Lake Powell Pipeline

Draft Study Report 21
Wildlife Resources

March 2010

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Wildlife Resources Study Report
Executive Summary

ES-1 Introduction

This study report describes the results and findings of an analysis to evaluate wildlife resources impacts along the proposed alternative alignments of the Lake Powell Pipeline Project (LPP Project), No Lake Powell Water Alternative, and No Action Alternative. The purpose of the analysis, as defined in the 2008 Wildlife Resources and Habitats Study Plan prepared for the Federal Energy Regulatory Commission (Commission), was to identify potential impacts on wildlife resources and habitats from construction and operations of the alternatives, and identify and document measures to mitigate impacts from the LPP Project as necessary.

ES-2 Methodology

The analysis of impacts on wildlife resources follows methodology identified and described in the Preliminary Application Document, Scoping Document No. 1 and the Wildlife Resources and Habitats Study Plan filed with the Commission.

ES-3 Key Results of the Wildlife Resources Impact Analyses

Significant impacts on wildlife and habitats were defined as substantial disturbances to wildlife habitat or populations that destroy a large area of utilized habitat, disturb or displace a resident population or sub-population, or result in losses of a large number of individuals of the species within the LPP Project study area. Significant impacts would also result from a substantial loss, temporary or permanent, or unavailability of big game critical seasonal range or migration corridors during critical use periods as designated by game management agencies.

ES-3.1 LPP Project Alternative

Total permanent habitat disturbance from the alternative alignments of the LPP Project are shown in Table ES-1. Because most of the permanent disturbance would occur in habitat already degraded or altered by road or transmission line rights-of-way, grazing or other human activity, it was determined that the disturbance to habitat would not meet the significance criteria.

Table ES-1
Permanent Habitat Disturbance from the LPP Project Alternative Alignments (Acres)

Alternative Alignment	Net Vegetation Community Impacts
South	1,487
Existing Highway	1,168
Southeastern Corner	1,100
Transmission Lines	170

Direct permanent disturbance and indirect temporary noise disturbance on big game critical seasonal range were analyzed for three species: mule deer, pronghorn and desert bighorn sheep. There would be minor permanent disturbance of habitat for each species, occurring mostly in areas already impacted by infrastructure or in areas with extensive equivalent habitat adjacent to the study area. Temporary noise disturbance would not occur in critical or high value range and could be mitigated by scheduling work outside of critical seasonal use or migration. It was determined that impacts on big game critical seasonal range or migration routes from the alternative alignments of the LPP Project would not be significant.

Wildlife populations would not be significantly impacted by the alternative alignments of the LPP Project. No species or population would be placed at risk and impacts would not exceed the significance criteria.

ES-3.2 No Lake Powell Water Alternative

The No Lake Powell Water Alternative would have no significant impacts on wildlife habitat and populations. Areas within the Mohave Desert and Great Basin ecological regions would be temporarily and permanently disturbed by the Anderson Junction Reservoir and Ash Creek Pipeline projects, and mule deer crucial winter range near the Interstate 15 highway corridor would be temporarily disturbed by construction of the Ash Creek Pipeline. These impacts would not exceed the significance criteria because of adjacent equivalent habitat.

ES-3.3 No Action Alternative

The No Action Alternative would have no impacts on wildlife habitat and populations.

Chapter 1
Introduction

1.1 Introduction

This chapter presents a summary description of the alternatives studied for the Lake Powell Pipeline (LPP) project, located in north central Arizona and southwest Utah (Figure 1-1) and identifies the issues and impact topics for the Wildlife Resources Study Report. The alternatives studied and analyzed include different alignments for pipelines and penstocks and transmission lines, a no Lake Powell water alternative, and the No Action alternative. The pipelines would convey water under pressure and connect to the penstocks, which would convey the water to a series of hydroelectric power generating facilities. The action alternatives would each deliver 86,249 acre-feet of water annually for municipal and industrial (M&I) use in the three southwest Utah water conservancy district service areas. Washington County Water Conservancy District (WCWCD) would receive 69,000 acre-feet, Kane County Water Conservancy District (KCWCD) would receive 4,000 acre-feet and Central Iron County Water Conservancy District (CICWCD) could receive up to 13,249 acre-feet each year.

1.2 Summary Description of Alignment Alternatives

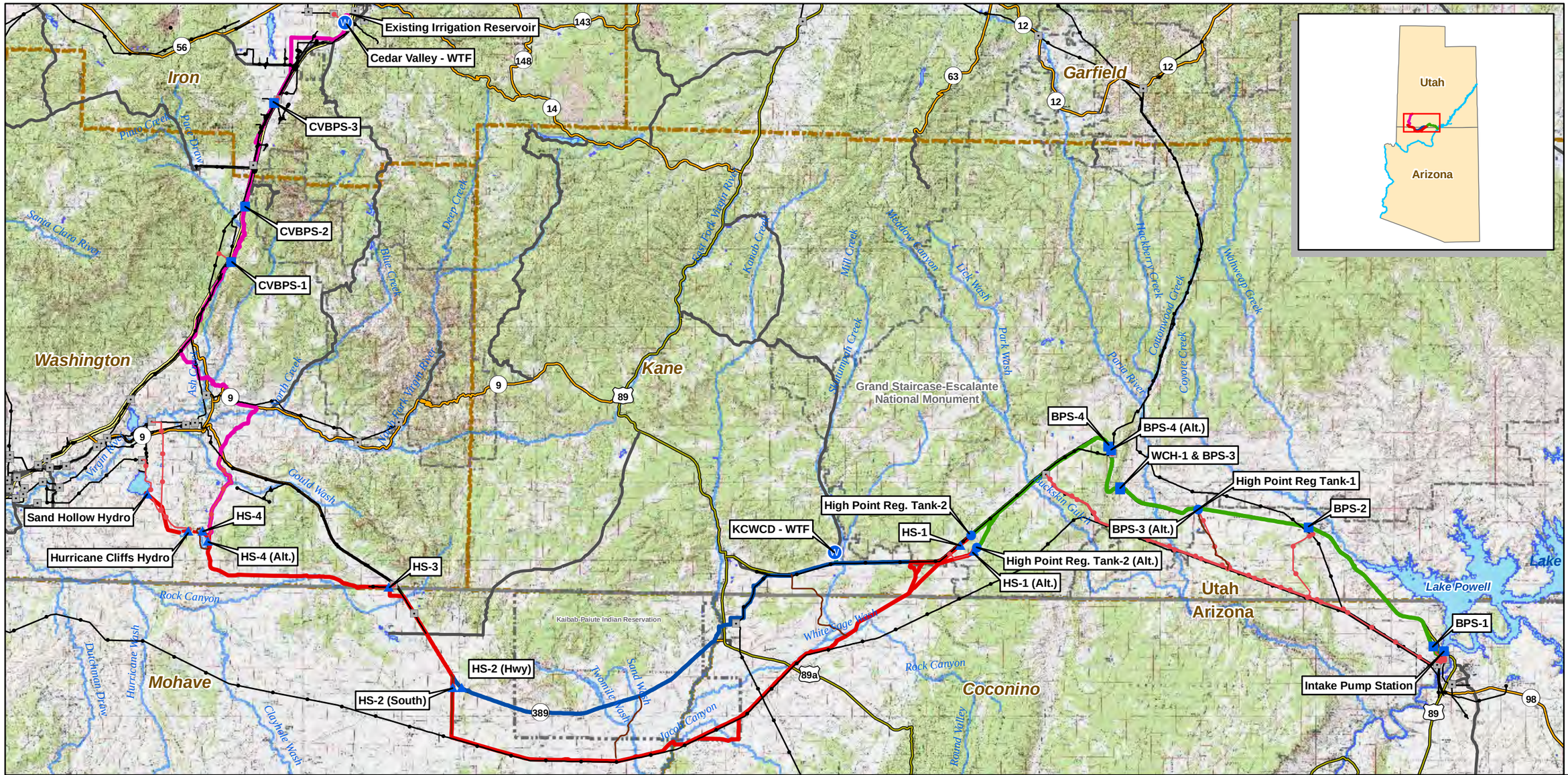
Three primary pipeline and penstock alignment alternatives are described in this section along with the electrical power transmission line alternatives. The pipeline and penstock alignment alternatives share common segments between the intake at Lake Powell and delivery at Sand Hollow Reservoir, and they are spatially different in the area through and around the Kaibab-Paiute Indian Reservation. The South Alternative extends south around the Kaibab-Paiute Indian Reservation. The Existing Highway Alternative follows an Arizona state highway through the Kaibab-Paiute Indian Reservation. The Southeast Corner Alternative follows the Navajo-McCullough Transmission Line corridor through the southeast corner of the Kaibab-Paiute Indian Reservation. The transmission line alignment alternatives are common to all the pipeline and penstock alignment alternatives. Figure 1-1 shows the overall proposed project and alternative features from Lake Powell near Page, Arizona to Sand Hollow and Cedar Valley, Utah.

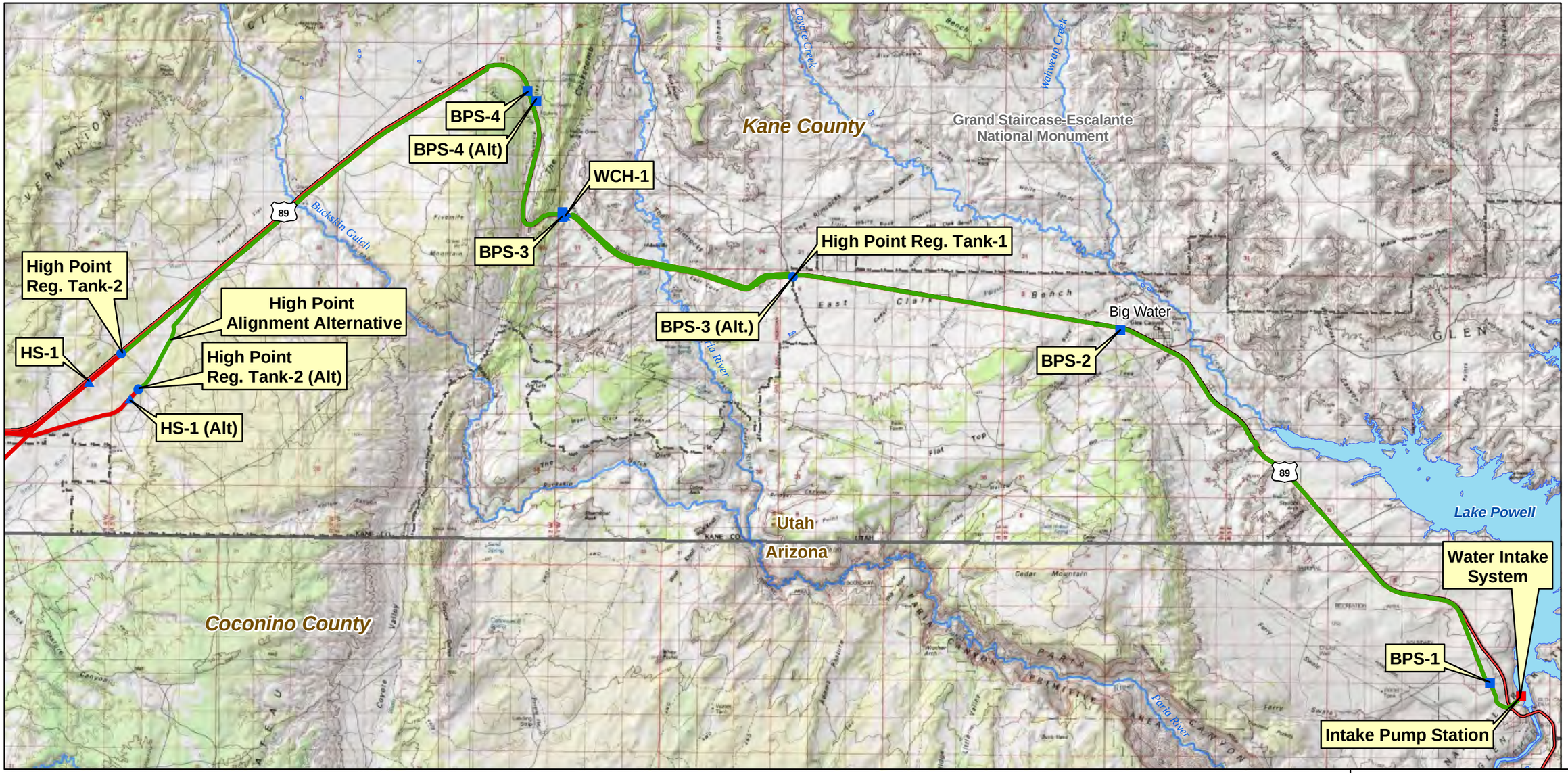
1.2.1 South Alternative

The South Alternative consists of five systems: Intake, Water Conveyance, Hydro, Kane County Pipeline, and Cedar Valley Pipeline.

The **Intake System** would pump Lake Powell water via submerged horizontal tunnels and vertical shafts into the LPP. The intake pump station would be constructed and operated adjacent to the west side of Lake Powell approximately 2,000 feet northwest of Glen Canyon Dam in Coconino County, Arizona (Figure 1-2). The pump station enclosure would house vertical turbine pumps with electric motors, electrical controls, and other equipment at a ground level elevation of 3,745 feet mean sea level (MSL).

The **Water Conveyance System** would convey the Lake Powell water from the Intake System for about 51 miles through a buried 69-inch diameter pipeline parallel with U.S. 89 in Coconino County, Arizona and Kane County, Utah to a buried regulating tank (High Point Regulating Tank-2) on the south side of U.S. 89 at ground level elevation 5,695 feet MSL, which is the LPP project topographic high point


Existing Irrigation Reservoir
Cedar Valley - WTF
CVBPS-3
CVBPS-2
CVBPS-1
Sand Hollow Hydro
HS-4
HS-4 (Alt.)
Hurricane Cliffs Hydro
HS-3
HS-2 (Hwy)
HS-2 (South)
KCWCD - WTF
High Point Reg. Tank-2
HS-1
High Point Reg. Tank-2 (Alt.)
HS-1 (Alt.)
BPS-4
BPS-4 (Alt.)
WCH-1 & BPS-3
High Point Reg Tank-1
BPS-3 (Alt.)
BPS-2
BPS-1
Intake Pump Station
Iron
Washington
Kane
Garfield
Mohave
Coconino
Utah
Arizona
Grand Staircase-Escalante National Monument
Kaibab-Paiute Indian Reservation
Lake Powell
Lake
Utah
Arizona
Water Treatment Facility
Project Pump Station
Project Regulating Tank
Project Hydro Station
Project Transmission Line
Existing Substation
Existing Transmission Line
Water Conveyance
Hydro System - South Alignment Alternative
Hydro System - Highway Alignment Alternative
KCWCD Pipeline System
Cedar Valley Pipeline
Interstate
US Highway
ST Highway
Hwy
Major Road
Access Roads
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams
National Park/Monument
GSENM-Boundary
Tribal Lands
State Boundaries
County Boundaries
FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472
N
0 2.5 5 10 15 20
Miles
Lake Powell Pipeline Project
Spatial Reference: UTM Zone 12N, NAD-83
UDWR Figure 1-1
MWH
Lake Powell Pipeline
Proposed Project and
Alternative Features



- Project Intake Pump Station
- Project Booster Pump Station
- Project Regulating Tank
- Project Hydro Station
- Water Conveyance System
- Hydro System - South Alignment Alternative
- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road
- Lakes & Reservoirs
- Major Rivers & Streams
- National Park/Monument
- GSENM Boundary
- State Boundaries

NGS USA Topographic Maps

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UTU-85472

N

0 0.5 1 2 3 4 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 1-2** MWH

Lake Powell Pipeline Intake and Water Conveyance Systems

(Figure 1-2). The pipeline would be sited within a utility corridor established by Congress in 1998 which extends 500 feet south and 240 feet north of the U.S. 89 centerline on public land administered by the Bureau of Land Management (BLM) (U.S. Congress 1998). Four booster pump stations (BPS) located along the pipeline would pump the water under pressure to the high point regulating tank. Each BPS would house vertical turbine pumps with electric motors, electrical controls, and other equipment. Additionally, each BPS site would have a substation, buried forebay tank and a surface emergency overflow detention basin. BPS-1 would be sited within the Glen Canyon National Recreation Area adjacent to an existing Arizona Department of Transportation maintenance facility located west of U.S. 89. BPS-2 would be sited on land administered by the Utah School and Institutional Trust Lands Administration (SITLA) near the town of Big Water, Utah on the south side of U.S. 89. BPS-3 and an in-line hydro station (WCH-1) would be sited at the east side of the Cockscomb geologic feature in the Grand Staircase-Escalante National Monument (GSENM) within the Congressionally-designated utility corridor. BPS-3 (Alt) is an alternative location for BPS-3 on land administered by the BLM Kanab Field Office near the east boundary of the GSENM on the south side of U.S. 89 within the Congressionally-designated utility corridor. Incorporation of BPS-3 (Alt.) into the LPP project would replace BPS-3 and WCH-1 at the east side of the Cockscomb geologic feature. BPS-4 would be sited on the west side of U.S. 89 and within the Congressionally-designated utility corridor in the GSENM on the west side of the Cockscomb geologic feature.

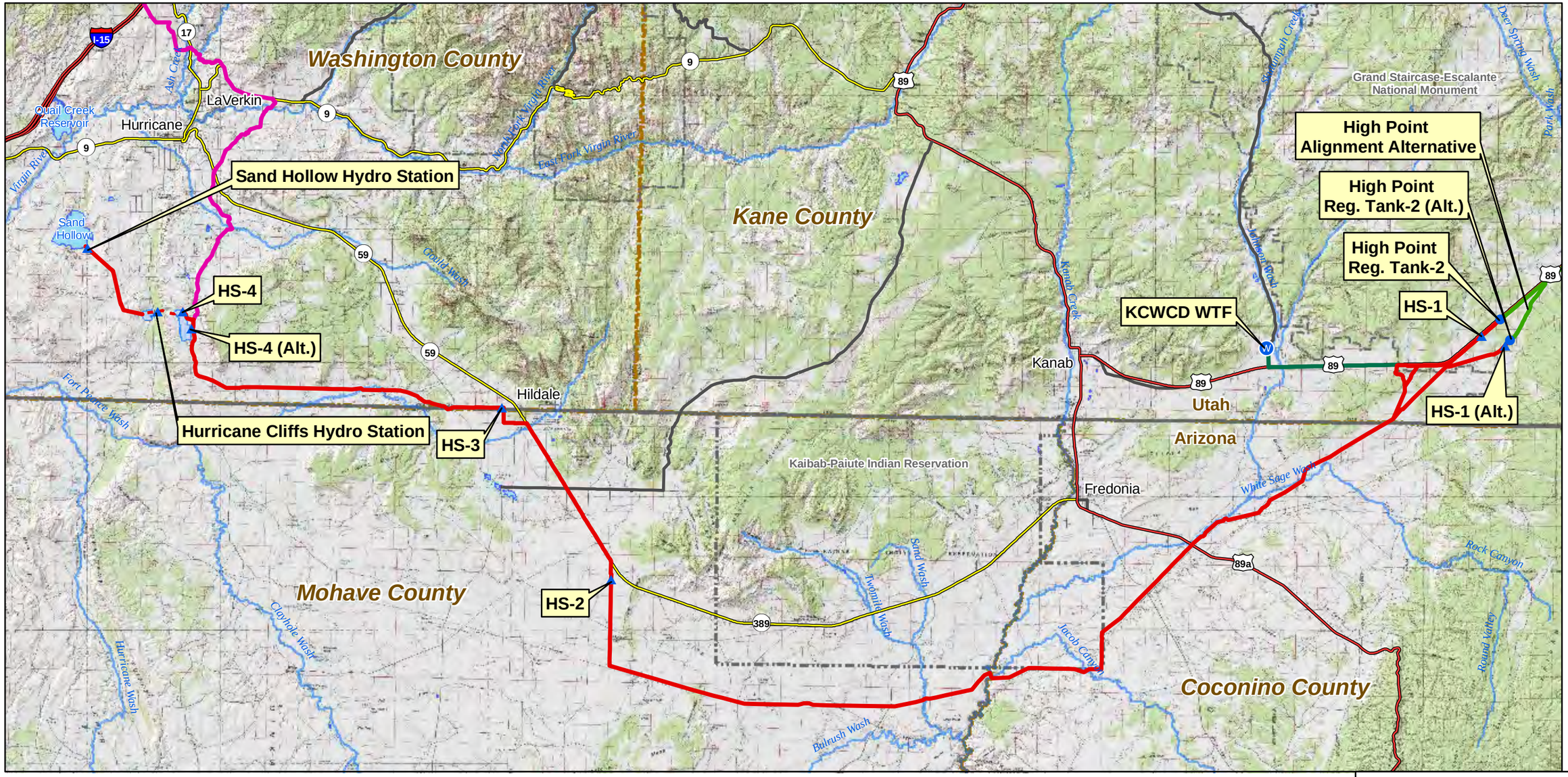
The High Point Alignment Alternative would diverge south from U.S. 89 parallel to the K4020 road and continue outside of the Congressionally-designated utility corridor to a buried regulating tank (High Point Regulating Tank-2 (Alt.) at ground level elevation 5,630 feet MSL, which would be the topographic high point of the LPP project along this alignment alternative (Figure 1-2). The High Point Alignment Alternative would include BPS-4 (Alt.) on private land east of U.S. 89 and west of the Cockscomb geologic feature (Figure 1-2). Incorporation of the High Point Alignment Alternative and BPS-4 (Alt.) into the LPP project would replace the High Point Regulation Tank-2 along U.S. 89, the associated buried pipeline and BPS-4 west of U.S. 89.

A rock formation avoidance alignment option would be included immediately north of Blue Pool Wash along U.S. 89 in Utah. Under this alignment option, the pipeline would cross to the north side of U.S. 89 for about 400 feet and then return to the south side of U.S. 89. This alignment option would avoid tunneling under the rock formation on the south side of U.S. 89 near Blue Pool Wash.

A North Pipeline Alignment option is located parallel to the north side of U.S. 89 for about 6 miles from the east boundary of the GSENM to the east side of the Cockscomb geological feature.

The **Hydro System** would convey the Lake Powell water from High Point Regulating Tank-2 at the high point at ground level elevation 5,695 feet MSL for about 87 miles through a buried 69-inch diameter penstock in Kane and Washington counties, Utah and Coconino and Mohave counties, Arizona to Sand Hollow Reservoir near St. George, Utah (Figure 1-3). The High Point Alignment Alternative would convey the Lake Powell water from High Point Regulating Tank-2 (Alt.) at the high point at ground level elevation 5,630 feet MSL for about 87.5 miles through a buried 69-inch diameter penstock in Kane and Washington counties, Utah and Coconino and Mohave counties, Arizona to Sand Hollow Reservoir near St. George, Utah (Figure 1-3). Four in-line hydro generating stations (HS-1, HS-2 HS-3 and HS-4) with substations located along the penstock would generate electricity and help control water pressure in the penstock. HS-1 would be sited on the south side of U.S. 89 within the Congressionally-designated utility corridor through the GSENM. The High Point Alignment Alternative would include HS-1 (Alt.) along the K4020 road within the GSENM and continue along a portion of the K3290 road.

The proposed penstock alignment and two penstock alignment options are being considered to convey the water from the west GSENM boundary south through White Sage Wash. The proposed penstock



- Water Treatment Facility
- Project Regulating Tank
- Project Hydro Station
- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Major Rivers & Streams
- Hydro System - South Alignment Alternative
- Water Conveyance System
- Cedar Valley Pipeline
- KCWCD Pipeline System
- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road
- National Park/Monument
- GSENM Boundary
- Tribal Lands
- State Boundaries
- County Boundaries

FERC Project Number: 12966-001
BLM Serial Numbers: AZA-34941 UTU-85472

N

0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR Figure 1-3 MWH

Lake Powell Pipeline Hydro System South Alternative

alignment would parallel the K3250 road south from U.S. 89 and follow the Pioneer Gap Road alignment around the Shinarump Cliffs. One penstock alignment option would parallel the K3285 road southwest from U.S. 89 and continue to join the Pioneer Gap Road around the Shinarump Cliffs. The other penstock alignment option would extend southwest through currently undeveloped BLM land from the K3290 road into White Sage Wash.

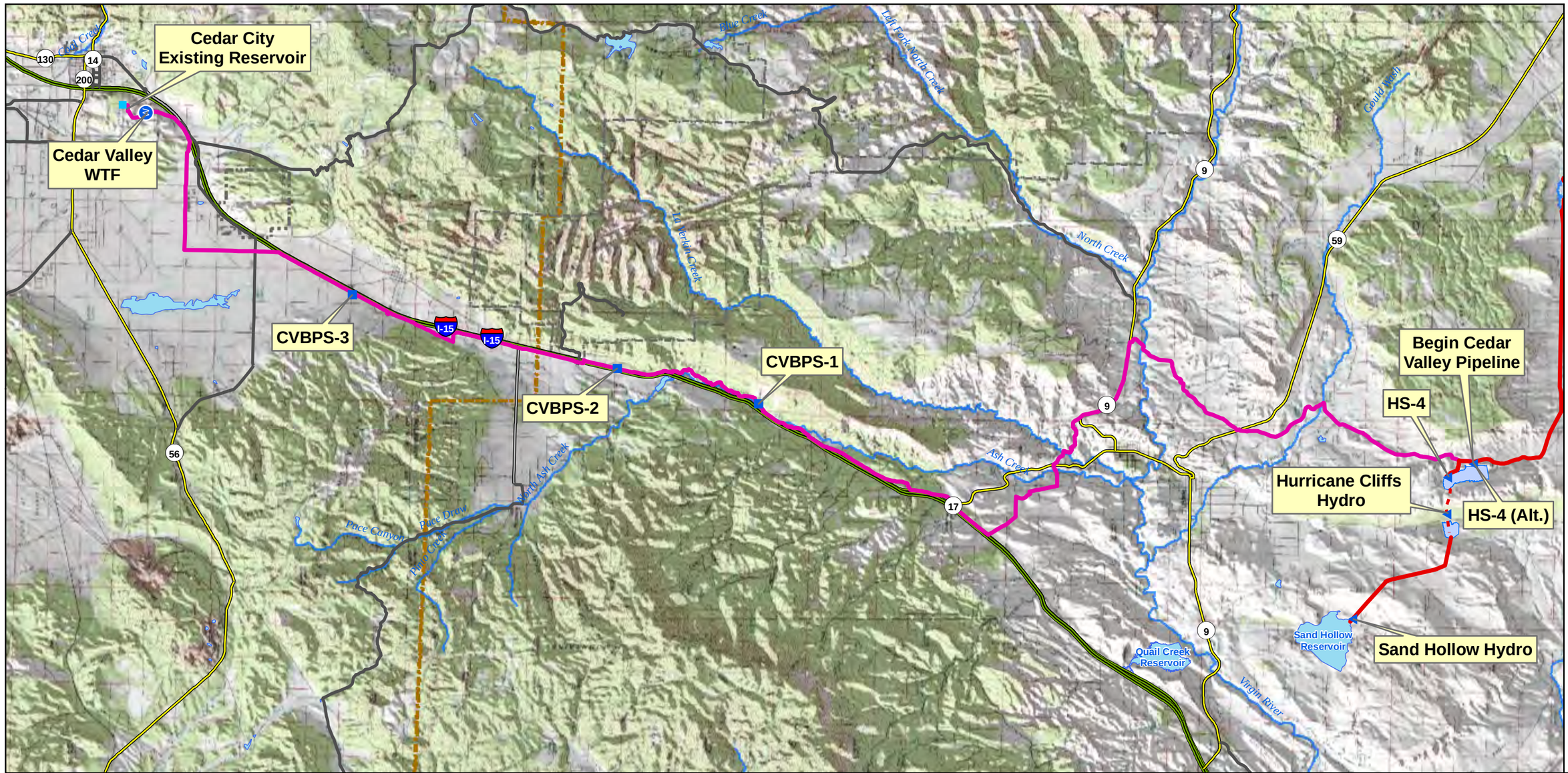
The penstock alignment would continue through White Sage Wash and then parallel to the Navajo-McCullough Transmission Line, crossing U.S. 89 Alt. and Forest Highway 22 toward the southeast corner of the Kaibab Indian Reservation. The penstock alignment would run parallel to and south of the south boundary of the Kaibab Indian Reservation, crossing Kanab Creek and Bitter Seeps Wash, across Moonshine Ridge and Cedar Ridge, and north along Yellowstone Road to Arizona State Route 389 west of the Kaibab Indian Reservation. HS-2 would be sited west of the Kaibab Indian Reservation. The penstock alignment would continue northwest along the south side of Arizona State Route 389 past Colorado City to Hildale City, Utah and HS-3.

The penstock alignment would follow Uzona Road west through Canaan Gap and south of Little Creek Mountain and turn north to HS-4 (Alt.) above the proposed Hurricane Cliffs forebay reservoir. The forebay reservoir would be contained in a valley between a south dam and a north dam and maintain active storage of 11,255 acre-feet of water. A low pressure tunnel would convey the water to a high pressure vertical shaft in the bedrock forming the Hurricane Cliffs, connected to a high pressure tunnel near the bottom of the Hurricane Cliffs. The high pressure tunnel would connect to a penstock conveying the water to a pumped storage hydro generating station. The pumped storage hydro generating station would connect to an afterbay reservoir contained by a single dam in the valley below the Hurricane Cliffs. A low pressure tunnel would convey the water northwest to a penstock continuing on to the Sand Hollow Hydro Station. The water would discharge into the existing Sand Hollow Reservoir.

The peaking hydro generating station option would involve a smaller, 200 acre-foot forebay reservoir with HS-4 discharging into the forebay reservoir, with the peaking hydro generating station discharging to a small afterbay connected to a penstock running north along the existing BLM road and west to the Sand Hollow Hydro Station. A low pressure tunnel would convey the water to a high pressure vertical shaft in the bedrock forming the Hurricane Cliffs, connected to a high pressure tunnel near the bottom of the Hurricane Cliffs. The high pressure tunnel would connect to a penstock conveying the water to a peaking hydro generating station, which would discharge into a 200 acre-foot afterbay reservoir. A penstock would extend north from the afterbay reservoir along the existing BLM road and then west to the Sand Hollow Hydro Station. The water would discharge into the existing Sand Hollow Reservoir.

The **Kane County Pipeline System** would convey the Lake Powell water from the Lake Powell Pipeline at the west GSENM boundary for about 8 miles through a buried 24-inch diameter pipe in Kane County, Utah to a conventional water treatment facility located near the mouth of Johnson Canyon. The pipeline would parallel the south side of U.S. 89 across Johnson Wash and then run north to the new water treatment facility site (Figure 1-3).

The **Cedar Valley Pipeline System** would convey the Lake Powell water from the Lake Powell Pipeline just upstream of HS-4 or HS-4 (Alt.) for about 58 miles through a buried 36-inch diameter pipeline in Washington and Iron counties, Utah to a conventional water treatment facility in Cedar City, Utah (Figure 1-4). Three booster pump stations (CVBPS) located along the pipeline would pump the water under pressure to the new water treatment facility. The pipeline would follow an existing BLM road north from HS-4, cross Utah State Route 59 and continue north to Utah State Route 9, with an aerial crossing of the Virgin River at the Sheep Bridge. The pipeline would run west along the north side of Utah State Route 9 and parallel an existing pipeline through the Hurricane Cliffs at Nephi's Twist. The pipeline



- Water Treatment Facility
- Project Pump Station
- Project Hydro Station
- Hydro System - South Alignment Alternative
- Water Conveyance System
- Hurricane Cliffs Pressure Tunnel
- Cedar Valley Pipeline
- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road
- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Major Rivers & Streams
- National Park/Monument
- County Boundaries
- Tribal Lands

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UTU-85472

0 1 2 4 6 8 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 1-4** MWH

Cedar Valley Pipeline System

would continue across LaVerkin Creek, cross Utah State Route 17, and make an aerial crossing of Ash Creek. The pipeline would continue northwest to the Interstate 15 corridor and then northeast parallel to the east side of Interstate 15 highway right-of-way. CVBPS-1 would be sited adjacent to an existing gravel pit east of Interstate 15. CVBPS-2 would be sited on private property on the east side of Interstate 15 and south of the Kolob entrance to Zion National Park. CVBPS-3 would be sited on the west side of Interstate 15 in Iron County. The new water treatment facility would be sited near existing water reservoirs on a hill above Cedar City west of Interstate 15.

1.2.2 Existing Highway Alternative

The Existing Highway Alternative consists of five systems: Intake, Water Conveyance, Hydro, Kane County Pipeline, and Cedar Valley Pipeline. The Intake, Water Conveyance and Cedar Valley Pipeline systems would be the same as described for the South Alternative.

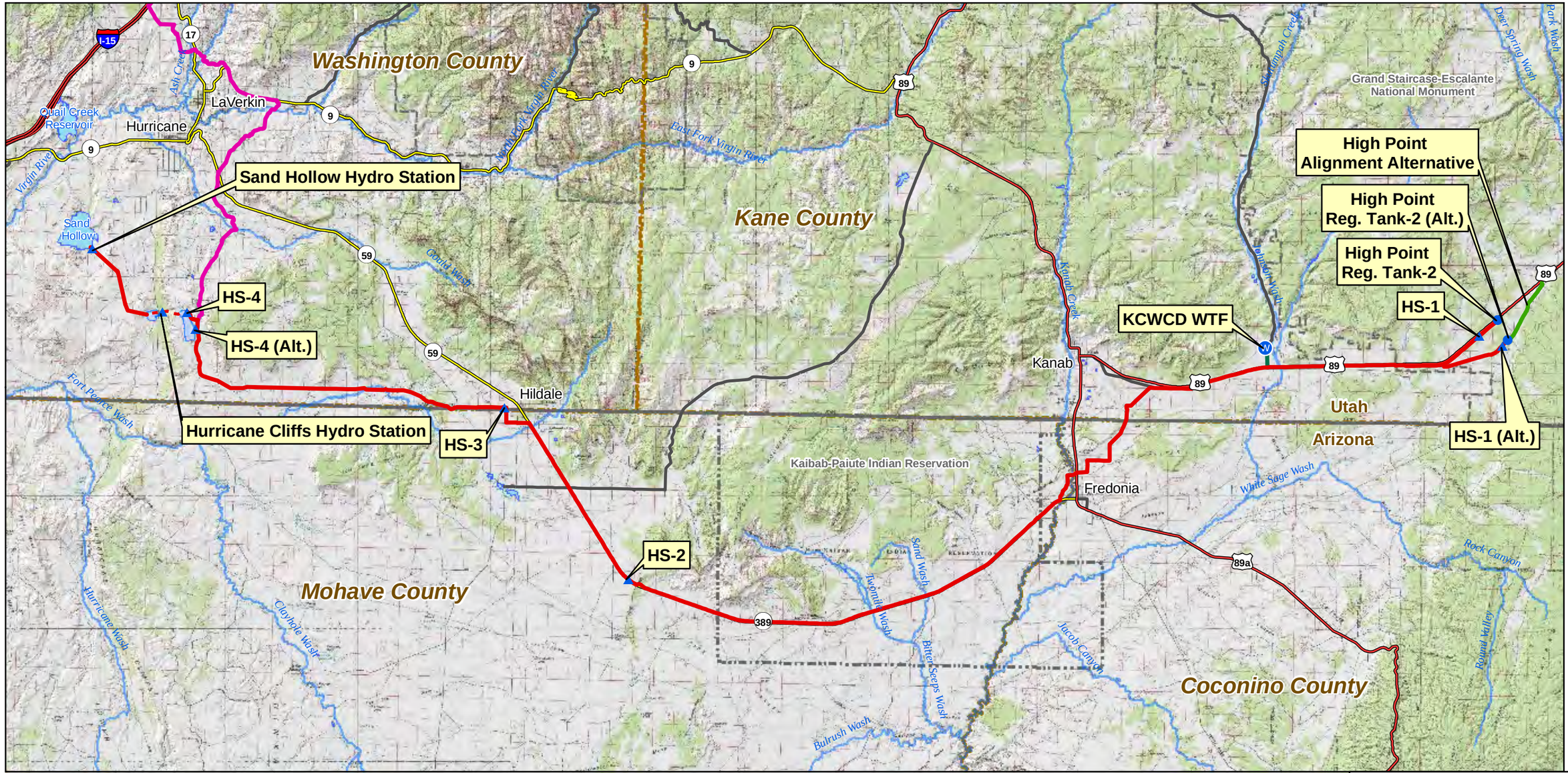
The **Hydro System** would convey the Lake Powell water from the regulating tank at the high point at ground elevation 5,695 feet MSL for about 80 miles through a buried 69-inch diameter penstock in Kane and Washington counties, Utah and Coconino and Mohave counties, Arizona to Sand Hollow Reservoir near St. George, Utah (Figure 1-5). The High Point Alignment Alternative would convey the Lake Powell water from High Point Regulating Tank-2 (Alt.) at the high point at ground level elevation 5,630 feet MSL for about 80.5 miles through a buried 69-inch diameter penstock in Kane and Washington counties, Utah and Coconino and Mohave counties, Arizona to Sand Hollow Reservoir near St. George, Utah (Figure 1-3). The High Point Alignment Alternative would rejoin U.S. 89 about 2.5 miles east of the west boundary of the GSENM. Four in-line hydro generating stations (HS-1, HS-2 HS-3 and HS-4) located along the penstock would generate electricity and help control water pressure in the penstock. HS-1 would be sited on the south side of U.S. 89 within the Congressionally-designated utility corridor through the GSENM. The High Point Alignment Alternative would include HS-1 (Alt.) along the K4020 road within the GSENM and continue along a portion of the K3290 road to its junction with the pipeline alignment along U.S. 89.

The penstock would parallel the south side of U.S. 89 west of the GSENM past Johnson Wash and follow Lost Spring Gap southwest, crossing U.S. 89 Alt. and Kanab Creek in the north end of Fredonia, Arizona. The penstock would run south paralleling Kanab Creek to Arizona State Route 389 and run west adjacent to the north side of this state highway through the Kaibab-Paiute Indian Reservation past Pipe Spring National Monument. The penstock would continue along the north side of Arizona State Route 389 through the west half of the Kaibab-Paiute Indian Reservation to 1.8 miles west of Cedar Ridge (intersection of Yellowstone Road with U.S. 89), from where it would follow the same alignment as the South Alternative to Sand Hollow Reservoir. HS-2 would be sited 0.5 mile west of Cedar Ridge along the north side of Arizona State Route 389.

The **Kane County Pipeline System** would convey the Lake Powell water from the Lake Powell Pipeline crossing Johnson Wash along U.S. 89 for about 1 mile north through a buried 24-inch diameter pipe in Kane County, Utah to a conventional water treatment facility located near the mouth of Johnson Canyon (Figure 1-5).

1.2.3 Southeast Corner Alternative

The Southeast Corner Alternative consists of five systems: Intake, Water Conveyance, Hydro, Kane County Pipeline, and Cedar Valley Pipeline. The Intake, Water Conveyance, Kane County Pipeline and Cedar Valley Pipeline systems would be the same as described for the South Alternative.



- Water Treatment Facility
- Project Regulating Tank
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- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Major Rivers & Streams
- Water Conveyance
- Hydro System - South Alignment Alternative
- Hurricane Cliffs Pressure Tunnel
- Cedar Valley Pipeline
- KCWCD Pipeline System
- Interstate
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- GSENM Boundary
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N

0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 1-5** MWH

Lake Powell Pipeline
Hydro System
Existing Highway Alternative

The **Hydro System** would be the same as described for the South Alternative between High Point Regulating Tank-2 and the east boundary of the Kaibab-Paiute Indian Reservation. The penstock alignment would parallel the north side of the Navajo-McCullough Transmission Line corridor in Coconino County, Arizona through the southeast corner of the Kaibab Indian Reservation for about 3.8 miles and then follow the South Alternative alignment south of the south boundary of the Kaibab-Paiute Indian Reservation, continuing to Sand Hollow Reservoir (Figure 1-6).

1.2.4 Transmission Line Alternatives

Transmission line alternatives include the Intake (3 alignments), BPS-1, Glen Canyon to Buckskin, Buckskin Substation upgrade, Paria Substation upgrade, BPS-2, BPS-2 Alternative, BPS-3 North, BPS-3 South, BPS-3 Underground, BPS-3 Alternative North, BPS-3 Alternative South, BPS-4, BPS-4 Alternative, HS-1 Alternative, HS-2 South, HS-3 Underground, HS-4, HS-4 Alternative, Hurricane Cliffs Afterbay to Sand Hollow, Hurricane Cliffs Afterbay to Hurricane West, Sand Hollow to Dixie Springs, Cedar Valley Pipeline booster pump stations, and Cedar Valley Water Treatment Facility.

The proposed new **Intake Transmission Line** would begin at Glen Canyon Substation and run parallel to U.S. 89 for about 2,500 feet to a new switch station, cross U.S. 89 at the Intake access road intersection and continue northeast to the Intake substation. This 69 kV transmission line would be about 0.9 mile long in Coconino County, Arizona (Figure 1-7). One alternative alignment would run parallel to an existing 138 kV transmission line to the west, turn north to the new switch station, cross U.S. 89 at the Intake access road intersection and continue northeast to the Intake substation. This 69 kV transmission line alternative would be about 1.2 miles long in Coconino County, Arizona (Figure 1-7). Another alternative alignment would bifurcate from an existing transmission line and run west, then northeast to the new switch station, cross U.S. 89 at the Intake access road intersection and continue northeast to the Intake substation. This 69 kV transmission line alternative would be about 1.3 miles long in Coconino County, Arizona (Figure 1-7).

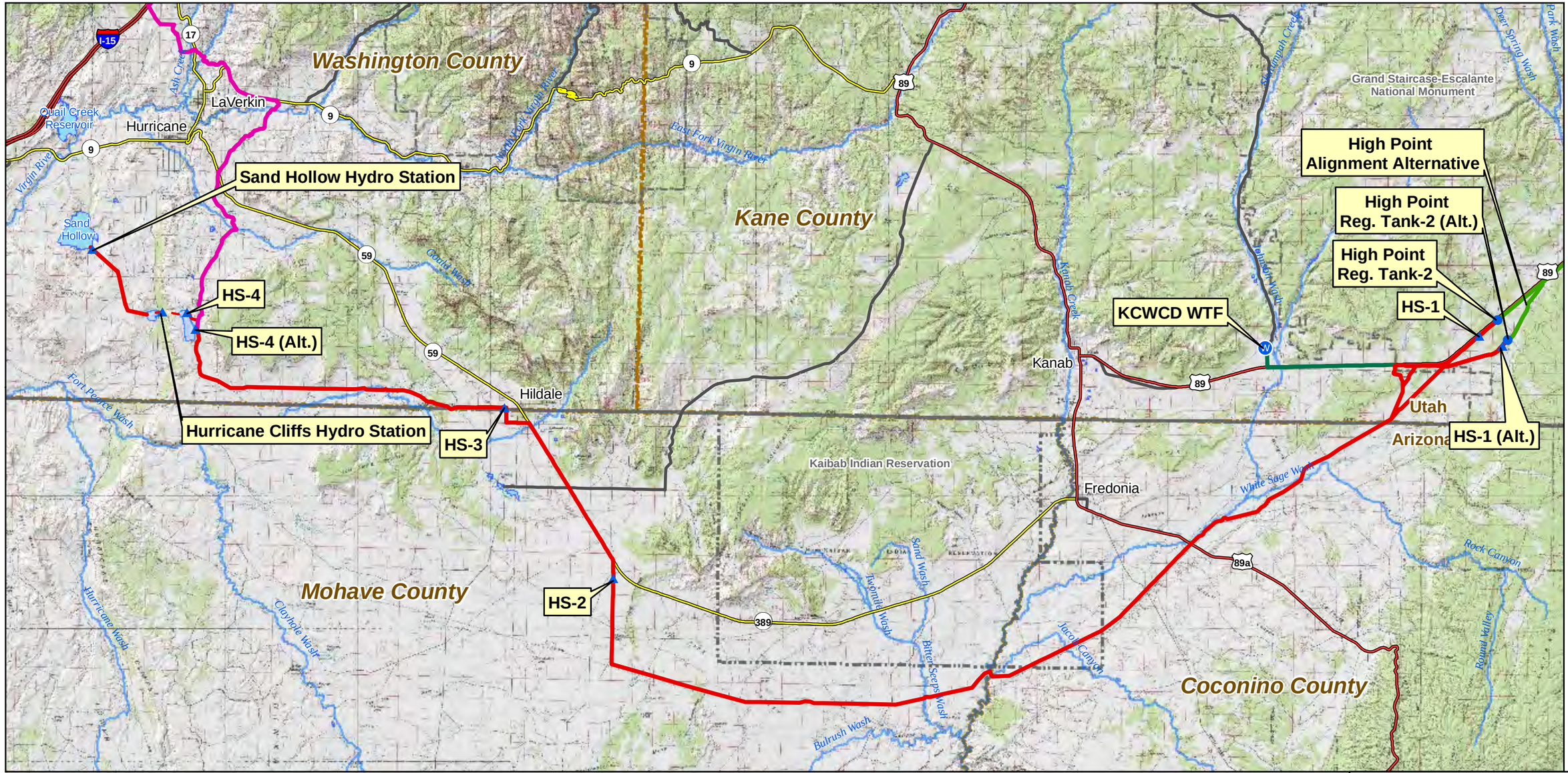
The proposed new **BPS-1 Transmission Line** would begin at the new switch station located on the south side of U.S. 89 and parallel the LPP Water Conveyance System alignment to the BPS-1 substation west of U.S. 89. This 69 kV transmission line would be about 1 mile long in Coconino County, Arizona (Figure 1-7).

The proposed new **Glen Canyon to Buckskin Transmission Line** would consist of a 230 kV transmission line from the Glen Canyon Substation to the Buckskin Substation, running parallel to the existing 138 kV transmission line. This transmission line upgrade would be about 36 miles long through Coconino County, Arizona and Kane County, Utah (Figure 1-7).

The existing **Buckskin Substation** would be upgraded as part of the proposed project to accommodate the additional power loads from the new 230 kV Glen Canyon to Buckskin transmission line. The substation upgrade would require an additional 5 acres of land within the GSENM adjacent to the existing substation in Kane County, Utah (Figure 1-7).

The existing **Paria Substation** would be upgraded as part of the proposed project to accommodate the additional power loads to BPS-4 Alternative. The substation upgrade would require an additional 2 acres of privately-owned land adjacent to the existing substation in Kane County, Utah (Figure 1-7).

The proposed new **BPS-2 Transmission Line** alternative would consist of a new 3-ring switch station along the existing 138 kV Glen Canyon to Buckskin Transmission Line and a new transmission line from the switch station to a new substation west of Big Water and a connection to BPS-2 substation in Kane



Water Treatment Facility
Project Regulating Tank
Project Hydro Station
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams

Water Conveyance System
Hydro System - Southeast Corner Alternative
Kane County Pipeline System
Cedar Valley Pipeline System

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N

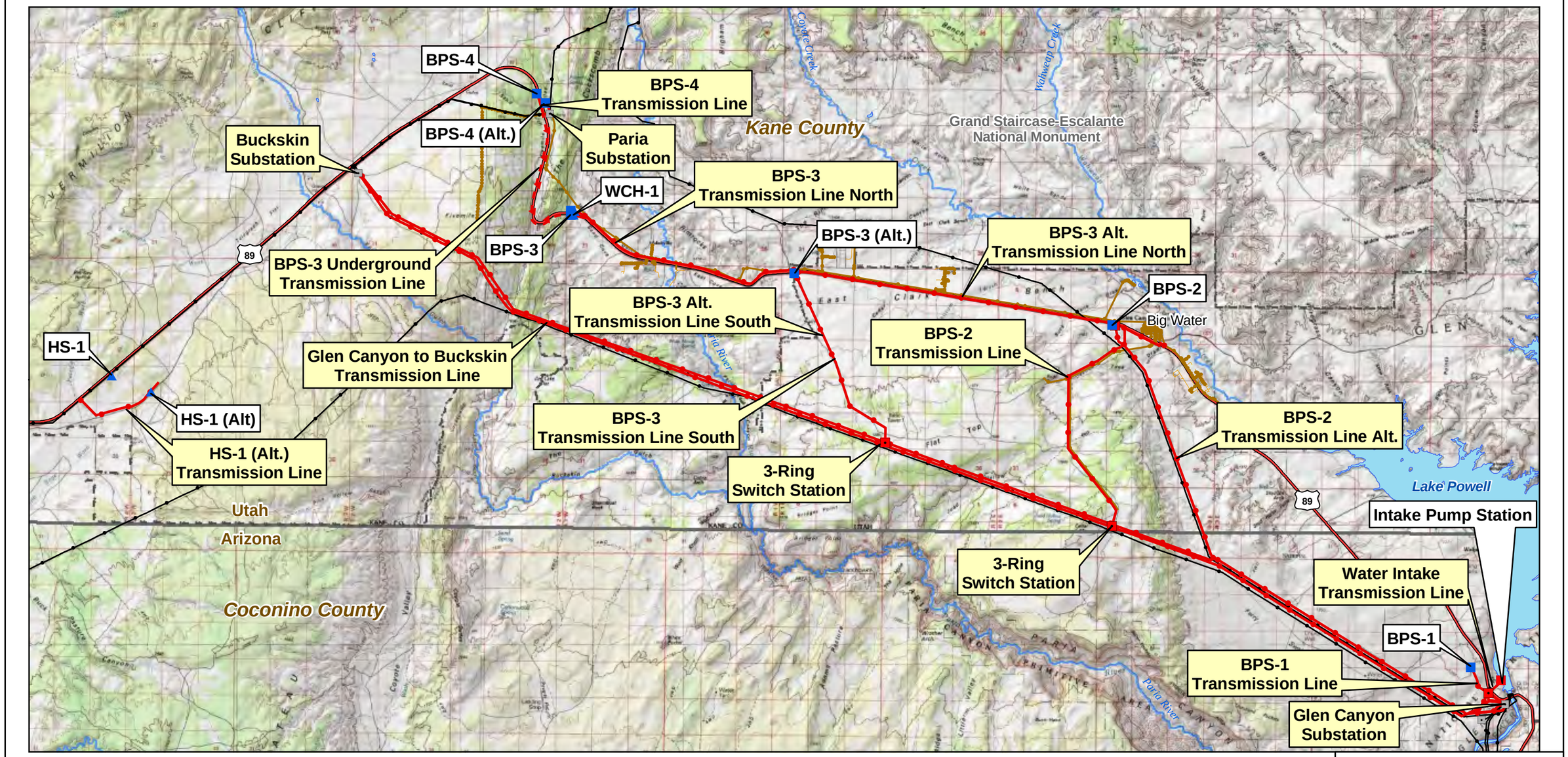
0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 1-6** MWH

Lake Powell Pipeline
Hydro System
Southeast Corner Alternative



Project Intake Pump Station
Project Booster Pump Station
Project Hydro Station
Existing Substation
Proposed Substation
Project Transmission Line
Underground Project Transmission Line
Existing Transmission Line
Existing OH Primary Line
Existing UG Primary Line
Interstate
US Highway
ST Highway
Hwy
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N

0 0.5 1 2 3 4 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 1-7** MWH

Lake Powell Pipeline Transmission Line Alternatives East

County, Utah. The new transmission line would parallel an existing distribution line that runs northwest, north and then northeast to Big Water. This new 138 kV transmission line alternative would be about 7 miles long across Utah SITLA-administered land, with a 138 kV connection to the BPS-2 substation (Figure 1-7).

The new **BPS-2 Alternative Transmission Line** would consist of a new 138 kV transmission line from Glen Canyon Substation parallel to the existing Rocky Mountain Power 230 kV transmission line, connecting to the BPS-2 substation west of Big Water. This new 138 kV transmission line alternative would be about 16.5 miles long in Coconino County, Arizona and Kane County, Utah crossing National Park Service-administered land, BLM-administered land and Utah SITLA-administered land (Figure 1-7).

The new **BPS-3 Transmission Line North** alternative would consist of a new 138 kV transmission line from BPS-2 paralleling the south side of U.S. 89 within the Congressionally designated utility corridor west to BPS-3 at the east side of the Cockscomb geological feature. This new 138 kV transmission line alternative would be about 15.7 miles long in Kane County, Utah (Figure 1-7).

The new **BPS-3 Transmission Line South** alternative would consist of a new 3-ring switch station along the existing 138 kV Glen Canyon to Buckskin Transmission Line and a new transmission line from the switch station north along an existing BLM road to U.S. 89 and then west along the south side of U.S. 89 within the Congressionally designated utility corridor to BPS-3 at the east side of the Cockscomb. This new 138 kV transmission line alternative would be about 12.3 miles long in Kane County, Utah (Figure 1-7).

The new **BPS-3 Underground Transmission Line** alternative would consist of a new buried 24.9 kV transmission line (2 circuits) from the upgraded Paria Substation to BPS-3 on the east side of the Cockscomb geological feature. This new underground transmission line would be parallel to the east and south side of U.S. 89 and would be about 4.1 miles long in Kane County, Utah (Figure 1-7).

The new **BPS-3 Alternative Transmission Line North** alternative would consist of a new 138 kV transmission line from BPS-2 paralleling the south side of U.S. 89 west to BPS-3 Alternative near the GSENM east boundary within the Congressionally-designated utility corridor. This new 138 kV transmission line alternative would be about 9.3 miles long in Kane County, Utah (Figure 1-7).

The proposed new **BPS-3 Alternative Transmission Line South** alternative would consist of a new 3-ring switch station along the existing 138 kV Glen Canyon to Buckskin Transmission Line and a new transmission line from the switch station north along an existing BLM road to BPS-3 Alternative near the GSENM east boundary and within the Congressionally-designated utility corridor. This new 138 kV transmission line alternative would be about 5.9 miles long in Kane County, Utah (Figure 1-7).

The new **BPS-4 Transmission Line** alternative would begin at the upgraded Paria Substation and run parallel to the west side of U.S. 89 north to BPS-4 within the Congressionally designated utility corridor. This new 138 kV transmission line would be about 0.8 mile long in Kane County, Utah (Figure 1-7).

The proposed new **BPS-4 Alternative Transmission Line** would begin at the upgraded Paria Substation and run north to the BPS-4 Alternative. This 69 kV transmission line would be about 0.4 mile long in Kane County, Utah (Figure 1-7).

The proposed new **HS-1 Alternative Transmission Line** would begin at the new HS-1 Alternative and run southwest parallel to the K4020 road and then northwest parallel to the K4000 road to the U.S. 89 corridor where it would tie into the existing 69 kV transmission line from the Buckskin Substation to the

Johnson Substation. This 69 kV transmission line would be about 3 miles long in Kane County, Utah (Figure 1-7).

The proposed new **HS-2 South Transmission Line** alternative would connect the HS-2 hydroelectric station and substation along the South Alternative to an existing 138 kV transmission line paralleling Arizona State Route 389. This new 34.5 kV transmission line would be about 0.9 mile long in Mohave County, Arizona (Figure 1-8).

The proposed new **HS-3 Underground Transmission Line** would connect the HS-3 hydroelectric station and substation to the existing Twin Cities Substation in Hildale City, Utah. The new 12.47 kV underground circuit would be about 0.6 mile long in Washington County, Utah (Figure 1-8).

The proposed new **HS-4 Transmission Line** would consist of a new transmission line from the HS-4 hydroelectric station and substation north along an existing BLM road to an existing transmission line parallel to Utah State Route 59. The new 69 kV transmission line would be about 8.2 miles long in Washington County, Utah (Figure 1-8).

The new **HS-4 Alternative Transmission Line** alternative would connect the HS-4 Alternative hydroelectric station and substation to an existing transmission line parallel to Utah State Route 59. The new 69 kV transmission line would be about 7.5 miles long in Washington County, Utah (Figure 1-8).

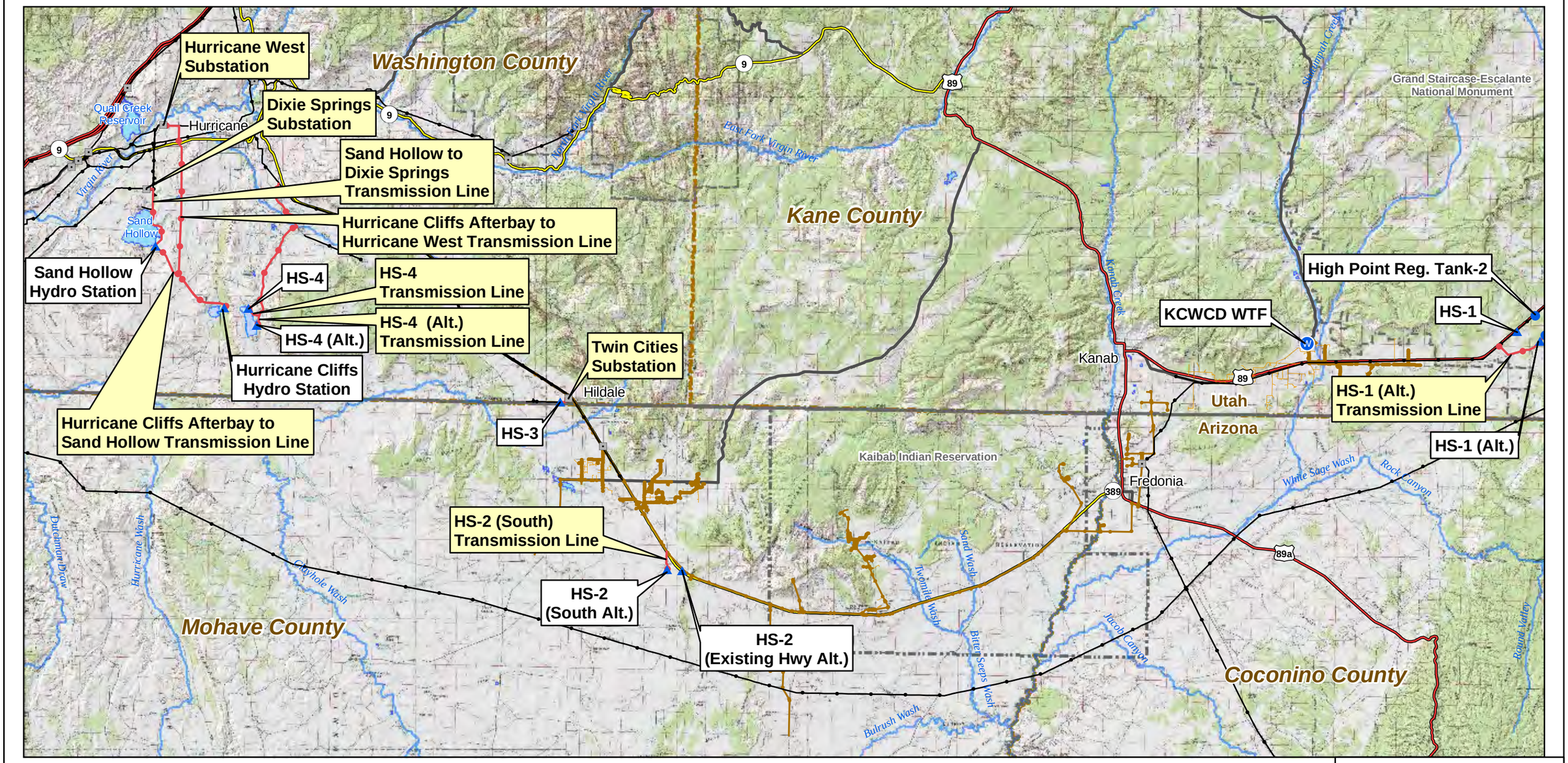
The proposed new **Hurricane Cliffs Afterbay to Sand Hollow Transmission Line** would consist of a new 69 kV transmission line from the Hurricane Cliffs peaking power plant and substation, and run northwest to the Sand Hollow Hydro Station substation. This new 69 kV transmission line would be about 4.9 miles long in Washington County, Utah (Figure 1-8).

The proposed new **Hurricane Cliffs Afterbay to Hurricane West Transmission Line** would consist of a new 345 kV transmission line from the Hurricane Cliffs pumped storage power plant and run northwest and then north to the planned Hurricane West 345 kV substation. This new 345 kV transmission line would be about 10.9 miles long in Washington County, Utah (Figure 1-8).

The proposed new **Sand Hollow to Dixie Springs Transmission Line** would consist of a new 69 kV transmission line from the Sand Hollow Hydro Station substation around the east side of Sand Hollow Reservoir and north to the existing Dixie Springs Substation. This new 69 kV transmission line would be about 3.4 miles long in Washington County, Utah (Figure 1-8).

The three **Cedar Valley Pipeline** booster pump stations would require new transmission lines from existing transmission lines paralleling the Interstate 15 corridor. The new CVBPS-1 transmission line would extend southeast over I-15 from the existing transmission line to the booster pump station substation for about 1.3 miles in Washington County, Utah (Figure 1-9). The new CVBPS-2 transmission line would extend east over I-15 from the existing transmission line to the booster pump station substation for about 0.2 mile in Washington County, Utah (Figure 1-9). The new CVBPS-3 transmission line would extend west over I-15 from the existing transmission line and southwest along the west side of Interstate 15 to the booster pump station substation for about 0.6 mile in Iron County, Utah (Figure 1-9).

The **Cedar Valley Water Treatment Facility Transmission Line** would begin at an existing substation in Cedar City and run about 1 mile to the water treatment facility site in Iron County, Utah (Figure 1-9).



Water Treatment Facility
Project Regulating Tank
Project Hydro Station
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams

Existing Substation
Project Transmission Line
Existing Transmission Line
Existing OH Primary Line
Existing UG Primary Line

Interstate
US Highway
ST Highway
Hwy
Major Road

National Park/Monument
GSENM Boundary
Tribal Lands
State Boundaries
County Boundaries

FERC Project Number: 12966-001
BLM Serial Numbers: AZA-34941 UTU-85472

N

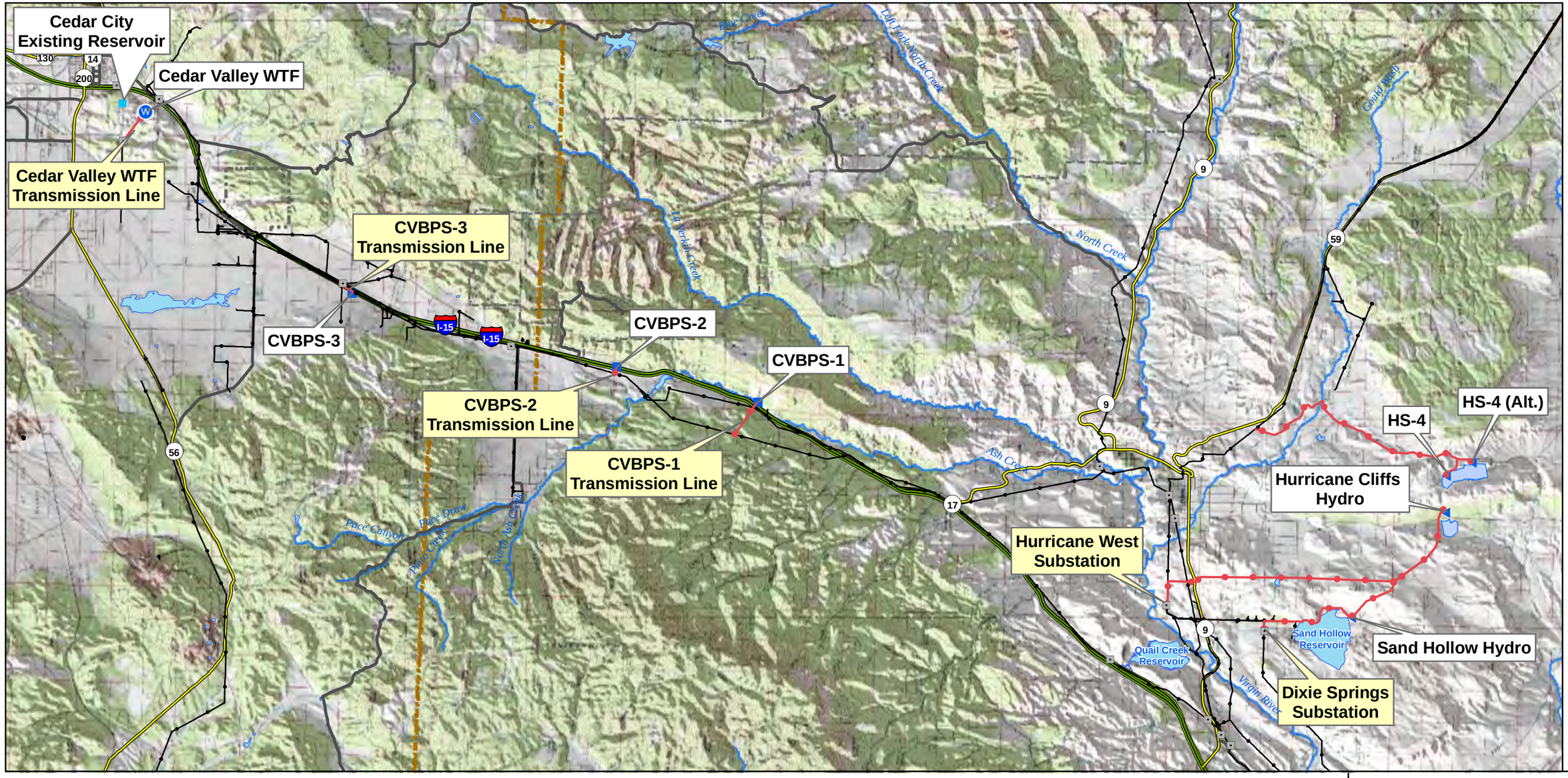
0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 1-8** MWH

Lake Powell Pipeline Transmission Line Alternatives West



Water Treatment Facility
Project Pump Station
Project Hydro Station

Existing Substation
Project Substation
Project Transmission Line
Existing Transmission Line
Existing OH Primary Line
Existing UG Primary Line

Interstate
US Highway
ST Highway
Hwy
Major Road

Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams
National Park/Monument
County Boundaries
Tribal Lands

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

0 1 2 4 6 8 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 1-9** MWH

Cedar Valley Transmission Line Alternatives

1.3 Summary Description of No Lake Powell Water Alternative

The No Lake Powell Water Alternative would involve a combination of developing remaining available surface water and groundwater supplies, developing reverse osmosis treatment of existing low quality water supplies, and reducing residential outdoor water use in the WCWCD and CICWCD service areas. This alternative could provide a total of 86,249 acre-feet of water annually to WCWCD, CICWCD and KCWCD for M&I use without diverting Utah's water from Lake Powell.

1.3.1 WCWCD No Lake Powell Water Alternative

The WCWCD would implement other future water development projects currently planned by the District, develop additional water reuse/reclamation, and convert additional agricultural water use to M&I use as a result of urban development in agricultural areas through 2020. Remaining planned and future water supply projects through 2020 include the Ash Creek Pipeline (5,000 acre-feet per year), Crystal Creek Pipeline (2,000 acre-feet per year), and Quail Creek Reservoir Agricultural Transfer (4,000 acre-feet per year). Beginning in 2020, WCWCD would convert agricultural water to secondary use and work with St. George City to maximize existing wastewater reuse, bringing the total to 96,258 acre-feet of water supply per year versus demand of 98,427 acre-feet per year, incorporating currently mandated conservation goals. The WCWCD water supply shortage in 2037 would be 70,000 acre-feet per year, 1,000 acre-feet more than the WCWCD maximum share of the LPP water. Therefore, the WCWCD No Lake Powell Water Alternative needs to develop 69,000 acre-feet of water per year to meet comparable supply and demand requirements as the other action alternatives.

The WCWCD would develop a reverse osmosis (RO) advanced water treatment facility near the Washington Fields Diversion in Washington County, Utah to treat up to 40,000 acre-feet per year of Virgin River water with high total dissolved solids (TDS) concentration and other contaminants. The RO advanced water treatment facility would produce up to 36,279 acre-feet per year of water suitable for M&I use. The WCWCD would develop the planned Warner Valley Reservoir to store the diverted Virgin River water, which would be delivered to the RO advanced water treatment facility. The remaining 3,721 acre-feet per year of brine by-product from the RO treatment process would require evaporation and disposal meeting State of Utah water quality regulations.

The remaining needed water supply of 32,721 acre-feet per year to meet WCWCD 2037 demands would be obtained by reducing and restricting outdoor residential water use in the WCWCD service area. The Utah Division of Water Resources (UDWR) estimated 2005 culinary water use for residential outdoor watering in the communities served by WCWCD was 97.4 gallons per capita per day (gpcd) (UDWR 2009). This culinary water use rate is reduced by 30.5 gpcd to account for water conservation attained from 2005 through 2020, yielding 66.9 gpcd residential outdoor water use available for conversion to other M&I uses. The equivalent water use rate reduction to generate 32,721 acre-feet per year of conservation is 56.6 gpcd for the 2037 population within the WCWCD service area. Therefore, beginning in 2020, the existing rate of residential outdoor water use would be gradually reduced and restricted to 10.3 gpcd, or an 89.4 percent reduction in residential outdoor water use.

The combined 36,279 acre-feet per year of RO product water and 32,721 acre-feet per year of reduced residential outdoor water use would equal 69,000 acre-feet per year of M&I water to help meet WCWCD demands through 2037.

1.3.2 CICWCD No Lake Powell Water Alternative

The CICWCD would implement other future groundwater development projects currently planned by the District, purchase agricultural water from willing sellers for conversion to M&I uses, and convert additional agricultural water use to M&I use as a result of urban development in agricultural areas through 2020. Remaining planned and future water supply projects through 2020 include additional groundwater development projects (3,488 acre-feet per year), agricultural conversion resulting from M&I development (3,834 acre-feet per year), and purchase agricultural water from willing sellers (295 acre-feet per year). Beginning in 2020, CICWCD would have a total 19,772 acre-feet of water supply per year versus demand of 19,477 acre-feet per year, incorporating required progressive conservation goals. The CICWCD water supply shortage in 2060 would be 11,470 acre-feet per year. Therefore, the CICWCD No Lake Powell Water Alternative needs to develop 11,470 acre-feet of water per year to meet comparable supply and demand limits as the other action alternatives.

The remaining needed water supply of 11,470 acre-feet per year to meet CICWCD 2060 demands would be obtained by reducing and restricting outdoor residential water use in the CICWCD service area. The UDWR estimated 2005 culinary water use for residential outdoor watering in the communities served by CICWCD was 84.5 gpcd (UDWR 2007). A portion of this residential outdoor water would be converted to other M&I uses. The equivalent water use rate to obtain 11,470 acre-feet per year is 67.8 gpcd for the 2060 population within the CICWCD service area. Therefore, the existing rate of residential outdoor water use would be gradually reduced and restricted to 16.7 gpcd beginning in 2023, an 80 percent reduction in the residential outdoor water use rate between 2023 and 2060. The 11,470 acre-feet per year of reduced residential outdoor water use would be used to help meet the CICWCD demands through 2060.

1.3.3 KCWCD No Lake Powell Water Alternative

The KCWCD would use existing water supplies and implement future water development projects including new groundwater production, converting agricultural water rights to M&I water rights as a result of urban development in agricultural areas, and developing water reuse/reclamation. Existing water supplies (4,039 acre-feet per year) and 1,994 acre-feet per year of new ground water under the No Lake Powell Water Alternative would meet projected M&I water demand of 6,033 acre-feet per year within the KCWCD service area through 2060. The total potential water supply for KCWCD is about 12,140 acre-feet per year (4,039 acre-feet per year existing culinary plus secondary supply, and 8,101 acre-feet per year potential for additional ground water development up to the assumed sustainable ground water yield) without agricultural conversion to M&I supply. Short-term ground water overdrafts and new storage projects (e.g., Jackson Flat Reservoir) would provide reserve water supply to meet demands during drought periods and other water emergencies.

1.4 Summary Description of the No Action Alternative

No new intake, water conveyance or hydroelectric features would be constructed or operated under the No Action Alternative. The Utah Board of Water Resources' Colorado River water rights consisting of 86,249 acre-feet per year would not be diverted from Lake Powell and would continue to flow into the Lake until the water is used for another State of Utah purpose or released according to the operating guidelines. Future population growth as projected by the Utah Governor's Office of Planning and Budget (GOPB) would continue to occur in southwest Utah until water and other potential limiting resources such as developable land, electric power, and fuel begin to curtail economic activity and population in-migration.

1.4.1 WCWCD No Action Alternative

The WCWCD would implement other future water development projects currently planned by the District, develop additional water reuse/reclamation, convert additional agricultural water use to M&I use as a result of urban development in agricultural areas, and implement advanced treatment of Virgin River water. The WCWCD could also limit water demand by mandating water conservation measures such as outdoor watering restrictions. Existing and future water supplies under the No Action Alternative would meet projected M&I water demand within the WCWCD service area through approximately 2020. The 2020 total water supply of about 96,528 acre-feet per year would include existing supplies, planned WCWCD water supply projects, wastewater reuse, transfer of Quail Creek Reservoir supplies, and future agricultural water conversion resulting from urban development of currently irrigated lands. Each future supply source would be phased in as needed to meet the M&I demand associated with the forecasted population. The No Action Alternative would not provide WCWCD with any reserve water supply (e.g., water to meet annual shortages because of drought, emergencies, and other losses). Maximum reuse of treated wastewater effluent for secondary supplies would be required to meet the projected M&I water demand starting in 2020. The No Action Alternative would not provide adequate water supply to meet projected water demands from 2020 through 2060. There would be a potential water shortage of approximately 139,875 acre-feet per year in 2060 under the No Action Alternative (UDWR 2008b).

1.4.2 CICWCD No Action Alternative

The CICWCD would implement future water development projects including converting agricultural water rights to M&I water rights as a result of urban development in agricultural areas, purchasing “buy and dry” agricultural water rights to meet M&I demands, and developing water reuse/reclamation. The Utah State Engineer would act to limit existing and future ground water pumping from the Cedar Valley aquifer in an amount not exceeding the assumed sustainable yield of 37,600 ac-ft per year. Existing and future water supplies under the No Action Alternative meet projected M&I water demand within the CICWCD service area during the planning period through agricultural conversion of water rights to M&I use, wastewater reuse, and implementing “buy and dry” practices on irrigated agricultural land. Each future water supply source would be phased in as needed to meet the M&I demand associated with the forecasted population. The CICWCD No Action Alternative includes buying and drying of agricultural water rights covering approximately 8,000 acres between 2005 and 2060 and/or potential future development of West Desert water because no other potential water supplies have been identified to meet unmet demand. The No Action Alternative would not provide CICWCD with any reserve water supply (e.g., water to meet annual shortages because of drought, emergencies, and other losses) after 2010 (i.e., after existing supplies would be maximized).

1.4.3 KCWCD No Action Alternative

The KCWCD would use existing water supplies and implement future water development projects including new ground water production, converting agricultural water rights to M&I water rights as a result of urban development in agricultural areas, and developing water reuse/reclamation. Existing water supplies (4,039 acre-feet per year) and 1,994 acre-feet per year of new ground water under the No Action Alternative would meet projected M&I water demand of 6,033 acre-feet per year within the KCWCD service area through 2060. The total potential water supply for KCWCD is about 12,140 acre-feet per year (4,039 acre-feet per year existing culinary plus secondary supply, and 8,101 acre-feet per year potential for additional ground water development up to the assumed sustainable ground water yield) without agricultural conversion to M&I supply. Short-term ground water overdrafts and new storage projects (e.g., Jackson Flat Reservoir) would provide reserve water supply to meet demands during drought periods and other water emergencies.

1.5 Identified Issues

The following wildlife and habitat issues were raised during the public and agency scoping and informational process:

- What would be the impact of the LPP Project on wildlife habitats and species in the study area?
- What would be the impact of the LPP Project on big game critical seasonal ranges and migration routes?

1.6 Impact Topics

The following impact topics are analyzed in this study report:

- Wildlife habitats
- Wildlife populations
- Big game critical seasonal ranges and migration routes

Chapter 2
Methodology

2.1 Introduction

This study report analyzes general wildlife and their habitats. Federally listed threatened, endangered and candidate species, and species of federal, state and agency concern are analyzed in Study Report 13, Special Status Wildlife Species and Habitats. This chapter describes the data used in the analysis, assumptions used in the analysis and impact analysis methodology.

2.2 Data Used

The analysis of wildlife and habitat used data described in Draft Study Report 15, Vegetative Community Mapping (LSD 2010) and observations of wildlife made by vegetation surveyors during their field work. Additional wildlife data were used from the Utah Division of Wildlife Resources Conservation Data Center (UCDC 2010), the Utah GIS Portal (AGRC 2010), the Arizona Game and Fish Department Natural Heritage Program Data Management System (HDMS 2010), NatureServe (NatureServe 2010) and standard field guides for wildlife species (National Geographic Field Guide to the Birds of North America, Mammals of North America). Utah critical winter wildlife habitat data were obtained from AGRC (AGRC 2010); Arizona critical habitats were obtained from the Arizona Bureau of Land Management Geographic Information Systems (GIS) website (BLM 2010). Impacts were analyzed for the Lake Powell Pipeline (LPP) Project study area as defined in the LPP Project Study Area Map Book and associated GIS data.

Analysis of construction and facility operation noise impacts used data from Study Report 7, Noise, and methodology previously described in the Utah Lake Drainage Basin Water Delivery System (ULS) Wildlife Resources and Habitat Technical Report (CUWCD 2005). The noise analysis is contained in Appendix A.

2.3 Assumptions

The analysis used the following assumptions of noise impacts on wildlife habitat:

- Highways are equivalent to linear sound sources.
- Construction sites are equivalent to point sound sources.
- The noise threshold for possible effects on wildlife is 60 decibels (dBA). Noise levels between 60 to 70 dBA would have minor negative impact on wildlife habitat values, 70 to 80 dBA would have moderate negative impact, over 80 dBA would have high negative impact.
- Construction noise would not affect areas that are predominantly urban in character and those areas can be eliminated from potential noise impacts on habitat.

The analysis used the following assumptions of construction disturbance on wildlife habitat.

- Vegetation communities immediately outside of the vegetation survey area would generally be similar to the contiguous surveyed communities and would be available for dispersal of wildlife species away from construction disturbance.

- Habitats temporarily disturbed by pipeline construction would be revegetated with native plant species and would regain significant habitat value after two to three growing seasons.

2.4 Impact Analysis Methodology

2.4.1 Wildlife Habitat

Vegetation communities mapped in Draft Study Report 15 (LSD 2010) were spatially analyzed with Geographic Information Systems (GIS) to determine the area of each major ecological region impacted by permanent habitat removal, temporary construction disturbance revegetated to pre-existing conditions, habitat values reduced by temporary noise impacts and impacts from operational and maintenance activities. Details of the methodology used to determine noise impacts are shown in Appendix A, including a map of habitats subject to noise impacts. Where noise impacts from two or more features overlapped, they were clipped to prevent "double counting."

Maps showing wildlife critical winter range or migration corridors were also spatially analyzed by GIS for impacts on these ranges by LPP Project construction, operations and maintenance activities.

2.4.2 Wildlife Populations

Observations of wildlife recorded on data sheets during vegetation community mapping were compiled by major ecological region (Colorado Plateau, Mohave Desert, and Great Basin). After review of the vegetation community spatial data and community descriptions, it was determined that the mosaic of individual vegetation communities and overlap of vegetation species and structure between communities would make analysis of wildlife populations at the vegetation community level exceedingly complex.

Recorded wildlife observations were used if they met the following criteria:

- Global Positioning System (GPS) data associated with an observation were sufficient to place the observation within one of the major ecological regions crossed by the study area, based on Draft Study Report 15, Appendix B, Map B-3, Ecological Regions (LSD 2010). GPS boundaries used for analysis were: Colorado Plateau Ecological Region – east of Universal Transverse Mercator (UTM) 2951000E (generally the Hurricane Cliffs); Mohave Desert Ecological Region – west of UTM 2951000E and south of UTM 4128000N; Great Basin Ecological Region – north of UTM 4128000N. Google Earth® was used to establish the general boundaries of the ecological regions. If GPS parameters were not recorded for an observation, it was not included in the analysis unless there was additional specific location information (e.g. "Reservation Survey", "Kane County") sufficient to place the observation within an ecological region.

- Wildlife observations were identified sufficiently in the field notes to determine genus and species. General observations, such as "lizard" or "rattlesnake," were not used unless species range maps or descriptions of habitat utilized indicated that only one such species occurs in the ecological regions crossed by the study area.

- Wildlife sign, including carcasses, cast antlers, distinctive ground markings (e.g. tracks, burrows) or other evidence (e.g. typical middens) were included when sufficient to identify a genus or species.

Wildlife species lists were augmented with species potentially present in ecological regions, but not observed. Common wildlife species in the study area were derived from sources listed in Section 2.2, including range maps and occurrence data.

Impacts on wildlife species were analyzed by general habitats utilized and changes in those habitats that would be caused by construction or operation and maintenance of LPP Project features and facilities. Impacts on populations from loss or fragmentation of habitat were evaluated in terms of minimum home range requirements and migration patterns, where known. Some species may require a critical area of contiguous habitat; other species are able to utilize a wider range of habitats or habitats that are not contiguous. Indirect impacts on wildlife populations caused by activities associated with construction and operation or maintenance of the LPP Project were determined based on best professional judgment. Direct and indirect impacts were quantified and compared to significance criteria to determine significant impacts.

Chapter 3
Affected Environment (Baseline Conditions)

3.1 Impact Area (Study Area)

The impact area (or study area) includes the following:

- Corridors (approximately 120 feet wide) along the areas directly affected by construction of pipelines and associated features (e.g. pressure valves and drains), access roads, new or upgraded transmission lines and associated features (e.g. transformers, switch stations), pump stations and associated features (e.g. parking, forebays, afterbays), generation stations and associated features (e.g. parking, transformers, switch stations), construction staging areas, and reservoirs and associated features (e.g. dikes, overflows)

- Areas affected by noise and human activity that may impact wildlife habitat values or wildlife population behavior or migration patterns

- Streams and rivers and associated riparian vegetation that could have alterations in flow from baseline conditions under operations of the LPP Project

Figures 3-1, 3-2 and 3-3 show the overall study area for the LPP Project alternatives. Maps of noise impact areas are contained in Appendix A. Detailed maps of project features and facilities are contained in Chapter 1.

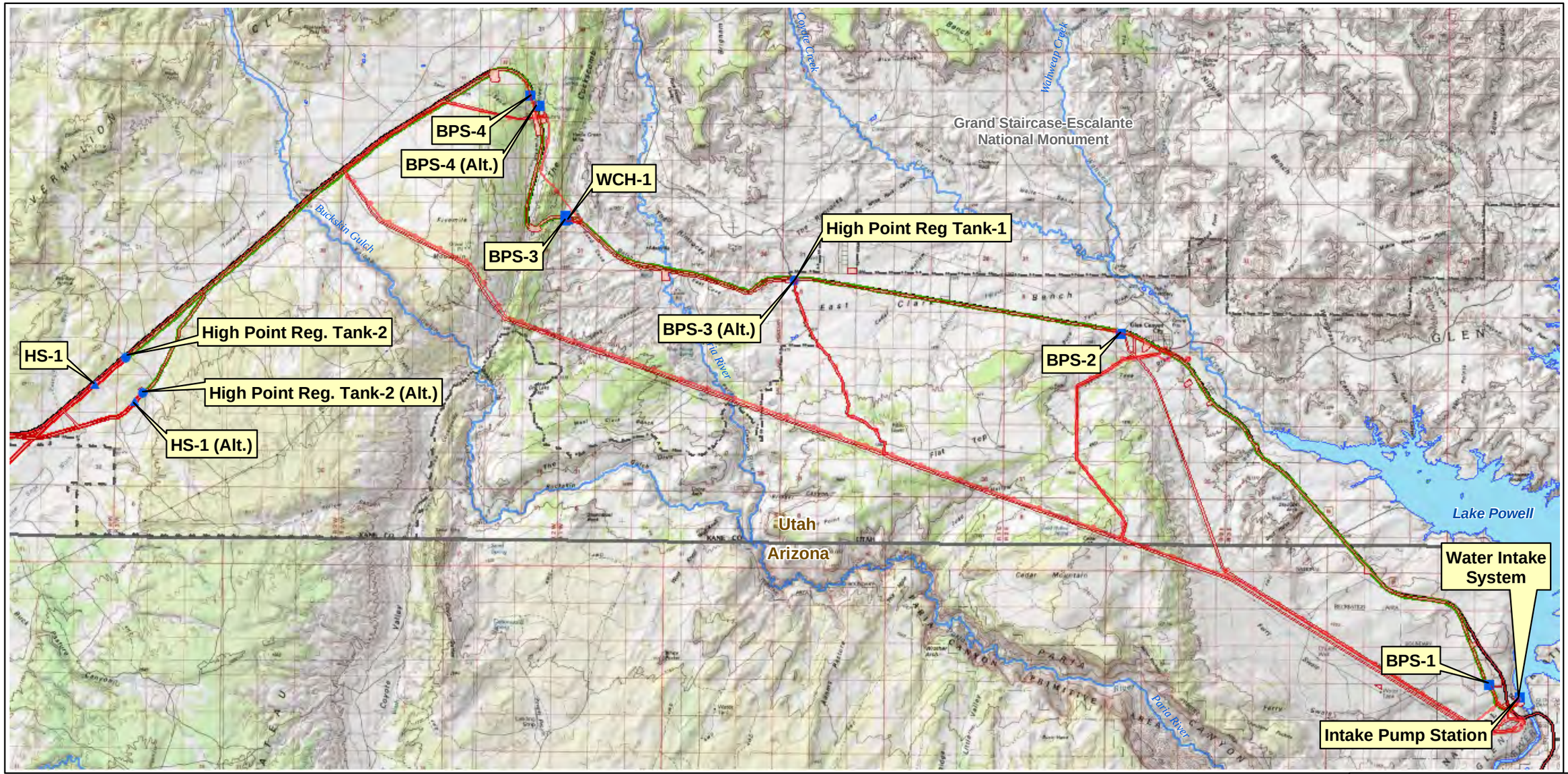
3.2 Overview

Plant communities, local topography, elevation, proximity to water, soil type, disturbance from human activities and livestock grazing generally characterize wildlife habitats and values in the study area. The 240 miles of pipeline and penstocks in the study area and 152 miles of transmission line corridors in the study area traverse a wide range of vegetation communities that provide wildlife habitats for a broad range of potential wildlife species. Approximately 14 percent of the alternative corridors are within or adjacent to developed areas, existing highway right-of-ways, access roads, transmission line right-of-ways or other disturbed areas that have reduced habitat and wildlife values (LSD 2010).

3.3 Wildlife Habitat

The Draft Vegetative Community Mapping Study Report (LSD 2010) describes 34 plant communities in the study area. The vegetation communities are defined by three major ecological regions: the Colorado Plateau Ecological Region, the Great Basin Ecological Region, and the Mohave Desert Ecological Region.

Each major ecological region is subdivided into “ecological systems” that are equivalent to definable vegetation communities (LSD 2010). A total of 19,977.8 acres were surveyed. Detailed descriptions and maps of these communities are included in the Vegetation Communities Report and will not be duplicated here. The vegetation mapping survey included 300 or 600-foot corridors surrounding features of the LPP Project; the wider corridor was surveyed in areas with greater potential for sensitive plant species, based

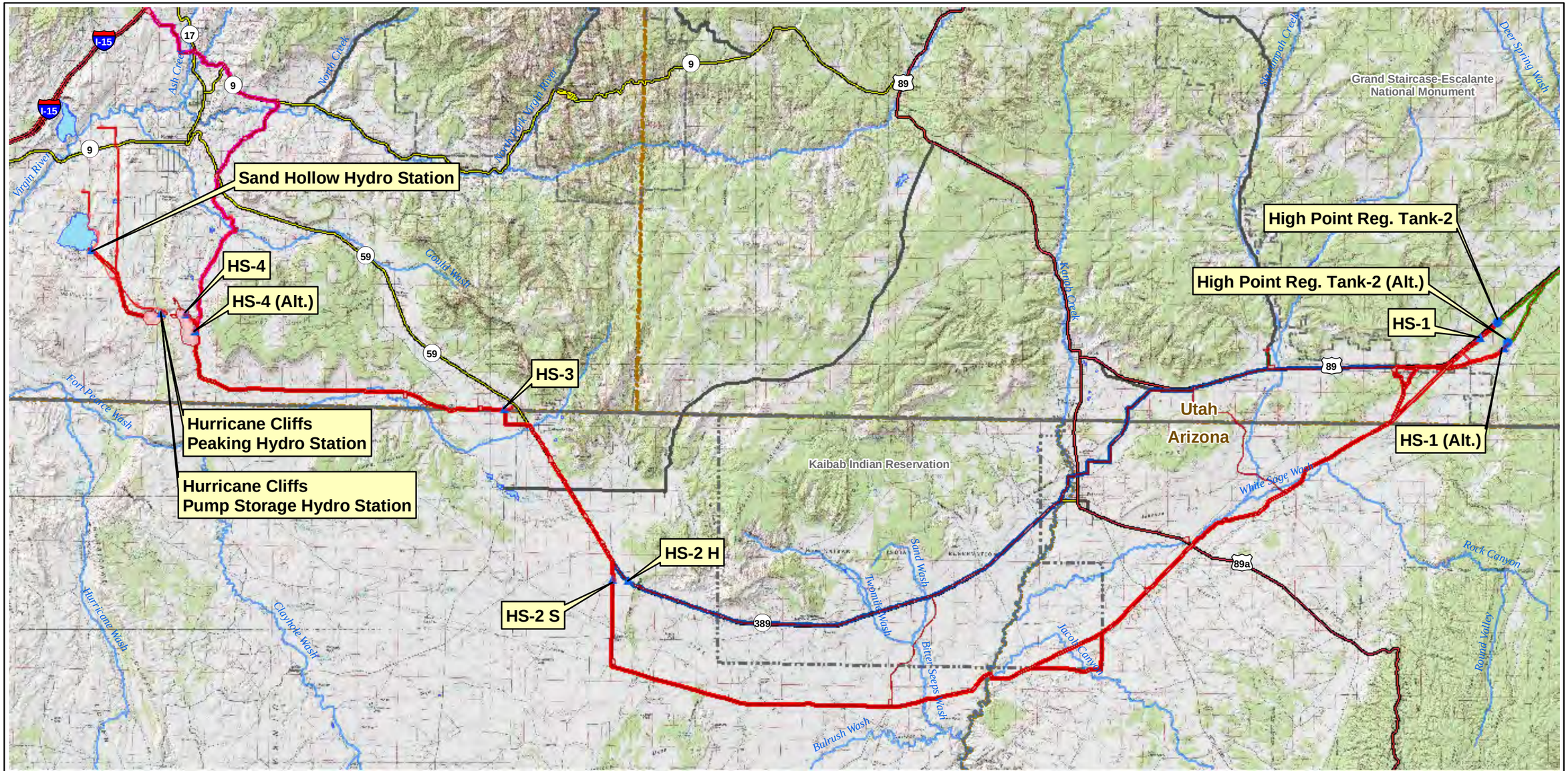


Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 3-1** MWH

Lake Powell Pipeline Water Conveyance System Study Area



- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- 250 ft Study Area
- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Major Rivers & Streams
- Water Conveyance System
- Hydro System - South Alignment Alternative
- Hydro System - Existing Highway Alignment Alternative
- Kane County Pipeline System
- Cedar Valley Pipeline System
- Proposed Transmission Lines
- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road
- National Park/Monument
- GSENM Boundary
- Tribal Lands
- State Boundaries
- County Boundaries

FERC Project Number: 12966-001
BLM Serial Numbers: AZA-34941 UTU-85472

N

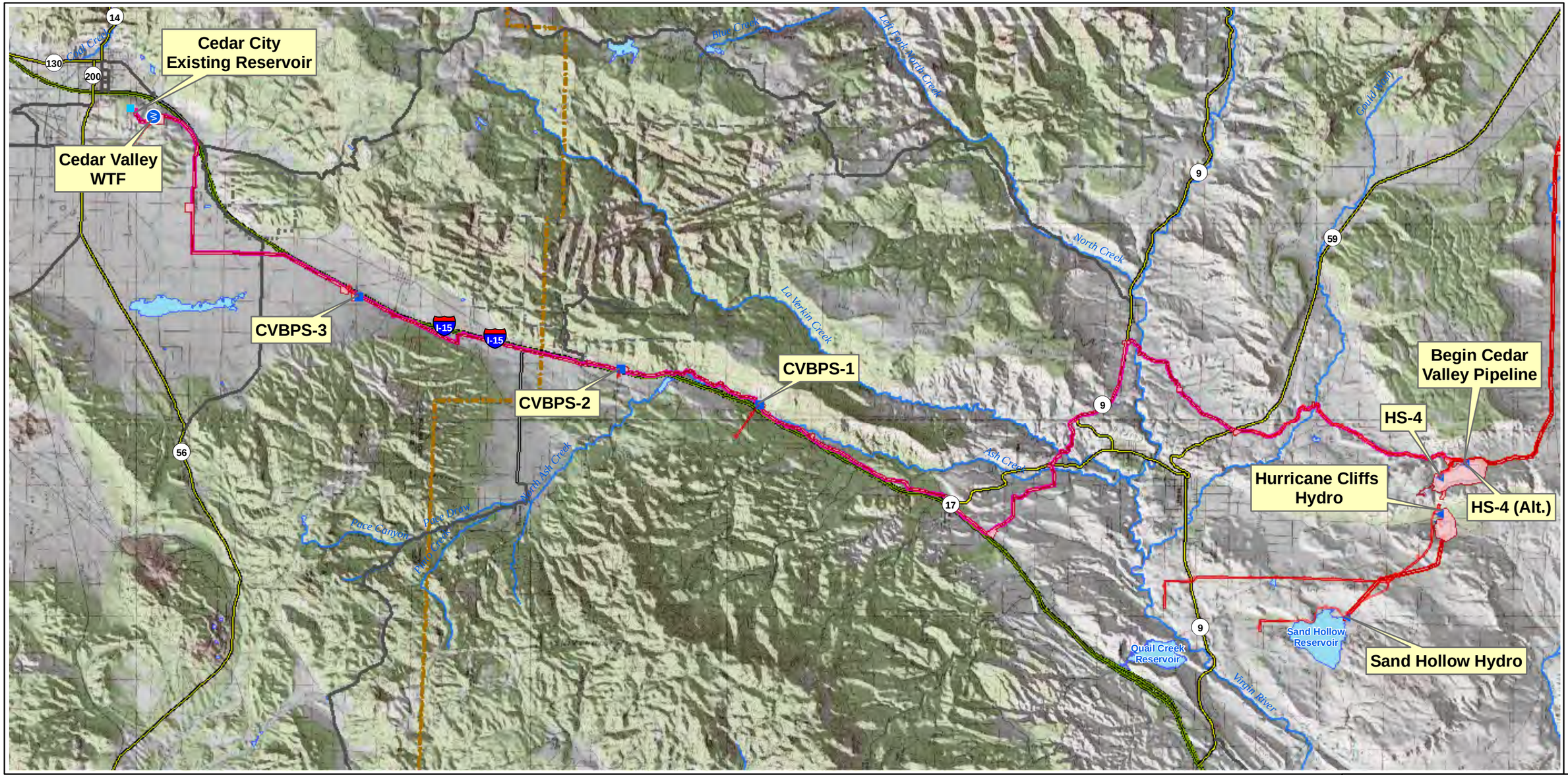
0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 3-2** MWH

Lake Powell Pipeline Hydro System Study Area



- Water Treatment Facility
- Project Pump Station
- Project Hydro Station
- 250 ft Study Area
- Hydro System Lake Powell Pipeline
- Hurricane Cliffs Pressure Tunnel
- Cedar Valley Pipeline
- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road
- Proposed Transmission Lines
- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Major Rivers & Streams
- National Park/Monument
- County Boundaries
- Tribal Lands

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N

0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 3-3** MWH

Cedar Valley Pipeline System Study Area

on soil type and geologic substrate. The survey area, including corridor widths, is shown on Map 2-1 of the Draft Vegetative Communities Study Report. For the purposes of this report, the vegetation communities are considered potential wildlife habitats. The vegetation communities are not uniform segments along the project corridors, but are a mosaic of communities, both longitudinally and transversely in the corridors (see LSD 2010, Appendix E for detailed mapping of the vegetation communities in the survey area). The vegetation communities are listed with surveyed acreages in Table 3-1, are shown in Figure 3-4 and are briefly summarized in following sections. Big game seasonal crucial ranges and migration routes are considered separately. Utah Division of Wildlife Resources designates crucial seasonal ranges based on habitat values rather than vegetation community type (AGRC 2010).

Table 3-1
Vegetation Communities in the LPP Project Study Area

Vegetation Community Type	Acreage in Study Area
Colorado Plateau Ecological Region	
Colorado Plateau Active and Stabilized Dune	332.4
Colorado Plateau Big Sagebrush Shrubland	3,279.8
Colorado Plateau Blackbrush-Mormon-tea Shrubland	2,263.1
Colorado Plateau Grassland	565.2
Colorado Plateau Greasewood Flat	185.7
Colorado Plateau Gypsum Badland	807.5
Colorado Plateau Juniper Savanna	152.9
Colorado Plateau Lower Montane Riparian Woodland and Shrubland	125.2
Colorado Plateau Mixed Bedrock Canyon and Tableland	475.8
Colorado Plateau Mixed Desert Scrub	4,130.2
Colorado Plateau Mixed Low Sagebrush Shrubland	187.3
Colorado Plateau Pinyon-Juniper Woodland	866.9
Colorado Plateau Shrub Steppe	1,703.9
Colorado Plateau Volcanic Rock and Cinder Land	76.3
Colorado Plateau Wash	98.8
Total	**15,251**
Mohave Desert Ecological Region	
Mohave Desert Active and Stabilized Dune	165.4
Mohave Desert Blackbrush-Mormon-tea Shrubland	44.4
Mohave Desert Creosotebush-White Bursage Desert Scrub	572.7
Mohave Desert Gypsum Badland	28.8
Mohave Desert Lower Montane Riparian Woodland and Shrubland	18.0
Mohave Desert Mixed Desert Scrub	212.2
Mohave Desert Shrub-Steppe	121.8
Mohave Desert Volcanic Rock and Cinder Land	50.1
Mohave Desert Wash	2.4
Total	**1215.8**
Great Basin Ecological Region	
Great Basin Big Sagebrush Shrubland	165.4
Great Basin Blackbrush-Mormon-tea Shrubland	2.2
Great Basin Chaparral	63.9
Great Basin Gambel Oak - Mixed Montane Shrubland	7.0
Great Basin Greasewood Flat	64.9
Great Basin Lower Montane Riparian Woodland and Shrubland	12.9
Great Basin Mixed Desert Scrub	22.8
Great Basin Pinyon Juniper Woodland	296.5

Table 3-1
Vegetation Communities in the LPP Project Study Area

Vegetation Community Type	Acreage in Study Area
Great Basin Ecological Region	
Great Basin Semi-Desert Grassland	4.3
Great Basin Volcanic Rock and Cinder Land	1.2
Total	**641.1**
Grand Total	**17,107.9**

Source: Lake Powell Pipeline Draft Vegetation Communities Study Report, Logan Simpson Design, 2010.

Several incidental land classes were also described in the vegetation community survey, including quarries (45.9 acres), reservoirs (4.8 acres), ruderal (disturbed herbaceous) vegetation (793.5 acres) and stock ponds (4.1 acres). These areas generally have reduced wildlife habitat value, although quarries, reservoirs and stock ponds may serve as potential water sources in a generally arid environment and may provide wildlife habitats in riparian vegetation at their margins.

Developed lands in the surveyed study area totaled 349 acres, 263.8 acres of paved roads and 241.3 acres of graded roads. Invasive upland vegetation totaled 1,167.5 acres. These areas were not considered significant wildlife habitat for impact analysis.

All reduced value habitat and non-habitat areas totaled 2,869.9 acres, approximately 14.4 percent of the vegetation survey area.

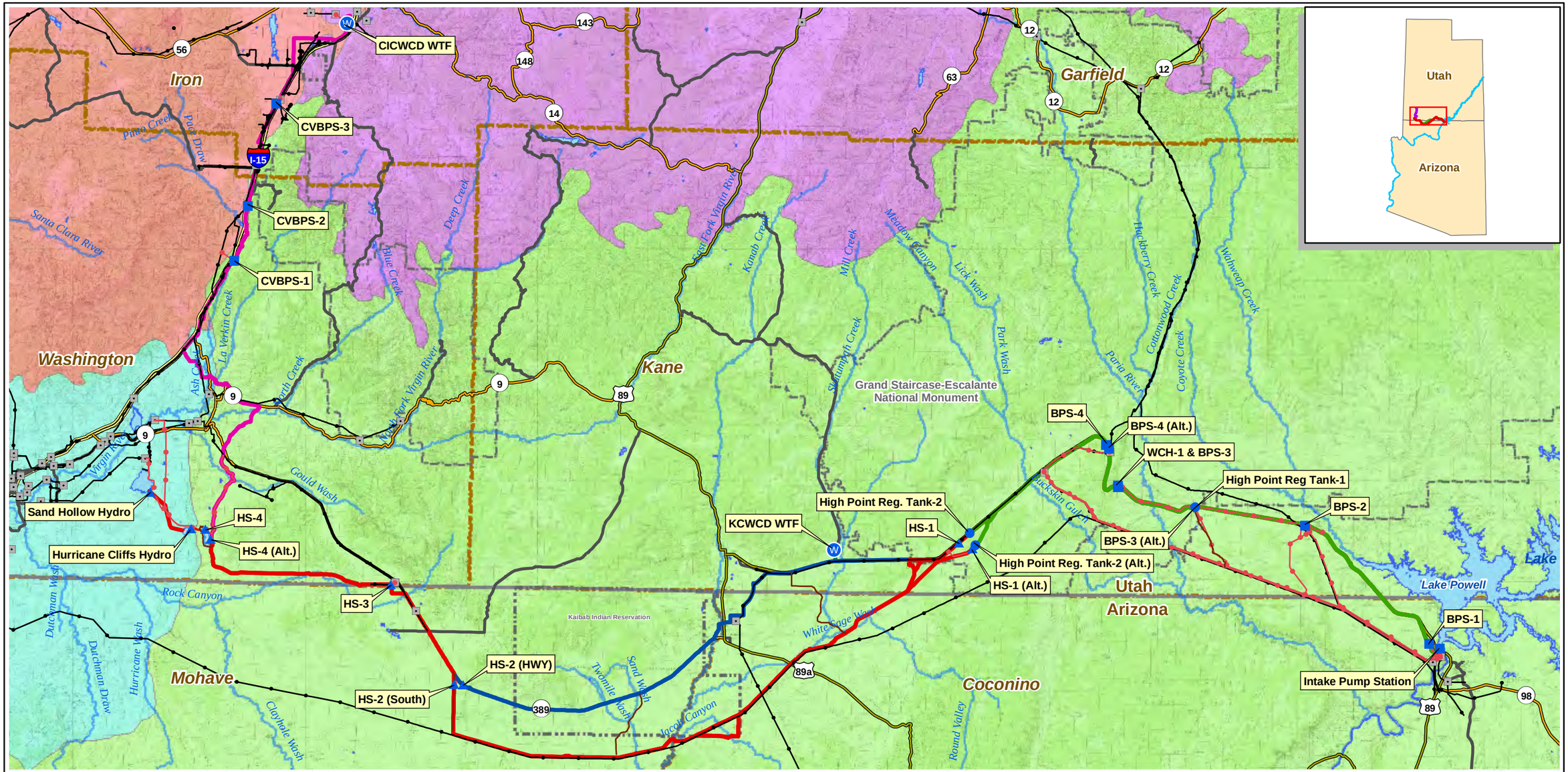
3.3.1 Colorado Plateau Ecological Region and Vegetation Communities

The Colorado Plateau Ecological Region covers all of the LPP study area in Kane County, Utah, most of the study area in Washington County, Utah, and all the study area in Coconino and Mohave Counties, Arizona. The Colorado Plateau includes all of the LPP Project Water Intake System, Water Conveyance System and Hydro System and electrical transmission lines from Lake Powell to the top of the Hurricane Cliffs. The elevation of the Colorado Plateau in the project study area ranges from approximately 3,740 feet above mean sea level (MSL) to 5,695 feet MSL. Average rainfall ranges from 6.5 inches annually at Page, Arizona to 13.6 inches annually at Kanab, Utah.

The Colorado Plateau region comprises 76 percent of the total vegetation community survey area and contains 15 vegetation communities described briefly in the following sections (LSD 2010).

3.3.1.1 Colorado Plateau Active and Stabilized Dune

The active and stabilized dune community is predominantly found within the western portion of the Colorado Plateau Region. The only two exceptions to this are along Highway 389 west of Mount Trumbull Road and along Highway 89 just west of Fredonia. Sand sagebrush (*Artemisia filifolia*) and big sagebrush (*Artemisia tridentata*) are the dominant species associations. This ecological system is most frequently a sparse shrubland, shrubland, or dwarf shrubland.



Ecoregion
- Colorado Plateau
- Great Basin
- Mojave Desert
- Utah High Plateaus

- Water Treatment Facility
- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- Access Roads
- Project Transmission Line
- Existing Substation
- Existing Transmission Line

- Water Conveyance System
- Hydro System - South Alignment Alternative
- Hydro System - Highway Alignment Alternative
- Kane County Pipeline System
- Cedar Valley Pipeline System
- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Major Rivers & Streams

- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road

- National Park/Monument
- GSENM-Boundary
- Tribal Lands
- State Boundaries
- County Boundaries

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

0 2.5 5 10 15 20 Miles

N

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure 3-4** MWH

Ecological Regions

3.3.1.2 Colorado Plateau Big Sagebrush Shrubland

The second largest Colorado Plateau community in area, comprising 22 percent of the Colorado Plateau region, the big sagebrush shrubland community is found predominantly within the central portion of the Colorado Plateau region. Occurrences were documented from the Cockscomb in the east to nearly La Verkin in the west. The areas of greatest concentration for Big Sagebrush Shrubland are from approximately three miles east of Kanab along Highway 89 to the Cockscomb for the northern proposed pipeline alignment, and from the east edge of the Kaibab Paiute Indian Reservation west to where the southern alignment joins Highway 89. Additional areas of higher concentration include just west of Colorado City and along the Honeymoon trail south of Highway 59. This ecological system is primarily shrubland or sparse understory shrubland with big sagebrush (*Artemisia tridentata*) as the dominant species association.

3.3.1.3 Colorado Plateau Blackbrush-Mormon-tea Shrubland

The third largest Colorado Plateau community in area, comprising 15 percent of the Colorado Plateau region, the blackbrush-Mormon-tea shrubland occupies three distinct areas within the Colorado Plateau Region. Within the western portion of the Colorado Plateau Region Blackbrush-Mormon-tea Shrubland is a dominant ecological system. High concentrations were documented from the Nephi Twist south and east along SR 9, south to Highway 59, south along the Honeymoon trail, along the east and southern edges of the forebay, and continuing east to just west of Canaan Gap. Further east occurrences were documented along Highway 389 at the intersection with Yellowstone Road, along Yellowstone Road to the south, and just east of Yellowstone Road along the proposed pipeline corridor. The remainder of the occurrences documented were within the eastern portion of the Region. This ecological system is commonly shrubland or dwarf-shrubland; occasionally sparse shrubland; and rarely wooded shrubland, shrub herbaceous vegetation or herbaceous vegetation. Blackbrush (*Coleogyne ramosissima*) with Nevada jointfir (*Ephedra nevadensis*), forbs and grasses are the most common plant associations.

3.3.1.4 Colorado Plateau Grassland

This grassland community is found scattered throughout the central portion of the Colorado Plateau Region. This community is primarily herbaceous vegetation or shrub herbaceous vegetation, and rarely a mosaic of sparse vegetation and herbaceous vegetation. It has generally been overgrazed. James' galleta (*Pleuraphis jamesii*) is the most common plant association.

3.3.1.5 Colorado Plateau Greasewood Flat

The greasewood flat community is found sporadically throughout the Colorado Plateau Region. It had been documented from as far east as the Paria River to Short Creek near Canaan Gap (west of Colorado City). The greatest concentration of greasewood flats occurred near Fredonia. Here it was documented on both the east and west sides of Highway 89, where the proposed pipeline crosses the highway. Greasewood (*Sarcobatus vermiculatus*) is a "halophyte" adapted to alkaline or saline soils. This community is frequently a shrubland, occasionally a sparse shrubland, and rarely shrub herbaceous vegetation in a complex with shrubland dominated by greasewood.

3.3.1.6 Colorado Plateau Gypsum Badland

The gypsum badland community is found in three distinct reaches within the region. From east to west, the first area is located along both the northern and southern proposed pipeline corridors from the Kanab and Fredonia area east for approximately 16 miles, including areas along Eight Mile Gap. The second

area is located from Kanab Creek in Fredonia west to the Pipe Springs National Monument turnoff along Highway 389. The third area is located south from SR 9 (east of La Verkin), south across Highway 59, along the Honeymoon Trail. Gypsum badlands are most commonly comprised of sparse shrublands and shrublands, occasionally sparse vegetation, woodland and dwarf shrublands with numerous plant associations, no one of which is dominant.

3.3.1.7 Colorado Plateau Juniper Savanna

Juniper savanna is found in three distinct areas within the Colorado Plateau Region. From west to east, the first occurrences are within the southern portion of the forebay, just west of the Honeymoon Trail (south of Highway 59); the second occurrences are more centrally located, approximately three miles west of the Pipe Springs National Monument turnoff along Highway 389; the third and most easterly occurrences are located west of the Cedar Mountains along both the proposed pipeline corridor and the transmission line corridor. Within the LPP Project study area, this community is variously a sparse woodland, wooded shrubland, and wooded herbaceous vegetation dominated by little Utah juniper (*Juniperus osteosperma*).

3.3.1.8 Colorado Plateau Lower Montane Riparian Woodland Shrubland

This community is found scattered throughout the Colorado Plateau Region. It is most often found adjacent to rivers, creeks, washes, and vegetated stock ponds. It is commonly shrubland, occasionally sparse shrubland, and rarely woodland, forest, shrub herbaceous vegetation, or sparse vegetation. Tamarisk (Tamarix spp.) is the most common species.

3.3.1.9 Colorado Plateau Mixed Bedrock Canyon and Tableland

This community had greater numbers of occurrences within the eastern portion of the project area along the southern transmission line corridor. It is comprised of sparse vegetation, occasionally shrubland, infrequently sparse woodland, and rarely sparse dwarf shrubland, wooded dwarf shrubland, sparse shrubland, woodland, wooded shrubland, or dwarf shrubland. Nevada jointfir (*Ephedra nevadensis*) was the most common plant association.

3.3.1.10 Colorado Plateau Mixed Desert Scrub

Mixed desert scrub is found throughout the Colorado Plateau region and has the largest area – 27 percent – of the Colorado Plateau survey area. It is most commonly a shrubland, and less commonly a dwarf shrubland or sparse shrubland. Broom snakeweed (*Gutierrezia sarothrae*) and sand sagebrush (*Artemisia filifolia*) are the most common plant associations.

3.3.1.11 Colorado Plateau Mixed Low Sagebrush Shrubland

This small community is found within the central portion of the Colorado Plateau Region. Occurrences were documented along the transmission line corridor from the west side of the Cedar Mountains to Highway 89, on either side of Buckskin Gulch along Highway 89, along the southern pipeline corridor from Highway 89A to Mount Trumbull Road, and along Mount Trumbull Road. Mixed low sagebrush shrubland is frequently a shrubland, sparse shrubland or dwarf shrubland. Black sagebrush (*Artemisia nova*) dominates.

3.3.1.12 Colorado Plateau Pinyon-Juniper Woodland

The pinyon-juniper woodland is found scattered throughout the Colorado Plateau Region. From east to west, occurrences are concentrated south of Highway 59 along the Honeymoon Trail adjacent to the forebay area; west of Colorado City along the proposed pipeline corridor; southeast of Colorado City scattered along Highway 389 to Pipe Springs; and along both Highway 89 and the transmission line to the south from the Kanab area to immediately east of Cedar Mountain. It is most commonly a woodland, less commonly a sparse woodland, occasionally a sparse understory woodland. Little Utah juniper (*Juniperus osteosperma*) dominates the plant associations.

3.3.1.13 Colorado Plateau Shrub Steppe

The fourth most common community in the Colorado Plateau region, with 11 percent of the surveyed area, Colorado Plateau Shrub-Steppe occurred in three distinct areas within the Region; the majority of these are centrally located. Very few occurrences were documented east of the Cockscomb. The vast majority were found along the southern pipeline corridor from the Johnson's Wash area to Yellowstone Road and along highway 389 from Fredonia to Yellowstone Road. The third area is west of Colorado City from Canaan Gap to the forebay and north to Highway 59 and SR 9. It is most frequently a dwarf shrubland, shrubland, sparse dwarf shrubland, or shrub herbaceous vegetation. It has numerous plant associations, of which broom snakeweed (*Gutierrezia sarothrae*) is the most common.

3.3.1.14 Colorado Plateau Volcanic Rock and Cinder Land

All occurrences of this small community were documented south of Highway 59 along the Honeymoon Trail and within the northern area of the forebay, just west of the Honeymoon Trail. It is variously comprised of shrubland, sparse shrubland, shrub herbaceous vegetation, herbaceous vegetation, and probably wooded shrubland. Blackbrush (*Coleogyne ramosissima*) is the most common plant association.

3.3.1.15 Colorado Plateau Wash

Over 40 individual washes were documented across the proposed pipeline and transmission line corridors within the Colorado Plateau Region. Many were too small to be mapped on the 1:3,780 scale aerial imagery most commonly used in the LPP Project study area. Thus, the occurrences of this community represent washes wide enough to be accurately delineated; across a 300 foot or 600 foot corridor, this is equal to an average minimum mapping area of 0.3 acre. Washes are shrubland, occasionally sparse shrubland or sparse vegetation, and rarely dwarf shrubland, woodland or sparse woodland with over 12 shrubs and trees as dominant species.

3.3.2 Mohave Desert Ecological Region and Vegetation Communities

The Mohave Desert Ecological Region in the LPPP study area is located entirely within Washington County, Utah and contains the Hydro System Hurricane Cliffs afterbay, penstock alternatives to the Sand Hollow Hydro Station and associated electrical transmission lines. It also includes a short segment of the Cedar Valley Pipeline along State Highway 9 from its intersection with State Highway 17 to the Interstate 15 corridor just south of Anderson Junction. The elevation of the Mohave Desert in the project study area ranges from approximately 3,380 feet MSL to 3,770 feet MSL. Average rainfall is 8.3 inches annually at St. George, Utah.

The Mohave Desert region comprises six percent of the vegetation survey area and contains nine vegetation communities described briefly in the following sections.

3.3.2.1 Mohave Desert Active and Stabilized Dune

This community is found in two distinct areas within the Mohave Desert region of the project area. The northern area is just south and east of the Interstate15 and SR 17 interchange. The southern area contours the southeast edge of Sand Hollow Reservoir. It is typically a shrubland, occasionally a wooded shrubland where little Utah juniper (*Juniperus osteosperma*) has invaded and rarely a sparse shrubland in the creosote bush (*Larrea tridentata*) alliance. Sand sagebrush (*Artemisia filifolia*) is the most common alliance.

3.3.2.2 Mohave Desert Blackbrush-Mormon-tea Shrubland

This community occurs in two distinct areas within the Mohave Desert region of the project area. The northern area is west of the community of Toquerville, just west of Ash Creek. The southern area falls in the vicinity of Quail Creek Reservoir, occurring to the northwest (adjacent to I-15), south (north of the Virgin River), and east (south and east of the Virgin River). It is either shrubland or sparse shrubland with blackbrush (*Coleogyne ramosissima*) dominant.

3.3.2.3 Mohave Desert Creosotebush-White Bursage Desert Scrub

This community is widespread throughout the Mohave Desert region and has the largest area (47 percent) of the vegetation survey in the region. It is most commonly associated with relatively flat upland habitats and is commonly a shrubland, less commonly a sparse shrubland. Creosote bush (*Larrea tridentate*) dominates.

3.3.2.4 Mohave Desert Gypsum Badland

This community is found along the eastern edge of the Harrisburg Cliffs along the southwest edge of Quail Creek Reservoir. It is exclusively sparse vegetation comprised of Nevada jointfir (*Ephedra nevadensis*) and Torrey's jointfir (Ephedra *torreyana*).

3.3.2.5 Mohave Desert Lower Montane Riparian Woodland and Shrubland

This community is found sporadically throughout the Mohave Desert region in association with both major and minor drainages. Some examples include Ash Creek, Ash Creek inflow to Quail Creek Reservoir, the outflow from Quail Creek Reservoir, the Virgin River, Sand Hollow Reservoir, as well as areas associated with agricultural water usage. It is commonly sparse shrubland, occasionally woodland, shrubland, or shrub herbaceous vegetation dominated by tamarisk (*Tamarix* spp.).

3.3.2.6 Mohave Desert Mixed Desert Scrub

The second largest community in the Mohave Desert region (17 percent of surveyed area) is found throughout the Mohave Desert region. One area of greater concentration is just west of the community of Toquerville, west of Ash Creek. It is comprised of shrubland and dwarf shrubland and occasionally sparse dwarf shrubland. The most common alliance is broom snakeweed (*Gutierrezia sarothrae*).

3.3.2.7 Mohave Desert Shrub-Steppe

This community is found predominantly south of SR 9 within Hurricane between Interstate 15 and the Hurricane Cliffs. It is commonly dominated by herbaceous vegetation with less than10 percent shrub

cover. The big galleta/broom snakeweed association (*Pleuraphis rigida* / *Gutierrezia sarothrae*) is the most common.

3.3.2.8 Mohave Desert Volcanic Rock and Cinder Land

This community is found scattered throughout the Mohave Desert region in association with rock outcrops and rock lands. It is either herb or shrub dominated, generally with blackbrush (*Coleogyne ramosissima*) or creosote (*Larrea tridentata*).

3.3.2.9 Mohave Desert Wash

The two occurrences of this community represent washes wide enough to accurately delineate located just west of the Hurricane Cliffs, approximately seven miles south of the city of Hurricane, in association with the afterbay. It is either a shrubland or a sparse shrubland of broom snakeweed (*Gutierrezia sarothrae*).

3.3.2 Great Basin Ecological Region and Vegetation Communities

The Great Basin Ecological Region in the LPP study area is located in Washington and Iron Counties, Utah, beginning at the junction of the Cedar Valley Pipeline with the Interstate 15 corridor and extending to the project terminus near Cedar City, Utah. The elevation of the Great Basin in the project study area ranges from approximately 3,770 feet MSL to 5,820 feet MSL. Average rainfall is 10 inches annually at Cedar City, Utah.

Lava flow topography represents much of the project immediately north of Anderson Junction, abruptly changing to valleys north of Ash Creek Reservoir. The Great Basin Region comprises three percent of the vegetation survey area and contains 10 vegetation communities described briefly in the following sections.

3.3.3.1 Great Basin Big Sagebrush Shrubland

This community is throughout the Great Basin region of the project area and is the second largest with 26 percent of the vegetation survey area (165.4 acres) in the Great Basin region. It is comprised of both shrublands and sparse shrublands. Beetle Mountain big sagebrush (*Artemisia tridentata* ssp. *Vaseyana*) dominates.

3.3.3.2 Great Basin Blackbrush-Mormon-tea Shrubland

This tiny community (2.2 acres) is confined to remnant strands of sand on abandoned sand mines at the Ranch Exit (Exit 36) on Interstate 15, south of Ash Creek Reservoir. It is strictly a shrubland comprised of sand sagebrush (*Artemisia filifolia*).

3.3.3.3 Great Basin Chaparral

All of the occurrences of chaparral occur along Ash Creek east of Interstate 15 and north of Anderson Junction (the Interstate 15 and SR 17 interchange). Most of the occurrences are found adjacent to Great Basin Pinyon-Juniper Woodlands. It is most commonly a wooded shrubland and occasionally a shrubland or complex of wooded dwarf-shrubland and wooded shrubland. Scrub oak – little Utah juniper (*Quercus turbinella - Juniperus osteosperma*) and manzanita (*Arctostaphylos pungens*) are the dominant associations.

3.3.3.4 Great Basin Gambel Oak – Mixed Montane Shrubland

Only three occurrences of this community, totaling seven acres, were documented within the project area. They occur south of the community of Kanarraville, west of Interstate 15 and near the Harris Gubler Reservoir. It is exclusively a sparse shrubland dominated by Gambel oak (*Quercus gambelii*).

3.3.3.5 Great Basin Greasewood Flat

Greasewood flat is found within the northern portion of the Great Basin region south of the historic community of Hamilton's Fort, west of Interstate 15. It is comprised of either shrublands or sparse shrublands dominated by greasewood (*Sarcobatus vermiculatus*).

3.3.3.6 Great Basin Lower Montane Riparian Woodland and Shrubland

This community is scattered throughout the Great Basin region on both the east and west side of Interstate 15. The majority of occurrences are concentrated along Ash Creek, south of the Ash Creek Reservoir and east of Interstate 15. It is commonly comprised of either woodland or sparse woodland communities dominated by Fremont cottonwood (*Populus fremontii*).

3.3.3.7 Great Basin Mixed Desert Scrub

There are only three occurrences of mixed desert scrub within the southern Great Basin region. It is found just northeast of the community of Pintura, along Interstate 15 interspersed with private property including agricultural land and invasive upland vegetation. It is comprised of either sparse shrubland or shrub herbaceous vegetation. Blackbrush (*Coleogyne ramosissima*) and broom snakeweed (*Gutierrezia sarothrae*) associations dominate.

3.3.3.8 Great Basin Pinyon-Juniper Woodland

The most common community in the Great Basin region, with 46 percent of the surveyed area, pinyon-juniper woodland occurs from Cedar City south to Anderson Junction, on both the east and west side of Interstate 15. It is generally a woodland and occasionally a sparse woodland or wooded shrubland. Little Utah juniper/big sagebrush (*Juniperus osteosperma / Artemisia tridentata*) associations dominate.

3.3.3.9 Great Basin Semi-Desert Grassland

This community occurs once both within the northern portion and the southern portion of the Great Basin region. The northern occurrence is located near Cedar City and is interspersed with Great Basin Big Sagebrush shrubland and agricultural lands. The southern occurrence is located just north of Pintura on the east side of Interstate 15 and is interspersed with Great Basin Pinyon-Juniper Woodland. It is strictly herbaceous vegetation comprised of Jame's galleta (*Pleuraphis jamesii*).

3.3.3.10 Great Basin Volcanic Rock and Cinder Land

The one occurrence of this community (1.2 acres) is located just north of Pintura on the east side of Interstate 15 and is interspersed with Great Basin Pinyon-Juniper Woodland and invasive upland vegetation. It is a shrubland comprised of narrow leaf yerba santa (*Eriodictyon angustifolium*).

3.3.4 Big Game Crucial Ranges and Migration Routes

The Utah Division of Wildlife Resources (UDWLR) has established areas that are crucial seasonal ranges for mule deer, desert bighorn sheep and pronghorn; species that occur in the LPP Project study area. UDWLR classifies seasonal ranges on the basis of distribution, abundance, forage availability and availability to the animals. "Crucial habitat" is defined as "sensitive use areas that, because of limited abundance and/or unique qualities, constitute irreplaceable crucial requirements for high interest wildlife." Additional areas are recognized as important seasonal migration routes, especially for mule deer. Figure 3-5 shows the designated crucial seasonal ranges for these species contained in GIS files in the Utah GIS Portal (AGRC) and the Arizona Game and Fish Division Heritage Data Management System (HDMS), which contain "crucial" and "high value" seasonal big game ranges in Arizona. Species crucial ranges are discussed in the following sections.

3.3.4.1 Mule Deer

Mule deer seasonal habitat is shown in Figure 3-5. Utah mule deer crucial winter range lies west of the Cockscomb and south of Highway 89, on Little Creek Mountain, and along the Cedar Valley corridor of Interstate 15 (AGRC 2010). There is a recognized migration route for the Paunsaugunt mule deer herd that migrates across Highway 89 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 and motorist warning signs have been installed in high-use deer crossing locations.

Arizona mule deer crucial winter range is located just south of the Utah border from the Coyote Valley to Highway 89A, including the Buckskin Mountain area, and south of the Kaibab Paiute Indian Reservation on both sides of the Kanab Creek canyon (HDMS 2010) . High quality year-long mule deer habitat is located on the Paria Plateau, east of the Kaibab Paiute Indian Reservation both north and south of U.S. Highway 89A, and from the Yellowstone Mesa north along the Cedar Ridge to the Cottonwood Point Wilderness, crossing SR 389 (HDMS 2010).

3.3.4.2 Desert Bighorn Sheep

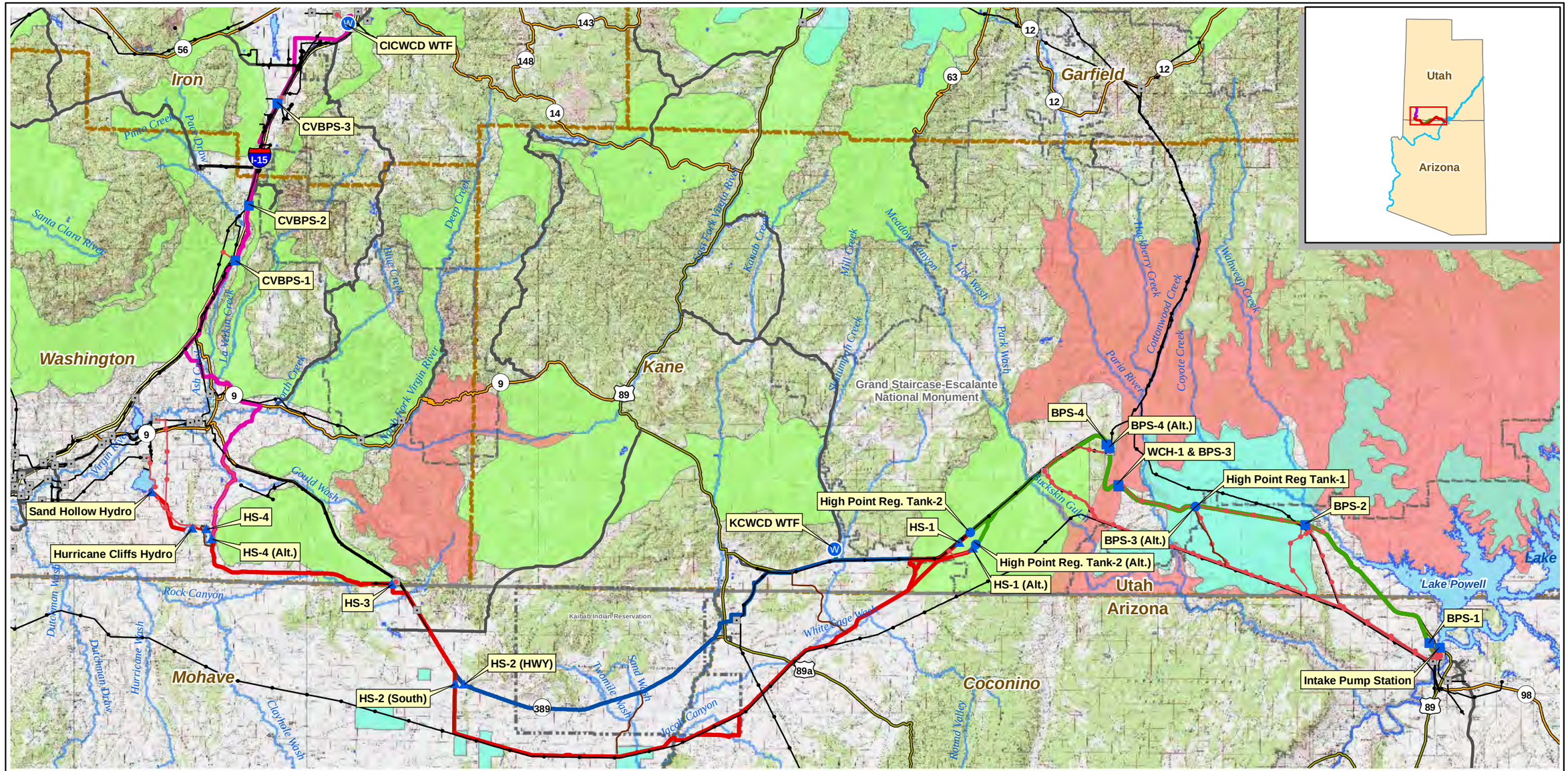
Utah desert bighorn sheep year-round crucial range is shown in Figure 3-5. Utah bighorn sheep crucial winter range is located north of Highway 89 in the Glen Canyon highlands and Fourmile and Jack Riggs Benches areas, and crosses the highway at the Cockscomb, extending south through the Paria Canyon – Vermillion Cliffs Wilderness onto the Paria Plateau in Arizona. Another area of year-long crucial range is located on top of the Vermillion Cliffs and Canaan Mountain in Utah (AGRC 2010).

Arizona bighorn sheep habitat is located on the rim of the Vermillion Cliffs on the Paria Plateau and in the Kanab Creek canyon south of the Kaibab Paiute Indian Reservation (HDMS 2010).

3.3.4.3 Pronghorn

Pronghorn seasonal range is shown in Figure 3-5. There is no crucial pronghorn seasonal range close to the LPP Project study area; there is "high value" year-round pronghorn range on the East Clark Bench on both sides of Highway 89 between Big Water and the Paria River in Utah (AGRC 2010).

Arizona does not define "crucial" pronghorn seasonal range; however, "high quality" pronghorn habitat "with problems" is located south of the Kaibab Paiute Indian Reservation and west of Kaibab Creek and in the Yellowstone Mesa area near the southwest corner of the Reservation (HDMS 2010).


CICWCD WTF
CVBPS-3
CVBPS-2
CVBPS-1
Sand Hollow Hydro
HS-4
HS-4 (Alt.)
Hurricane Cliffs Hydro
HS-3
HS-2 (HWY)
HS-2 (South)
KCWCD WTF
High Point Reg. Tank-2
HS-1
High Point Reg. Tank-2 (Alt.)
HS-1 (Alt.)
BPS-4
BPS-4 (Alt.)
WCH-1 & BPS-3
BPS-3 (Alt.)
High Point Reg Tank-1
BPS-2
BPS-1
Intake Pump Station
Iron
Washington
Kane
Garfield
Mohave
Coconino
Grand Staircase-Escalante National Monument
Kaibab Indian Reservation
Utah
Arizona
Lake Powell
Lake
Pine Creek
Pace Draw
Santa Clara River
La Verkin Creek
Ash Creek
North Creek
Virgin River
North Fork Virgin River
Gould Wash
Deep Creek
Blue Creek
East Fork Virgin River
Kanab Creek
Mill Creek
Meadow Canyon
Smithsonian Creek
Park Wash
Last Chance Creek
Paria River
Hackberry Creek
Cottonwood Creek
Coyote Creek
Wahweap Creek
Buckskin Gulch
Rock Canyon
Dutchman Wash
Dutchman Draw
Hurricane Wash
Clayhole Wash
White Sage Wash
Twomile Wash
Sand Wash
Jacob Canyon
Round Valley
Pronghorn Crucial Habitat
Big Horn Sheep Crucial Habitat
Muledeer Crucial Habitat
Water Treatment Facility
Project Pump Station
Project Regulating Tank
Project Hydro Station
Access Roads
Project Transmission Line
Existing Substation
Existing Transmission Line
Water Conveyance System
Hydro System - South Alignment Alternative
Hydro System - Highway Alignment Alternative
Kane County Pipeline System
Cedar Valley Pipeline System
Interstate
US Highway
ST Highway
Hwy
Major Road
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams
National Park/Monument
GSENM-Boundary
Tribal Lands
State Boundaries
County Boundaries
FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472
0 2.5 5 10 15 20 Miles
N
Lake Powell Pipeline Project
Spatial Reference: UTM Zone 12N, NAD-83
UDWR Figure 3-5 MWH
Big Game
Seasonal Range Map

3.4 Wildlife Populations

A broad range of wildlife species inhabits the ecological regions crossed by the LPP Project study area. Wildlife observed during vegetation communities mapping in each region are listed in tables and additional representative species not observed are presented for each region.

3.4.1 Colorado Plateau Ecological Region Wildlife

Table 3-2 lists wildlife observed in the Colorado Plateau Ecological Region during vegetation communities mapping (LSD 2010).

Table 3-2
Wildlife Observed in the Colorado Plateau Ecological Region

Common Name	Scientific Name
Mammals	
American badger	*Taxidea taxus*
Antelope squirrel	*Ammospermophilus spp.*
Black-tailed jackrabbit	*Lepus caku=ifornicus*
Bobcat	*Lynx rufus*
Chipmunk	*Tamias spp.*
Cottontail rabbit	*Sylvagius spp.*
Coyote	*Canis laterans*
Elk	*Cervus elaphus*
Jackrabbit	*Lepus spp.*
Mule deer	*Odocoileus hemionus*
Pronghorn	*Antilocapra americana*
Rock squirrel	*Spermophilus variegatus*
Woodrat (packrat)	*Neotona spp.*
Birds	
American robin	*Turdus migratorius*
Ash-throated flycatcher	*Myiarchus cinerascens*
Bewick's wren	*Thryornanes bewicki*
Black-chinned hummingbird	*Archilochus alexandri*
Black-throated gray warbler	*Dendroica nigrescens*
Black-throated sparrow	*Amphispiza bilineata*
Bluebird	*Sailia spp.*
Blue-gray gnatcatcher	*Polioptila caerulia*
Brewer's sparrow	*Spizella breweri*
Brown-headed cowbird	*Molothrus ater*
Canyon wren	*Catherpes mexicanus*
Chipping sparrow	*Spizella passerina*
Common poorwill	*Phalaenoptilus nuttalii*
Common raven	*Corus corvax*
Cooper's hawk	*Accipiter cooperii*
Costa's hummingbird	*Calypte costae*
Curve-billed thrasher	*Toxostoma curvirostre*
Gambel's quail	*Callipepia gambelii*
Gray flycatcher	*Empidonax wrightii*

Table 3-2
Wildlife Observed in the Colorado Plateau Ecological Region

Common Name	Scientific Name
Birds	
Greater roadrunner	*Geococcyx californianus*
Great-tailed grackle	*Quiscalus mexicanus*
Green-tailed towhee	*Pipilo chorurus*
Grey vireo	*Vireo vicinior*
Horned lark	*Erenophila alpestris*
House finch	*Carpodacus mexicanus*
House sparrow	*Passer domesticus*
Killdeer	*Charadrius vociferous*
Lark sparrow	*Chondestes grammacus*
Lesser goldfinch	*Carduelis psaltria*
Loggerhead shrike	*Lanius ludovicianus*
Lucy's warbler	*Vermivora luciae*
Mourning dove	*Zenaida macroura*
Northern mockingbird	*Mimus polyglottos*
Northern rough-winged swallow	*Steigidopteryx serripennis*
"Oriole"	*Icterus spp.*
Osprey	*Pandion haliaetus*
Phainopepla	*Phainopepla nitens*
Red tailed hawk	*Buteo jamacensis*
Red-winged blackbird	*Agelaius phoeniceus*
Rock wren	*Salpinctes obsoletus*
Say's phoebe	*Sayorra saya*
Song sparrow	*Melospiza melodia*
Spotted towhee	*Pipilo maculatus*
Turkey vulture	*Cathartes aura*
Violet-green swallow	*Tachycineta thalassina*
"Vireo"	*Vireo spp.*
Western grebe	*Aechmophorus occidentalis*
Western kingbird	*Tyrannus verticalis*
Western scrub jay	*Aphelocoma californica*
Western tanager	*Piranga ludoviciana*
White-crowned sparrow	*Zonotrichia leucophyrus*
Wild turkey (Merriam's)	*Meleagris gallopavo merriami*
Yellow warbler	*Dendroica petichia*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Reptiles	
Coachwhip	*Masticophis flagellum*
Common ground snake	*Sonora semiannulata*
Common lesser earless lizard	*Holbrookia maculate*
Common sagebrush lizard	*Sceloporus graciosus*
Common sideblotched lizard	*Uta stansburiana*
Desert spiny lizard	*Sceloporus magister*
Eastern collared lizard	*Crotaphytus collaris*
Gopher snake	*Pituophis catenifer*
Greater short-horned lizard	*Phrynosoma hernandesi*
Horned lizard	*Rhynosomia spp.*
Long-nosed leopard lizard	*Gambelia wislizenii*

Table 3-2
Wildlife Observed in the Colorado Plateau Ecological Region

Common Name	Scientific Name
Reptiles	
Mountain short-horned lizard	*Phrynosoma hernandesi*
"Rattlesnake"	*Crotalus spp.*
Striped whipsnake	*Masticophis taeniatus*
Western fence lizard	*Sceloporus occidentalis*
Western patch-nosed snake	*Salvadora hexalepis*
Western rattlesnake	*Crotalus viridis*
Western skink	*Eumeces skiltonianus*
Whiptail	*Aspidoscelis spp.*

Representative wildlife species that were not observed in the Colorado Plateau Ecological Region are listed in Table 3-5.

3.4.2 Mohave Desert Ecological Region Wildlife

Table 3-3 lists wildlife observed in the Mohave Desert Ecological Region during vegetation communities mapping (LSD 2010).

Table 3-3
Wildlife Observed in the Mohave Desert Ecological Region

Common Name	Scientific Name
Mammals	
American raccoon	*Procyon lotor*
Antelope squirrel	*Ammospermophila spp.*
Black-tailed jackrabbit	*Lepus californicus*
Cottontail rabbit	*Sylvagius spp.*
Jackrabbit	*Lepus spp.*
Birds	
Ash-throated flycatcher	*Myiarchus cinerascens*
Black-chinned hummingbird	*Archilochus alexandri*
Black-throated sparrow	*Amphispiza bilineata*
Blue-gray gnatcatcher	*Polioptila caerulia*
Brewer's sparrow	*Spizella breweri*
Brown-headed cowbird	*Molothrus ater*
Canyon wren	*Catherpes mexicanus*
Common poorwill	*Phalaenoptilus nuttalii*
Common raven	*Corus corvax*
Gambel's quail	*Callipepia gambelii*
Gray flycatcher	*Empidonax wrightii*
Greater roadrunner	*Geococcyx californianus*
Green-tailed towhee	*Pipilo chorurus*
Grey vireo	*Vireo vicinior*
House Finch	*Carpodacus mexicanus*

Table 3-3
Wildlife Observed in the Mohave Desert Ecological Region

Common Name	Scientific Name
Birds	
House sparrow	*Passer domesticus*
Killdeer	*Charadrius vociferous*
Lark sparrow	*Chondestes grammacus*
Lesser goldfinch	*Carduelis psaltria*
Mourning dove	*Zenaida macroura*
Northern mockingbird	*Mimus polyglottos*
Northern rough-winged swallow	*Steigidopteryx serripennis*
Red tailed hawk	*Buteo jamacensis*
Red-winged blackbird	*Agelaius phoeniceus*
Rock wren	*Salpinctes obsoletus*
Say's phoebe	*Sayorra saya*
Song sparrow	*Melospiza melodia*
Violet-green swallow	*Tachycineta thalassina*
"Vireo"	*Vireo spp.*
Western grebe	*Aechmophorus occidentalis*
Western kingbird	*Tyrannus verticalis*
Western tanager	*Piranga ludoviciana*
White-crowned sparrow	*Zonotrichia leucophyrus*
White-throated swift	*Aeronautes saxatalis*
Yellow warbler	*Dendroica petichia*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Reptiles	
Collared lizard	*Crotaphytus spp.*
Common king snake	*Lampropeltis getula*
Common sideblotched lizard	*Uta stansburiana*
Gopher snake	*Pituophis catenifer*
Horned lizard	*Rhynosomia spp.*
Rattlesnake	*Crotalus spp.*
Sidewinder	*Crotalus cerastes*
Western fence lizard	*Sceloporus occidentalis*
Western rattlesnake	*Crotalus viridis*
Whiptail	*Aspidoscelis spp.*

Representative wildlife species that were not observed in the Mohave Desert Ecological Region are listed in Table 3-5.

3.4.3 Great Basin Ecological Region Wildlife

Table 3-4 lists wildlife species observed in the Great Basin Ecological Region during vegetation communities mapping (LSD 2010).

Table 3-4
Wildlife Observed in the Great Basin Ecological Region

Common Name	Scientific Name
Mammals	
Cottontail rabbit	*Sylvagius spp.*
Elk	*Cervus elaphus*
Ground squirrel	*Spermophilus spp.*
Harris antelope squirrel	*Ammospermophilus harrisii*
Jackrabbit	*Lepus spp.*
Mule deer	*Odocoileus hemionus*
Rock squirrel	*Spermophilus variegatus*
Birds	
American robin	*Turdus migratorius*
Black-throated gray warbler	*Dendroica nigrescens*
Black-throated sparrow	*Amphispiza bilineata*
Blue-gray gnatcatcher	*Polioptila caerulia*
Brewer's sparrow	*Spizella breweri*
Chipping sparrow	*Spizella passarina*
Gambel's quail	*Aphelocoma californica*
Gray flycatcher	*Empidonax wrightii*
Great-tailed grackle	*Quiscalus mexicanus*
Green-tailed towhee	*Pipilo chorurus*
Horned lark	*Erenophila alpestris*
Mourning dove	*Zenaida macroura*
Roadrunner	*Geococcyx californianus*
Spotted towhee	*Pipilo maculatus*
Western kingbird	*Tyrannus verticalis*
Western scrub jay	*Aphelocoma californica*
Wild turkey (Merriam's)	*Meleagris gallopavo merriami*
Yellow warbler	*Dendroica petichia*
Reptiles	
Common sideblotched lizard	*Uta stansburiana*
Great Basin collared lizard	*Crotaphytus bicinctores*
Long-nosed leopard lizard	*Gambelia wislizenii*
Western fence lizard	*Sceloporus occidentalis*
Whiptail	*Aspidoscelis spp.*

3.4.4 Additional Potential Species in the LPP Project Study Area

Table 3-5 lists wildlife species that were not observed during the vegetation communities field survey, but are potentially present in the LPP Project study area (indicated by "X"). This list is not intended to be comprehensive; it includes species representative of the ecological regions. Species would occur in appropriate habitats within the ecological regions and, for migratory species, during appropriate seasons. Species are not necessarily limited to one ecologic region; potential occurrence of listed species in multiple regions is indicated in the table. If a species was observed in one ecological region, but is potential in other regions, it is included in the table (indicated by "O").

A portion of the Cedar Valley Pipeline corridor was surveyed for the Anderson Junction Reservoir and Ash Creek Pipeline Project in 2009 by JBR Environmental Consultants, Inc. (WCWCD 2009). Species observed during that survey are included in Table 3-5 and indicated by an asterisk (*).

Table 3-5
Additional Potential Wildlife Species in the LPP Project Study Area

Common Name	Scientific Name	Colorado Plateau	Mohave Desert	Great Basin
Mammals				
Allen's big-eared bat	*Idinycteris phyllatis*	X	X	
American badger	*Taxidea taxix*	O	X	X
American black bear	*Ursus americanus*	X	X	X
American raccoon	*Procyon lotor*	X	O	X
Arizona woodrat	*Neotoma devia*		X	
Big brown bat	*Eptescius fuscus*	X	X	X
Big free-tailed bat	*Nyctinomops macrotis*	X	X	
Bobcat	*Lynx rufus*	O	X	X
California myotis	*Myotis californicus*	X	X	
Common gray fox	*Urocyon cinereaargenteus*	X	X	X
Cougar	*Puma concolor*			X
Coyote	*Canis laterans*	O	X	X
Deer mouse	*Peromyscis spp.*	X	X	X
Desert shrew	*Notiosorex crawfordi*	X	X	
Desert woodrat	*Neotoma lepida*			X*
Ermine	*Mustala erminea*			X
Golden-mantled ground squirrel	*Sphermopilus lateralis*			X
Kangaroo rat	D*ipodomys spp.*	X	X	X
Little brown myotis	*Myotis lucifugus*	X	X	X
Long-legged myotis	*Myotis volans*	X	X	X
Long-tailed weasel	*Mustela frenata*	X	X	X
North American porcupine	*Erethizon dorsalis*	X	X	X
Red fox	*Vulpes Vulpes*	X		X
Striped skunk	*Mephitus mephitus*	X	X	X
Western spotted skunk	*Spigale gracilus*	X	X	X
Yuma myotis	*Myotis yumaensis*	X	X	
Birds				
American crow	*Corvis bracyrhynchos*	X		X
American kestrel	*Falco sparverius*	X	X	X
Black-capped chickadee	*Poecile atricapillus*	X	X	X
Brewer's blackbird	*Euphagus cyanocephalus*	X	X	X*
Cooper's hawk	*Accipiter cooperii*	O	X	X*
Dark-eyed junco	*Junco hyemalis*			X*
Downy woodpecker	*Picoides pubescens*	X	X	X
European starling	*Sturnus vulgaris*	X	X	X
Great horned owl	*Bubo virginianus*	X	X	X
Hairy woodpecker	*Picoides villosus*	X	X	X
House wren	*Troglodytes aedon*	X	X	X
Juniper titmouse	*Baeolophus ridgwayi*			X*
Mallard	*Anas platyrhynchos*	X	X	X*
Nighthawk	*Chordeiles spp.*	X	X	X

Table 3-5
Additional Potential Wildlife Species in the LPP Project Study Area

Common Name	Scientific Name	Colorado Plateau	Mohave Desert	Great Basin
Birds				
Northern flicker	*Colaptes auratus*	X	X	X
Northern pygmy owl	*Glaucidium gnoma*			X
Plumbeous vireo	*Vireo plumbeus*	X		X
Red-tailed hawk	*Buteo jamacencis*			X*
Sharp-shinned hawk	*Accipiter striatus*	X	X	X*
Steller's jay	*Cyanocitta stelleri*			X*
Swainson's hawk	*Buteo swainsoni*	X	X	X
Western screech-owl	*Megascops kennicotti*	X	X	X
White-breasted nuthatch	*Sitta carolinensus*	X	X	X
Reptiles				
Desert glossy snake	*Arizona elegans philipi*		X	
Desert horned lizard	*Phrynosoma platyrhinos*			X*
Desert spiny lizard	*Sceloporus magister*			X*
Eastern racer	*Coluber constrictor*	X	X	X
Great Basin rattlesnake	*Crotalus oreganus lutosus*			X*
Night snake	*Hypsiglena torquata*	X	X	X
Terrestrial garter snake	*Thamnophis elegans*	X	X	X
Tiger whiptail	*Aspidoscelis tigris*			X*
Western banded gecko	*Coleonyx variegatus*		X	
Amphibians				
Western chorus frog	*Pseudacris triseriata*			X
Tiger salamander	*Ambystoma tigrinum*	X	X	X
Pacific tree frog	*Pseudacris regilla*		X	
Northern leopard frog	*Rana pipiens*	X	X	X
Canyon tree frog	*Hyla arenicolor*	X	X	X
Great Basin spadefoot	*Spea intermontana*	X	X	X

Notes:
X = Wildlife species potentially present in the LPP Project study area (not observed during vegetation communities field surveys
O = Wildlife species observed in one ecological region within LPP Project study area and potentially could occur in other ecological regions
* = Wildlife species observed during wildlife surveys performed in 2009 along portions of the Cedar Valley Pipeline alignment (WCWCD 2009)

Chapter 4
Environmental Consequences (Impacts)

4.1 Significance Criteria

There are no regulatory guidelines for wildlife population or habitat loss or impacts, and the significance criteria are based on past experience with similar projects and best professional judgment.

The following criteria were used to determine significant impacts on wildlife and habitats:

- Project activities resulting in substantial disturbance to wildlife habitat or populations. A substantial disturbance is one that destroys a large area of utilized habitat, disturbs or displaces a resident population or sub-population, or results in losses of a large number of individuals of the species within the Lake Powell Pipeline (LPP) Project study area. Disturbance may arise from direct construction impacts on habitat or indirectly by noise or human activity that would reduce wildlife habitat values. Substantial disturbance is based on the status, population dynamics, behavior, habitat availability and quality for each species group (e.g. game or non-game species) relative to the type, intensity and duration of a specific impact. Species that are locally common or have a high reproductive potential and ability to recognize previously disturbed sites rapidly would have less potential impacts than species with small populations, restricted to limited habitats, have low reproductive potential or limited ability to disperse out of or back into previously disturbed habitats.

- Project activities that would cause a substantial loss (temporary or permanent) or unavailability of big game crucial seasonal range or migration corridors during crucial use periods (as designated by game management agencies).

4.2 Potential Impacts Eliminated From Further Analysis

4.2.1 Construction Phase

No potential impacts were eliminated from further analysis.

4.2.2 Operations and Maintenance Phase

- Noise from operation of booster pump stations or hydro generation stations would not impact wildlife habitat and populations. All operating equipment in the pump stations and hydro stations would be contained within buildings with acoustical shielding, and noise levels outside the structures would not exceed ambient sound levels at 100 feet from the structure. (Study Report 7, Noise).

- Noise from operation of electrical substations and transmission lines would not impact wildlife habitat and populations; electrically-generated sound would not exceed 60 dBA outside of the perimeter of substations or 100 feet from transmission lines (Aspen 2010).

4.2.3 Virgin River Return Flows From LPP Water

Wildlife species and habitats along the Virgin River would not be directly or indirectly impacted by the Lake Powell Pipeline construction or operation. LPP construction activities would terminate at Sand Hollow Reservoir more than three miles east of the Virgin River. LPP project operation would supply raw water to Sand Hollow Reservoir for treatment in the Quail Creek Water Treatment Plant before distribution throughout the Washington County Water Conservancy District (WCWCD) service area. Following water use in homes, businesses and institutions, the wastewater would be treated in wastewater treatment facilities and then further treated in the wastewater reclamation facility for reuse as secondary irrigation water. This water would be stored in existing and approved reservoirs in the St. George metropolitan area and used for outdoor watering. The Utah Division of Water Resources (UDWR) has modeled the Virgin River using the Virgin River Daily Simulation Model (VRDSM) for scenarios involving no LPP water (Base Case) and with LPP water to determine the potential for return flows to the Virgin River that could potentially affect wildlife species and habitat. The VRDSM results indicate that LPP return flows to the Virgin River would be within the measurement accuracy of the USGS gages on the Virgin River and changes in river flows would not be measurable. Therefore, potential impacts on wildlife and habitats along the Virgin River are eliminated from further analysis. A detailed analysis of the VRDSM model results is included in the draft Surface Water Resources Study Report (UBWR 2011).

4.3 Classification of Impacts

Potential impacts from construction, operation and maintenance of LPP Project features and facilities are described in the following sections.

4.3.1 Impacts on Wildlife Habitats

- **Permanent Impacts**: Habitat would be permanently removed by replacement with constructed features such as pipelines and accessories (e.g. valves, drains), pump stations, hydro generating stations, regulating tanks, reservoirs, hard surface or graded roads, parking areas, transmission line tower pads and electrical substations.

- **Temporary Impacts**: Habitat disturbed during construction would be restored and revegetated. Some habitat would be revegetated with a different plant structure, i.e. shrubland or woodland converted to grassland/forbs over a pipeline. In general for the LPP Project, because vegetation communities are relatively patchy, this would create a softer ecotone (boundary between two habitats) as opposed to an abrupt “hard” ecotone such as a highway corridor cleared through a dense forest.

4.3.2 Impacts on Wildlife Populations

- **Direct Impacts**: Impacts resulting from mortality of individual animals from construction by crushing, road kills, loss of nests, death of eggs or nestlings or abandonment of nests before young are fledged or able to forage independently (mammals).

- **Indirect Impacts**: Impacts resulting from changes in land use patterns or levels of human activity, noise, disruption of home ranges or migration routes or alterations in the carrying capacity of habitats. Indirect impacts from construction would be less on nocturnal species because construction would be done during daylight hours.

4.4 South Alternative

The South Alternative would construct, operate and maintain the features and facilities described in Chapter 1, Section 1.2.1 and shown in Figures 1-1, 1-2 and 1-3. Pipelines (water delivery system and penstocks) would have a 100-foot permanent disturbance corridor over the length of the features and 30-foot temporary construction disturbance corridors on either side of the permanent disturbance area (total 60-foot temporary disturbance corridor). The Cedar Valley Pipeline would have a 30-foot permanent disturbance corridor over the length of the feature and 30-foot temporary construction corridors on either side of the permanent disturbance area (total 60-foot temporary disturbance corridor). Footprints of booster pump stations, hydro generation stations, regulating tanks, forebays and afterbays, and access roads associated with those features are included in the permanent disturbance area. Construction staging areas would be temporarily disturbed and revegetated after construction is completed. To avoid "double counting," the footprints of staging areas within either permanent or temporary disturbance areas are not included in the habitat disturbance tables in the following sections; the footprints of staging areas outside of project feature disturbance areas are included in the habitat disturbance tables as temporary impacts.

4.4.1 Construction Phase

4.4.1.2 Wildlife Habitats

Wildlife habitat disturbance areas are analyzed by major ecological region. Areas that do not provide significant habitat values (developed areas, ruderal vegetation, invasive vegetation, stock ponds, paved and graded roads and quarries) are quantified and deducted from overall habitat impacts to reflect the net wildlife habitat disturbance impact.

4.4.1.2.1 Colorado Plateau Ecological Region. The estimated Colorado Plateau habitat area disturbed by construction of the South Alternative is shown in Table 4-1.

Table 4-1
Colorado Plateau Habitat Disturbance from the South Alternative

Overall Impacts		Non-habitat Area Impacts	Net Habitat Area Impacts
Permanent Impacts (acres)	1,536.4	157.2	1,379.2
Temporary Impacts (acres)	1,073.4	142.3	931.1
Total (acres)	**2,609.8**	**299.5**	**2,310.3**

The net permanent habitat impact of 1,379.2 acres would not be significant because of the extensive area of equivalent or better quality habitat immediately adjacent to the construction corridor. Staging areas would add 682.1 acres to the temporary disturbance area. The area of temporary impacts would be restored and revegetated and would regain most of its habitat values within two or three growing seasons. Temporary impacts would not exceed the significance criteria.

4.4.1.2.2 Mohave Desert Ecological Region. The estimated Mohave Desert habitat area disturbed by construction of the South Alternative is shown in Table 4-2.

Table 4-2
Mohave Desert Habitat Disturbance from the South Alternative

Overall Impacts		Non-habitat Area Impacts	Net Habitat Area Impacts
Permanent Impacts (acres)	90.5	17.5	73.0
Temporary Impacts (acres)	65.7	22.5	43.2
Total (acres)	**156.2**	**40.0**	**116.2**

The net permanent habitat impact of 73.0 acres would not be significant because of the extensive area of equivalent or better quality habitat immediately adjacent to the construction corridor. Staging areas would add 56.6 acres to the temporary disturbance area. The area of temporary impacts would be restored and revegetated and would regain most of its habitat values within two or three growing seasons. Temporary impacts would not exceed the significance criteria.

4.4.1.2.3 Great Basin Ecological Region. The estimated Great Basin habitat area disturbed by construction of the South Alternative is shown in Table 4-3.

Table 4-3
Great Basin Habitat Disturbance from the South Alternative

Overall Impacts		Non-habitat Area Impacts	Net Habitat Area Impacts
Permanent Impacts (acres)	66.7	32.1	34.6
Temporary Impacts (acres)	75.6	41.0	34.6
Total (acres)	**142.3**	**73.1**	**69.2**

The net permanent wildlife habitat impacts of 34.6 acres would not be significant because of the extensive area of equivalent or better quality habitat immediately adjacent to the construction corridor. Staging areas would add 117.0 acres to the temporary disturbance area. The area of temporary impacts would be restored and revegetated and would regain most of its habitat values within two or three growing seasons. Temporary impacts would not exceed the significance criteria.

4.4.1.2.4 Big Game Seasonal Ranges and Migration Routes. Big game seasonal ranges and migration routes are analyzed by species in the following sections.

4.4.1.2.4.1 Mule Deer. The South Alternative water delivery pipeline and penstock corridors would cross crucial winter mule deer range and cross a known migration route of the Paunsaugunt mule deer herd along U.S. 89 west of the Cockscomb (Figure 3-5). The pipeline corridors through the mule deer range would be approximately 32.3 miles in length; approximately 235 acres of habitat would be permanently disturbed and an equivalent area would be temporarily disturbed, restored and revegetated. Construction in the area of seasonal range and the migration corridor should occur outside of the periods of high use by the herd, generally November 1 though April 15; in that case, disruption of this habitat would not exceed the significance criteria. Construction of the penstock through the migration route would be placed as far

from U.S. 89 as possible so that it would not interfere with potential future construction of wildlife crossings or underpasses intended to reduce existing mule deer mortality on U.S. 89.

Approximately 4.7 miles of the penstock corridor would cross Arizona mule deer crucial winter range south of the Kaibab Paiute Indian Reservation (Figure 3-5). About 34 acres of this habitat would be permanently disturbed and about 34 acres would be temporarily disturbed, restored and revegetated. These areas of disturbance would not exceed the significance area. During construction, the area within the noise impact area would have temporary reduced habitat values (Appendix A, Figure A-2); construction should be scheduled outside of the high-use season. In that case, noise impacts would not exceed the significance criteria.

A 9.5-mile access road would be constructed between the penstock construction corridor and U.S. 89 east of Fredonia through the Muggins Flat area (Figure 3-5); 0.7 miles of this road would be new construction, totaling about 1.2 acres of permanent disturbance. About 8.8 miles would be upgrades of existing dirt roads. This road crosses approximately five miles of Arizona crucial winter mule deer range. Approximately 3.6 miles of penstock corridor would cross crucial mule deer winter range in Utah between Hildale City and the Canaan Gap; permanent habitat disturbance would be approximately 26 acres with temporary disturbance of an equivalent area.
During construction, the area within the noise impact area would have temporary reduced habitat values (Appendix A, Figure A-2); if possible, construction utilizing this road should be scheduled outside of the high-use season. In that case, impacts would not exceed the significance criteria.

The Cedar Valley Pipeline (CVP) would cross crucial winter mule deer range along the Interstate 15 corridor for a distance of approximately 2.9 miles starting approximately 0.6 miles south of Anderson Junction (Figure 3-5) and a second segment of 0.2 miles 15 miles north; a total of approximately 11.2 acres of habitat would be permanently disturbed. There is no identified migration corridor in this segment of the CVP. The pipeline would be located immediately adjacent to the busy Interstate Highway 15 and construction would create temporary habitat disturbance in the seasonal mule deer range (Appendix A, Figure A-3) for approximately one year; however, because of their proximity to the Interstate and its ambient noise disturbance, the additional noise disturbance would not be significant. The small area of habitat permanently disturbed would not be significant because of the large area of equivalent habitat adjoining the construction corridor.

4.4.1.2.4.2 Desert Bighorn Sheep. The South Alternative would cross year-long crucial bighorn sheep range in the area of the Cockscomb; pump station BPS-1 and hydro station WCH-1 would be located in this area (Figure 3-5). A short (approximately 2,500-foot) access road would also be constructed in this area. The area is not identified as specific migration corridor, but it provides continuity of habitat between Utah and Arizona for Bighorn sheep. All LPPP features would be constructed within or adjacent to the U.S. 89 right-of way and would cause temporary additional disturbance in the bighorn sheep seasonal (Appendix A, Figure A-1) for a period of up to one year. However, it is unlikely that this added disturbance would materially impact sheep migration patterns or exceed the significance criteria.

Project features do not cross Arizona bighorn sheep habitat (Figure 3-5); there would be no impacts on seasonally important Arizona bighorn sheep range.

4.4.1.2.4.3 Pronghorn. There is crucial pronghorn winter range on the East Clark Bench on both sides of U.S. 89 between Big Water and the Paria River in Utah; approximately 14.8 miles of the Water Delivery System pipeline corridor would be placed within the U.S. 89 right-of-way (ROW) through this area (Figure 3-5). Approximately 108 acres of crucial pronghorn range would be permanently disturbed, although its proximity to the highway would make it unlikely that this habitat would be a significant resource for pronghorns.

There would be two pipeline construction staging areas totaling 14.3 acres in potential crucial pronghorn habitat; both would be placed within existing developed lands and would not impact pronghorn seasonal range.

High quality pronghorn habitat "with problems" is located in Arizona south of the Kaibab Paiute Indian Reservation west of Kaibab Creek and on Yellowstone Mesa (Figure 3-5). The Hydro System penstock would be constructed across these areas. The penstock corridor would cross approximately 1.1 miles of the eastern habitat area and a 25-acre construction staging area would also be located in this area. An existing dirt road would be upgraded extending north from the pipeline corridor across the eastern habitat area for approximately 0.9 miles. The penstock would cross approximately 3.3 miles of high quality habitat near Yellowstone Mesa and a 28-acre construction staging area would also be located in that area. Permanent habitat disturbance would be approximately 40 acres; this would not be significant because of the extensive area of equivalent habitat adjacent to the Project study area.

Permanent habitat disturbance would not be significant because of the extensive area of equivalent habitat adjacent to the Project study area. Although there would be temporary human activity and noise disturbance that would reduce habitat values in the described areas during construction (Appendix A, Figures A-1, A-2), impacts would not meet the significance criteria. Construction staging areas would be restored and revegetated and would regain most of their habitat values within two or three growing seasons. Coordination with the Utah Division of Wildlife Resources should be done to schedule construction outside of pronghorn high use periods in the construction corridors.

4.4.1.3 Wildlife Populations

4.4.1.3.1 Direct Impacts. The estimated area of net permanent habitat impacts (1,486.8 acres) is small relative to the available surrounding habitat area; much of the construction corridor is located in or adjacent to areas of existing land use or disturbance that would reduce its habitat value. Construction could cause mortality of some small mammals and reptiles that would not be able to disperse from the site. Most mammals, birds and larger reptiles would disperse from construction sites and direct mortality would not be expected. Small animals could fall into open trenches and be buried by placement of fill or concrete. Clearing or trees and other vegetation could cause mortality of bird eggs or nestlings if performed during the nesting season; construction corridors should be cleared outside of the nesting and fledging period. Flooding of newly-created reservoirs could drown small animals that would be unable to disperse from the area of inundation.

Procedures to avoid and minimize these impacts are described in Chapter 5, Mitigation and Monitoring. It would be unlikely that any wildlife population would be placed at risk or that direct impacts on wildlife populations or species would meet the significance criteria.

4.4.1.3.2 Indirect Impacts. Most wildlife species would disperse from temporary construction and noise disturbances into abundant adjacent habitats. It is estimated that the active construction impact on any given point along a pipeline corridor would be about 10 work days (with a noise/activity buffer of 1,250 feet (equal to 70 dBA) in front of and behind the construction site – total 2,500 feet (see Appendix A) – and estimated construction progress of 250 feet per day). After restoration and re-vegetation, temporarily disturbed areas would regain much of their habitat values in two or three growing seasons. It is possible that some wildlife populations could be impacted if adjacent habitats were not suitable or were already at carrying capacity and some small terrestrial species could be permanently displaced from their home ranges, but it would be unlikely that these impacts would place any population at risk or exceed the significance criteria.

4.4.2 Operations and Maintenance Phase

4.4.2.1 Wildlife Habitats

4.4.2.1.1 General Wildlife Habitats. It is anticipated that LPP Project pumping stations and hydro generating stations would be operated using electronic Supervisory Control and Data Acquisition (SCADA) systems, minimizing disturbance from human presence and traffic noise. Onsite visits are estimated to take place weekly to these facilities. Human presence at the large intake facility would likely be on a daily basis. Except for hydro stations on top of the Hurricane Cliffs, all of these facilities would be located proximate to existing highways and human visitation activity would not cause sufficient additional disturbance during operations to raise impacts to the level of the significance criteria. Occasional maintenance surveys along pipeline corridors would not cause significant disturbance.

Restored and revegetated pipeline corridors would not act as barriers to movement or migration of wildlife populations and after revegetation is complete in two or three growing seasons, home ranges would not be significantly impacted. Some revegetated areas may have higher quality habitat than existed before disturbance and long-term impacts could be positive, although the magnitude of those positive impacts cannot be estimated.

Recreational activities (all terrain vehicle (ATV) or off-road vehicle (ORV)) could increase on maintenance roads along revegetated pipeline corridors and direct (road kill) and indirect (noise and activity) impacts are possible, but the level of impacts would not likely place any population at risk or exceed the significance criteria. Access controls at road heads could minimize potential impacts.

Draining of the water delivery system pipeline or hydro system penstock may be required for periodic maintenance, most likely annually. The specific locations of drains in either feature are not available at this time, pending final engineering design; however, drains would be located at low points in the pipelines or penstocks and these would correspond to natural drainages in the construction corridor. The 69-inch pipeline or penstock diameter translates to a volume of approximately 3.2 acre-feet per mile of pipe. Release of project water into existing drainages would be equivalent to natural storm events and a single annual release would not change existing riparian habitat or alter the baseline topography of the study area. Impacts from water releases would not exceed the significance criteria.

4.4.2.1.2 Big Game Seasonal Ranges and Migration Routes

4.4.2.1.2.1 Mule Deer. High Point Regulating Tank-2 or High Point Regulating Tank-2 (Alt) and Hydro Station HS-1 or Hydro Station HS-1 (Alt) would be constructed near the migration crossing of the Paunsaugunt mule deer herd (Figure 3-5). Maintenance activities at these facilities would be only occasional and would occur during the daytime, when deer would not likely be actively migrating; there would be no significant impacts from operations and maintenance. Recreational access road impacts would be the same as described in Section 4.4.2.1.1.

4.4.2.1.2.2 Desert Bighorn Sheep. Desert bighorn sheep year-long crucial range crosses the project study area at the Cockscomb, which would also be the site of hydro station WCH-1 (Figure 3-5); however, this station would be located immediately adjacent to U.S. 89 and its presence and human activity for operations and maintenance would not materially change the existing levels of disturbance in the area; impacts would not be significant. Recreational access road impacts would be the same as described in Section 4.4.2.1.1.

4.4.2.1.2.3 Pronghorn. There are no pump stations or hydro stations near pronghorn high-quality range; rare maintenance surveys would take place on pipeline access roads near pronghorn range in Arizona. Impacts from these surveys would be minor and not significant. Recreational access road impacts would be the same as described in Section 4.4.2.1.1.

4.4.2.2 Wildlife Populations

4.4.2.2.1 Direct Impacts. Minor mortality of small terrestrial species would be possible from maintenance surveys along pipelines, but the impacts would not exceed the significance criteria.

4.4.2.2.2 Indirect Impacts. Occasional maintenance surveys and activities along the pipelines could cause temporary disturbance of wildlife, but the impacts would not be significant. Recreational access road impacts would be the same as described in Section 4.4.2.1.1.

4.5 Existing Highway Pipeline Alternative

The Existing Highway Pipeline Alternative would construct, operate and maintain the features and facilities described in Chapter 1, Section 1.2.2 and shown in Figure 1-4. It would be similar to the South Alternative except that the penstock would be constructed in the S.R. 389 ROW instead of south of the Kaibab-Paiute Indian Reservation.

4.5.1 Construction Phase

4.5.1.1 Wildlife Habitats

4.5.1.1.1 Colorado Plateau Ecological Region. The estimated Colorado Plateau area disturbed by construction of the Existing Highway Alternative is shown in Table 4-4.

Table 4-4
Colorado Plateau Habitat Disturbance from the Existing Highway Alternative

Overall Impacts		Non-vegetation Area Impacts	Net Vegetation Community Impacts
Permanent Impacts (acres)	1,337.4	276.7	1,060.7
Temporary Impacts (acres)	933.7	182.1	751.6
Total (acres)	**2,271.1**	**458.8**	**1,812.3**

The net permanent wildlife habitat impacts of 1,060.7 acres would not be significant because of the extensive area of equivalent or better quality habitat immediately adjacent to the construction corridor. Staging areas would add 682.1 acres to the temporary disturbance area. The area of temporary impacts would be restored and revegetated and would regain most of its habitat values within two or three growing seasons. Temporary impacts would not exceed the significance criteria.

4.5.1.1.2 Mohave Desert Ecological Region. Impacts would be the same as described in Section 4.4.1.2.2.

4.5.1.1.3 Great Basin Ecological Region. Impacts would be the same as described in Section 4.4.1.2.3.

4.5.1.1.4 Big Game Seasonal Ranges and Migration Routes.

4.5.1.1.4.1 Mule Deer. Impacts in Utah would be essentially the same as described in Section 4.4.1.2.4.1 and would not be significant. The penstock corridor would cross about 2.3 miles of Arizona crucial mule deer winter range; permanent disturbance would be about 16.7 acres. This impact would not be significant because of the extensive adjacent habitat of equivalent value.

4.5.1.1.4.2 Desert Bighorn Sheep. Impacts would be the same as described in Section 4.4.1.2.4.2 and would not be significant.

4.5.1.1.4.3 Pronghorn. Impacts on the East Clark Bench would be the same as described in Section 4.4.1.2.4.3 and would not be significant. There would be no impacts from construction of pipelines, staging areas or access roads in Arizona pronghorn range.

4.5.1.2 Wildlife Populations

4.5.1.2.1 Direct Impacts. Direct impacts would be the same as described in Section 4.4.1.3.1.

4.5.1.2.2 Indirect Impacts. Indirect impacts would be the same as described in Section 4.4.1.3.2.

4.5.2 Operations and Maintenance Phase

4.5.2.1 Wildlife Habitats

4.5.2.1.1 General Wildlife Habitats. Operations and maintenance impacts would be occasional and similar to those described in Section 4.4.2.1.1. Impacts would not exceed the significance criteria.

4.5.2.1.2 Big Game Seasonal Ranges and Migration Routes. Impacts would be the same as described in Section 4.4.2.1.2 and would not be significant.

4.5.2.2 Wildlife Populations

4.5.2.2.1 Direct Impacts. Impacts would be the same as described in Section 4.4.2.2.1 and would not be significant.

4.5.2.2.2 Indirect Impacts. Impacts would be the same as described in Section 4.4.2.2.2 and would not be significant.

4.6 Southeast Corner Pipeline Alternative

The Southeast Corner Pipeline Alternative would construct, operate and maintain the features and facilities described in Chapter 1, Section 1.2.3 and shown in Figure 1-5. This alternative would be the same as the South Alternative except that the penstock would be constructed across the southeast corner of the Kaibab-Paiute Indian Reservation.

4.6.1 Construction Phase

4.6.1.1 Wildlife Habitats

4.6.1.1.1 Colorado Plateau Ecological Region. The only difference between the South Alternative and the Southeast Corner Alternative would be shortening of the penstock corridor by approximately 1.4 miles. This would reduce the net permanent habitat disturbance area by 68.4 acres and the temporary habitat disturbance area by 10.0 acres. The difference in net total disturbance area is three percent between the alternatives. This difference would not be material and impacts would be the same as described in Section 4.4.1.2.1.

4.6.1.1.2 Mohave Desert Ecological Region. Impacts would be the same as described in Section 4.4.1.2.2.

4.6.1.1.3 Great Basin Ecological Region. Impacts would be the same as described in Section 4.4.1.2.3.

4.6.1.1.4 Big Game Seasonal Ranges and Migration Routes. Impacts would be the same as described in Section 4.4.1.2.4.

4.6.1.2 Wildlife Populations

4.6.1.2.1 Direct Impacts. Direct impacts in construction areas would be similar to those described in Section 4.4.1.3.1.
4.6.1.2.2 Indirect Impacts. Indirect impacts in construction areas would be similar to those described in Section 4.4.1.3.2.

4.6.2 Operations and Maintenance Phase

4.6.2.1 Wildlife Habitats

4.6.2.1.1 General Wildlife Habitats. Operations and maintenance impacts would be occasional and similar to those described in Section 4.4.2.1.1. Impacts would not exceed the significance criteria.

4.6.2.1.2 Big Game Seasonal Ranges and Migration Routes. Operations and maintenance impacts would be occasional and similar to those described in Section 4.4.2.1.2. Impacts would not exceed the significance criteria.

4.6.2.2 Wildlife Populations

4.6.2.2.1 Direct Impacts. Impacts would be the same as described in Section 4.4.2.2.1 and would not be significant.

4.6.2.2.2 Indirect Impacts. Impacts would be the same as described in Section 4.4.2.2.2 and would not be significant.

4.7 Transmission Line Alternatives

The Transmission Line Alternatives would construct, operate and maintain the features and facilities described in Chapter 1, Section 1.2.4 and shown in Figures 1-6, 1-7 and 1-8.

4.7.1 Construction Phase

All of the aerial transmission lines to be constructed are high voltage lines with voltages ranging from 34.5 kV (one line) to 345 kV (one line). Depending on alternative alignments selected, up to a maximum of approximately 123.4 miles or a minimum of 99.6 miles of new transmission lines would be constructed. Most of the aerial lines would be 138 kV (nine lines) or 69 kV (five lines). Two potential new underground lines totaling 4.7 miles would be constructed (4.1 miles of 24.9 kV and 0.6 mile of 12.47kV). Each underground transmission line would require a 30-foot temporary disturbance construction corridor and a 2-foot permanent disturbance corridor. Aerial transmission line supports would be 75 – 100 foot tall steel single-poles. Foundations for the poles would be constructed by ground crews and the towers would be delivered to each foundation by helicopter for installation. Pole foundations would be approximately 8 by 8 feet square and spaced 450 feet apart (12 per mile). Total permanent tower base disturbance would be approximately 0.02 acres per line mile. Each new transmission line would have a double track 10-foot wide access road constructed parallel to the line; new lines would use existing access road alignments where possible. Total permanent disturbance for new or upgraded access roads would be approximately 1.2 acres per line mile; total permanent disturbance for transmission lines would be approximately 1.22 acres per line mile. Conductors would be pulled by helicopter and would not require additional disturbance area for installation.

New proposed underground transmission lines would require temporary disturbance in a 30-foot corridor and a permanent disturbance in a 2-foot corridor, not including access roads. Underground transmission line alternatives would cause approximately 3.6 acres of temporary habitat disturbance and 1.44 acres of permanent disturbance per line mile (including access roads).

A transmission line ROW requires an area cleared of trees sufficient to protect the conductor wires from hazards from falling trees and arcing. The required distance of clearing from the centerline of the ROW is variable because of the variable sag of conductors between support poles, the greatest sag occurring at the midpoint between support poles. Conductor sag is greater with higher loads and during hot weather. Conductors also sway laterally due to wind pressure. Any trees within the conductor cross-section of the line that would potentially contact or arc to the conductors at maximum sag, load and sway would be removed from the ROW; certain tall “danger trees” outside of the ROW would also be removed if there were risk to the conductors if the trees fell. In general, for a 75-foot support tower pole line, vegetation over 25 feet in height would be required to be cleared to a distance of 50 feet from the center line only in the region surrounding maximum sag. Because of the patchy distribution of trees along most of the new transmission lines and varying topography, it is not possible to estimate the necessary area of ROW clearing.

New switch stations and substations would be constructed and existing substations would be upgraded to handle the increased line voltages. Upgraded substations would require about five acres of additional permanent land disturbance outside of the existing substation footprint. New switch stations and substations would require a footprint of approximately five acres of permanent land disturbance.

4.7.1.1 Wildlife Habitats

4.7.1.1.1. Colorado Plateau Ecological Region. Because of multiple alternative transmission line configurations, there are three possible scenarios for calculation of impacts. The "basic" scenario includes all transmission lines that are not described as "alternative" (Alt.). The 'minimum" scenario includes lines described as alternative (Alt.) that are shorter than the basic lines. The "maximum" scenario includes alternative lines (Alt.) that are longer than the basic lines. The estimated permanent habitat disturbance area in the Colorado Plateau Ecological Region from overhead transmission lines is shown in Table 4-5.

Table 4-5
Colorado Plateau Ecological Region
Permanent Aerial Transmission Line Habitat Disturbance
(acres)

Transmission Lines		Sub-stations	Total
Basic	105.7	25	130.7
Minimum	88.8	25	113.8
Maximum	117.8	25	142.8

The new BPS-3 Underground Transmission Line would be placed within the U.S. 89 highway ROW and would not impact wildlife habitat. The new HS-3 Underground Transmission Line would be constructed in or adjacent to existing roads and would not impact wildlife habitat.

Under any of the scenarios, the permanent impact would not be significant because of the extensive area of equivalent or better quality habitat immediately adjacent to the construction corridor.

ROW clearing would impact a small part of the transmission line corridors because most of the dune, grassland, shrubland, steppe and savannah habitat in the Colorado Plateau Ecological Region does not have vegetation at a height that would exceed the ROW requirements. Little Utah juniper (*Juniperus osteosperma*), the most common juniper species in the region, has a mature height of 26 feet (USDA 2010), which would require clearing at a distance of about 50 feet from the corridor center line at the region of maximum sag. Plant communities potentially containing juniper and other trees of equal or greater height occur in 7.5 percent of the Colorado Plateau Ecological Region vegetation survey area; however, juniper stands are relatively patchy where they occur across transmission line corridors. ROW clearing would create a relatively soft edge effect that would not adversely impact most resident species home ranges or movements. The impact of ROW clearing would not be significant because of the extensive area of equivalent or better quality habitat immediately adjacent to the construction corridor.

Staging areas would cause temporary habitat impacts on 56.1 acres that would be restored and revegetated.

4.7.1.1.2 Mohave Desert Ecological Region. The estimated permanent habitat disturbance in the Mohave Desert Ecological Region is shown in Table 4-6.

Table 4-6
Mohave Desert Ecological Region
Permanent Aerial Transmission Line Habitat Disturbance
(acres)

Transmission Lines	Sub-stations	Total
23.4	0	23.4

This permanent impact would not be significant because of the extensive area of equivalent or better quality habitat immediately adjacent to the construction corridor.

Plant communities potentially containing juniper and other trees of equal or greater height occur in 1.1 percent of the Mohave Desert Ecological Region vegetation survey area. ROW impacts would be minimal, as described in Section 4.7.1.1.1.

Staging areas would cause temporary habitat impacts on 120 acres that would be restored and revegetated.

4.7.1.1.3 Great Basin Ecological Region. The estimated permanent habitat disturbance in the Great Basin Ecological Region is shown in Table 4-7.

Table 4.7
Great Basin Ecological Region
Permanent Aerial Transmission Line Habitat Disturbance
(acres)

Transmission Lines	Sub-stations	Total
3.8	0	3.8

This permanent impact would not be significant because of the extensive area of equivalent or better quality habitat immediately adjacent to the construction corridor.

Plant communities potentially containing juniper and other trees of equal or greater height occur in 49 percent of the Great Basin Ecological Region vegetation survey area. ROW impacts would not be significant because of the short lengths of transmission lines constructed and the large area of equal or better quality habitat adjacent to the construction corridor.

4.7.1.1.4 Big Game Seasonal Ranges and Migration Routes

4.7.1.1.4.1 Mule Deer. A total of 13.9 miles of transmission lines would be constructed in mule deer crucial winter range south of the Cockscomb ; the total permanent habitat disturbance would be approximately 17 acres. A 0.6-mile transmission line would be constructed near the Petrified Hollow Wash in the area of the migration route across U.S. 89; total permanent habitat disturbance would be less than one acre. The new 1.3-mile CVBPS-1 transmission line would be constructed in mule deer crucial winter range across the Interstate 15 corridor north of Pintura. The permanent habitat impact would not be significant because of the large area of equivalent value habitat adjacent to the construction corridors.

All construction of transmission lines in crucial mule deer winter range should be coordinated with the Utah Division of Wildlife Resources and construction should be scheduled outside of the crucial high use period of November 1 to April 15.

4.7.1.1.4.2 Desert Bighorn Sheep. Approximately 2.3 miles of the new Glen Canyon to Buckskin transmission line would be constructed across desert bighorn sheep year-long crucial range located south of the Cockscomb. A new underground BPS-3 transmission line would be constructed for 4.1 miles from BPS-3 to the Paria Substation along U.S. 89. The line would be in the U.S. 89 ROW and would not impact bighorn sheep habitat. Approximately 0.6 miles of transmission line and associated access road would be constructed across crucial bighorn sheep range at the Paria River (Figure 3-5); less than one acre of potential habitat would be permanently disturbed.

Total permanent habitat impact from new aerial transmission lines would be approximately 3.6 acres. This impact would not be significant because of the large area of equivalent habitat adjacent to the construction corridor. New construction and transmission line upgrades should be done outside of seasonal high use periods; Utah Division of Wildlife Resources should be consulted to schedule the transmission line construction.

4.7.1.1.4.3 Pronghorn. Approximately 14.8 miles of BPS-3 North transmission line would be constructed in the U.S. 89 ROW through crucial pronghorn habitat; however, proximity of the line to the highway minimizes that habitat value. New BPS-2 and BPS-3 South transmission lines totaling approximately 28.8 miles would be constructed across crucial pronghorn range on the East Clark Bench. Approximately 14.6 miles of the new Glen Canyon to Buckskin transmission line would be constructed through crucial pronghorn habitat. Three electrical substations would be constructed in crucial pronghorn habitat with about 15 acres of permanent impacts. Total permanent habitat impact would be approximately 86 acres. This impact would not meet the significance criteria because of the large area of equivalent high value pronghorn range adjacent to the construction corridors. New construction should be done outside of seasonal high use periods; Utah Division of Wildlife Resources should be consulted to schedule the transmission line construction.

Staging areas would cause temporary habitat impacts on approximately 52.9 acres that would be restored and revegetated.

4.7.1.2 Wildlife Populations

4.7.1.2.1 Direct Impacts. Direct impacts would be similar to those described in Section 4.4.1.3.1, but of lesser magnitude because excavation would occur in a smaller area. Small vertebrate species could suffer mortality from access road traffic and transmission tower construction; larger species would disperse to surrounding habitats and direct mortality would not be anticipated. No species or population would be placed at risk and impacts would not exceed the significance criteria.

New transmission lines could provide hunting perches for raptors, possibly impacting prey species in the immediate vicinity of the transmission lines. The impacts of this enhanced predation would be speculative and not quantifiable; it is unlikely that any prey species population would be placed at risk and impacts would not exceed the significance criteria.

4.7.1.2.2 Indirect Impacts. Indirect impacts would be similar to those described in Section 4.4.1.3.2, but of lesser magnitude because of smaller areas of major construction disturbance. Impacts would be temporary and habitat would be reoccupied after construction was completed. Home ranges and migration routes would not be impacted.

4.7.2 Operations and Maintenance Phase

4.7.2.1 Wildlife Habitats

4.7.2.1.1 General Wildlife Habitats. It is anticipated that LPP Project switch stations and substations would be operated using electronic SCADA systems, minimizing disturbance from human presence and noise. Infrequent human visitation for operations and maintenance would not cause significant impacts on habitat quality. ROW impacts would be the same as described in Section 4.7.1.1.1.

It is possible that new or upgraded access roads along transmission lines could lead to increased off-road vehicle activity; however, the magnitude of the potential disturbance is not possible to estimate at this time. Access controls at road heads could minimize potential impacts.

4.7.2.1.2 Big Game Seasonal Ranges and Migration Routes. Operations and maintenance of transmission lines and substations would not require frequent human presence or disturbance during crucial wildlife range high use or migration periods. Impacts would not exceed the significance criteria.

It is possible that new or upgraded access roads along transmission lines could lead to increased off-road vehicle activity; however, the magnitude of the potential disturbance is not possible to estimate at this time. Access controls at road heads could minimize potential impacts.

4.7.2.2 Wildlife Populations

4.7.2.2.1 Direct Impacts

Operation and maintenance of transmission lines and substations would not cause direct impacts on most wildlife populations. Some small mammals and reptiles may suffer road kill during ground surveys or maintenance activity, but the number of animals impacted would be small and no species or population would be placed at risk. Impacts would not meet the significance criteria.

It is possible that new or upgraded access roads along transmission lines could lead to increased recreational off-road vehicle activity and associated road kill mortality; however, the level of impacts would not likely place any population at risk or exceed the significance criteria. Access controls at road heads could minimize potential impacts.

Transmission lines are known hazards to birds by mortality from collisions with towers or conductors and by electrocution of raptors nesting on towers. This mortality would be minimized by following the Edison Electrical Institute (EEI) Avian Protection Plan Guidelines (EEI and USFWS 2005) and the EEI Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (EEI 2006). Mortality caused by transmission lines would not place any species or population at risk and impacts would not meet the significance criteria.

4.7.2.2.2 Indirect Impacts

Transmission lines and associated access roads would not be barriers to migration and would have minimal impacts on species home ranges. Impacts would not be significant.

It is possible that new or upgraded access roads along transmission lines could lead to increased recreational off-road vehicle activity and associated noise and disturbance that would lower habitat

values; however, the magnitude of the potential disturbance is not possible to estimate at this time. Access controls at road heads could minimize potential impacts.

4.8 No Lake Powell Water Alternative

The No Lake Powell Water Alternative would not deliver Lake Powell water to the WCWCD, CICWCD or KCWCD. There would be no construction of the LPP Project water intake, water transmission or water hydro systems or their associated electrical transmission lines. Water supplies for the WCWCD, CICWCD and KCWCD would be obtained by a combination of developing remaining available surface water and groundwater supplies, developing reverse osmosis treatment of existing low quality water supplies (WCWCD only), and reducing residential outdoor water use.

4.8.1 Construction Phase

Currently planned construction projects for the WCWCD include the Ash Creek Pipeline and Reservoir (5,000 acre-feet per year), the Anderson Junction Reservoir and the Crystal Creek Pipeline (2,000 acre-feet per year). A future potential WCWCD project would be construction of a reverse-osmosis (RO) treatment plant near the Washington Fields Diversion to treat poor-quality Virgin River water to culinary use standards. This would require a brine treatment facility for disposal of RO filtration by-product. The KCWCD would construct the Jackson Flat Reservoir; The CICWCD would not construct new water supply facilities. Shortfalls in water supplies would be met in the WCWCD and CICWCD by conservation measures and conversion of agricultural to municipal and industrial (M&I) uses.

4.8.1.1 Wildlife Habitats

4.8.1.1.1 Colorado Plateau Ecological Region. No features or facilities would be constructed in the Colorado Plateau Ecological Region; there would be no impacts from the No Lake Powell Water Alternative.

4.8.1.1.2 Mohave Desert Ecological Region. Approximately 250 acres of the Mohave Desert Ecological Region would be permanently disturbed for the Anderson Junction Reservoir and approximately 10 acres would be disturbed, mostly temporarily, for the Ash Creek Pipeline south of the reservoir to near Toquerville and north to Anderson Junction. These impacts would not exceed the significance criteria because of adjacent equivalent habitat.

4.8.1.1.3 Great Basin Ecological Region. The Ash Creek Pipeline would be constructed parallel to the Interstate 15 corridor from Anderson Junction north for approximately 9.7 miles to Ash Creek Reservoir, with two spur pipelines near Pintura totaling approximately 2 miles. A rough estimate of disturbance, mostly temporary, would be 100 acres for these pipelines. These impacts would not exceed the significance criteria because of adjacent equivalent habitat.

4.8.1.1.4 Big Game Seasonal Ranges and Migration Routes. The Ash Creek Pipeline and spur pipelines would cross designated mule deer crucial winter range, but would be adjacent to the busy Interstate 15 highway corridor. Impacts would be minimized by scheduling construction outside of high use periods as much as possible. Construction impacts would not exceed the significance criteria because of adjacent equivalent habitat.

4.8.1.2 Wildlife Populations

4.8.1.2.1 Direct Impacts. Direct impacts in construction areas would be similar to those described in Section 4.4.1.3.1 and would not be significant.

4.8.1.2.2 Indirect Impacts. Indirect impacts in construction areas would be similar to those described in Section 4.4.1.3.2 and would not be significant.

4.8.2 Operations and Maintenance Phase

4.8.2.1 Wildlife Habitats

4.8.2.1.1 General Wildlife Habitats. Operations and maintenance impacts would be occasional and similar to those described in Section 4.4.2.1.1. Impacts would not exceed the significance criteria.

4.8.2.1.2 Big Game Seasonal Ranges and Migration Routes. Operations and maintenance impacts would be occasional and similar to those described in Section 4.4.2.1.2. Impacts would not exceed the significance criteria.

4.8.2.2 Wildlife Populations

4.8.2.2.1 Direct Impacts. Operations and maintenance impacts would be occasional and similar to those described in Section 4.4.2.2.1. Impacts would not exceed the significance criteria.
4.8.2.2.2 Indirect Impacts. Operations and maintenance impacts would be occasional and similar to those described in Section 4.4.2.2.2. Impacts would not exceed the significance criteria.

4.9 No Action Alternative

Under the No Action Alternative, there would be no construction of water intake, distribution or treatment facilities. The No Action Alternative would not cause construction, operation or maintenance impacts on wildlife habitat, wildlife populations, or big game seasonal ranges or migration routes.

Chapter 5
Mitigation and Monitoring

This chapter describes mitigation and monitoring methods to reduce impacts of LPP Project construction and operation and maintenance on wildlife habitats and wildlife populations. Many of these methods will be incorporated into project "Standard Construction Procedures" (SCPs) to be used in the field as LPP Project features and facilities are being constructed.

5.1 General Mitigation Procedures

The following procedures would be applicable to all LPP Project features and facilities during construction.

- To the extent feasible, construction activities on or around important wildlife habitat (e.g., deer fawning areas and migration corridors) should be scheduled to avoid the periods of greatest use.

- Vehicular speeds should be limited to safe speeds in construction zones or on construction access roads to minimize collisions with wildlife.

- The area directly ahead of trenching equipment should be monitored for small animals and, to the extent possible, any small animals observed should be hazed from the construction corridor by a qualified wildlife biologist or captured and relocated to a safe distance from the construction corridor.

- Trenches should be covered, backfilled, or barriers and working lights placed along open trenches at the completion of each day and no more than 1,000 feet of trench should be open at any one location. All open trenches should be constructed with escape ramps for trapped wildlife to exit the trenches.

- Open trenches should be observed before beginning construction activities daily and small animals in the trenches should be captured and relocated if possible by a qualified wildlife biologist before active construction commences.

- Impacts on wildlife resources can be avoided and minimized by following standard hazardous materials control procedures, restoration and erosion control procedures, air pollution prevention procedures surface water protection procedures, noxious weed control procedures and wetland protection procedures.

- Construction sites should be kept free of trash, garbage and food refuse.

- New and upgraded overhead power transmission lines should be constructed to meet the most current edition of *Suggested Practices for Raptor Protection on Power Lines* (EEI 2006).

5.2 South Pipeline Alternative

5.2.1 Construction

- Construction of South Alternative features in the mule deer migration zone should be scheduled outside of high-use periods.

5.2.2 Operation and Maintenance

- Access roads should have access controls (locked gates) wherever possible.
- Survey or maintenance vehicles should restricted to safe speeds according to road locations.

5.3 Existing Highway Pipeline Alternative

5.3.1 Construction

Same as Section 5.2.1.

5.3.2 Operation and Maintenance

Same as Section 5.2.2.

5.4 Southeast Corner Pipeline Alternative

5.4.1 Construction

Same as Section 5.2.1.

5.4.2 Operation and Maintenance

Same as Section 5.2.2.

5.5 Transmission Line Alternatives

5.5.1 Construction

Same as Section 5.2.1.

5.5.2 Operation and Maintenance

Same as Section 5.2.2.

5.6 No Lake Powell Water Alternative

5.6.1 Construction

Same as Section 5.2.1.

5.6.2 Operation and Maintenance

Same as Section 5.2.2.

5.7 No Action Alternative

No features or facilities would be constructed, operated or maintained under the No Action Alternative, therefore no mitigation or monitoring would be required.

Chapter 6
Unavoidable Adverse Impacts

This chapter describes unavoidable adverse impacts from construction, operation and maintenance of the LPP Project alternatives. Unavoidable adverse impacts are those remaining after application of mitigation and monitoring measures described in Chapter 5. Only resources that would have unavoidable adverse impacts are described here. Unavoidable adverse impacts may not meet or exceed the significance criteria.

Unavoidable adverse impacts are not anticipated from operation or maintenance of any LPP Project alternatives.

6.1 South Pipeline Alternative

6.1.1 Construction Phase

6.1.1.1 Wildlife Habitats

Permanent disturbance of 1,486.8 acres of potential wildlife habitat along 204 miles of pipeline alignments would be an unavoidable adverse impact.

6.1.1.2 Big Game Seasonal Range and Migration Routes

6.1.1.2.1 Mule Deer. Permanent disturbance of 86.2 acres of critical mule deer winter range would be an unavoidable adverse impact.

6.1.1.3 Wildlife Populations

6.1.1.3.1 Direct Impacts. Construction-related mortality of animals unable to disperse from the construction corridor would be an unavoidable adverse impact.

6.2 Existing Highway Pipeline Alternative

6.2.1 Construction Phase

6.2.1.1 Wildlife Habitats

Permanent disturbance of 1,168.3 acres of potential wildlife habitat along 197 miles of pipeline alignments would be an unavoidable adverse impact.

6.2.1.2 Big Game Seasonal Range and Migration Routes

6.2.1.2.1 Mule Deer. Permanent disturbance of 16.7 acres of crucial winter range would be an unavoidable adverse impact.

6.2.1.3 Wildlife Populations

Unavoidable adverse impacts would be the same as described in Section 6.1.1.3.

6.3 Southeast Corner Pipeline Alternative

6.3.1 Construction Phase

6.3.1.1 Wildlife Habitats

Permanent disturbance of 1,418.4 acres of potential wildlife habitat along 204 miles of pipeline alignments would be an unavoidable adverse impact.

6.3.1.2 Big Game Seasonal Range and Migration Routes

Unavoidable adverse impacts would be the same as described in Section 6.1.1.2.

6.4 Transmission Line Alternatives

6.4.1 Construction Phase

6.4.1.1 Wildlife Habitats

Permanent disturbance of up to 170 acres (maximum alternatives) of potential wildlife habitat along 152 miles of transmission line alignments would be an unavoidable adverse impact.

6.4.1.2 Big Game Seasonal Range and Migration Routes

6.4.1.2.1 Mule Deer. Permanent disturbance of 12.8 acres of mule deer critical winter range would be an unavoidable adverse impact.

6.4.1.2.2 Desert Bighorn Sheep. Permanent disturbance of 2.8 acres of bighorn sheep critical winter range would be an unavoidable adverse impact.

6.4.1.2.3 Pronghorn. Permanent disturbance of 86 acres of pronghorn high value range would be an unavoidable adverse impact.

6.4.1.3 Wildlife Populations

Unavoidable adverse impacts would be the same as described in Section 6.1.1.3.

6.5 No Lake Powell Water Alternative

6.5.1 Construction Phase

6.5.1.1 Wildlife Habitats

Permanent loss of wildlife habitat would be an unavoidable adverse impact. Exact footprints of potential projects are not available, but it is estimated that there would be no permanent loss in the Colorado Plateau Ecological Region, 260 acres would be permanently lost in the Mohave Desert Ecological Region, and 100 acres would be permanently lost in the Great Basin Ecological Region. The total unavoidable adverse impact would be approximately 360 acres.

6.5.1.2 Big Game Seasonal Range and Migration Routes

There could be minor unavoidable adverse impacts on big game seasonal range in the Great Basin Ecological Region, but the magnitude of those impacts cannot be estimated at this time.

6.5.1.3 Wildlife Populations

Unavoidable adverse impacts would be the same as described in Section 6.1.1.3.

6.6 No Action Alternative

The No Action Alternative would not cause unavoidable adverse impacts.

Chapter 7
Cumulative Impacts

This chapter analyzes cumulative impacts that may occur from construction and operation of the proposed LPP project when combined with the impacts of other past, present, and reasonably foreseeable future actions and projects after all proposed mitigation measures have been implemented. Only those resources with the potential to cause cumulative impacts are analyzed in this chapter.

7.1 South Alternative

(The cumulative impacts analysis is pending completion for identification of inter-related projects that would cause cumulative impacts with the LPP project.)

7.2 Existing Highway Alternative

(The cumulative impacts analysis is pending completion for identification of inter-related projects that would cause cumulative impacts with the LPP project.)

7.3 Southeast Corner Alternative

(The cumulative impacts analysis is pending completion for identification of inter-related projects that would cause cumulative impacts with the LPP project.)

7.4 Transmission Line Alternatives

(The cumulative impacts analysis is pending completion for identification of inter-related projects that would cause cumulative impacts with the LPP project.)

7.5 No Lake Powell Water Alternative

(The cumulative impacts analysis is pending completion for identification of inter-related projects that would cause cumulative impacts with the LPP project.)

7.6 No Action Alternative

The No Action Alternative would have no cumulative impacts.

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Abbreviations and Acronyms

Abbreviation/Acronym	Meaning/Description
AGRC	Automated Geographic Reference Center
Alt.	Alternative
ATV	All Terrain Vehicle
BLM	U.S. Bureau of Land Management
BPS	Booster Pump Station
CBPS	Cedar Booster Pump Station
CICWCD	Central Iron County Water Conservancy District
CVP	Cedar Valley Pipeline
dB	Decibel
dBA	A-weighted decibel
EEI	Edison Electrical Institute
GIS	Geographic Information System
GOPB	Utah Governor's Office of Planning and Budget
gpcd	gallons per capita per day
GSENM	Grand Staircase-Escalante National Monument
HDMS	Natural Heritage Program Data Management System
HS	Hydro System
KCWCD	Kane County Water Conservancy District
kV	kilovolt
LPP	Lake Powell Pipeline
LSD	Logan Simpson Design
M&I	Municipal and Industrial
mph	miles per hour
MSL	mean sea level
ORV	Off-road Vehicle
RO	Reverse Osmosis
ROW	Right-of-Way
SCADA	Supervisory Control and Data Acquisition
SCP	Standard Construction Procedures
SITLA	School and Institutional Trust Land Adminstration
TDS	Total Dissolved Solids
UCDC	Utah Conservation Data Center
UDWLR	Utah Division of Wildlife Resources
UDWR	Utah Division of Water Resources
ULS	Utah Lake Drainage Basin Water Delivery System
USDA	United States Department of Agriculture
UTM	Universal Transverse Mercator
WCH	Water Conveyance Hydro
WCWCD	Washington County Water Conservancy District

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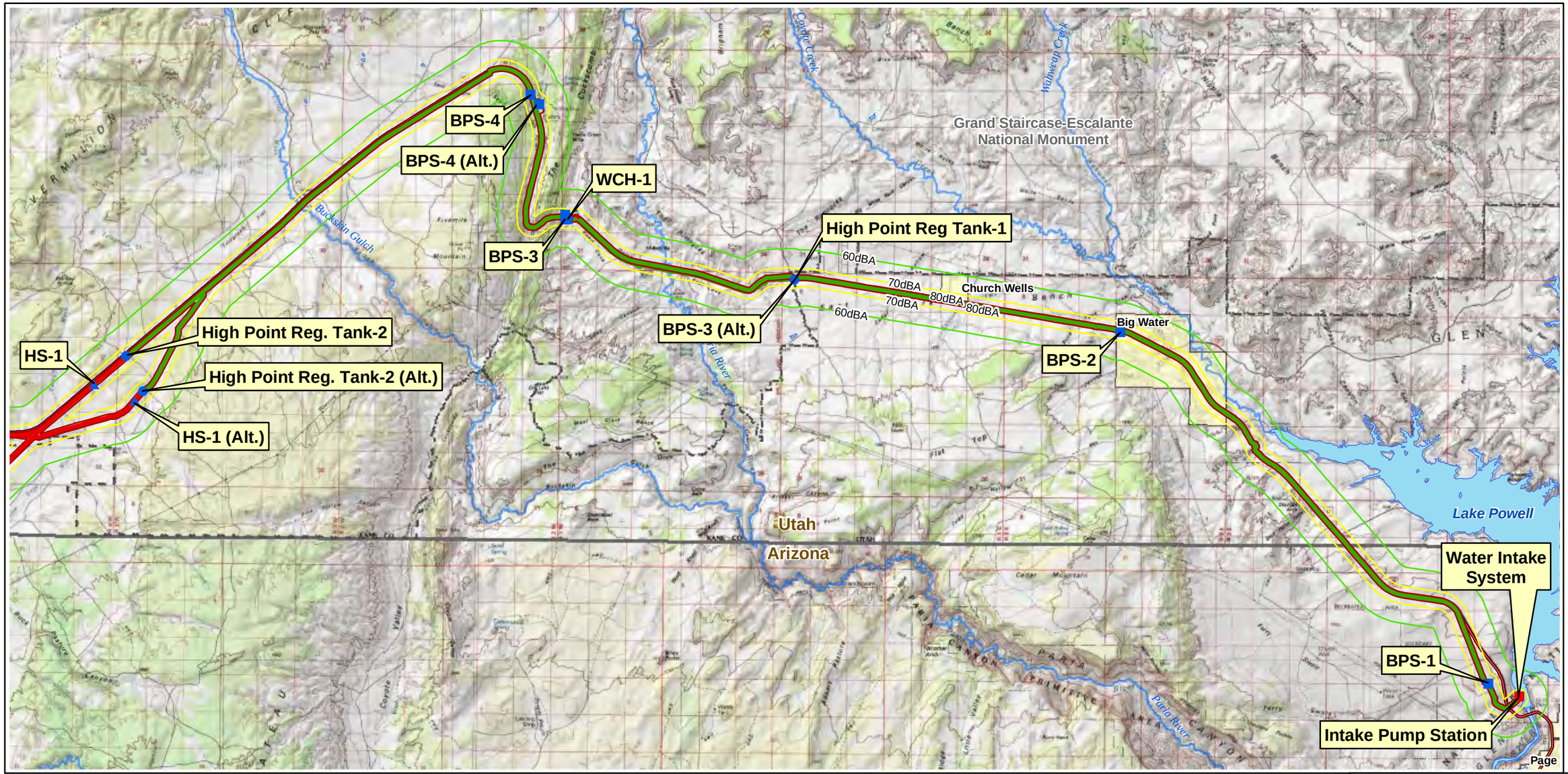
Appendix A
Noise Buffer Zone Maps



Noise Contour dBA Levels

- 80 dBA
- 70 dBA
- 60 dBA

- Project Intake Pump Station
- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- Water Conveyance System
- Hydro System - South Alignment Alternative

- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road

- Lakes & Reservoirs
- Major Rivers & Streams
- National Park/Monument
- GSENM Boundary
- State Boundaries
- Cities

FERC Project Number: 12966-001
BLM Serial Numbers: AZA-34941 UTU-85472

N

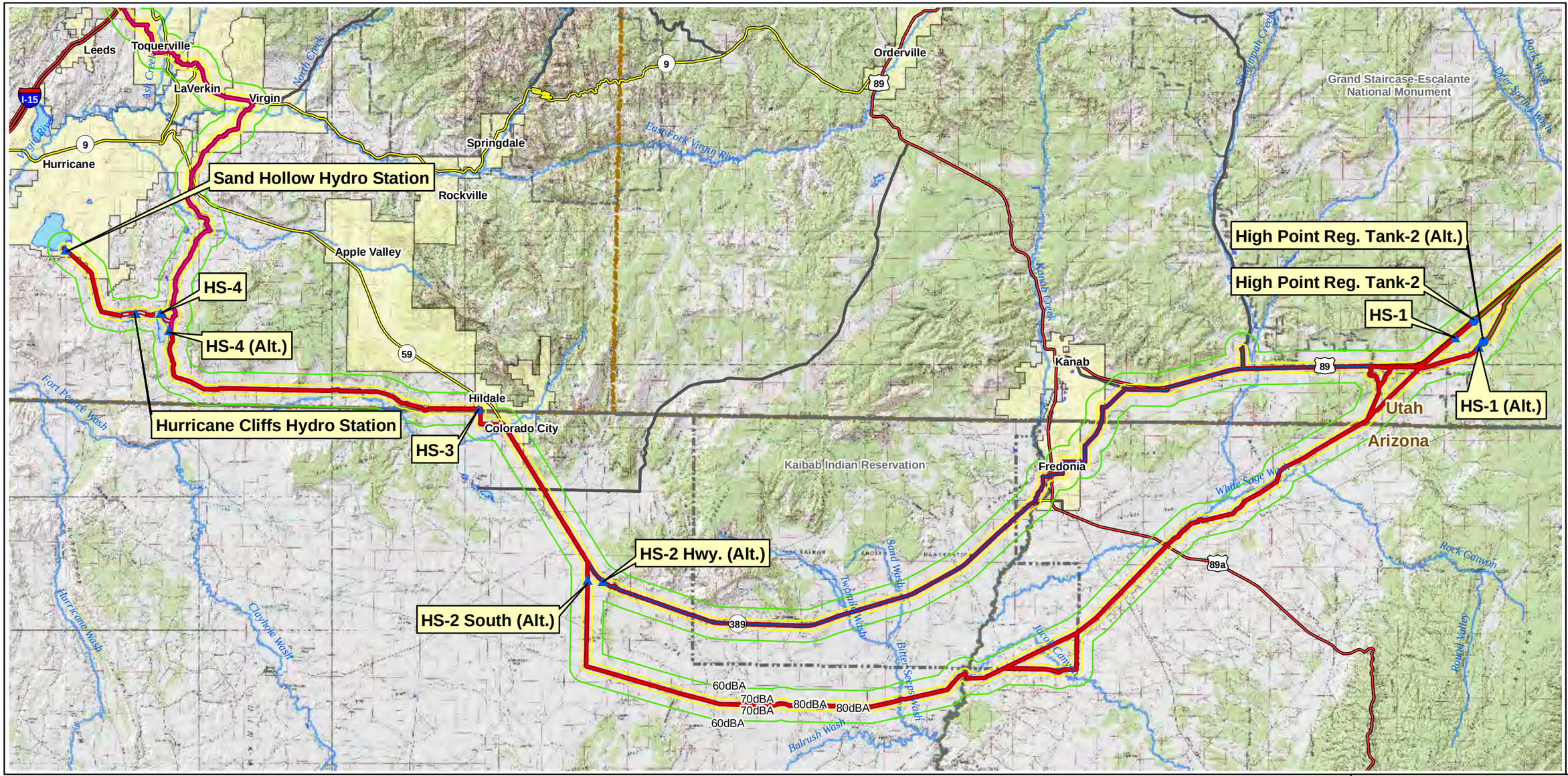
0 0.5 1 2 3 4 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure A-1** MWH

Lake Powell Pipeline
Water Conveyance System
Noise Buffer Zone Map



Noise Contour dBA Levels

- 80 dBA
- 70 dBA
- 60 dBA

- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- Water Conveyance System
- Hydro System - South Alignment Alternative

- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Major Rivers & Streams

- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road

- National Park/Monument
- GSENM Boundary
- Tribal Lands
- State Boundaries
- Cities
- County Boundaries

FERC Project Number: 12966-001
BLM Serial Numbers: AZA-34941 UTU-85472

N

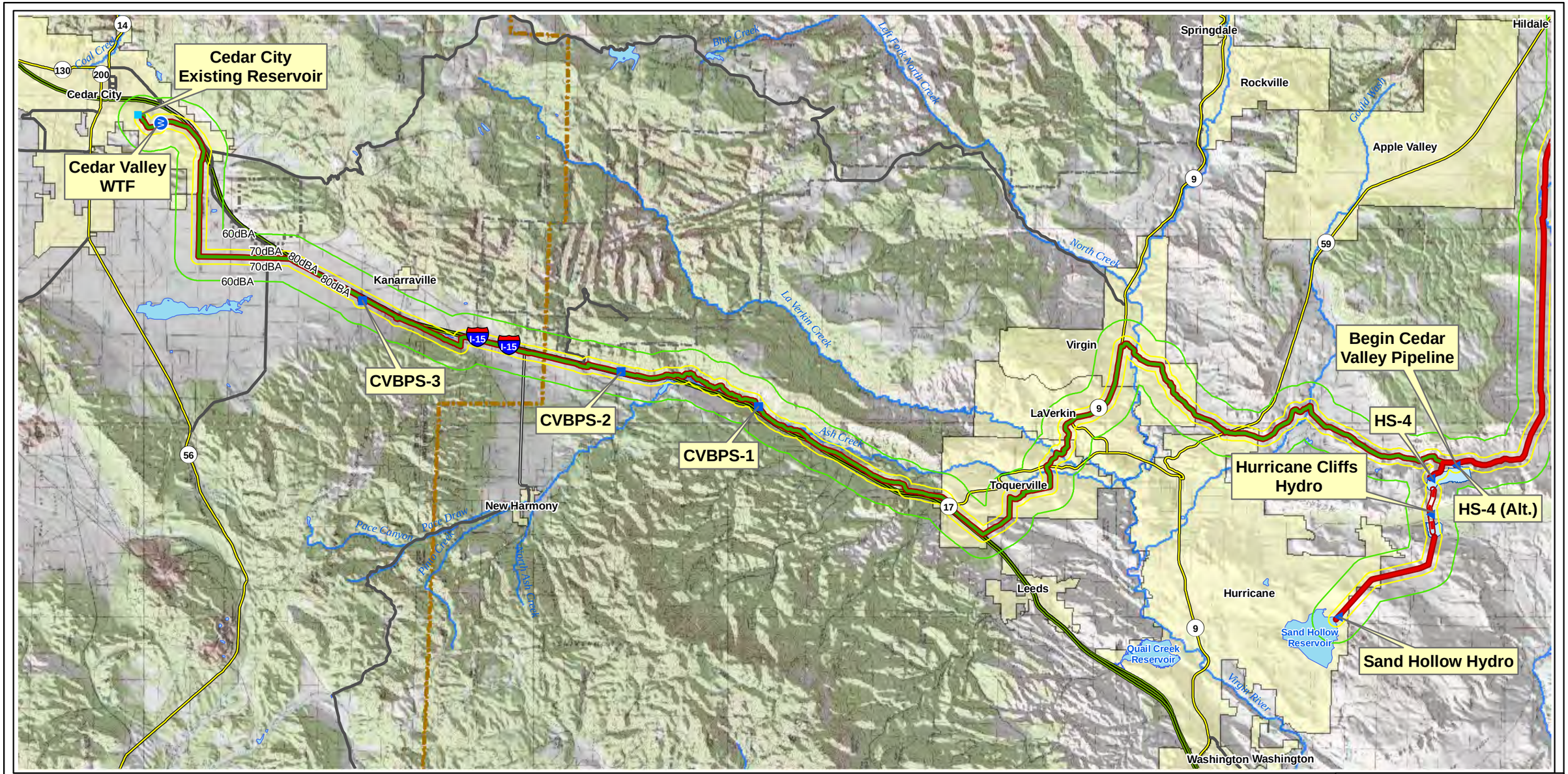
0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure A-2** MWH

Lake Powell Pipeline Hydro System Noise Buffer Zone Map



Noise Contour dBA Levels

- 80 dBA
- 70 dBA
- 60 dBA

- Water Treatment Facility
- Project Pump Station
- Project Hydro Station
- Hydro System Lake Powell Pipeline
- Hurricane Cliffs Pressure Tunnel
- Cedar Valley Pipeline

- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road

- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Major Rivers & Streams
- National Park/Monument
- County Boundaries
- Cities
- Tribal Lands

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR **Figure A-3** MWH

Cedar Valley Pipeline System Noise Buffer Zone Map