonwood gallery forests will be abundant and provide habitat for yellow-billed cuckoos.
- DFC-TE-41     Potential roosting and nesting sites for riparian dependent special status birds will be abundant.

The Grand Staircase-Escalante National Monument Management Plan (BLM 2000) and the St. George Field Office RMP (1999) specify BLM's objective for the management of riparian resources "to maintain or restore them to properly functioning conditions and to ensure that stream channel morphology and functions are appropriate to the local soil type, climate, and landform." These management plans also identify specific provisions related to management of riparian areas.

## **20.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

### ***20.4.1 Background Description***

Significant wetland and riparian resources within the Project vicinity are generally known; however, site-specific information along the Project alternative alignments is currently undefined.

### ***20.4.2 Study Area Definition***

The study area will include the entire length of the alternative alignments and transmission corridors; particular attention will be required for the following:

- Any wetland, riparian, or other potentially jurisdictional areas (including intermittent and ephemeral drainages) directly affected by Project feature construction or operations
- Any stream or river and associated corridor that would be subject to water deliveries or alterations in flow
- Any new wetlands created or developed in Project hydroelectric forebay or afterbay facilities
- Any wetland, riparian or other potentially jurisdictional area (including intermittent and ephemeral drainages) affected by transmission line construction and maintenance

Few wetland areas exist within the Project area because of the arid climate generally associated with the Project. Mapping from the State of Utah and BLM indicates that there are two designated wetland areas that could intersect with the Project alternative alignments. One area is situated along the CVP alignment in Iron County, parallel to Interstate 15. The other wetland area occurs along Highway 89 in Kane County within the Glen Canyon National Recreation Area.

The Project alternative alignments would cross riparian resources along the Virgin River, Paria River, Buckskin Gulch, White Sage Wash, Jacob Canyon, Kanab Creek, Bitter Seeps Wash, Short Creek, Ash Creek, and along highway crossings of unnamed tributary drainages. The alternative alignments would also cross a number of unvegetated ephemeral and intermittent drainages. The Virgin River and Paria River crossings would be subsurface crossings, either bored and jacked or microtunneled.

### ***20.4.3 Issues and Data Needs***

The wetland and riparian analyses will include the following:

- Geographic Information System (GIS) layer with footprint of ground-disturbing impacts from the project alternatives
- Wetland mapping (i.e. National Wetland Inventory [NWI] maps)
- Soils mapping, including locations of hydric soils
- Hydrologic maps showing locations of intermittent, ephemeral, and permanent waterways and their receiving bodies, including U.S. Geological Survey (USGS) topographic maps
- Aerial photography and video
- Precipitation and flow data
- Vegetation mapping, including identification of riparian areas
- Mapped location of roadway culverts
- Stream scour data
- Stream cross-sections and profiles
- Other data to be developed for various resources by the Project Team

The data required to complete the wetland, riparian areas, and jurisdictional waters analysis can be acquired from the following identified and existing sources:

- GIS layer with footprint of ground-disturbing impacts from the project alternatives can be obtained from the engineering team



- NWI maps are available electronically for a very limited portion of the study area in Utah; hard copy maps may be obtainable for portions of the study area in Arizona; the remainder of the study area is unmapped
- Soil mapping is available electronically from the Natural Resources Conservation Service (NRCS) for the majority of the study area
- Electronic USGS quad maps (displaying topography and hydrology) are available for the entire study area. It is unknown whether more detailed hydrologic maps are available.
- High resolution aerial photography is available for portions of the project area. Lower resolution aerial photography is available for the remaining area from publicly available sources such as Google Earth. High resolution aerial photography that can be georegistered to the project footprint for GIS evaluation will be necessary for identifying and evaluating wetlands, riparian areas, and jurisdictional waters, particularly in areas not accessible for field surveys. Video coverage of portions of the study area filmed during recent helicopter surveys will assist in mapping of wetlands, riparian areas, and jurisdictional waters. Historical aerial photography may be available from USACE or other government agencies
- Precipitation and flow data are available through USGS, National Oceanic and Atmospheric Administration (NOAA) National Weather Service, and data stations operated by Mohave County. It is unlikely that comprehensive data would be available without installation of rain and water gages
- Limited vegetation data may be available through the state GAP programs. Vegetation mapping, specifically riparian area mapping, has been conducted for some portions of the study area by the U.S. Bureau of Land Management (BLM). The resolution, age, and availability of these data are unknown however; therefore, their potential utility is uncertain. The Kaibab Band of Paiute Indians of Northern Arizona has provided a list of Plants of Cultural Concern. This list will be referenced in evaluation of wetland and riparian vegetation
- The location of culverts may be available on major roadways by the state highway departments. If these data are available, they are not expected to be comprehensive
- Stream scour data may be available from the State. If data are not available, they may be obtained through the use of scour chain, crest gauges, and elevation control points
- Stream cross-sections and profiles will be obtained for aquatic species and habitat analyses

## 20.5 Nexus to Project (§5.11(d)(4))

The Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, air release and pipeline blow-off equipment, transmission lines and other features associated with conveying water from Lake Powell to the St. George area and continuing on to the Cedar Valley. The pipeline and facilities will require installation through native soils and rocks.

Wetlands occur near the alternative alignments; however, direct impacts on wetlands would be avoided or minimized during construction. Direct impacts on riparian areas may occur during the Project's construction phase. Pipeline and penstock construction activities involving open-cut excavation may result in permanent or temporary loss of riparian areas and/or changes in riparian functions, including changes in plant communities, soils, or hydrology.

Indirect impacts on wetlands and riparian areas may occur from increased infestation of disturbed soils with invasive species such as tamarisk. The resulting effects may include more evapotranspiration by new tamarisk plants and less water available for native wetland and/or riparian plant species, and reduction in plant species diversity.

Operation and maintenance activities including release of water from the pipeline and penstock through blowoff valves may affect wetlands and riparian areas during and following annual inspection and maintenance periods. Blowoff valve releases would be regulated to avoid erosion and sedimentation at the blowoff locations. Water released from blowoff valves may provide a temporary source of moisture for wetland and riparian vegetation.

## **20.6 Proposed Study Methodology (§5.11(d)(5))**

### ***20.6.1 Introduction and Overall Approach***

Wetland and riparian areas have been preliminarily identified and mapped. Data analysis, field surveys, and consultation with federal and state resource management agencies will be performed to more accurately identify resource locations and to determine extent of potential impacts on wetlands, riparian resources, and other jurisdictional waters along the Project alternative alignments. Functional assessments will be performed to determine the baseline hydrologic functions and habitat support provided by identified wetlands and riparian areas. Indirect effects from changes in soils, groundwater, surface water flows, and water quality will also be evaluated.

### ***20.6.2 Methods for Preliminary Analysis and Preliminary Design***

Methods pertaining to evaluation of wetland and riparian conditions that may affect preliminary engineering analysis and preliminary design are identified in this section.

#### **20.6.2.1 Task 1 - Review of Existing Wetland and Riparian Resource Literature**

Existing data that will be evaluated include mapped locations of wetlands, riparian areas, and other potential jurisdictional waters; groundwater mapping; topography; mapped locations of culverts; soils and vegetation maps; and aerial photography. Complete coverage of these datasets is not available for the entire study area. Areas of missing data will be identified, and information will be supplemented with field surveys where possible.

#### **20.6.2.2 Task 2 - Field Investigations**

Potential wetland, riparian area, and jurisdictional waters locations, as identified in review of existing data, will be located using a Global Positioning System (GPS) instrument. The location of additional areas identified during field surveys of the alternative alignments will be marked using the GPS instrument. All areas will be documented photographically. Field data collected will include description of vegetation community and structure, soil characteristics, and hydrology, including topography and identification of receiving water body where possible. Access for field surveys may not be possible for the entire study area. Where access is not permitted, potential wetland, riparian area, and jurisdictional water features will be identified based on review of existing data and comparison with other observed features in the study area. Results of data evaluation and field surveys will be transferred to a computer-generated GIS base map. Best efforts will be used to survey all possible affected riparian and wetland areas, and jurisdictional waters, even though such areas may be difficult to access. Tribal permission will be obtained prior to conducting field surveys and mapping on, and aerial photography over, the Kaibab Indian Reservation for the analysis of impacts to riparian and wetland areas, and jurisdictional waters.

### 20.6.2.3 Task 3 - Data Analyses

The USACE June 2001 “Final Summary Report: Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest” will be used as a guide for determining which streams and drainages may be jurisdictional waters (USACE 2001). Additionally, the 2007 Guidance on the Rapanos Decision (USEPA and USACE 2007) will be used in consultation with the USACE and USEPA to determine which waters and waterways are jurisdictional and those that are not jurisdictional. Data collected during initial data review and field survey results will be used in meeting with agency staff to reach concurrence on the location of jurisdictional waters. A final baseline GIS map will be produced that delineates jurisdictional wetlands and waterways and other non-jurisdictional wetlands and riparian areas within the Project area.

The baseline condition will be described using an evaluation of existing mapped data and the results of field surveys to identify and delineate existing wetlands, riparian areas and other jurisdictional waters, characterize wetland hydrology and hydrogeological settings, and determine wetland and riparian area functions within the impact area.

Functions are the ecological processes performed by wetlands. In contrast to wetland functions, values are subjective descriptions of the worth or quality of a wetland from a societal perspective, including aesthetics and recreational opportunities. There are various methods of evaluating wetland functions and values, including the Utah Department of Transportation (UDOT) Wetland Functional Assessment (Johnson et al. 2006), Wetland Evaluation Technique (WET) (Adamus et al. 1987), Oregon Freshwater Wetland Assessment Methodology (Roth et al. 1996), and professional judgment. The basic approach in these methodologies is to evaluate a wetland against a checklist of specific functions and values based on a visual assessment of its physical, biological, hydrological, and societal characteristics. Because the UDOT Wetland Functional Assessment was designed to be used in portions of the study area, this method will serve as a guideline for assessing wetland function. Biologic and hydrologic functions evaluated in this method include level of habitat disturbance, presence of listed species, plant community composition, flood attenuation, and sediment/nutrient/toxin attenuation and removal. The exact method to be used will be based on professional judgment, however, and will be determined after evaluating the type and extent of wetlands in the study area. In performing the functional assessment, the visual assessment of easily identifiable characteristics will be supplemented with habitat and hydrologic data documenting actual functional performance. Supporting data collected for other resources being analyzed in the EIS (i.e. wildlife; rare, threatened, endangered, and special status species; aquatic resources; surface and groundwater hydrology) will be used. The perceived value of wetlands in the study area will be described, using input from other resource evaluations, including recreation.

Impacts on wetland, riparian areas, and jurisdictional waters will be analyzed for each of the alternative alignments. These impacts will be measured by calculating the area of direct impact, identifying potential indirect impacts, and estimating potential changes in wetland function or value.

The acreage of direct fill impacts under the alternatives will be determined by overlaying the acres to be disturbed over a map showing the existing riparian areas and jurisdictional waters. Areas where tunneling is proposed will be identified, and the resulting change in impacts to riparian areas and jurisdictional waters will be considered. Direct impacts to wetland areas are expected to be avoided.

Impacts of groundwater level changes on wetland hydrology will be estimated qualitatively for wetlands and riparian areas using the results of the EIS groundwater evaluation. The results of the surface water hydrology analysis, including impacts from blowoff valve releases, will be used to qualitatively determine if wetlands, riparian areas, and jurisdictional waters might be reduced or enhanced because of changes in surface water levels in streams and canals. Results from analyses of soils and vegetation along with

review of proposed stormwater pollution prevention and other construction best management plans will be evaluated to determine potential results to wetlands, riparian areas, and jurisdictional waters from sedimentation or introduction of non-native or invasive plant species.

The baseline wetland functions and values assessment information will be used to characterize the existing wetland resources in the impact area of influence and to assess the effects and significance of potential changes from project-related activities. The functional assessment also will be used to evaluate potential mitigation opportunities, including wetland enhancement and restoration.

The wetland, riparian areas, and jurisdictional waters cumulative impacts analysis will address the combined impacts of the alternatives and any past or future proposed or planned actions that have or are likely to affect the wetland, riparian areas, and jurisdictional waters in the impact area.

Impacts on wetlands, riparian areas, and jurisdictional waters are considered significant if construction, operation or maintenance activities would result in any of the following conditions:

- A net loss of wetland area, riparian areas, or jurisdictional waters resulting from construction or operational activities
- Changes in the quality or quantity of hydrologic support (either through surface flow or groundwater levels) that would result in an overall loss or gain of in the area of wetlands, riparian areas, or jurisdictional waters
- Other indirect impacts on wetlands, riparian areas, or jurisdictional water resulting from Project construction or operational activities
- Loss of wetland functions or values from changes in water supply affecting wetland plant communities, wetland soils, or hydrology

The analysis of impacts on wetlands, riparian areas, and jurisdictional waters will be based on the standard operating procedures and measures to avoid or reduce impacts. The significance criteria for wetlands, riparian areas, and jurisdictional waters will then be applied to determine if any impact would be significant. Mitigation measures would then be developed to offset significant impacts (Task 5).

#### **20.6.2.4 Task 4 – Report Preparation**

A study report will be prepared to document the literature review, field investigations, and data analyses. It will present project goals and objectives and describe the study area, document the literature review, and note general and specific conditions that pertain to wetland and riparian resources in the Project area. Field investigation activities and methods will be described, and data analyses and results will be presented. It will be necessary to document in detail baseline conditions of and potential impacts on wetlands, riparian areas, and other jurisdictional waters. Results will be discussed with a focus on the study objectives. The study report will include mitigation measures to reduce significant wetland and riparian resource impacts resulting from the Project. The conclusions may include recommendations that could affect Project design. The study report will include information on permits required and will be the basis for preparing the 404(b)(1) analysis, which will be a product of this study.

#### **20.6.2.5 Task 5 – Mitigation Plan Preparation**

A mitigation plan will be prepared as part of the study and will be reviewed and approved by resource agencies prior to finalization. Mitigation measures identified in the plan will reduce project impacts on wetlands and riparian areas to less than significant levels whenever possible. Mitigation measures will outline the use of best management practices (BMPs) and may also include compensatory mitigation,

such as wetland enhancement or restoration. BMPs will include standard construction practices and standard operating procedures for grading and erosion control, riparian revegetation and monitoring, hazardous materials management, and stormwater pollutions prevention. Various specific measures will be outlined to address each of these areas, such as stock-piling and replacement of native materials, revegetation of disturbed areas with agency-approved native seed mix, use of silt fencing, and dust-suppression methods. The mitigation plan will be incorporated into the study report.

The mitigation measures will be based on applicable state and Federal statutes and regulations, past experience and best professional judgment to either satisfy a legal requirement or to satisfy the public interest requirement. In some cases significant impacts may not be able to be mitigated. All reasonably foreseeable mitigation options will be developed in consultation with and evaluated by the Federal Energy Regulatory Commission, Bureau of Land Management, tribes, and other responsible federal or other resource agencies and factored into the respective decision documents. If it is determined that an individual permit would be required under Section 404 of the Clean Water Act, a conceptual mitigation and restoration plan would be developed, including description of mitigation for all impacts to wetlands and riparian vegetation.

## 20.7 Schedule and Level of Effort (§5.11(d)(6))

The research into wetland and riparian impacts will require professionals with appropriate experience to conduct the field investigations and data analyses identified above. Each professional performing literature research, field investigation, and data analyses will provide their own field equipment, sheets and notes for documentation of activities, data and information. Total study costs are estimated to be approximately \$85,000.

An approximate schedule for performance of the study is shown in Table 20-1. The study can be completed within a one-year period.

<p style="text-align: center;"><b>Table 20-1</b> <b>Wetlands and Riparian Resources Proposed Study Schedule</b></p>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review of Wetland and Riparian Literature	Ongoing	February 2009	-
2	Field Investigations	March 2009	September 2009	210
3	Data Evaluation	June 2009	October 2009	150
4	Final Report Preparation	November 2009	February 2010	90

## 20.8 Progress Reporting (§5.11(b)(3))

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009, August 2009 and November 2009. The final report will be submitted in February 2010.

## 20.9 Dependencies on Other Resource Analyses

The wetlands and riparian resources analysis will be primarily dependent on the analyses results of the following resource studies:

- Surface Water Hydrology
- Surface Water Quality
- Groundwater Resources (groundwater hydrology and groundwater quality)
- Land Use Plans and Conflicts

## 20.10 References

- Adamus, P.R., E.J. Clairain, R.D. Smith, and R.E. Young. 1987. Wetland Evaluation Technique (WET), Volume II: Methodology. Department of the Army, Waterways Experiment Station, Vicksburg, MS. NTIS No. ADA 189968.
- Johnson, Craig, R. Pitts, L. Porreca, D. Frey. 2006. UDOT Wetland Functional Assessment Method, UDOT Report No. UT-06.12. April 2006.
- Roth, E, Olsen, R, Snow, P and Sumner, R 1996, Oregon Freshwater Wetland Assessment Methodology, Oregon Division of State Lands, Salem, OR.
- U.S. Bureau of Land Management (BLM). 2008a. Kanab Field Office Record of Decision and Approved Resource Management Plan. October 2008.
- U.S. Bureau of Land Management (BLM). 2008b. Arizona Strip Field Office Record of Decision and Approved Resource Management Plan. February 2008.
- U.S. Bureau of Land Management (BLM). 2000. Grand Staircase-Escalante National Monument Approved Management Plan Record of Decision. Effective February 2000.
- U.S. Bureau of Land Management (BLM). 1999. St. George Field Office Record of Decision and Approved Resource Management Plan. March 1999.
- U.S. EPA (USEPA) and U.S. Army Corps of Engineers (USACE). 2007. Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in *Rapanos v. United States* & *Carabell v. United States*.
- U.S. Army Corps of Engineers (USACE). 2001. Final Summary Report: Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest. June 2001.
- U.S. Army Corps of Engineers (USACE). 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A176 912. Available online at: <http://www.nan.usace.army.mil/business/buslinks/regulat/formdocs/wlman87.pdf>
- U.S. Department of the Interior, National Park Service (NPS). 2003. Director's Order 77-1: Wetland Protection.

## **Study Plan 21: Wildlife Resources**

### **21.1 Introduction**

This study plan documents methods for determining wildlife resources impacts from the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on the PAD and Scoping Documents 1 and 2, as well as those provided in the September and October study plan meetings in Salt Lake City and St. George, Utah. Wildlife species include game and non-game species managed by the Utah Division of Wildlife Resources, the Arizona Game and Fish Department, the Bureau of Land Management and the National Park Service. Wildlife species and their habitats with special status designation by federal, state, or tribal agencies are analyzed in Study Plan 13: Special Status Wildlife and Habitat Study Plan. This study plan presents the an approach for advancing knowledge and understanding of wildlife resources as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. This study plan also addresses study requests made by FERC; other federal, state and tribal agencies; and the public in their comments made during the study plan development process.

### **21.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

The goal of this study is to develop additional information to supplement the existing information necessary to address the potential effects of Project construction, operation and maintenance activities on the presence of wildlife species and their habitat. The specific information to be obtained is the type, abundance, and general distribution of wildlife and wildlife habitat within the Project area, required to assess the potential effect of the Project on wildlife species. The information will be used to determine how potential impacts can be avoided, minimized, or mitigated. All habitat assessments and study plans would include sufficient detail to support the completion of a study report, including potential mitigation measures necessary to prevent adverse impacts. A mitigation plan will be prepared as part of the study and incorporated into the study report to address mitigation measures and concepts, standard construction procedures, standard operating procedures, and best management practices that will be used during project construction and operation to mitigate adverse impacts on wildlife resources.

### **21.3 Agency Resource Management Goals (§5.11(d)(2))**

Resource management goals are included in state and agency resource management plans and are generally specific to the jurisdictional area of organization subdivisions. Relevant management plans include the Glen Canyon National Recreational Area Strategic Plan (National Park Service), Grand Staircase-Escalante National Monument Management Plan (Bureau of Land Management), the Kanab Field Office Management Plan (Bureau of Land Management), the Arizona Strip Management Plan (Bureau of Land Management), the St. George Field Office Resource Management Plan (Bureau of Land Management), the Utah State Wildlife Action Plan and the Arizona Comprehensive Wildlife Management Plan (Arizona Fish and Game Department). These management plans provide resource information that will be incorporated into the analysis of wildlife species and mitigation plans to reduce Project impacts.

## **21.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

### ***21.4.1 Background Description***

Significant wildlife resources within the Project vicinity are generally known; however, site-specific information along the Project alternative alignments is currently undefined.

### ***21.4.2 Study Area Definition***

The study area would include the entire length of the alternative pipeline alignments and transmission line corridors, including access roads and staging areas; particular attention will be required for the following:

- Culturally sensitive areas
- Tourist use areas
- Environmentally sensitive areas
- Sensitive wildlife habitats
- Wildlife migration corridors and winter range
- Locations of perceived aesthetic value
- Reservoirs, waterways and surrounding area
- National Recreation Areas and Monuments

Modifications to proposed alignments or new proposed alignments will be incorporated into the studies as alignment changes are identified..

### ***21.4.3 Issues and Data Needs***

FERC must decide whether to issue a license to the Utah Board of Water Resources for the Project. Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a Project is located, and what conditions should be placed on any license that may be issued. In making its license decision, the Commission must equally consider the environmental, recreational, fish and wildlife, and other non-developmental values of the Project, as well as power and developmental values. Any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.

Wildlife species are of particular interest because of their ecological, recreational, social and economic functions. Ensuring that environmental measures pertaining to these resources are considered in a reasoned way is relevant to the Commission's public interest determination.

The following data sources have been identified.

- Utah wildlife species accounts and general distribution information for most of the commonly found wildlife species in Utah from the Utah Division of Wildlife Resources, Utah Conservation Data Center (UCDC) Species Profiles and Utah GAP Analysis Maps. Available on the Worldwide Web at: <http://dwrcdc.nr.utah.gov/rsgis2/Search/SearchVerts.asp>.
- Utah critical and high-value wildlife range data available from the Utah Division of Wildlife Resources in Geographic Information Systems (GIS) format for a number of species including elk, mule deer, sage grouse, pronghorn, black bear, desert bighorn sheep and moose available on the Worldwide Web at: <http://www.utahcdc.usu.edu/ucdc/DownloadGIS/disclaim.hTR>



- Utah big game management plans, available on the Worldwide Web at: <http://wildlife.utah.gov/hunting/>
- Grand Staircase – Escalante National Monument Management Plan and Final EIS, available on the Worldwide Web at: [http://www.blm.gov/ut/st/en/fo/grand\\_staircase-escalante/planning/monument\\_management.html](http://www.blm.gov/ut/st/en/fo/grand_staircase-escalante/planning/monument_management.html)
- Grand Staircase – Escalante National Monument GIS files, available on the Worldwide Web at: <http://www.ut.blm.gov/monument/gis-data-library.php>
- Arizona wildlife species accounts and general distribution for most of the commonly found wildlife species in Arizona from the Arizona Natural Heritage Program available on the Worldwide Web at: [http://www.gf.state.az.us/w\\_c/edits/species\\_concern.shtml](http://www.gf.state.az.us/w_c/edits/species_concern.shtml)
- Arizona wildlife species GIS distribution maps from the Southern Arizona Data Services Program available on the Worldwide Web at: <http://sdrsnet.snr.arizona.edu/index.php?page=datamenu&lib=0&sublib=all>
- Arizona Game and Fish Department: Comprehensive Wildlife Conservation Plan: 2005 -2015, available on the Worldwide Web at: [http://www.azgfd.gov/w\\_c/cwcs\\_downloads.shtml](http://www.azgfd.gov/w_c/cwcs_downloads.shtml).
- Burt, W.H. and R.P. Grossenheider. 1989. *A Field Guide to the Mammals: North America North of Mexico* (Peterson Field Guides). Houghton Mifflin Co. New York, N.Y.
- *National Geographic Field Guide to the Birds of North America*, Third Edition. National Geographic Society. Washington, D.C. 1999
- Project pipeline and transmission line corridors in ArcView GIS format
- National Wetlands Inventory (NWI) data in ArcView GIS format for the Project area
- Arizona Strip Management Plan Final EIS, available on the Worldwide Web at: [http://www.blm.gov/az/st/en/info/nepa/environmental\\_library/eis/strip\\_FEIS\\_07.html](http://www.blm.gov/az/st/en/info/nepa/environmental_library/eis/strip_FEIS_07.html).
- Arizona Strip Management Plan, available on the Worldwide Web at: [http://www.blm.gov/az/st/en/info/nepa/environmental\\_library/arizona\\_resource\\_management/strip\\_ROD.html](http://www.blm.gov/az/st/en/info/nepa/environmental_library/arizona_resource_management/strip_ROD.html)
- Kanab Field Office Proposed Resource Management Plan and Final EIS, available on the Worldwide Web at: [http://www.blm.gov/ut/st/en/fo/kanab/planning/proposedrmp\\_feis.html](http://www.blm.gov/ut/st/en/fo/kanab/planning/proposedrmp_feis.html)
- St. George Field Office Resource Management Plan, available on the Worldwide Web at: [http://www.blm.gov/pgdata/etc/medialib/blm/ut/st\\_\\_george\\_fo/planning.Par.99584.File.dat/RMP\\_ROD.PDF](http://www.blm.gov/pgdata/etc/medialib/blm/ut/st__george_fo/planning.Par.99584.File.dat/RMP_ROD.PDF)
- Glen Canyon National Recreation Area Strategic Plan, available on the Worldwide Web at: <http://www.nps.gov/glca/parkmgmt/upload/GLCA.RABR.SP.FY05.FY08.pdf>
- Topographic maps and aerial orthophotography of the Project south and alternative alignments

- Aerial videography of the Project south alignment

The following data needs have been identified.

- Migration corridor data for terrestrial big game species (mule deer, pronghorn)
- Nesting survey maps for raptors
- Critical habitat maps (including live water and riparian habitats) for migratory birds, including waterfowl
- Pronghorn fawning area map(s)
- Desert bighorn sheep lambing and rutting area maps (Kanab Creek WHA and Hurricane Cliffs)

## **21.5 Nexus to Project (§5.11(d)(4))**

The Project consists of 186 miles of steel pipeline, pumping stations, tunnels and shafts, forebay and afterbay reservoirs, hydropower generation facilities, air release and pipeline blow-off equipment, and other features to convey water from Lake Powell to the St. George area and continuing on to the Cedar Valley. The pipeline and facilities will require installation through native soils and rocks; salt and selenium leaching from substrates in forebay and afterbay reservoirs may have impacts on waterfowl, this will be analyzed to the extent that existing data are available. Project construction and maintenance have the potential to cause impacts on wildlife species due to temporary construction disturbance from noise and human presence in the construction zone, potential mortality of small mammals, reptiles and amphibians, and bird nests, nestlings and eggs, potential disturbance of migration routes and timing, loss of habitat from project features, changes in vegetation type and changes in human use of habitat areas (increased access due to new or improved roads, etc.). Project construction and maintenance may have cumulative impacts with past or future actions occurring within the Project area of influence.

## **21.6 Proposed Study Methodology (§5.11(d)(5))**

### ***21.6.1 Introduction and Overall Approach***

Wildlife impacts will be analyzed by estimating the impact of habitat disturbance developed by the vegetation resource discipline, estimating the area of critical wildlife habitat disturbed by Project construction and operation along the alternative alignments, estimating the impact of Project construction and operation on wildlife breeding habitat and migration corridors, and by estimating direct mortality of wildlife from Project construction and operation along the alternative alignments and indirect mortality from habitat loss and changes in human population and activity.

### ***21.6.2 Study Methods***

The following study methods will be used to determine potential impacts on wildlife resources resulting from Project construction, operation and maintenance.

### **21.6.2.1 Task 1 - Review of Existing Wildlife Resources Literature**

A detailed review of existing wildlife resources data and information relevant to the Project that are available in current published reports, studies, and literature will be performed. The literature review will include information from established agency sources such as the State of Utah, State of Arizona, Bureau of Land Management, National Park Service, and other undetermined sources. Previous preliminary investigation work performed by engineering and scientific consultants and organizations will be obtained and reviewed for relevant wildlife resources data and information.

### **21.6.2.2 Task 2 - Field Investigations**

Wildlife resources baseline conditions will be defined by existing wildlife species populations and habitat in the impact area and surrounding area. Species and habitats will be described at a landscape scale, and quantitative field surveys within the impact area are not anticipated. Targeted habitat field assessments may be performed to verify habitat characteristics and suitability from office evaluations or as determined by federal or state agencies.

Field studies or habitat assessments, including aerial surveys and videography, on the Kaibab Indian Reservation will require permission from the Kaibab Band of Paiute Indians .

### **21.6.2.3 Task 3 - Data Analyses**

Critical wildlife habitat maps will be developed using a geographic information systems (GIS) for the impact area for each alternative alignment. Acres of disturbance of general habitat by vegetative community type will be obtained from the vegetation resource analysis. Undisturbed habitat will be differentiated from disturbed habitat along transportation or utility corridors. Disturbance will include direct alteration or loss of habitat from construction or operation of Project features and noise impacts from construction or operation of Project features that would reduce wildlife habitat values or wildlife habitat use. The time frame of impacts – short and long-term – will be considered as part of the analysis.

Wildlife species recorded within the impact area will be analyzed by habitats utilized and the impacts on those habitats by construction or operation of Project features. Loss or fragmentation of habitat will be evaluated in terms of minimum home range requirements of species, where known. Some species may require a critical amount of contiguous habitat. Where such species have been found in the study area in recent surveys, the available habitat and potential changes will be evaluated in terms of their critical habitat needs. Indirect impacts on wildlife species from changes in human population or activities associated with the Project in the impact area will be analyzed for impacts on habitat utilization and wildlife mortality. Direct and indirect impacts will be quantified to the degree possible and compared to the significance criteria to determine significant impacts.

Utah Division of Wildlife Resources (UDWR) and the Arizona Fish and Game Department (AZFGD) have commented on the Project Pre-Application Document (PAD) regarding the Paunsaugunt mule deer herd that migrates across the south alignment alternative between the Cockscomb and Kanab, Utah. This herd has been characterized as a premium species population and an important sportsman resource. The herd is subject to high traffic-related mortality on U.S. Highway 89, which crosses the migration route between summer and winter ranges in Utah and Arizona. Motorist warning signs have been installed on Highway 89 in high deer crossing locations, resulting in significant reductions in deer mortality. UDWR and AZFGD continue to explore potential wildlife crossing strategies to further mitigate mule deer mortality in the migration corridor.

Project biologists will work with UDWR and AZFGD to identify potential wildlife crossings of the highway based on historic deer movement and mortality data, topographic characteristics (ridgelines, drainages) and habitat (vegetation type, density). This information will be used to develop pipeline design criteria with the least potential impact on highway wildlife crossings.

Critical pronghorn fawning ranges and movement corridors and desert bighorn sheep lambing and rutting ranges will be identified for consideration of seasonal restrictions of construction and maintenance activity to prevent disturbance during critical species activity.

Critical habitats for migratory birds and waterfowl (including riparian and live water habitats) will be identified for planning of construction and maintenance schedules to minimize disturbance in these areas during migration. Known raptor nesting sites will also be identified for scheduling of construction and maintenance outside of the nesting and brood rearing period.

The wildlife resources cumulative impacts analysis will address the combined impacts of the alternatives and any past or future proposed or planned actions that have or are likely to affect the wildlife resources in the impact area. Inter-related projects will be identified for analysis of cumulative impacts.

#### **21.6.2.4 Task 4 – Report Preparation**

A study report will be prepared to document the literature review, field investigations, and data analyses. It will present project goals and objectives and describe the study area, document the literature review, and note general and specific conditions that pertain to wildlife resources in the study area. Field investigation activities and methods will be described, and data analyses and results will be presented. Results will be discussed with a focus on the study objectives. The study report will include mitigation measures to address significant impacts resulting from the Project. The study report will incorporate a mitigation plan to document mitigation measures identified to avoid, minimize or reduce impacts on wildlife resources. The conclusions may include recommendations that could affect Project design. Variances from the study plan will be summarized and documented in the study report.

### **21.7 Schedule and Level of Effort (§5.11(d)(6))**

The research into wildlife resource impacts resulting from the Project will require professionals with appropriate experience to conduct the field investigations and data analyses identified above. Each professional performing literature research, field investigation, and data analyses will provide their own field equipment, sheets and notes for documentation of activities, data and information. Total study costs are estimated to be approximately \$50,000.

An approximate schedule for performance of the study is shown in Table 21-1. The study can be completed within a one-year period.

**Table 21-1**  
**Wildlife Resources Proposed Study Schedule**

<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Review of Wildlife Resources Literature	Ongoing	February 2009	-
2	Field Investigations	March 2009	June 2009	10
3	Data Evaluation	July 2009	September 2009	30
4	Final Report Preparation	October 2009	November 2009	45

## **21.8 Progress Reporting (§5.11(b)(3))**

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009 and August 2009. The final report will be submitted in November 2009.

## **21.9 Dependencies on Other Resource Analyses**

Wildlife Resources studies are dependent on the results of the Vegetation Community Mapping, Wetlands and Riparian Resources and Noise analyses.

Vegetation Community Mapping will establish general wildlife habitat types that will be used to analyze the ranges of wildlife species in the Project area and to calculate the area of impact on each habitat type from Project construction and maintenance.

Wetlands and Riparian Resources data will be used to locate potential critical habitat for migratory birds and waterfowl and other riparian-associated wildlife.

Noise data will be used to analyze potential for reduced utilization of habitat adjacent to the pipeline corridor by wildlife during Project construction and maintenance.

## **21.10 References**

Arizona Game and Fish Department: Comprehensive Wildlife Conservation Plan: 2005 -2015, available on the Worldwide Web at: [http://www.azgfd.gov/w\\_c/cwcs\\_downloads.shtml](http://www.azgfd.gov/w_c/cwcs_downloads.shtml).

Arizona Strip Management Plan Final EIS, available on the Worldwide Web at: [http://www.blm.gov/az/st/en/info/nepa/environmental\\_library/eis/strip\\_FEIS\\_07.html](http://www.blm.gov/az/st/en/info/nepa/environmental_library/eis/strip_FEIS_07.html).

Arizona Strip Management Plan, available on the Worldwide Web at: [http://www.blm.gov/az/st/en/info/nepa/environmental\\_library/arizona\\_resource\\_management/strip\\_ROD.html](http://www.blm.gov/az/st/en/info/nepa/environmental_library/arizona_resource_management/strip_ROD.html)

Arizona wildlife species accounts and general distribution for most of the commonly found wildlife species in Arizona from the Arizona Natural Heritage Program available on the Worldwide Web at: [http://www.gf.state.az.us/w\\_c/edits/species\\_concern.shtml](http://www.gf.state.az.us/w_c/edits/species_concern.shtml)

Arizona wildlife species GIS distribution maps from the Southern Arizona Data Services Program available on the Worldwide Web at:  
<http://sdrsnet.snr.arizona.edu/index.php?page=datamenu&lib=0&sublib=all>

Burt, W.H. and R.P. Grossenheider. 1989. *A Field Guide to the Mammals: North America North of Mexico* (Peterson Field Guides). Houghton Mifflin Co. New York, N.Y.

Glen Canyon National Recreation Area Strategic Plan, available on the Worldwide Web at:  
<http://www.nps.gov/glca/parkmgmt/upload/GLCA.RABR.SP.FY05.FY08.pdf>

Grand Staircase – Escalante National Monument GIS files, available on the Worldwide Web at:  
<http://www.ut.blm.gov/monument/gis-data-library.php>

Grand Staircase – Escalante National Monument Management Plan and Final EIS, available on the Worldwide Web at: [http://www.blm.gov/ut/st/en/fo/grand\\_staircase-escalante/planning/monument\\_management.html](http://www.blm.gov/ut/st/en/fo/grand_staircase-escalante/planning/monument_management.html)

Kanab Field Office Proposed Resource Management Plan and Final EIS, available on the Worldwide Web at: [http://www.blm.gov/ut/st/en/fo/kanab/planning/proposed\\_rmp\\_feis.html](http://www.blm.gov/ut/st/en/fo/kanab/planning/proposed_rmp_feis.html)

*National Geographic Field Guide to the Birds of North America*, Third Edition. National Geographic Society. Washington, D.C. 1999.

Utah big game management plans, available on the Worldwide Web at: <http://wildlife.utah.gov/hunting/>

Utah critical and high-value wildlife range data available from the Utah Division of Wildlife Resources in Geographic Information Systems (GIS) format for a number of species including elk, mule deer, sage grouse, pronghorn, black bear, desert bighorn sheep and moose available on the Worldwide Web at: <http://www.utahcdc.usu.edu/ucdc/DownloadGIS/disclaim.hTR>

Utah Conservation Data Center (UCDC) Species Profiles and Utah GAP Analysis Maps. Available on the Worldwide Web at: <http://dwrcdc.nr.utah.gov/rsgis2/Search/SearchVerts.asp>.

Wildlife Crossings 2008, available on the Worldwide Web at:  
<http://www.wildlifecrossings.info/crossings/pubdetail.cfm?projname=deer&locstate=ut&Submit=Search&pID=807>. 9/20/2008.

## **Study Plan 22: Alternatives Development**

### **22.1 Introduction**

This study plan documents the methods for developing alternatives for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 and September 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2. This study plan presents an approach for advancing knowledge and understanding of water supply alternatives, including the pros and cons of each potential alternative. It addresses study requests made by FERC, other federal, state and tribal agencies, and the public.

This study plan describes goals and objectives, provides a description of the study area, describes the Project nexus, presents the proposed methodology, presents staffing and equipment requirements, provides a budget for activities associated with the alternatives development portion of the study, and provides a generalized project schedule.

### **22.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

#### ***22.2.1 Study Description***

The study will describe possible combinations of water supply components that could be used to develop alternatives to meet water demands for the Project participants. The study also will describe alternatives that will be carried into the NEPA process as Action and No Action Alternatives. One action alternative developed under this study plan will involve a combination of potential future sources, increased water conservation, reuse and recycling, and reverse osmosis treatment of Virgin River water, without supplying water via the LPP. The study will document pros and cons of each of the alternatives, including details of technical feasibility, land use requirements, environmental and physical characteristics, and cost estimates, in coordination with the other resource studies.

#### ***22.2.2 Goals and Objectives***

The objectives of the alternatives analysis study plan are to document the process used to develop each of the alternatives considered, and to summarize the characteristics of each of the alternatives. The study will document the screening process used to select final alternatives that will be considered in the environmental documents for the FERC license application, to provide transparency in the alternatives selection process. The primary objectives of the study are:

- Provide a description of the process used to develop water supply alternatives, based on a combination of water supply components
- Consider alternatives developed during the Phase I Water Needs Assessment (described in Study Plan 19, Water Supply and Climate Change), and any other alternatives identified during the Project
- Develop a No Action Alternative and one Action Alternative in addition to the Proposed Action

- Summarize the characteristics of each water supply alternative considered, including the capacity of meeting projected water demands, technical feasibility, water supply reliability, cost, and environmental and land use considerations
- List the pros and cons of each of the water supply alternatives based on characteristics of each alternative
- Describe the screening process used to select water supply alternatives that will be carried forward for detailed analyses in the environmental document prepared for the FERC license application
- Provide descriptions for all alternatives considered, including those that are eliminated from further analysis in the environmental document prepared for the FERC license application
- Document deficiencies of the alternatives considered inappropriate for inclusion in the environmental document prepared for the FERC license application

### **22.3 Agency Resource Management Goals (§5.11(d)(2))**

This study plan will address resource management goals of the State of Utah, State of Arizona, Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Reclamation, and other agencies such as counties or cities or Indian tribes with jurisdiction over the resources to be studied. Additionally, FERC must decide whether to issue a license to the Utah Board of Water Resources for the Lake Powell Hydroelectric System Project. Sections 4(e) and 10(a) of the Federal Power Act require FERC to give equal consideration to all uses of the waterway on which a project is located, and what conditions should be placed on any license that may be issued. In making its license decision, FERC must equally consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values. Any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. The available water supply may affect the economics of a proposal which is relevant to the FERC's public interest determination.

### **22.4 Existing Information and Additional Information Needs (§5.11(d)(3))**

#### ***22.4.1 Background Description***

Existing information that will be used in the development of water supply alternatives includes previous studies on the Project participant's existing and potential future water supply systems and capital facilities plans. Sources of existing information that will be used include the following:

- Washington County Water Conservancy District's Regional Water Capital Facilities Plan and Impact Fee Analysis (Lewis, Young, Robertson, and Burningham 2006)
- Central Iron County Water Conservancy District Capital Facilities Plan and Impact Fee Analysis (Stanley Consultants 2007)
- Lake Powell Pipeline Study Water Needs Assessment, Phase I Report, Final Draft (MWH 2008)
- Water supply information for Project participants' existing water supplies (Boyle 1998; CICWCD 2007; Lewis, Young, Robertson, and Burningham 2006)

In particular, the Draft Phase I Report for the Lake Powell Pipeline Study Water Needs Assessment that was recently completed for the Project participants will be used as the primary basis for developing Project alternatives. Preliminary planning and engineering analysis of existing and future water needs for the LPP participants were performed using procedures consistent with those used in previous water needs assessments for the study area, and with methods and data compatible with Utah Division of Water



Resources studies. The following information from the Phase I Water Needs Assessment will be used to summarize the characteristics of potential water supplies that will be included in alternatives to be considered:

- Reliability of water supply from potential future projects
- Technical feasibility of potential future supply projects
- Environmental and land use considerations for potential future supply projects

### ***22.4.2 Study Area Definition***

The study area will include the service areas for the three Project participants, which includes the following:

- Washington County Water Conservancy District service area
- Central Iron County Water Conservancy District service area
- Kane County Water Conservancy District service area

### ***22.4.3 Issues and Data Needs***

Specific analyses to be completed as part of the alternatives development will address the following questions and issues:

- What combinations of existing and future possible water supplies could be conceived to meet the projected water demands described in Phase I of the Water Needs Assessment as described by MWH (2008) and updated in Phase II of the Water Needs Assessment (Study Plan 19, Water Supply and Climate Change)?
- What non-LPP Action and No Action alternatives can be developed based on the combinations of existing and future water supplies?
- What technical feasibility issues exist for potential project alternatives?
- What water supply reliability issues exist for potential project alternatives?
- What would the total cost (capital and operation and maintenance) be for the potential project alternatives?
- What environmental issues would exist for the potential project alternatives?
- What land use considerations should be considered for the potential project alternatives?

## **22.5 Nexus to Project (§5.11(d)(4))**

The process of selecting alternatives to be considered, and the screening process used to determine which alternatives should be carried forward for additional analyses are integral to completing a water supply project capable of meeting projected water demands for the Project participants. The tasks described in this study plan outline a structured process in selecting alternatives for consideration and documenting the processes used for screening potential alternatives. The alternatives development process is an integral part of the Project because of the importance of selecting a range of feasible Project alternatives for detailed consideration in the NEPA process.

## **22.6 Proposed Study Methodology (§5.11(d)(5))**

### ***22.6.1 Introduction and Overall Approach***

The alternatives development tasks include development of conceptual alternatives and a screening process to evaluate the conceptual alternatives. Conceptual alternatives will be screened using a consistent process, resulting in a set of Project alternatives to be evaluated further in the forthcoming environmental document prepared as part of the FERC license application. Each of the individual tasks is described below.

### ***22.6.2 Task 1 – Conceptual Project Development***

Conceptual Project alternatives will be developed that would meet projected water demands for the Project participants. The alternatives will be comprised of existing and potential future water supply components described in Phase I of the Water Needs Assessment (described in Study Plan 19, Water Supply and Climate Change). Conceptual project development will include the following specific tasks:

- Review existing and potential future water supply projects described in Phase I of the Water Needs Assessment, including the expected reliable supply from each project
- Summarize technical feasibility issues, cost, and environmental and land use considerations for each of the potential water supply projects
- Identify conceptual Project alternatives, which would meet projected water demands, from combinations of existing and potential future water supply projects
- Identify the No Action Alternative consisting of existing and planned future water supply projects, water management actions, and other measures (e.g., ongoing water conservation and reuse) that each District would take in the absence of the LPP
- Identify one Action Alternative that would serve the same population as the Proposed Action but without the LPP; this would utilize a combination of technically and legally feasible water supply and management options
- Incorporate alternatives recommended by FERC to the extent they are technically and legally feasible
- Summarize total cost, technical feasibility issues, and environmental and land use considerations for each conceptual Project alternative

### ***22.6.3 Task 2 – Alternatives Screening***

Each of the Project alternatives identified in Task 1 will be defined and evaluated using a consistent screening process to evaluate the pros and cons of the alternatives. A screening process will be developed, which will consist of evaluating the characteristics of the Project alternatives. The screening process and results will be documented for this task, including a description of Project alternatives selected for additional analyses. The alternatives screening task will include the following specific tasks:

- Develop and document a consistent screening process that will be used to evaluate the pros and cons of each conceptual Project alternative. The screening process will include evaluation of the following criteria at a minimum: capacity to meet projected water demands, technical feasibility issues, estimated cost, and environmental and land use considerations. This could incorporate a numerical scoring and weighting process, or it could be a more qualitative approach. If used, weighting for each of the screening criteria will be developed using input from Project

participants. The end result of the screening process may include a weighted score for each conceptual Project alternative.

- Complete the alternatives screening process for each of the conceptual Project alternatives developed for Task 1 of this study plan. Information from Phase I and II of the Water Needs Assessment will be input to the screening process, including cost estimates, technical feasibility issues, and environmental and land use considerations.
- Document results of the screening process, including a summary of weighted scores for each of the conceptual Project alternatives if a numerical scoring system is adopted.
- Provide a ranked list of conceptual Project alternatives, and a recommendation of a No Action Alternative and at least one other Action Alternative to be considered for future detailed analyses in the environmental document prepared for submittal to FERC as part of the license application.

#### **22.6.4 Task 3 – Report Preparation**

The alternatives development process will be documented in a technical report, including a description of conceptual Project alternatives, the screening process used to evaluate each of the alternatives, the screening results, and a recommendation of alternatives to be carried forward for future detailed analyses.

#### **22.7 Schedule and Level of Effort (§5.11(d)(6))**

The alternatives development process will require input from the results of other study plans (e.g., results of the Water Needs Assessment described in Study Plan 19, Water Supply and Climate Change). As a result, the schedule will be partially dependent on completion of these other study plans. Total study costs are estimated to be approximately \$150,000.

An approximate schedule to perform the study is shown in Table 22-1. The study can begin immediately using information from the Phase I Water Needs Assessment. Alternative evaluation can occur when input information for the screening process is available from results of other dependent study plans. Once input data are available for the screening process, the alternatives development study plan tasks can be completed.

<p align="center"><b>Table 22-1</b> <b>Alternatives Development Proposed Study Schedule</b></p>				
<b>Task Number</b>	<b>Description</b>	<b>Start Date</b>	<b>Completion Date</b>	<b>Duration (Days)</b>
1	Conceptual Project Alternative Development	February 2009	April 2009	70
2	Alternatives Screening	May 2009	June 2009	60
3	Report Preparation	June 2009	July 2009	45

#### **22.8 Progress Reporting (§5.11(b) (3))**

Three progress reports will be completed for the alternatives development study plan tasks. The first progress report will be completed in April 2009, and will report on the conceptual alternative development process. It will present the list of alternatives being considered and a description of how they

would meet future regional water needs. The second progress report will be completed in June 2009, and will provide an update on alternatives recommended for screening. A final progress report will be submitted in August 2009 at the completion of the alternatives development tasks.

## **22.9 References**

Boyle. 1998. Water supply needs for Washington and Kane Counties & Lake Powell Pipeline Study. Prepared for Washington County Water Conservancy District and Utah State Division of Water Resources. December 1998.

Central Iron County Water Conservancy District (CICWCD). 2007. Working draft capital facilities plan and impact fee analysis. Prepared by Stanley Group. March 30, 2007.

Lewis, Young, Robertson, and Burningham. 2006. Regional water capital facilities plan and impact fee analysis. Prepared for Washington County Water Conservancy District. October.

MWH Ameriacs, Inc. (MWH). 2008. Lake Lowell Pipeline Study Water Needs Assessment, Phase I Report, Final Draft. Prepared for Utah Department of Natural Resources. August.

Stanley Consultants. 2007. Central Iron County Water Conservancy District Capital Facilities Plan and Impact Fee Analysis. Preliminary Working Draft. March 30.

## **Study Plan 23: Ethnographic Resources**

### **23.1 Introduction**

This study plan documents the methods for planning and analysis of ethnographic resources for the Lake Powell Pipeline (LPP) and Cedar Valley Pipeline (CVP), herein collectively referred to as the Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Federal Energy Regulatory Commission (FERC) on March 4, 2008. It addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as draft study plan review comments received during study plan meetings and filed with FERC. This study plan presents an approach for advancing knowledge and understanding of the ethnographic resources as they pertain to the Project's south alignment alternative, existing highway alignment alternative, and the no action alternative. The information developed during execution of this study plan will be incorporated into a Historic Properties Management Plan (HPMP) per instructions developed by the FERC and approved by the Advisory Council on Historic Preservation (ACHP) on May 20, 2002. This study plan addresses study requests and comments made by FERC, other federal, state and tribal agencies, and the public.

### **23.2 Study Description and Objectives and Information to be Obtained (§5.11(d)(1))**

The study plan describes goals and objectives, provides a description of the study area, describes the Project nexus, presents the proposed methodology, presents staffing and equipment requirements, provides a budget for activities associated with the ethnographic study, and provides a generalized project schedule. The study will identify potential impacts of the Project on ethnographic resources during Project construction and operation, and identify measures to mitigate impacts on cultural resources and Traditional Cultural Properties that could be affected by Project construction, operation and maintenance activities.

The Project construction, operation and maintenance activities would involve pipelines, pump stations, hydroelectric generating stations, transmission lines and substations, material borrow and disposal areas, staging areas, and access roads. Project alternative alignments would cross perennial and ephemeral streams, rivers, washes and other drainage ways.

Ethnographic resources include, but are not restricted to, Traditional Cultural Properties (TCPs) or other sites associated with the cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community.

Identified issues associated with ethnographic resources for which the existing, relevant, and reasonably available information is insufficient to address the issues. These issues are:

- Potential effects on culturally important plants for Native Americans
- Potential Project effects on areas of traditional or spiritual significance to Tribes

The goal of this study is to develop essential additional information to supplement the existing information necessary to address ethnographic resources. Objectives in support of this goal include (1) identification and documentation of TCPs and other ethnographic resources associated with the Project,

(2) identification of Project-related effects on these TCPs and other ethnographic resources, and (3) evaluation of affected TCPs for National Register of Historic Places (NRHP) eligibility.

The ethnographic resources study will document TCPs and other ethnographic resources within the Project's Area of Potential Effect (APE), seek to identify potential TCPs and other resources within the Project APE through research, evaluate the NRHP eligibility of these historic properties within the APE, and assess the potential effect of any Project-related impacts.

The purpose of this study plan is to establish comprehensive baseline information about ethnographic resources within the Project boundary that will be taken into consideration in the HPMP.

Specifically, the goals are to:

- Identify existing data and data needs
- Identify issues and concerns
- Define the area of potential impact and significance criteria to be used in the study
- Describe the analysis methodology
- Identify dependency items and relationships among other resources

Specific ethnographic resource-related objectives include determining how the Project may affect the resources along the alternative alignments. The primary objectives of the study plan with regard to cultural resources are:

- Determine the impacts on ethnographic resources from Project construction and operation
- Identify the Traditional Cultural Properties that exist within the APE and how would they be affected
- Identify cultural landscapes and archaeological districts within and near the APE and how would they be affected
- Address specific concerns about cultural resources noted by the Kaibab Band of Paiute Indians with respect to aboriginal land on the Kaibab Band of Paiute Indian Reservation
- Determine the steps that would be taken to protect ethnographic resources from possible construction accidents, operational failures or maintenance damage
- Identify the impacts that could occur from Project construction, operation and maintenance on Indian Trust Assets within the APE

The study will be prepared in compliance with the following federal legislation: the Antiquities Act of 1906 (P.L. 59\_209; 34 Stat. 225; 16 U.S.C. 431\_433); the Historic Sites Act of 1935 (P.L. 74\_292; 49 Stat. 666; 16 U.S.C. 461\_467); the National Historic Preservation Act of 1966 (NHPA)(P.L. 89\_665; 80 Stat. 915; 16 U.S.C. 470 as amended by P.L. 90\_243, P.L. 93\_54, P.L. 94\_422, and P.L. 94\_458); the National Environmental Policy Act of 1969 (NEPA)(P.L. 91\_190; 83 Stat. 852; 42 U.S.C. 4321 et seq.); Executive Order 11593 of 1971; Executive Order 13007; the Archaeological and Historical Conservation Act of 1974 (P.L. 86\_523, as amended by P.L. 93\_291; 16 U.S.C. 469\_469c); American Indian Religious Freedom Act of 1978 (AIRFA) (P.L. 95\_341); Native American Graves and Repatriation Act of 1990 (NAGPRA) (P.L.101-601); National Register of Historic Places (NRHP), National Register Bulletins; and other pertinent legislation and implementing regulations. Utah state legislation to be complied with consists of the Antiquities Protection Act of 1993 (U.C.A. Sec. 9-8-101-806). Arizona state legislation to be complied with consists of the Arizona Antiquities Act A.R.S. 15-1631, A.R.S. 41-841, Arizona State

burial protection laws A.R.S. 41-844 and 41-865, and the Arizona State Historic Preservation Act A.R.S. 41-861 through 864.

A Programmatic Agreement (PA) will be developed and will be signed by primary participating agencies to ensure that all understand and are in agreement with the proposed ethnographic study of the Lake Powell Pipeline alternatives. This agreement will be based upon the HPMP, which will be prepared following the identification and evaluation of sites for eligibility to the NRHP. The PA will be utilized to implement the recommendations and mitigation measures outlined in the project HPMP. Agencies to be included in the Programmatic Agreement include the State of Utah, the Federal Energy Regulatory Commission, the Bureau of Land Management, the National Park Service, the Bureau of Reclamation, the Utah State Historic Preservation Office, the Arizona State Historic Preservation Office, the Arizona Department of Transportation, the Arizona State Lands Department, the Utah Department of Transportation, the Utah School and Institutional Trust Lands Administration, the Kaibab Band of Paiute Indians and the Advisory Council on Historic Preservation.

### **23.3 Existing Information**

Ethnographic literature of tribal occupation within the project area can be found in a variety of institutions. Some of the more important institutions include:

- University of California, Berkeley
- Smithsonian Institution, Washington, D.C.
- Bureau of Applied Research in Anthropology (BARA), University of Arizona
- University of Nevada, Las Vegas
- Human Relations Area Files (HRAF), Yale University
- American West Center, University of Utah
- American Museum of Natural History, New York
- Offices of Native American tribes with affiliations to the Project Area

In addition, Dr. Richard D. Stouffle, of BARA, has and continues to carry out ethnographic research among the Kaibab Band of Paiute Indians. One of his important publications in this regard concerns TCPs on the Kaibab Reservation. Other ethnographers and ethnologists have published studies and others continue research of Southern Paiute tribes and other tribes claiming historic occupation and use of portions of the Project area.

There are many published sources of information regarding the lifeways and resource use of the Project area, historically, by the Southern Paiutes. Examples include the works of Isabel Kelly (eg. 1932-1933; 1934; 1939; 1964); Kelly and Fowler (1986); Euler (1966; 1972); Euler and Fowler 1973; and Inter-Tribal Council of Nevada (1976).

### **23.4 Agency Resource Management Goals (§5.11(d)(2))**

While no specific agency resource management goals have been identified with regard to ethnographic resources in this study plan, each of the various agency resource management plans and guidelines that specifically identify goals and objectives will be consulted prior to commencing the ethnographic research.

### **23.5 Proposed Study Methodology (§5.11(d)(5))**

#### ***23.5.1 Introduction and Overall Approach***

This study will determine the potential cultural significance of the area and if the undertaking will have an impact upon TCPs. The following tasks will be undertaken: (1) archival research, (2) interviews with Tribal members and other fieldwork; (3) identification of potential TCPs, including areas used to gather plants for traditional purposes; and (4) evaluation of specific properties for NRHP eligibility (as appropriate). Assessment of TCPs and/or potential Districts would be conducted in continuous consultation between FERC, the Utah and Arizona SHPOs, Native American Tribes, and appropriate agencies (e.g., BLM, the National Park Service [NPS], and identified Native American Tribes). The following is a definition of TCPs as used in this study (taken from National Register Bulletin 38, Parker and King 1998), followed by a description of the tasks that will be used to identify and evaluate TCPs.

- Locations associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world
- A rural community whose organization, buildings and structures, or patterns of land use reflect the cultural traditions valued by its long-term residents
- An urban neighborhood that is the traditional home of a particular cultural group, and that reflects its beliefs and practices
- Locations where Native American religious practitioners have historically gone and are known or thought to go today, to perform ceremonial cultural practices
- Locations where a community has traditionally carried out economic, artistic, or other cultural practices important in maintaining its historic identity

Additionally, reasonable efforts will be made to research additional potential sources of information received from participants subsequent to PAD preparation.

### ***23.5.2. Archival Research***

Archival research will focus on identifying previous studies and ethnographic information to be used to establish a context by which potential TCPs or other ethnographic resources may be identified and evaluated. The places to be contacted or visited shall include:

- Utah State Historic Preservation Office
- Utah State History Library
- University of Utah, Ethnographic Collections
- University of Utah Library, Special Collections
- University of Arizona, Bureau of Applied Research in Anthropology (BARA)
- University of Arizona, Special Collections
- University of Nevada at Las Vegas Library
- Arizona Historical Society Library
- Arizona State Historic Preservation Office
- Arizona State Museum
- Arizona State Library, Archives, and Public Records
- Bureau of Land Management, General Land Office
- Tribal Office, Kaibab Band of Paiute Indians
- Other identified research facilities

Additionally, reasonable efforts will be made to research additional potential sources of information received from participants subsequent to the preparation of the HPMP.



### ***23.5.3 Tribal Consultation and Identification of Resources***

Tribal consultation will be carried out, as mentioned above between the various federal agencies and Tribes. However, the specific identification of potential TCPs and ethnographic resources will consist of research that will be carried out and coordinated carried between an ethnographer and in cooperation with the various Tribes and Tribal members. This research and any necessary fieldwork and potential TCP documentation shall be undertaken in accordance with Section 106 of the National Historic Preservation Act, as amended, and shall take into consideration National Register Bulletin No. 38, *Guidelines for Evaluating and Documenting Identification of Traditional Cultural Properties* (Parker and King 1998). To facilitate this consultation, the Utah State Water Board will retain a qualified ethnographer or other individual with demonstrated experience in documentation of ethnographic resources per National Register Bulletin No. 38.

Native American Tribes and Bands that are considered for consultation as part of this project include the following:

- Chemeheuvi Tribe
- Colorado River Tribes
- White Mountain Apache Tribe
- Cocopah Tribe
- Quechan Tribe
- Hopi Tribe
- San Carlos Apache Tribe
- Kaibab Band of Paiute Indians
- Las Vegas Paiute Tribe
- Moapa Paiute Tribe
- San Juan Southern Paiutes
- Havasupai Tribe
- Hualapai Tribe
- Yavapai-Apache Tribe
- Ute Indian Tribe
- Ute Mountain Ute Tribe
- Southern Ute Tribe
- Paiute Indian Tribe of Utah
- Shivwits Band (Paiute)
- Cedar Band (Paiute)
- Indian Peaks Band (Paiute)
- Kanosh Band (Paiute)
- Koosharem Band (Paiute)

To protect confidentiality of disclosed locations, the ethnographer preparing the study shall agree not to disclose these locations to any parties other than the federal land management agencies as appropriate, FERC, and the SHPOs. Interviews with Tribal elders and other representatives (Tribal Interviewees) will be required. The ethnographer will contact the appropriate Tribe(s) to arrange for interviews with Tribal elders or other representatives who may have knowledge of special-interest areas within the Project APE. In some cases, it may be appropriate or necessary for the Tribal interviewees and the ethnographer to visit the APE together to accurately define potential TCPs, particularly, areas used to gather botanical resources for traditional purposes. If necessary, the Utah Division of Water Resources will arrange for an

initial introductory meeting between the Utah Board of Water Resources, appropriate Tribal representatives, and the ethnographer.

More than one Tribal representative may have knowledge of potential TCPs and/or other ethnographic resources in the APE. To ensure that locational and other data are accurate, information about potential TCPs that is gathered during interviews must be provided to the ethnographer by individuals with *direct* knowledge of these properties. The oral traditions collected during the interviews will be used to help define potential TCPs in the APE and to assist in making sound judgments and management decisions in Project planning. These data will be used to develop an HPMP that helps the Utah Board of Water Resources establish the policies, procedures, and strategies for avoidance or protection of TCPs and other ethnographic resources, or management or mitigation measures that may be necessary during the Project. This information will be kept confidential and respectfully documented by the ethnographer. If participating Native American Tribes do not wish to disclose the locations of any potential TCPs due to religious or confidentiality reasons, the Utah Board of Water Resources shall, instead, work with the Tribes to identify the general issues and concerns that the Tribe(s) may have regarding potential impacts of the Project upon resources known to the Tribe(s) and work to develop agreeable measures to alleviate these concerns. These measures will be addressed in the Project HPMP.

## **23.5.4 Analysis**

### **23.5.4.1 National Register of Historic Places Evaluation**

Following identification and documentation of potential TCPs, Historic Districts and other ethnographic resources within the Project APE, properties may be assessed for their NRHP eligibility as discussed in the Methods section above. NRHP evaluations are site-specific and depend on the nature of the identified impact (*e.g.*, adverse effects, non-adverse effects). Individual site significance can be defined in a number of ways. The criteria for the evaluation of historic properties for eligibility to the NRHP are outlined in 36 CFR § 60.4, which state:

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and

- (a) that are associated with events that have made a significant contribution to the broad pattern of our history;
- (b) that are associated with the lives of persons significant in our past;
- (c) that embody the distinctive characteristics of a type, period, or 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
- (d) that have yielded, or may be likely to yield, information important to prehistory or history.

In addition to the criteria set forth at 36 CFR § 60.4, properties can have other cultural values that should be considered. Amendments to the National Historic Preservation Act in 1992 [§101(d) (6)(A)] specify that properties of traditional religious and cultural importance (TCPs) to a Native American Tribe may be determined eligible for inclusion in the NRHP because of their “association with cultural practices or

beliefs of a living community that are (1) rooted in that community's history; and (2) are important in maintaining the continuing cultural identity of the community." Therefore, a property may also be significant if it has traditional or ethnographic significance because of its ties to the cultural past of Native Americans. If formal evaluation is appropriate, the above criteria will be used to analyze the potential TCPs identified within the APE to provide NRHP evaluations to be presented to the appropriate SHPO for concurrence. Any formal NRHP evaluations of identified potential TCPs and/or potential Historic Districts that are undertaken for the Project will be undertaken in consultation with the appropriate tribe(s), federal land management agencies, FERC, and the SHPOs.

#### **23.5.4.2 Consistency With Generally Accepted Scientific Practice**

The proposed study methods discussed above are consistent with the study methods followed in other FERC projects. These methods have been accepted by the participating Native American Tribes, agencies, and other interested parties associated with these projects. The methods presented in this Study Plan also are consistent with the Advisory Council on Historic Preservation's guidelines for compliance with the requirements of Section 106 of the National Historic Preservation Act, found at 36 CFR § 800, and with National Register Bulletin 38.

#### **23.5.5 Products**

Study products will include:

1. Confidential stand-alone reports and site documentation for submittal to the Kaibab Band of Paiute Indians, the Utah and Arizona SHPOs, and FERC cultural resource specialists. (Note: Both FERC and the SHPOs require detailed reporting in order to certify compliance with Section 106 of the National Historic Preservation Act).
2. A summary of the non-confidential information and findings.

Following consultation and completion of the ethnographic research with the above mentioned tribes, a report will be prepared that provides an ethnographic background of the APE, the results of the study, recommendations for NRHP eligibility, and a description of all Project-related effects on eligible and unevaluated resources. This report will contain an appendix describing specific botanical species used for traditional purposes. Such descriptions will include the common, scientific, and traditional names of these plants, their traditional use, and color photographs of the species. Locations of potential TCPs, including plant-gathering locations, will be provided in a second confidential appendix.

Identified effects will be assessed in terms of "adverse" and "no adverse" effects in accordance with 36 CFR § 800.5. If the research does not result in the identification of specific resources, but instead identifies Tribal issues and concerns regarding resources, these issues and concerns will be addressed in the report. The final report will be confidential in nature and will be provided only to the designated Tribe(s), federal land management agencies with jurisdiction within the APE, and FERC, and concurrence of report recommendations will be sought from the SHPOs. Upon instruction to the Utah State Water Board, in writing, by the participating Tribes, copies of the final report and detailed property location information may be withheld from public disclosure in accordance with Section 304 (16 U.S.C. 4702-3) of the National Historic Preservation Act, as amended.

Following completion of the study, preparation of a final report, and agreement to confidentiality, copies of all original field notes, documents and materials (including photographs, videos and audio recordings) collected, from or during an interview with a Tribal participant, will be transmitted to the participating Tribe(s) for their records. The Utah Board of Water Resources shall retain the original interview

materials. The Tribes will also be provided with copies of all research material utilized during the investigation that is not copyrighted by a third party. A listing of all copyrighted materials that were used for preparation of the report will also be provided.

The Utah Board of Water Resources intends to file a Draft Historic Properties Management Plan (HPMP) for the Project. The Utah Board of Water Resources intends to file a Final HPMP with FERC. It is anticipated that FERC will enter into a Programmatic Agreement (PA) between the Federal Energy Regulatory Commission, the State of Utah, the Bureau of Land Management, the National Park Service, the Bureau of Reclamation, the Utah State Historic Preservation Office, the Arizona State Historic Preservation Office, the Arizona Department of Transportation, the Arizona State Lands Department, the Utah Department of Transportation, the Utah School and Institutional Trust Lands Administration, the Kaibab Band of Paiute Indians and the Advisory Council on Historic Preservation and any other agencies or entities that the FERC deems appropriate. This PA would stipulate and implement the HPMP. The HPMP will be drafted by the Utah State Water Board in consultation with appropriate agencies and Tribes according to the Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects issued by the Advisory Council on Historic Places (ACHP 2002). The HPMP will call for the avoidance or protection of specified cultural resources, including potential TCPs and/or other ethnographic resources, whenever possible. Both site-specific and general treatment measures may be provided in the HPMP. General treatment measures may include a process and protocol for any cultural resources monitoring, public and employee education and interpretation, and general land management designed to reduce Project-related effects. The HPMP may also identify measures to be undertaken should impacts to NRHP-eligible resources be unavoidable, including on-going adverse effects that cannot be avoided, eliminated, or removed.

### **23.6 Schedule and Level of Effort (§5.11(d)(6))**

The ethnographic resources studies will require professional ethnographers or, as appropriate, experts appointed by individual tribes, with appropriate experience to perform the literature review, field investigations and data analyses identified in this study plan. It is expected that the ethnographic resources study can be completed within one year.

The proposed schedule for carrying out the various tasks of the cultural resources and the ethnographic studies is as follows:

- |                                |   |                   |
|--------------------------------|---|-------------------|
| • Draft Class I Report         | - | 20 February 2009  |
| • End of Comment Period        | - | 20 March 2009     |
| • Final Class I Report         | - | 21 April 2009     |
| • Fieldwork Begins             | - | 2 March 2009      |
| • End of Fieldwork             | - | 15 September 2009 |
| • First Draft Class III Report | - | 29 January 2010   |
| • Final Draft Class III Report | - | 21 May 2010       |
| • Draft HPMP                   | - | 25 June 2010      |

### **23.7 Progress Reporting (§5.11(b) (3))**

Progress reports will be prepared on a quarterly basis, beginning in February 2009, and will be updated in May 2009, August 2009, and November 2009. The final report will be submitted in February 2010.

In order to maintain the lines of communications between the various members of the Cultural Resource Working Group (FERC, Federal and State agencies, the Tribes, and other interested parties), quarterly meetings will be held in Salt Lake City and Saint George, Utah, and Phoenix, Arizona. These meetings, which will include discussions on the ethnographic study, will take place in conjunction with other project activities and will be open to in-person attendance or teleconferencing. These meetings are proposed to be held on the following dates:

- |                         |   |                 |   |                      |
|-------------------------|---|-----------------|---|----------------------|
| • Class I Report        | - | 2 March 2009    | - | Salt Lake City, Utah |
|                         | - | 3 March 2009    | - | Saint George, Utah   |
|                         | - | 4 March 2009    | - | Phoenix, Arizona     |
| • Class III – Fieldwork | - | 27 April 2009   | - | Salt Lake City, Utah |
|                         | - | 28 April 2009   | - | Saint George, Utah   |
|                         | - | 29 April 2009   | - | Phoenix, Arizona     |
| • Class III – Fieldwork | - | 27 July 2009    | - | Salt Lake City, Utah |
|                         | - | 28 July 2009    | - | Saint George, Utah   |
|                         | - | 29 July 2009    | - | Phoenix, Arizona     |
| • Class III Report      | - | 26 October 2009 | - | Salt Lake City, Utah |
|                         | - | 27 October 2009 | - | Saint George, Utah   |
|                         | - | 28 October 2009 | - | Phoenix, Arizona     |

## 23.8 References

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