Lake Powell Pipeline

Final Study Report 6
Land Use Plans and Conflicts

April 2016

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Land Use Plans and Conflicts
Executive Summary

ES-1 Introduction

This study report describes the results and findings of an analysis to evaluate available land management plans and guidelines 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 Land Use Plans and Conflicts Study Plan prepared for the Federal Energy Regulatory Commission (Commission), was to identify potential land use impacts from construction, maintenance, and operation of the alternatives, and identify and document measures to mitigate potential impacts as necessary.

ES-2 Methodology

The analysis of impacts on land management guidelines and resources follows methodology identified and described in the Preliminary Application Document, Scoping Document No. 1 and the Land Use Plans and Conflicts Study Plan #6 prepared for and filed with the Commission.

ES-3 Key Results of the Land Use Impact Analyses

Eleven land use topics were analyzed for direct and indirect impacts from the LPP project and its alternatives. The following sections summarize the key results of the land use impact analyses.

ES-3.1 Land Ownership and Management

The LPP Water Conveyance System would have permanent direct impacts on five acres of private land, and temporary direct impacts on management of 198 acres of public land. The South Alternative alignment would have permanent direct impacts on 17 acres of private land and 757 acres of public land, and temporary direct impacts on management of 1,027 acres of public land. The Existing Highway Alternative alignment would have permanent direct impacts on nine acres of private land and 749 acres of public land, and temporary direct impacts on management of 779 acres of public land. Additionally, the Existing Highway Alternative would have a significant impact on land use management across the Kaibab-Paiute Indian Reservation. The Southeast Corner Alternative alignment would have permanent direct impacts on 17 acres of private land and 757 acres of public land, and temporary direct impacts on management of 1,082 acres of public land. The Transmission Line alignments would have permanent direct impacts on nine acres of private land.

Land use management restrictions resulting from the No Lake Powell Water Alternative would have indirect impacts on more than 9,000 acres of existing developed land within the growth analysis study area. By 2060, land use management restrictions resulting from the No Lake Powell Water Alternative would have indirect impacts on more than 25,000 acres of projected developed land.

ES-3.2 Farmland

The LPP South Alternative alignment would have permanent direct impacts on five acres of prime farmland and temporary direct impacts on 393 acres of prime farmland. The Existing Highway Alternative alignment would have permanent direct impacts on five acres of prime farmland and temporary direct impacts on 276 acres of prime farmland. The Southeast Corner Alternative alignment would have the same impacts as the South Alternative alignment. The transmission line alignments would have temporary direct impacts on two acres of prime farmland.

The No Lake Powell Water Alternative would have permanent indirect impacts on 40,537 acres of prime farmland from pressure to convert agricultural irrigation water to raw water supply for treatment by reverse osmosis processes.

ES-3.3 Floodplain

The Water Conveyance System would have temporary direct impacts on 13 acres of floodplain. The South Alternative alignment would have temporary direct impacts on 15 acres of floodplain. The Existing Highway Alternative alignment would have temporary direct impacts on 33 acres of floodplain. The Southeast Corner Alternative alignment would have temporary direct impacts on 15 acres of floodplain.

ES-3.4 Waste Disposal and Hazardous Waste

The potential direct and indirect impacts of waste disposal and hazardous waste would be the same across all action alternatives.

ES-3.5 Wilderness, WSAs, and Land with Wilderness Characteristics

The Water Conveyance System could have minor indirect effects on recreational users in the southern portion of a wilderness study area near The Cockscomb geological feature. The remaining features of the LPP project alternatives and other alternatives would have no direct or indirect impacts on designated wilderness, wilderness study areas or land with wilderness characteristics.

ES-3.6 Wild and Scenic Rivers

The proposed 230 kV Glen Canyon to Buckskin Transmission Line would cross over the Lower Paria River-1 segment, considered to be suitable by BLM, which is to be eligible for designation as a Wild and Scenic River. The transmission line would cross the Paria River Canyon, ranging from 230 to 290 feet deep, parallel and adjacent to two existing high-voltage transmission lines (500 kV Navajo-McCullough Transmission Line and 169 kV Glen Canyon to Buckskin Transmission Line). The remaining features of the LPP project alternatives and other alternatives would have no direct or indirect impacts on river corridors designated or considered to be eligible as Wild and Scenic Rivers.

ES-3.7 Grazing Land

The LPP Water Conveyance System would have permanent direct impacts on five acres of grazing land and temporary direct impacts on 198 acres of grazing land. The South Alternative alignment would have permanent direct impacts on 757 acres of grazing land and temporary direct impacts on 1,027 acres of grazing land. The Existing Highway Alternative alignment would have permanent direct impacts on 749 acres of grazing land and temporary direct impacts on 779 acres of grazing land. The Southeast Corner Alternative alignment would have permanent direct impacts on 757 acres of grazing land and temporary

direct impacts on 1,082 acres of grazing land. The transmission line alignments would have temporary direct impacts on 25 acres of grazing land.

The No Lake Powell Water Alternative would have no direct or indirect impacts on grazing land.

ES-3.8 Rights-of-Way

The LPP alternatives would have minor direct and indirect impacts on established rights-of-way. The No Lake Powell Water Alternative would have no impacts on established rights-of-way.

ES-3.9 Trails and National Historic Trails

The LPP project alternative alignments would have temporary direct impacts on historic trails and national historic trails at several pipeline and penstock crossing locations. The trails and surrounding vegetation would be restored to pre-disturbance conditions at each crossing site.

The No Lake Powell Water Alternative would have no direct or indirect impacts on trails and national historic trails.

ES-3.10 Areas of Critical Environmental Concern (ACEC)

The LPP South Alternative and Southeast Corner Alternative would have temporary direct impacts on 12 acres of the Kanab Creek ACEC where the penstock would cross Kanab Creek Canyon and Bitter Seeps Wash. The other LPP action alternative features would have no impacts on ACECs.

The No Lake Powell Water Alternative would have no direct or indirect impacts on ACECs.

ES-3.11 Growth

The LPP project alternative alignments would have no direct impacts on growth in the St. George metropolitan area. The LPP project alternative would provide water for projected population increases associated with in-fill development within municipal boundaries served by transportation networks, schools, power, water distribution, sewer collection and other utility infrastructure. The growth scenario analysis excludes threatened and endangered species habitat, existing developed land, state parks, BLM-administered land, Indian reservations, conservation land, Red Cliffs Desert Reserve, U.S. Forest Service-administered land, open water, floodplains, wetlands and riparian areas, slopes greater than 25 percent, ridgelines, streams, and dry washes. Four growth scenarios were modeled; three of these scenarios were further modeled to exclude development in soil and rock hazard areas.

Scenario 1 would result in developing 108,744 acres within the growth study area including soil and rock hazard areas, and demonstrates the potential for urban and suburban sprawl without incorporating smart growth principles. Developable areas not connected to municipal boundaries, not proximate to existing or planned transportation networks, and not having infrastructure to support new development are excluded from growth Scenarios 2, 3, and 4. Scenario 2 represents growth on developable land incorporating smart growth principles. Scenario 3 represents growth on developable land with no land use conflicts and incorporates smart growth principles. Scenario 4 represents growth on developable land based on urban preference and incorporates smart growth principles. Scenarios 2A, 3A and 4A include development in soil and rock hazard areas; Scenarios 2B, 3B and 4B exclude development in soil and rock hazard areas. Table ES-1 shows the results of the growth scenario modeling for Scenarios 2B, 3B and 4B. The housing unit densities indicated under Scenarios 2B, 3B and 4B are within normal densities for urban

Table ES-1
Results of Growth Scenario Modeling in the Washington County Growth Study Area, 2060

Scenario	Demographic Indicators for Future Development				
	2060 Population[1]	Housing Units[1]	Household Size[1]	Housing Units Per Square Mile[2]	Housing Units Per Acre[2]
2B	581,731	237,065	2.42	1,468	2.29
3B	581,731	237,065	2.42	2,538	3.96
4B	581,731	237,065	2.42	1,915	2.99

Notes: [1]Data compiled from Utah Governor's Office of Planning and Budget, 2012 Baseline Projections
[2]Values include existing (2011) and future (2060) housing units

development. These analyses demonstrate the 2060 population of 581,731 people could be accommodated within the Washington County growth study area and within areas already served by infrastructure, incorporating conservative development assumptions. The LPP project would supply water to meet Washington County needs through approximately 2052, when the growth study area population would be slightly less than 500,000 with an average housing unit density of 2 units per acre. Therefore, the potential indirect impacts of the LPP operation on urban and suburban growth within the Washington County growth study area would not be significant.

The No Lake Powell Water Alternative would have no direct impact on growth in the St. George metropolitan area. Water developed from local supplies, conserved by eliminating residential outdoor watering, and treating Virgin River water mixed with reuse effluent using reverse osmosis treatment would meet the population growth projected by the Utah Governor's Office of Planning and Budget through approximately 2052.

The No Lake Powell Water Alternative would not have reasonably foreseeable indirect impacts on growth in the St. George metropolitan area. The areas of St. George identified for future growth would continue to infill with population as long as infrastructure is not prohibited.

Chapter 1
Introduction

1.1 Introduction

This chapter presents a summary description of the Lake Powell Pipeline (LPP) Project alignment alternatives, the No Lake Powell Water Alternative, and the No Action Alternative. It introduces the area studied for environmental resources. It provides an overview of the proposed LPP Project, including each alignment alternative and locator maps.

The LPP Project would deliver Utah's Colorado River water from Lake Powell to the service areas of Washington County Water Conservancy District (WCWCD) and Kane County Water Conservancy District (KCWCD). The LPP Project action alternatives studied include various pipeline and penstock system configurations. Each action alternative would deliver 86,249 acre-feet of municipal and industrial (M&I) use water to the following southwest Utah water conservancy district service areas:

- WCWCD would receive 82,249 acre-feet annually.
- KCWCD would receive up to 4,000 acre-feet annually.

One of the LPP systems previously studied included a conveyance system for the Central Iron County Water Conservancy District (CICWCD), which would have delivered approximately 13,249 acre-feet annually to the Cedar Valley area. The various alternatives were under study when the CICWCD decided to withdraw from the LPP Project, and this conveyance system is no longer being considered.

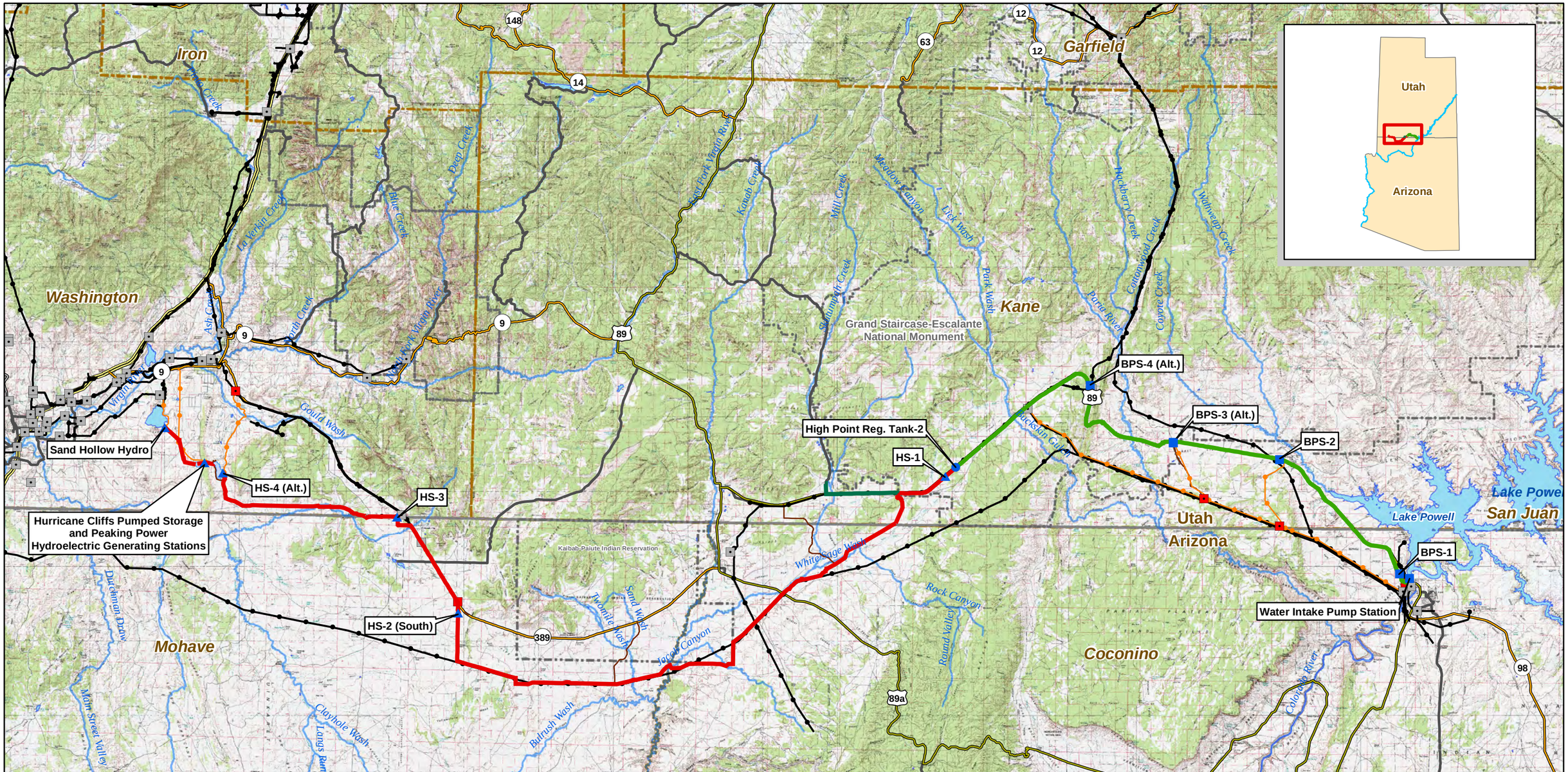
1.2 Summary Description of LPP Project Alignment Alternatives

Three primary pipeline and penstock alignment alternatives are described in this section, along with the electrical power transmission line alignments for providing power to the pump stations and a natural gas supply line alignment alternative. The pipeline and penstock alignment alternatives share common segments between the intake at Lake Powell and delivery at Sand Hollow Reservoir, and they differ spatially in, through and around Kaibab-Paiute Indian Reservation.

The South Alternative (Proposed Action) extends south around Kaibab-Paiute Indian Reservation. The Existing Highway Alternative follows an Arizona state highway through Kaibab-Paiute Indian Reservation. The Southeast Corner Alternative follows the Navajo-McCullough Transmission Line corridor through the southeast corner of Kaibab-Paiute Indian Reservation. The Electric Transmission Line alignments are common to all the pipeline and penstock alignment alternatives. The Natural Gas Supply Line Alignment Alternative is common to all pipeline and penstock alignment alternatives. The natural gas pipeline alignment would be coincident to the buried waterline and would not have a different alignment, as compared to transmission line alignments. Figure 1-1 shows the overall proposed project from Lake Powell near Page, Arizona to Sand Hollow Reservoir, Utah.

1.2.1 South Alternative

The South Alternative consists of four systems: **Water Intake, Water Conveyance, Hydro,** and **KCWCD** (see Figure 1-1).



Project Pump Station
Project Regulating Tank
Project Hydro Station
Substation
Proposed Substation

Water Conveyance System
Hydro System - South Alternative (Penstock Segment)
KCWCD System
Project Transmission Lines
Existing Transmission Lines

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

UDWRe **Figure 1-1** MWH

Lake Powell Pipeline Proposed Action

The **Water 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. An enclosed pump station building would house vertical turbine pumps with electric motors, electrical controls, and other equipment at a ground level elevation of 3,745 feet above mean sea level (AMSL).

The **Water Conveyance System** would convey water diverted from Lake Powell at the Intake System through a buried 69-inch diameter pipeline for about 51 miles, parallel with Highway 89 in Coconino County, Arizona and Kane County, Utah, to a buried regulating tank (High Point Regulating Tank-2) along Highway 89 at ground level elevation 5,691 feet AMSL. The pipeline would be a line of connected pipes used for carrying water over a long distance. Figure 1-2 shows the LPP Project Water Intake and Water Conveyance systems. The High Point Regulating Tank-2 would be the LPP Project topographic high point (Figure 1-2). The pipeline would be sited within a utility corridor established by Congress in 1998 that extends 500 feet south and 240 feet north of the Highway 89 centerline on public land administered by Bureau of Land Management (BLM) (U.S. Congress 1998). Figure 1-3 shows the typical 100-foot-wide right-of-way and 20-foot-wide temporary construction easement for the water conveyance system pipeline, adjacent to and away from the highway.

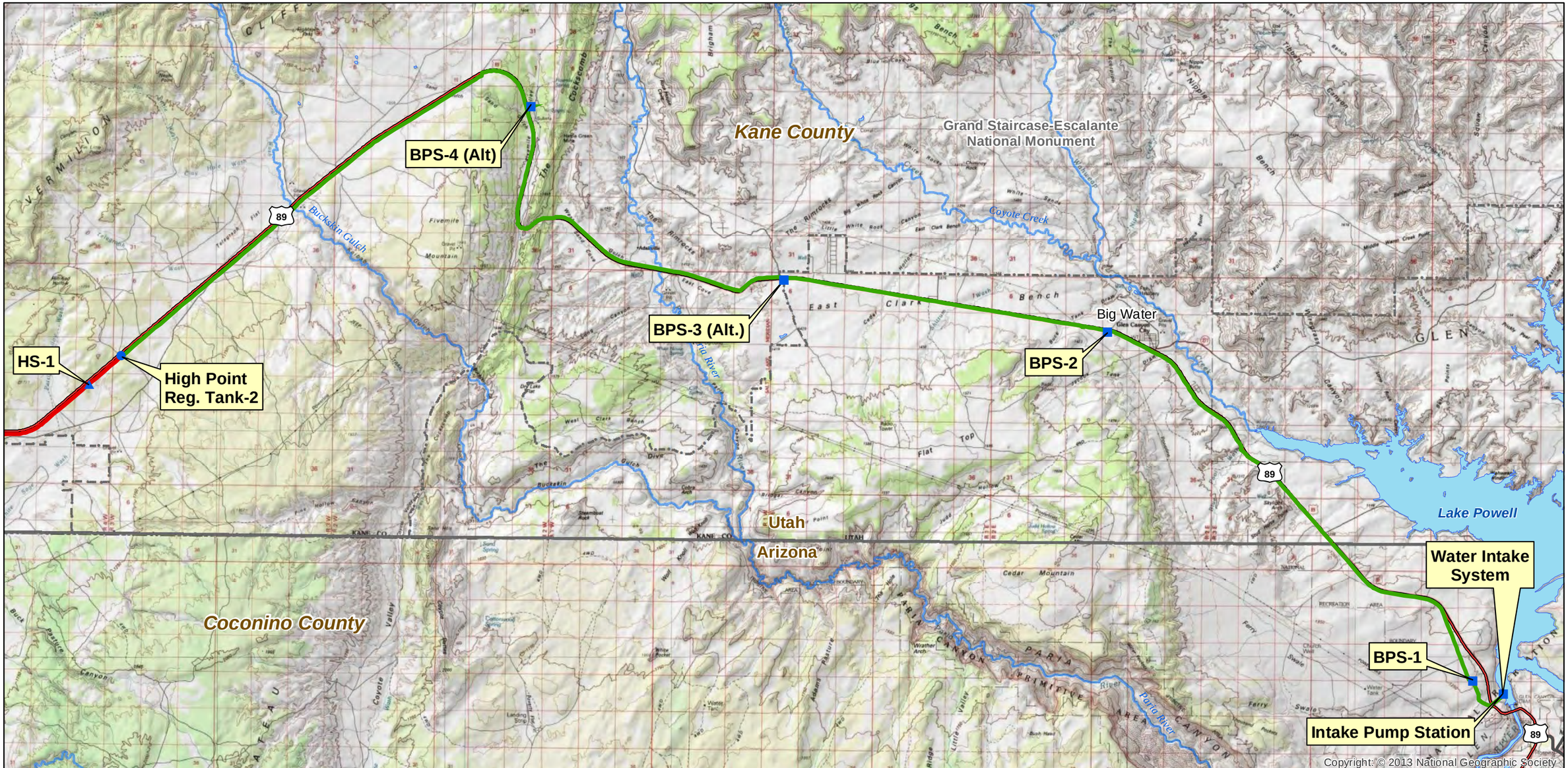
Four booster pump stations (BPS) along the pipeline would pump water to the high point regulating tank. Each BPS would house vertical turbine pumps with electric motors, electrical controls, and other equipment. Additionally, each BPS site would have a buried forebay tank, buried surge tanks, pig retrieval and launching stations, and a surface emergency overflow detention basin. BPS-1 would be located within Glen Canyon National Recreation Area (GCNRA) adjacent to an existing Arizona Department of Transportation maintenance facility, along a segment of abandoned highway, west of Highway 89. The BPS-1 site would cover about six acres and be surrounded by security fencing.

BPS-2 would be on land administered by Utah School and Institutional Trust Lands Administration (SITLA) near Big Water, Utah, on the south side of Highway 89. The BPS-2 site would cover about five acres and be surrounded by security fencing.

BPS-3 (Alt.) would be on land administered by BLM Kanab Field Office, near the east boundary of Grand Staircase-Escalante National Monument (GSENM) on the south side of Highway 89, within the Congressionally-designated utility corridor. The BPS-3 (Alt.) site would cover about five acres and be surrounded by security fencing.

BPS-4 (Alt.) would be located on private land east of Highway 89 and west of the Cockscomb geologic feature (Figure 1-2). The BPS-4 (Alt.) site would cover about six acres and be surrounded by security fencing. The proposed pipeline alignment west of the Cockscomb geologic feature would be situated adjacent to the south boundary of the Congressionally-designated utility corridor.

The proposed pipeline alignment would continue parallel to Highway 89 to the buried High Point Regulating Tank-2 at 5,691 feet AMSL, which would be the topographic high point of the LPP Project (Figure 1-2). The Water Conveyance System would terminate at High Point Regulating Tank-2. The buried High Point Regulating Tank-2 would cover about four acres and be surrounded by security fencing.



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

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

UDWRe **Figure 1-2** MWH

Lake Powell Pipeline Intake and Water Conveyance System

Figure 1-3 shows the typical 100-foot-wide right-of-way and 20-foot-wide temporary construction easement for the hydro system penstock adjacent to, and away from, the highway. Four in-line hydro generating stations (HS-1, HS-2 [South], HS-3, and HS-4 [Alt.]), with substations located along the penstock, would generate electricity and help control water pressure in the penstock. Each in-line hydro station would consist of a building housing the generator units, an afterbay reservoir, retention basin, pig retrieval and launching stations, switchyard, and maintenance parking area, all surrounded by perimeter security fencing.

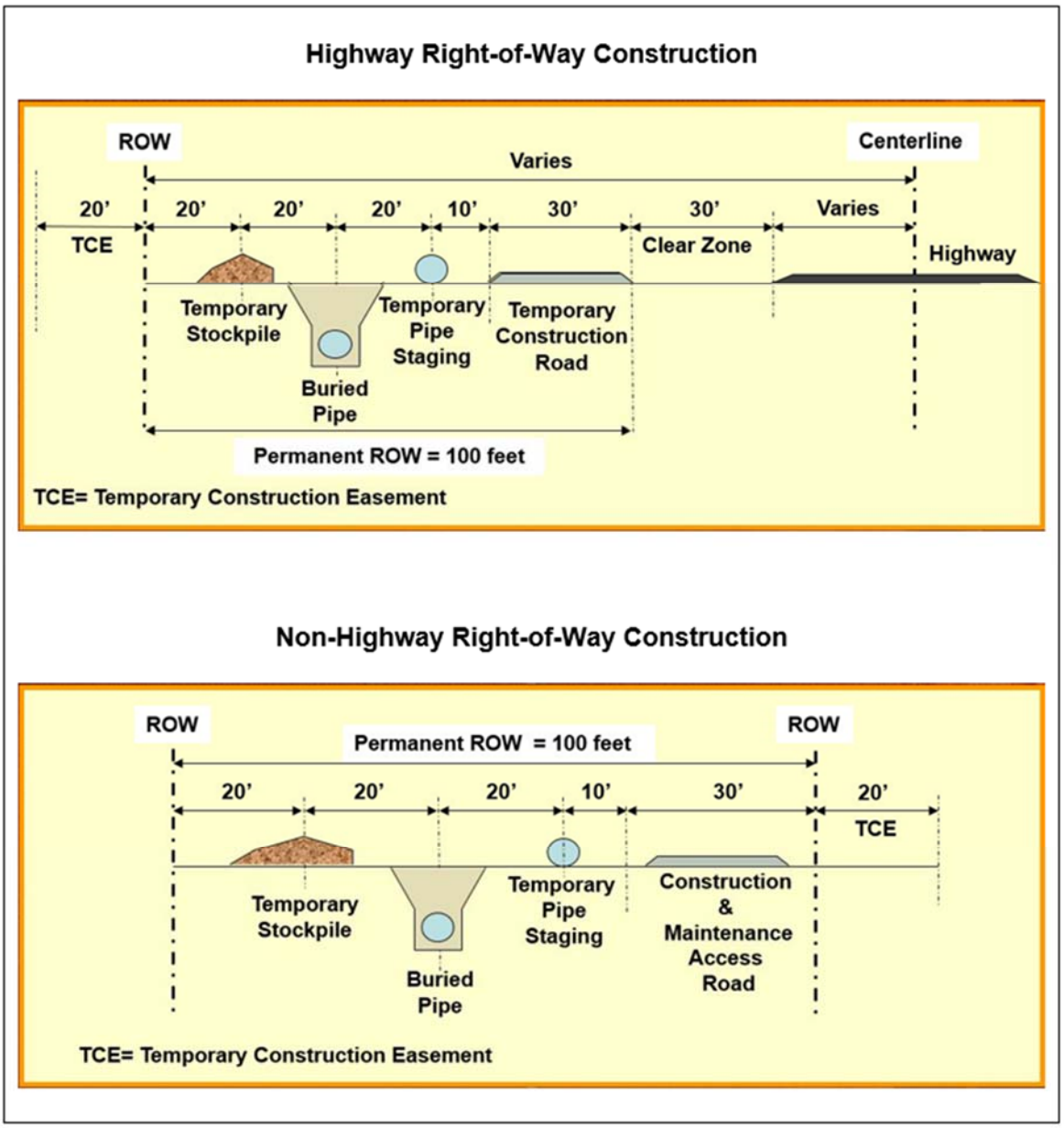


Figure 1-3
Pipeline and Penstock Right-of-Way

The **Hydro System** would convey the water from High Point Regulating Tank-2, at a topographic high point in the LPP Project with ground level elevation 5,691 feet AMSL, 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 1-4). A penstock is an enclosed pipe that delivers water to hydroelectric turbines.

A short penstock segment would convey the water to HS-1. This in-line hydro station would generate up to one megawatt (MW) of electricity at a site along Highway 89 within GSENM, and the penstock would continue west along Highway 89 to the GSENM west boundary. The HS-1 site would cover about five acres.

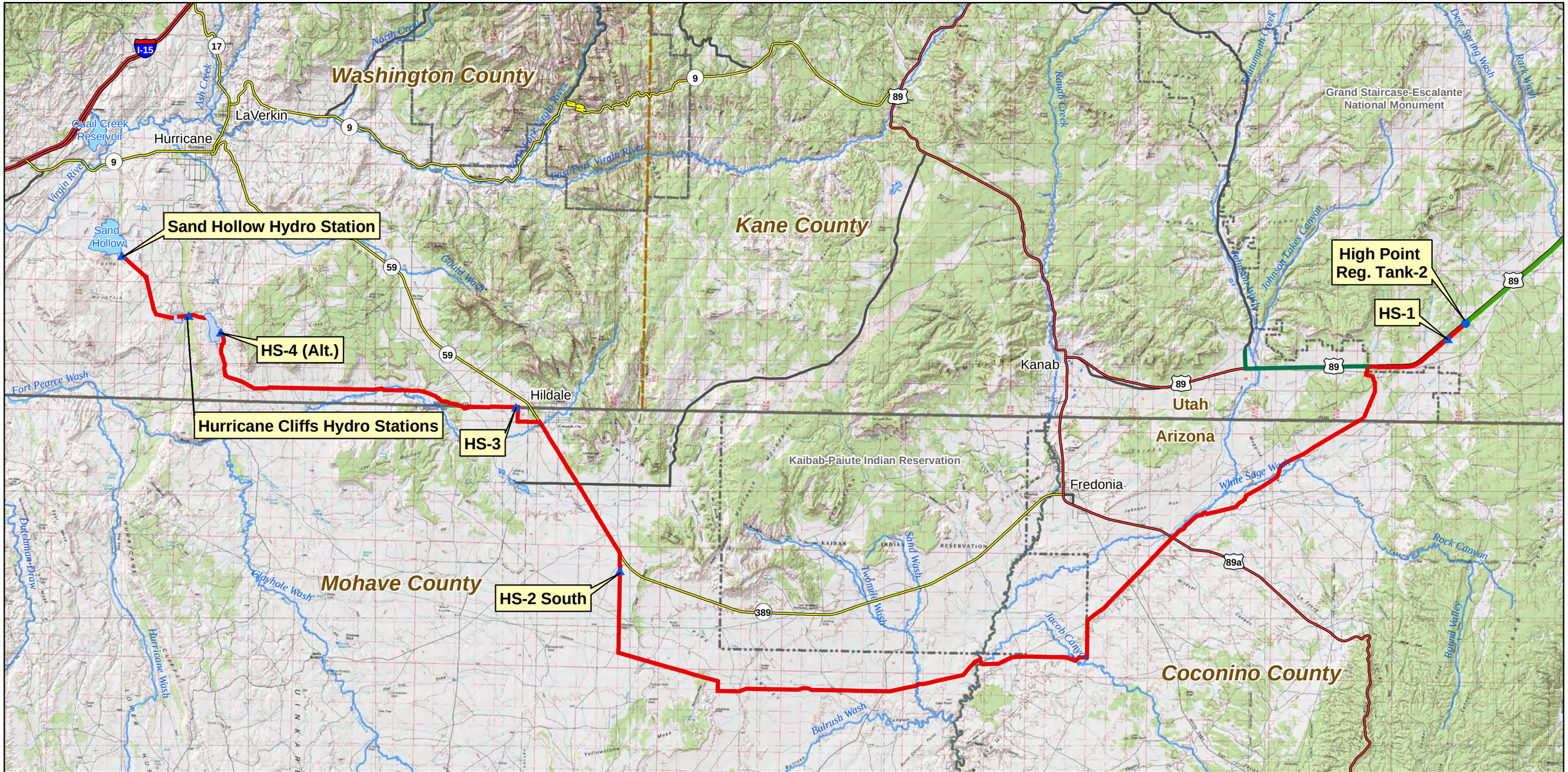
The penstock alignment would turn south from Highway 89 through private land and BLM-administered public lands into White Sage Wash. It would continue across White Sage Wash and then parallel Navajo-McCullough Transmission Line, crossing Highway 89 Alt. and Forest Highway 22 toward the southeast corner of Kaibab-Paiute Indian Reservation. The penstock alignment would run parallel to and south of the Kaibab-Paiute Indian Reservation south boundary, crossing Kanab Creek and Bitter Seeps Wash. It would continue across Moonshine Ridge and Cedar Ridge to Yellowstone Road. At this point, the penstock alignment would run north along Yellowstone Road to Arizona State Route 389 west of Kaibab-Paiute Indian Reservation. HS-2 (South) would be located west of Kaibab-Paiute Indian Reservation on private land east of Yellowstone Road. HS-2 (South) would generate up to one MW of electricity. The HS-2 (South) site would cover about five acres. 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. HS-3 would be located on private land west of Hildale City, Utah, north of and adjacent to Uzona Road. HS-3 would generate up to one MW of electricity. The HS-3 site would cover about five acres. A turnout for future delivery of 13,249 acre-feet of WCWCD's allocation of LPP Project water to Apple Valley would be located immediately west of HS-3.

The penstock alignment would follow Uzona Road west through Canaan Gap and south of Little Creek Mountain, turning north to HS-4 (Alt.) above the proposed Hurricane Cliffs forebay reservoir. HS-4 (Alt.) would be located on about three acres of public land administered by the BLM. HS-4 (Alt.) would generate up to 1.7 MW of electricity and would discharge into the forebay reservoir.

The forebay reservoir would be contained in a valley between two dams (south and north), maintaining active storage of 11,255 acre-feet of water. The forebay reservoir and two dams would cover about 500 acres of public land administered by BLM and would be surrounded by security fencing. 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 35-MW-capacity peaking power hydroelectric generating station and a 300-MW-capacity pumped storage hydroelectric generating station.

The Hurricane Cliffs hydroelectric generating stations and tailrace channel would cover about 50 acres of public land administered by BLM and would be surrounded by security fencing. The tailrace channel would discharge into an afterbay reservoir with 3,551 acre-feet of operating capacity, which is contained by a single dam in the valley below the Hurricane Cliffs. The afterbay reservoir and dam would cover about 200 acres of public land administered by BLM and would be surrounded by security fencing.

Water would be released from the forebay reservoir through the hydro generating system to meet peak power demands. Water would be pumped from the afterbay reservoir into the forebay reservoir during periods of off-peak power demand. The forebay and afterbay reservoirs would not be open to public access because the water levels would fluctuate rapidly during daily operations. A low pressure tunnel would convey the water northwest from the afterbay reservoir to a penstock, continuing to the Sand



Project Pump Station
Project Regulating Tank
Project Hydro Station
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs

Water Conveyance System
Hydro System - South Alternative (Penstock Segment)
KCWCD System
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

N

0 1 2 4 6 8 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-4** MWH

Lake Powell Pipeline Hydro System South Alternative

Hollow Hydro Station, which would generate up to 4.2 MW of electricity. The Sand Hollow Hydro Station would be located on land owned by WCWCD and cover about five acres adjacent to Sand Hollow Reservoir. The LPP Project water would discharge from the Sand Hollow Hydro Station into the existing Sand Hollow Reservoir.

The **KCWCD System** would convey water diverted from Lake Powell through the LPP at the west GSENM boundary for about eight miles through a buried 24-inch diameter pipeline in Kane County, Utah, near the mouth of Johnson Canyon. The pipeline would parallel the south side of Highway 89 across Johnson Wash and then run north for 5000 feet to the mouth of Johnson Canyon (Figure 1-4).

1.2.2 Existing Highway Alternative

The Existing Highway Alternative consists of four systems: **Water Intake, Water Conveyance, Hydro,** and **KCWCD**. The **Water Intake** and **Water Conveyance** systems would be the same as described for the South Alternative. The **Hydro System** would convey water diverted at Lake Powell from High Point Regulating Tank 2 at the LPP Project topographical high point (5,691 feet AMSL) 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 1-5). The alternative alignment parallels Highway 89 to the west and south boundary of GSENM and continues along Highway 89 to Lost Spring Gap. Four in-line hydro generating stations (HS-1, HS-2 [Hwy], HS-3, and HS-4 [Alt.]) located along the penstock would generate electricity and help control water pressure in the penstock. The HS-1, HS-3 and HS-4 (Alt.) hydro stations would be the same as described for the South Alternative.

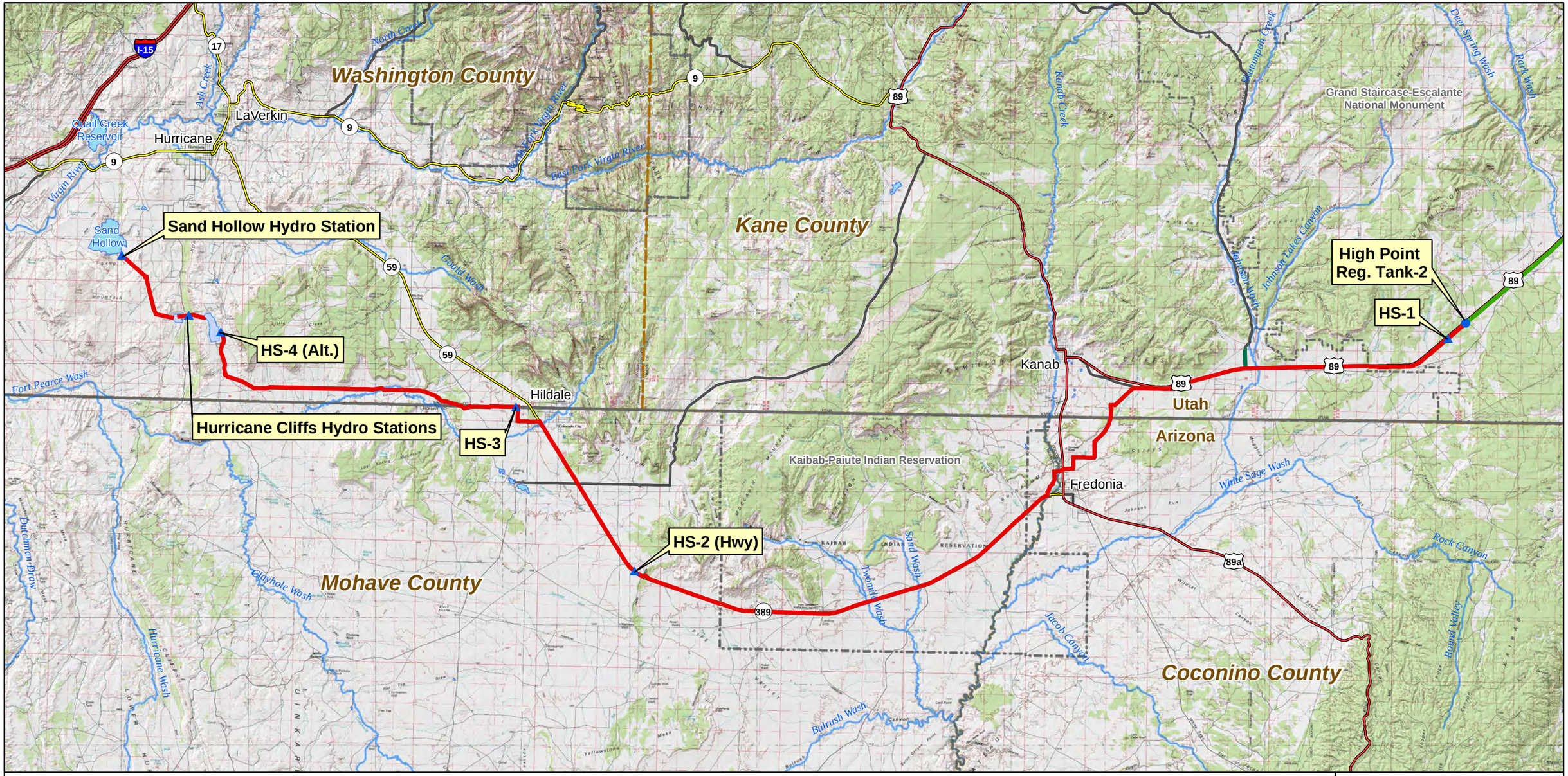
The penstock downstream from the proposed HS-1 would be sited along the south side of Highway 89 within GSENM. The penstock would parallel the south side of Highway 89 west of GSENM, continue past Johnson Wash and follow Lost Spring Gap southwest, crossing Highway 89 Alt. and Kanab Creek in the north end of Fredonia, Arizona. It would continue south, paralleling Kanab Creek to Arizona State Route 389, where it would run west, adjacent to the north side of Route 389 through 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 Kaibab-Paiute Indian Reservation to 1.8 miles west of Cedar Ridge (intersection of Yellowstone Road with Highway 89), where it would then follow the same alignment as the South Alternative to Sand Hollow Reservoir. HS-2 (Hwy) would be sited 0.5 miles west of Cedar Ridge along the north side of Arizona State Route 389. HS-2 (Hwy) would generate approximately 0.8MW of electricity and cover 8.7 acres of private land.

The **KCWCD System** would convey water diverted at Lake Powell from the LPP Project along Highway 89 north along Johnson Canyon Road for 5,000 feet through a buried 24-inch diameter pipeline in Kane County, Utah to the mouth of Johnson Canyon (Figure 1-5).

1.2.3 Southeast Corner Alternative

The Southeast Corner Alternative consists of four systems: **Water Intake, Water Conveyance, Hydro,** and **KCWCD**. The **Water Intake**, **Water Conveyance**, and **KCWCD** systems would be the same as described for the South Alternative.

The **Hydro System** would be the same as described for the South Alternative from High Point Regulating Tank 2 at the LPP Project topographical high point (5,691 feet AMSL) to the east boundary of Kaibab-Paiute Indian Reservation. At the east boundary of 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-Paiute Indian Reservation for



Project Pump Station
Project Regulating Tank
Project Hydro Station
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs

Water Conveyance System
Hydro System - Existing Highway Alternative (Penstock Segment)
KCWCD System
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

N

0 1 2 4 6 8 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-5** MWH

Lake Powell Pipeline Hydro System Existing Highway Alternative

about 3.8 miles. The penstock would 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). The Southeast Corner Alternative would be about 85.7 miles long from High Point Regulating Tank-2 to Sand Hollow Reservoir.

1.2.4 Transmission Line Alignments

Transmission line alignments have been identified to transmit electric power to pump stations in the Water Intake and Water Conveyance systems, and to transmit electric power generated by hydroelectric stations in the Hydro System. The transmission lines that would serve the Water Intake and Water Conveyance systems are located in the east half of the LPP Project. The transmission lines that would serve the Hydro System are located in the west half of the LPP Project.

The proposed new **Water Intake Transmission Line** would begin at Glen Canyon Substation and run parallel to Highway 89 for about 2,500 feet to a new switch station, cross Highway 89 at the Intake access road intersection, and continue northeast to a new electrical substation on the Intake Pump Station site. This 69 kV transmission line would be 0.9 mile 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 Highway 89 and parallel the LPP Project Water Conveyance System alignment to a new electrical substation on the BPS-1 site west of Highway 89. The 69 kV transmission line would be about one mile long in Coconino County, Arizona (Figure 1-7).

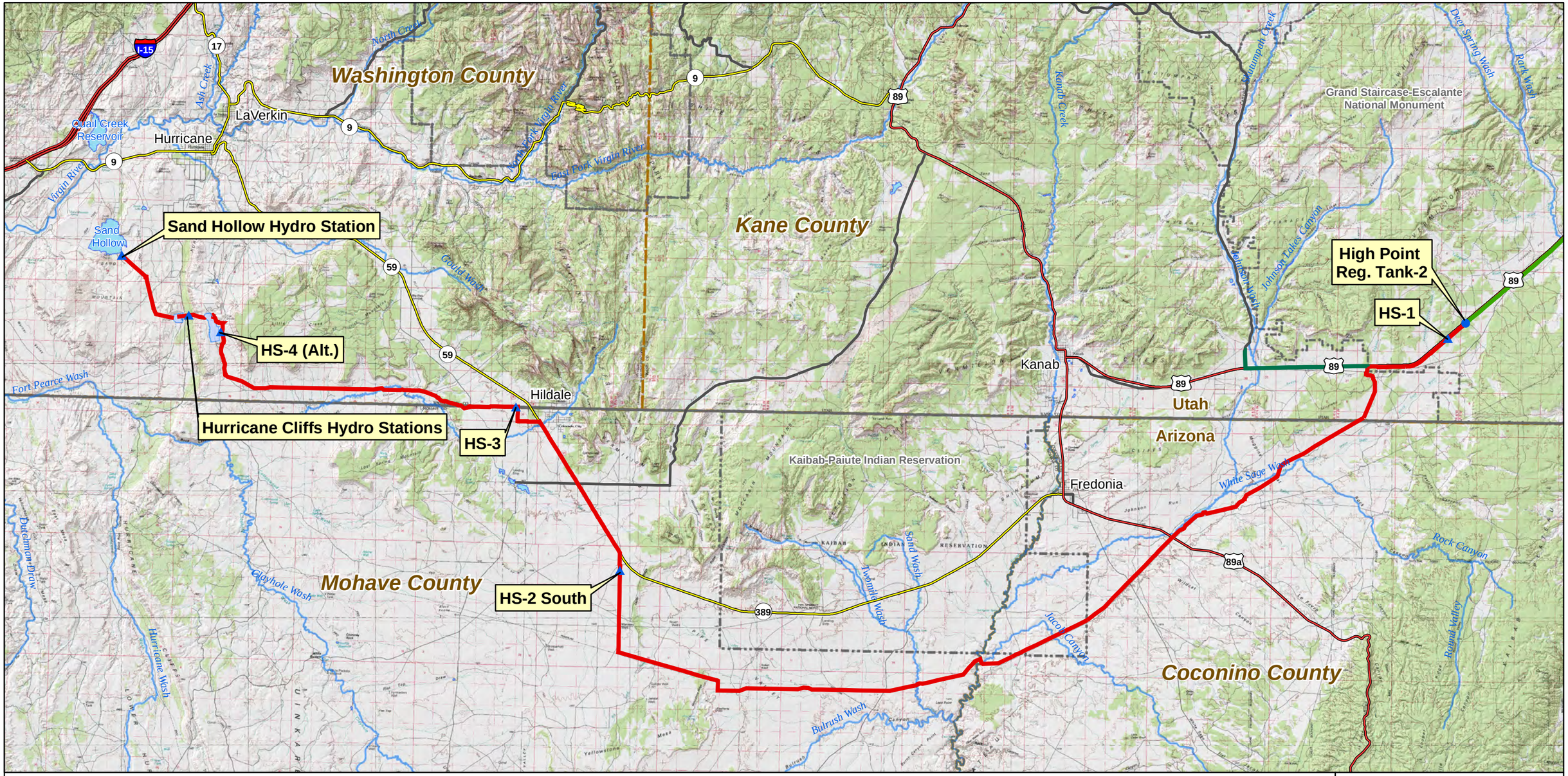
The proposed new **Glen Canyon to Buckskin Transmission Line** would consist of a 230 kV transmission line from the Glen Canyon Substation to the Buckskin Substation, running parallel to the existing 138 kV transmission line. This transmission line upgrade would be about 36 miles long through Coconino 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 five acres of land within 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 (Alt.). The substation upgrade would require an additional two acres of privately-owned land adjacent to the existing substation in Kane County, Utah (Figure 1-7).

The proposed new **BPS-2 Transmission Line** would consist of a new three-ring switch station along the new 230 kV Glen Canyon to Buckskin Transmission Line, 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 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 alignment would be about seven miles long across Utah SITLA-administered land, with a 138 kV connection to a new electrical substation on the BPS-2 site (Figure 1-7).

The proposed new **BPS-3 Alt. Transmission Line South** would consist of a new three-ring switch station along the new 230 kV Glen Canyon to Buckskin Transmission Line, and a new transmission line from the switch station north along an existing BLM road to a new electrical substation on the BPS-3 (Alt.) site near the GSENM east boundary and within the Congressionally-designated utility corridor. This new 138 kV transmission line alignment would be about 5.9 miles long in Kane County, Utah (Figure 1-7).



- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Water Conveyance System
- Hydro System - Southeast Corner Alternative (Penstock Segment)
- KCWCD System
- 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

N

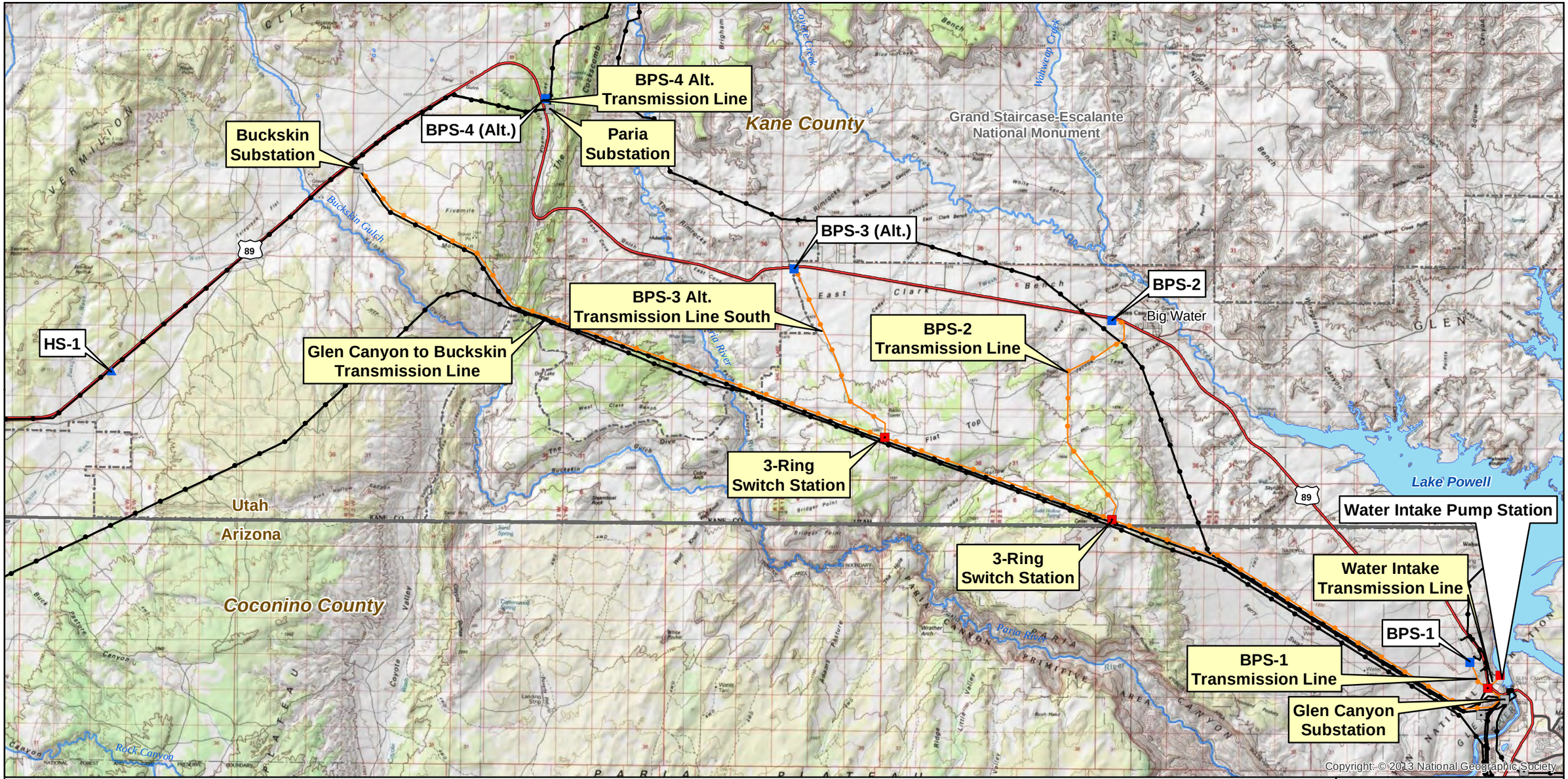
0 1 2 4 6 8 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-6** MWH

Lake Powell Pipeline
Hydro System
Southeast Corner Alternative



Project Intake Pump Station
Project Pump Station
Project Hydro Station
Substation
Proposed Substation
Project Transmission Lines
Existing Transmission Lines
Interstate
US Highway
ST Highway
Hwy
Major Road
Lakes & Reservoirs
Major Rivers & Streams
National Park/Monument
GSENM Boundary
State Boundaries

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

0 0.5 1 2 3 4 Miles

N

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-7** MWH

Lake Powell Pipeline Proposed Transmission Lines East

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

The proposed new **HS-1 Transmission Line** would begin at the new HS-1 and tie into the existing 69 kV transmission line along Highway 89 from the Buckskin Substation to the Johnson Substation. The HS-1 69 kV transmission line would be about 400 feet long in Kane County, Utah (Figure 1-8).

The proposed new **HS-2 (South) Transmission Line** 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 new **HS-2 (Highway) Transmission Line** alternative would directly connect the HS-2 hydroelectric station and substation along the Existing Highway Alternative to an existing 138 kV transmission line paralleling Arizona State Route 389. This new 34.5 kV transmission line would be about 200 feet long in Mohave County, Arizona.

The proposed new **HS-3 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 transmission line would be about 0.6 mile long in Washington County, Utah (Figure 1-8).

The proposed new **HS-4 (Alt.) Transmission Line** would connect the HS-4 (Alt.) 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).

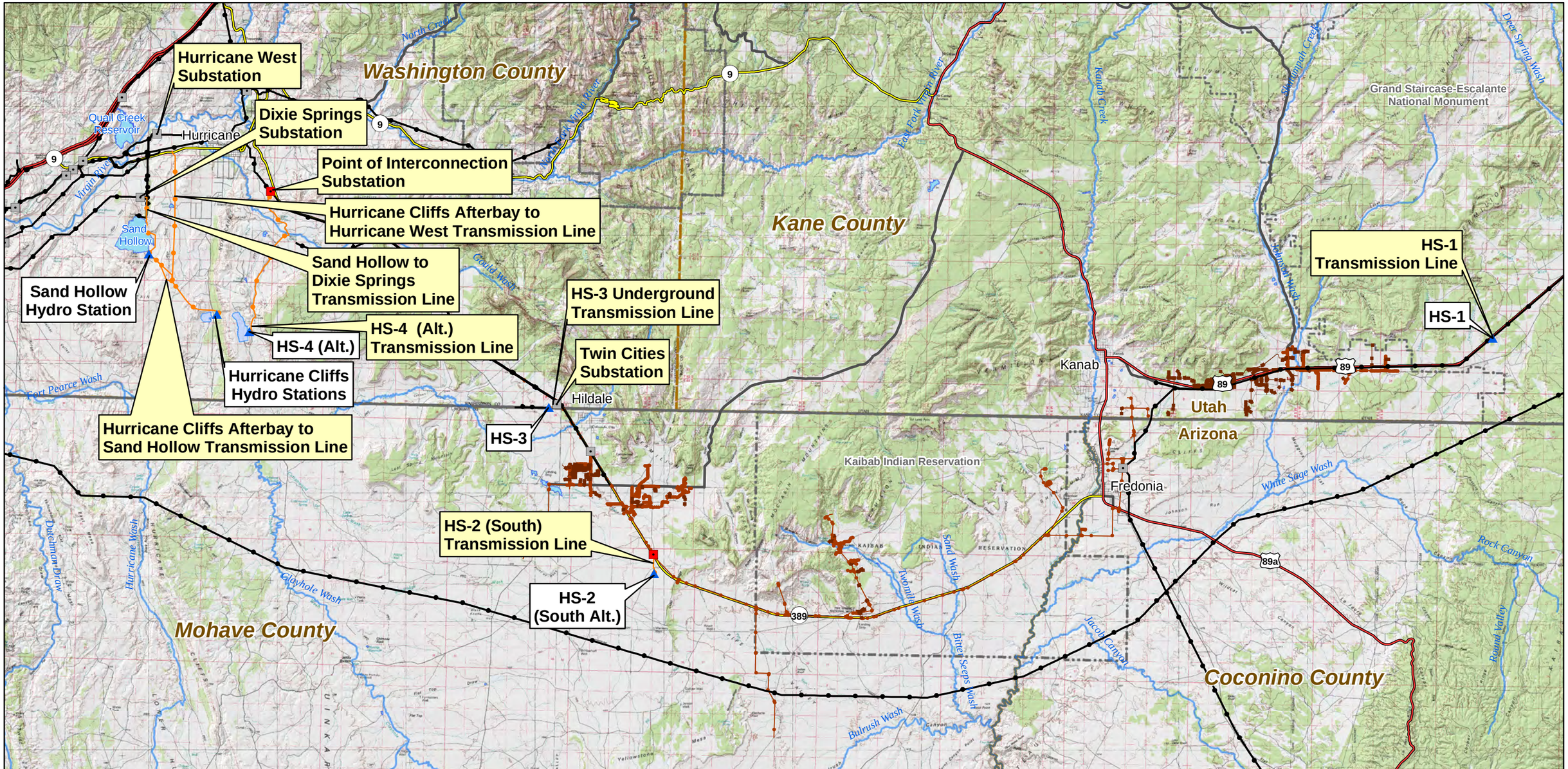
The proposed new **Hurricane Cliffs Afterbay to Sand Hollow Transmission Line** would consist of a new 69 kV transmission line, which would run northwest from the Hurricane Cliffs peaking power plant and substation to the Sand Hollow Hydro substation. This new 69 kV transmission line would be about 4.9 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, running from the Hurricane Cliffs pumped storage power plant 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, running from the Sand Hollow Hydro 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).

1.2.5 Natural Gas Pipeline and Generators Alternative

Natural gas engine-driven generation systems to power electric pumps would be an alternative to powering the LPP Project pump stations by electricity via transmission lines. Recent discussions with Questar Gas Company (local natural gas supplier) indicated that capacity would be available in the Kern River natural gas pipeline, which is located west of St. George, Utah, to supply natural gas for this alternative. Questar Gas Company indicated the company has future plans to extend a high pressure natural gas pipeline from the Kern River line to Hurricane, Utah. The Questar Gas pipeline would be sized to supply natural gas to the LPP Project if it is determined that a single-purpose, dedicated high pressure gas line would be extended to service the LPP pump stations. Based on the preliminary pump



Project Hydro Station
Substation
Proposed Substation
Project Transmission Lines
Existing Transmission Lines
Existing OH Primary Line
Existing UG Primary Line
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams
Interstate
US Highway
ST Highway
Hwy
Major Road
National Park/Monument
GSENM Boundary
Tribal Lands
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FERC Project Number:
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AZA-34941
UTU-85472

N

0 1 2 4 6 8 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-8** MWH

Lake Powell Pipeline Proposed Transmission Lines West

selection and fuel requirements, the natural gas supply pipeline would be 12 inches in diameter to provide natural gas supply for the LPP Project pump stations. The pipeline would likely be successively reduced in size as it delivers gas to each of the pump stations.

1.2.1.1 Natural Gas Transmission Line Connection

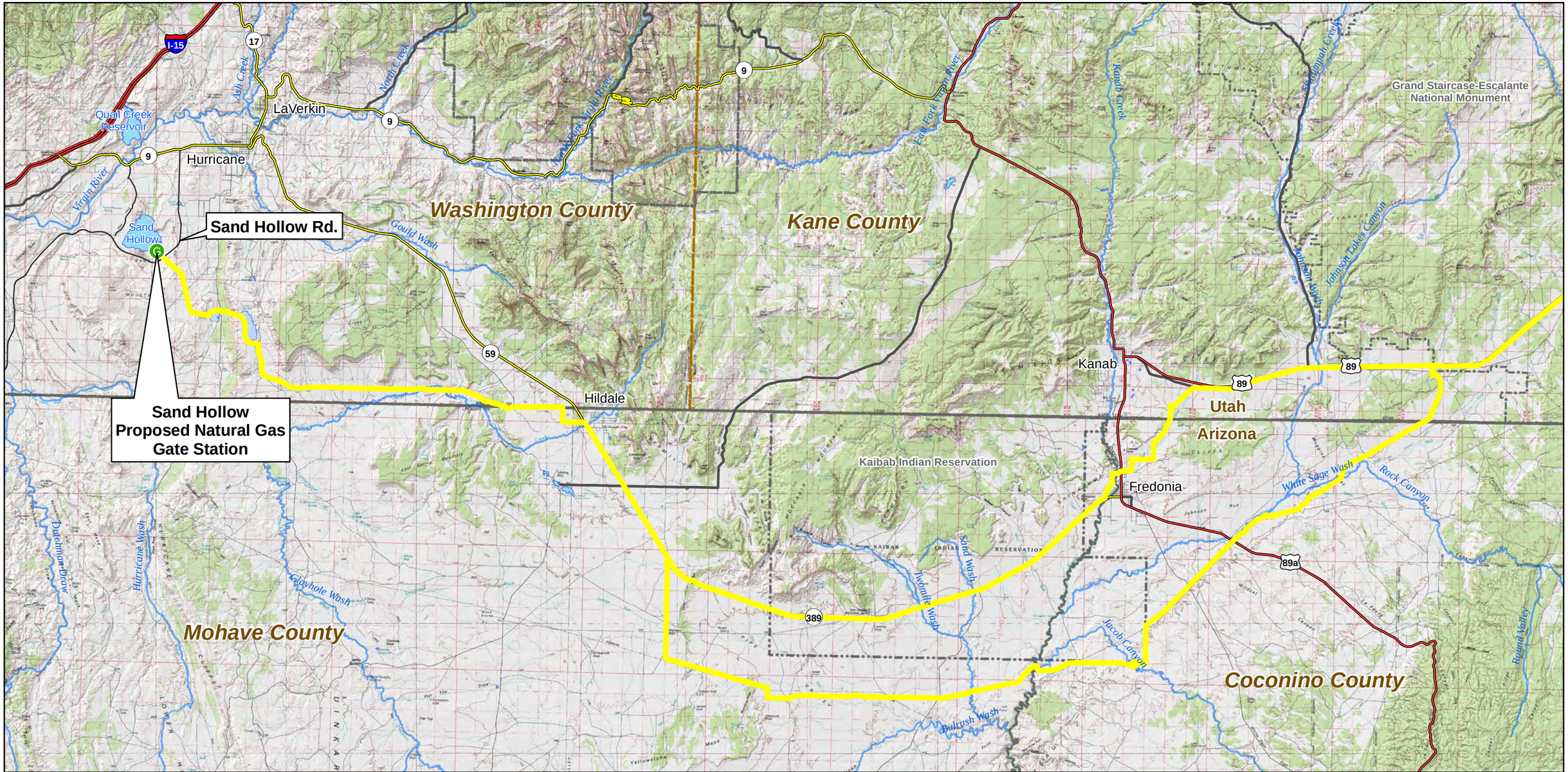
The natural gas supply line alternative would connect to the proposed Questar Gas Transmission Line from the existing Kern River line to Hurricane City. The natural gas supply line would connect to the high pressure gas transmission line at a proposed gate station southeast of Sand Hollow Reservoir. The proposed gate station would be located adjacent to the alignment of the extension of the Southern Corridor Highway, which is the existing alignment of Sand Hollow Road east of Sand Hollow Reservoir (Figure 1-9).

1.2.1.2 Natural Gas Supply Line

The proposed natural gas supply line would be an intermediate high pressure line and would operate between approximately 250 to 300 psi at the gate station connection. Because of pressure losses in the pipeline it is anticipated that the pressure at each of the LPP pump stations would vary between 50 and 100 psi, which would meet the requirements of the natural gas generators. The pipeline would be constructed of strong carbon steel and have a dielectric coating, such as a fusion bonded epoxy or extruded polyethylene. It would be installed with a minimum four feet of cover and be provided with cathodic protection (a technique that involves inducing an electric current through the pipe to ward off corrosion and rusting). The pipeline would be designed, constructed, tested, and operated at a minimum in accordance with all applicable requirements included in the U.S. DOT regulations in 49 CFR Part 192, “Transportation of Natural Gas and other Gas by Pipeline: Minimum Federal Safety Standards,” and other applicable federal and state regulations.

The natural gas supply line would follow the proposed LPP ROW from the Sand Hollow Gate Station to the intake pump station near Page, Arizona. The line would be about 138.5 miles long and installed a minimum of 10 feet from the edge of the proposed water pipeline in a separately excavated trench within the LPP ROW. Figure 1-9 shows the west alignment of the natural gas supply line as proposed and an alternative alignment along Arizona State Route 389 and through Fredonia, Arizona, parallel to the Existing Highway Alternative alignment, both to the west GSENM boundary. Figure 1-10 shows the east alignment of the natural gas supply line as proposed from the west GSENM boundary to the water intake pump station.

Sectionalizing valves would be required along the natural gas supply line alignment. These valves are safety devices used for emergency shut down or maintenance. The natural gas supply line sectionalizing valves would be required at approximately 20-mile intervals because of the gas line’s remoteness. The main line valve sites would cover a 40-foot by 40-foot area surrounded by a chain link fence within the confines of the permanent LPP pipeline ROW. The valves would be above ground and connected to the buried natural gas supply line. Additionally, pig launching or receiving equipment would be installed within the fenced areas. Pigs are devices that are placed into a natural gas supply line to clean the inside walls or to monitor its internal and external condition. Launching and receiving equipment is connected to the natural gas supply line to enable pigs to be inserted into or removed from the pipeline.



Natural Gas Gate Station
Natural Gas Supply Line Alignment
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:
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BLM Serial Numbers:
AZA-34941
UTU-85472

N

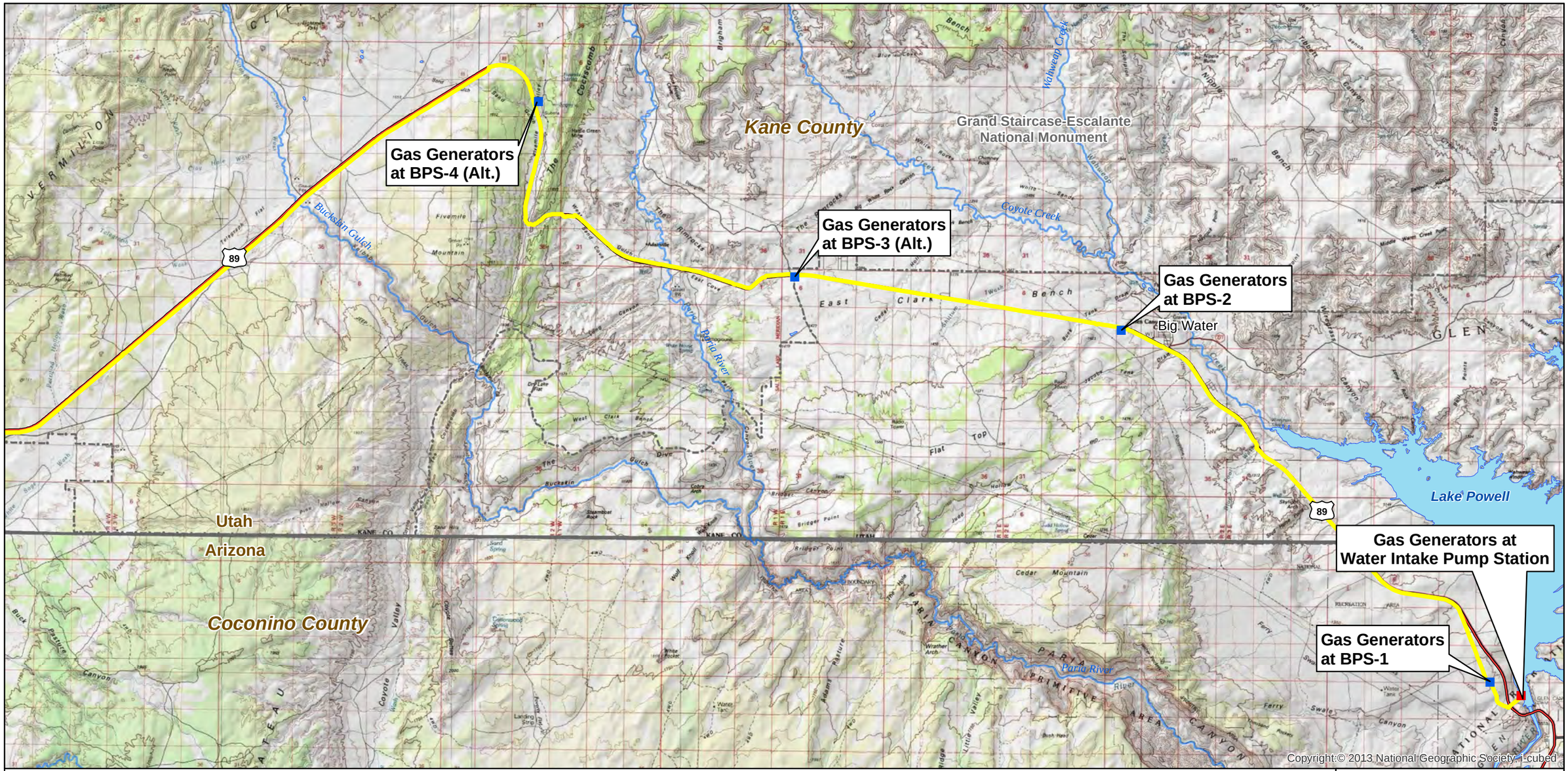
0 2 4 6 8 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-9** MWH

Lake Powell Pipeline
Natural Gas Supply Line and Generators West Alternatives



Project Water Intake Pump Station
Gas Generators at Booster Pump Station
Natural Gas Supply Line Alignment

Interstate
US Highway
ST Highway
Hwy
Major Road

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

FERC Project Number:
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BLM Serial Numbers:
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UTU-85472

N

0 1 2 3 4 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-10** MWH

Lake Powell Pipeline Natural Gas Supply Line and Generators East Alternative

1.2.5.3 Natural Gas Generators

Natural gas generators would be used to supply power to operate the electric pumps at the LPP pump stations. The size of the electric pumps is approximately 18 feet from center to center when configured. The overall pump station building size would be 14 feet wider and 18 feet longer than the pump stations which are powered by electricity from transmission lines.

The natural gas generators would be approximately 35 feet long by eight feet wide by nine feet high. The intake pump station building size for the natural gas generators would be approximately 65 feet wide by 170 feet long by 50 feet high, and located adjacent to the pump station electrical room within the five-acre site designated for each pump station. The booster pump station building size for the natural gas generators would be 65 feet wide and 39 feet high, with lengths ranging from 114 feet to 162 feet long. Each natural gas generator would require a 24-inch diameter stack, with guide wires, extending above the building roof to disperse the exhaust gases. The five stacks (four operating natural gas generators plus one standby natural gas generator) at the intake pump station would extend 20 feet above the top of the 55-foot tall building. The stacks at BPS-1, BPS-2, BPS-3 (Alt.), and BPS-4 (Alt.) would extend 61 feet above the top of the buildings to a total height of 100 feet above the ground surface. The natural gas generators at the intake pump station and BPS-4 (Alt.) would require emission control systems to meet air quality standards.

The natural gas generators alternative at the LPP pump stations would require an annual natural gas supply of 2,855,400 million British thermal units (MMBtu). Table 1-1 shows the annual natural gas consumption at the proposed project intake pump station and booster pump stations 1 through 4.

Table 1-1
Water Conveyance System Natural Gas Generator Annual Fuel Consumption

Pump Station	Site Elevation Feet MSL	Number of Pumps	Motor (HP)	Total Motor (kW)	Natural Gas Generator GE Model	# of Units[1]	Emission Control Required	Generator Total kW[2]	Annual Fuel Consumption (MMbtu)[3]
IPS	3,750	5	3000	11,190	JGS 620 F09	4+1	Yes	12,120	729,000
BPS-1	4,111	5	1500	5,595	JGS 620 F09	2+1	No	5,992	364,500
BPS-2	4,311	5	1750	6,530	JGS 620 F09	3+1	No	8,895	425,400
BPS-3 Alt.	4,657	5	2500	9,325	JGS 620 F09	4+1	No	11,652	607,500
BPS-4 Alt.	5,001	5	3000	11,190	JGS 620 F09	5+1	Yes	14,430	729,000
Total		**25**		**43,830**		**18+5**		**53,089**	**2,855,400**

Notes:
[1] Number of operating units plus standby generator
[2] Total generator capacity without standby generator
[3] The annual fuel consumption is based on all pumps operating at rated motor horsepower, 8400 hours/year operation with generators loaded at 87 percent on the average.

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 eliminating residential outdoor water use in the WCWCD service area. This alternative could provide a total of 86,249 acre-feet of water annually to WCWCD and KCWCD for M&I use without diverting Utah's water from Lake Powell.

1.3.1 WCWCD No Lake Powell Water Alternative

1.3.1.1 Background

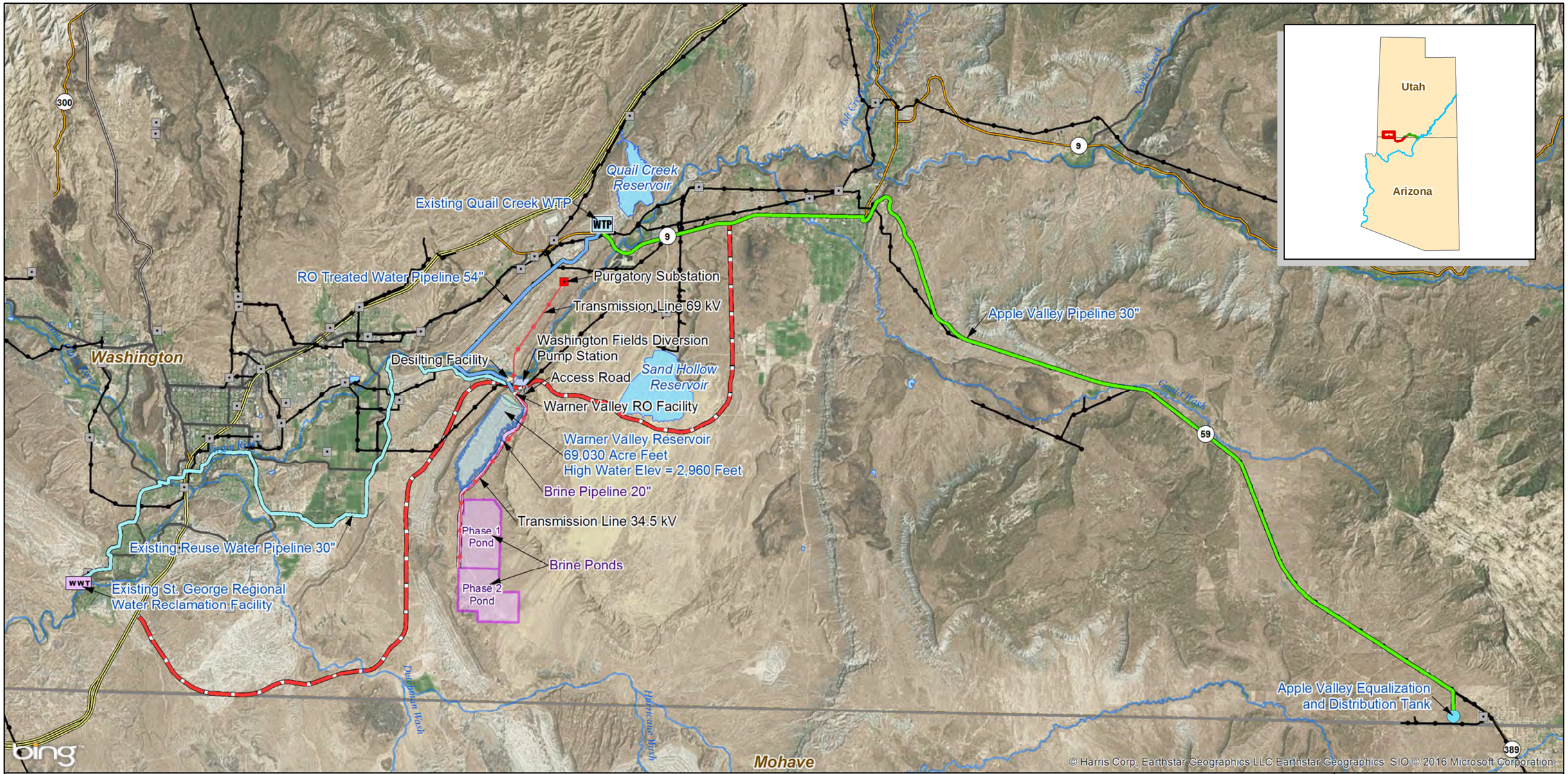
The WCWCD LPP allocation would be 82,249 acre-feet per year, and the WCWCD No Lake Powell Water alternative would need to supply 82,249 acre-feet per year to meet the same future water demands. In addition to the direct supply from Utah's Colorado River water, the water supplied by the LPP Project would provide additional wastewater reuse supply provided that sufficient storage is available.

The No Lake Powell Water Alternative would serve the same population as the LPP Project. WCWCD would implement other future water development projects currently planned by the District, develop additional water reuse/reclamation programs, continue to implement new water conservation measures, and convert additional agricultural water use to M&I use as a result of urban development in agricultural areas through 2028. Remaining planned and future water supply projects include the Ash Creek Pipeline (2,840 acre-feet per year), Sand Hollow recharge/recovery (3,000 acre-feet per year), Westside groundwater wells arsenic treatment (5,000 acre-feet per year), and development/yield increase of existing groundwater wells (2,830 acre-feet per year). Along with existing supplies, these future water supplies would yield an estimated 72,842 acre-feet per year of potable water and 8,505 acre-feet per year secondary water by 2028.

Under the No Lake Powell Water Alternative, actions in addition to the currently planned WCWCD projects would be taken to meet the water demand that would have been supplied by the Lake Powell Pipeline, as described below.

1.3.1.2 WCWCD No Lake Powell Water Alternative Features

Beginning in 2025, Washington County residential outdoor potable water use would be permanently re-purposed to indoor potable water use to help meet increasing indoor potable water demands. 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 50,000 acre-feet per year of diverted Virgin River water, which has a high total dissolved solids (TDS) concentration, mixed with an additional 19,030 acre-feet per year of reuse water. WCWCD would develop the Warner Valley Reservoir to store the reuse water and diverted Virgin River water prior to RO treatment. A water distribution pump station and pipeline would be constructed to convey 13,249 acre-feet of potable water from Quail Creek Water Treatment Plant to the Apple Valley area of Washington County. Figure 1-11 shows the primary conceptual components of the No Lake Powell Water Alternative. Table 1-2 summarizes available supplies and projected demands under the No Lake Powell Water Alternative and the LPP Project alternatives.



WTP Quail Creek WTP (Existing)
WWT St. George Regional Water Reclamation Facility (Existing)
Substation
Substation (Future)
Warner Valley Transmission Line
Existing Transmission Lines
Desilting Facility
RO WTP
Washington Fields Diversion Pump Station
Lakes & Reservoirs
Brine Evaporation Ponds
Access Road
Apple Valley Pipeline 30"
Brine Pipeline 20"
Existing Reuse Water Pipeline 30"
RO Treated Water Pipeline 54"
Major Rivers & Streams
Interstate
US Highway
ST Highway
Hwy
Major Road
Southern Corridor Highway
State Boundaries
County Boundaries

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

N

0 0.75 1.5 3 4.5 6 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-11** MWH

No Lake Powell Water Alternative Primary Infrastructure

Table 1-2 Available Supplies and Projected Demands Under the No Lake Powell Water and Lake Powell Pipeline Project Alternatives		
	No Lake Powell Water Alternative	**Lake Powell Pipeline Project Alternative**
Existing Supplies	67,677	67,677
Planned Projects	13,670	13,670
Lake Powell Pipeline Project	0	82,249
RO Treatment of Virgin River and Reuse Water	57,883	0
Agricultural Conversion	0[1]	10,080
Reuse	17,100[2]	36,130
2060 Total Supply	156,330	209,806
2060 Total Demand	133,119[3]	185,285
Surplus in 2060	**23,211**	**24,521**

Notes:
[1]Agricultural conversion water included in RO treatment.
[2]19,030 acre-feet per year additional reuse included in RO treatment.
[3]Demand reduced 52,166 acre-feet per year from elimination of residential outdoor watering,

1.3.1.2.1 Re-Purposing Potable Water Use. The No Lake Powell Water Alternative would permanently eliminate residential outdoor potable water use in Washington County, re-purposing the portion of potable water used for residential outdoor watering to indoor potable use. Projections of future water use through 2060 account for population growth, climate change (projected 6 percent reduction of Virgin River flows by 2050 [Reclamation 2014]), and water conservation (35 percent reduction in per capita water use from 2000 to 2060). Potable water in Washington County is consumed for residential indoor and outdoor uses, commercial uses, institutional uses, and industrial uses. These potable water uses would total 130,245 acre-feet per year by 2052, the year the LPP Project water is anticipated to be fully utilized (UDWRe 2015). Gradually eliminating residential outdoor potable water use starting in 2025 would provide the growing population with potable water for indoor use through 2045; however, re-purposing residential outdoor potable water use to indoor use would not increase the water supply and would have to be accompanied by adding another water supply to meet the growing demand. Re-purposing residential outdoor potable water use to indoor potable use would require converting traditional residential outdoor landscapes and uses to either landscaping requiring no irrigation or desert landscapes compatible with the local climate. Residential water users would be responsible for converting their traditional outdoor landscapes to non-irrigated or desert landscapes. If no additional water supply was added in Washington County after 2025 and potable water use continued to meet residential indoor and outdoor purposes, then the projected population would completely utilize the potable water supply of 72,842 acre-feet per year by 2028.

1.3.1.2.2 Reverse Osmosis Water Treatment. Washington County's additional future water supply under the No Lake Powell Water Alternative would be dependent on two water sources: 1) Virgin River water diverted at the Washington Fields Diversion; and 2) reuse water from an expanded St. George Regional Water Reclamation Facility. WCWCD would develop a RO advanced water treatment facility near Washington Fields Diversion in Washington County, Utah. The RO facility would be designed to treat 50,000 acre-feet of de-silted water per year diverted from the Virgin River at Washington Fields Diversion. St. George Regional Wastewater Reclamation Facility would provide an additional 19,030 acre-feet of water per year to be treated at the RO facility. The RO facility would be necessary to remove

the high concentrations of TDS present in both the Virgin River and the effluent from the St. George Regional Wastewater Reclamation Facility. The reuse facility has a current capacity of approximately 7,800 acre-feet per year, with a future design capacity of 11,760 acre-feet per year. An additional 7,830 acre-feet per year of future wastewater reclamation capacity would need to be added to meet the total reuse water requirement of 19,030 acre-feet per year for RO processing inflow. The RO process would separate the TDS from the water, resulting in two products: 1) a treated water product; and 2) a brine product consisting of highly concentrated salts. A two-stage RO process would be applied to the brine solution to recover additional water and reduce the brine volume for enhanced evaporation. The RO-treated water product would be pH-adjusted to neutral pH, dosed with sodium silicate, mixed with conventionally-treated water from the Quail Creek Water Treatment Plant, and disinfected for distribution throughout the WCWCD service area. The RO advanced water treatment facility would process up to 64,313 acre-feet per year and produce up to 57,883 acre-feet per year of water suitable for M&I potable indoor use. The two-stage RO process would remove 90 percent of the TDS. The remaining 10 percent rejection (6,430 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 RO water treatment plant would process approximately 64,313 acre-feet per year of inflow water from Warner Valley Reservoir storage to meet the 2052 water demand under the No Lake Powell Water Alternative.

The RO water treatment plant processes would consist of pressurized, parallel ultra-filtration units, an influent storage tank with acid added to adjust the pH, pressurized cartridge filtration to remove additional particles from the water, high pressure pumping to pass the water through the parallel RO membrane units, a product water storage tank with saturated lime solution added to adjust the pH of the treated product water prior to disinfection and distribution as potable water, and brine storage tanks in series with the two-stage RO process units for further brine reduction. These water treatment processes would be housed in a water treatment building with electrical, mechanical, chemical storage and metering, heating/air conditioning/ventilation, and SCADA systems. A seven-mile long buried 54-inch diameter pipeline would convey the product water from a pump station at the RO water treatment plant to the Quail Creek Water Treatment Plant. The RO water treatment plant would add RO membrane units in phases as necessary to meet the growing water demand. The RO water treatment plant would be powered by electricity, requiring a 2.8-mile long 69-kV power transmission line from the proposed Purgatory Substation.

The concentrated brine product (6,430 acre-feet per year) would be pumped from the brine tanks through a pipeline to an evaporation apron, spray system and double-lined pond, and then pumped into spray headers over a series of double-lined ponds with leak detection and recovery systems. The enhanced evaporation ponds would be located south of Warner Valley Reservoir and would cover approximately 2,000 acres, developed in two phases. A buried brine conveyance pipeline approximately 4.4 miles long would convey the concentrated brine to the enhanced evaporation ponds. A 4.4-mile long 34.5-kV power transmission line would be extended from the RO water treatment plant to the enhanced evaporation ponds to provide electricity for the pumps spraying the brine solution. The brine solids would be evaporated for approximately 25 years in the Phase 1 ponds, and then dried, collected and disposed in an approved solid waste landfill. The Phase 2 enhanced evaporation ponds would be used during the following 25 years to continue evaporating the brine by-product. Additional infrastructure would be required as part of this alternative, including a de-silting facility, pump stations, pipelines, switch stations and substations, blending and storage tanks, and other associated earthwork.

1.3.1.2.3 Secondary Water Storage in Warner Valley Reservoir. WCWCD would develop the Warner Valley Reservoir to store diverted Virgin River water and reuse water from the St. George Regional Water Reclamation Facility, which would be delivered as inflow to the RO advanced water treatment facility. Warner Valley Reservoir would be located south-southwest of the Washington Fields Diversion. An earth-fill embankment with a clay core and rock-riprap facing would be constructed across the north

entrance to the natural valley. The reservoir would have a maximum active storage volume of 69,030 acre-feet and would cover approximately 1,130 acres, including the earth-fill embankment. A large pump station would be constructed at the Washington Fields Diversion to pump the diverted Virgin River water into the Warner Valley Reservoir. The pump station would be powered by electricity via the 69-kV transmission line from the Purgatory Substation to the RO water treatment plant. The reservoir would store Virgin River water diverted at the Washington Fields Diversion (50,000 acre-feet per year) mixed with St. George Regional Water Reclamation Facility effluent (19,030 acre-feet per year), accounting for annual average evaporation (4,717 acre-feet per year), to produce up to 57,883 acre-feet of RO product water (assuming 90 percent recovery). The brine product from RO treatment would total approximately 6,430 acre-feet per year.

1.3.1.2.4 Water Distribution to Apple Valley. The largest remaining contiguous land area available for development in Washington County would be in Apple Valley. WCWCD would develop a pump station and 28-mile long pipeline to deliver 13,249 acre-feet per year of potable water from the Quail Creek Water Treatment Plant near Hurricane City to the Apple Valley area to meet future residential and commercial water demands.

1.3.2 KCWCD No Lake Powell Water Alternative

The KCWCD No Lake Powell Water Alternative would rely on existing water supplies, water conservation measures resulting in reduced water use, and future water development projects consisting of new groundwater production. Reliable water supplies (projected to be 2,170 acre-feet per year in 2035) for the area served by KCWCD (Kanab City and Johnson Canyon), adjusted for projected stream flow reductions (4.2 percent in 2035) resulting from climate change and a planning reserve (10 percent), would be exceeded by projected M&I water demands by 27 acre-feet per year within the KCWCD service area in 2035. KCWCD projected potable water demand in 2060 would be 3,435 acre-feet per year, with a potable water deficit of 1,334 acre-feet per year. Additional groundwater in the Kanab Creek drainage basin could be developed to provide up to 6,615 acre-feet per year of potable water within the aquifer's estimated safe yield. The quality of this water would likely require advanced water treatment. The developed groundwater from the Kanab Creek drainage basin would be pumped and conveyed through an eight-mile long pipeline to the Johnson Canyon drainage basin. The Johnson Canyon drainage basin comprises the potable water supply service area served by KCWCD in the area that could be served by the LPP Project.

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. FERC would not issue a license for the LPP Project. 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.

1.4.1 WCWCD No Action Alternative

Under the No Action Alternative, WCWCD would complete the Ash Creek Project, planned groundwater development and continue to implement planned conservation programs. Wastewater reuse would be utilized to the maximum extent storage allows. Existing and future water supplies totaling 72,840 acre-feet per year potable and 8,505 acre-feet per year secondary would meet projected M&I water demand within the WCWCD service area through approximately 2028, exhausting all water planning reserves.

Each supply source would be phased in to meet the M&I potable and secondary water 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). The No Action Alternative would not provide adequate water supply to meet projected water demands beyond 2028. There would be a projected water shortage of approximately 102,903 acre-feet per year in 2060 within the WCWCD service area under the No Action Alternative.

1.4.2 KCWCD No Action Alternative

KCWCD would use existing water supplies to meet potable water demands through 2035. Reliable water supplies are projected to be 2,101 acre-feet per year in 2060.

The No Action Alternative would not provide KCWCD with any reserve water supply (e.g., water to meet annual shortages because of drought, emergencies, and other losses). The No Action Alternative would not provide adequate water supply to meet projected water demands beyond 2035. There would be a projected water shortage of approximately 1,334 acre-feet per year in 2060 within the KCWCD service area under the No Action Alternative.

1.5 Identified Issues

1.5.1 Purpose of Study

This study was proposed by the Utah Department of Water Resources (UDWRe) in the Lake Powell Pipeline Project Pre-Application Document (PAD) (UBWR 2008a). During the scoping period, several agencies, groups and individuals including, but not limited to, the National Park Service, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, LPP Coalition, Great Basin Water Network, Citizens Education Project, the Kaibab Band of Paiute Indians, and others requested additional information, provided comments, and provided reference to materials applicable to the Land Use Plans and Conflicts Study Report. Comments received during the study plan development process were incorporated into the revised study plan. The Land Use Plans and Conflicts Study Report provides land use information about the LPP Project area that will be incorporated into the Federal Energy Regulatory Commission (Commission) license application and right-of-way permit applications submitted to the U.S. Bureau of Reclamation (Reclamation), National Park Service (NPS) and U.S. Bureau of Land Management (BLM).

The purpose of this study is to document impacts, both direct and indirect, of construction and operation on land use plans resulting from the proposed LPP Project. This information will be a factor in determining the methods for planning and design of the LPP and CVP Projects, herein collectively referred to as the LPP Project, as previously defined and addressed by the Pre-Application Document (PAD) submitted to the Commission on March 4, 2008. This study addresses comments made at the June 2008 public scoping meetings and responds to comments received on review of the PAD and Scoping Documents 1 and 2, as well as those provided in the September and October 2008 study plan meetings in Salt Lake City and St. George, Utah.

This study report describes the results and findings of a preliminary land use plans and conflicts analysis to evaluate conditions along the proposed alternative pipeline and transmission alignments of the LPP Project. This study also identifies and documents measures to mitigate impacts from the various land use plans as necessary.

1.5.2 Identified Issues

The land use issues identified in this analysis include the following:

- Identify all land-administering agency intentions and guidelines for land use
- Identify, evaluate, and quantify primary land use types and management goals for the topics listed below:
    - Farmland that may be converted to other uses
    - Floodplains that may be affected
    - Locations for dispersal of LPP Project waste and potential locations of hazardous waste
    - Land designated as "wild land" and road-less areas
    - Potential and current Wild and Scenic Rivers and limitations of associated classifications
    - Disruptions to public and private grazing land including access roadway closure, rotation disruption, facility damage (fences, water, etc), loss of forage, and forage rehabilitation time periods
- Community growth in developable and undevelopable areas as an indirect effect of the LPP Project
- Identify effects of construction and operation of the LPP Project on all of the above topics regarding changes in existing land use types
- Identify anticipated mitigation measures

1.6 Impact Topics

The following impact topics are addressed in the Land Use Plans and Conflicts Study Report:

- Land Ownership and Management
- Farmland
- Floodplain
- Waste Disposal and Hazardous Waste
- Wild land
- Wild and Scenic Rivers
- Grazing Land
- Rights-of-Way
- Trails and National Historic Trails
- Areas of Critical Environmental Concern
- Growth

Chapter 2
Methodology

2.1 Introduction

As described in the Revised Land Use Plans and Conflicts Study Plan (UBWR 2008b), the purpose of this study is to gather and analyze additional information about land within the LPP Project area to support decision-making related to LPP Project affects and requirements. The study plan defines the procedures for analyzing potential conflicts with land uses within the LPP Project. This study presents the issues identified during the scoping period, presents additional issues identified during the study, and summarizes available data.

2.2 Data Used

The following plans and data were used for this report (complete references can be found in the Reference Section):

- Arizona Administrative Code - Agency, Board & Commission Rules, Title 12, Chapter 5 (ADS 2009)
- Arizona Revised Statutes, Title 37, Public Lands (ASL 2009)
- City of Hurricane General Plan (City of Hurricane 1999)
- Sensitive Lands Ordinance, City of Hurricane, Utah (City of Hurricane undated)
- Future Land Use Map, City of Hurricane, Utah (City of Hurricane 2008a)
- City of Kanab General Planning Future Land Use, Kanab, Utah (City of Kanab Undated)
- City of Kanab General Planning Parks and Trails master Plan, Kanab, Utah (City of Kanab Undated)
- Coconino County Comprehensive Plan, Coconino County, Arizona (Coconino County 2003)
- Enoch City General Plan, Enoch City, Utah (Enoch City 2004)
- Mohave County, Arizona General Plan (Mohave County 2005)
- Kane County Land Use Map, Kane County, Utah (Kane County 2007a)
- National Wild and Scenic Rivers Act of 1968 (WSR 1968)
- Revised Proposal Town of Leeds General Plan, Leeds, Utah (The Planning Center 2007)
- Toquerville City Land Management Code, Toquerville, Utah (Toquerville City 2008)
- Town of Leeds Land Use Ordinance, Leeds, Utah (Town of Leeds 2008)
- General Plan Adopted, Town of Leeds, Utah (Town of Leeds 2004)
- Arizona Strip Field Office ROD Route Designations Map and Report, BLM, Utah. (BLM 2008d)
- Arizona Strip Field Office Resource Management Plan Record of Decision, BLM, St. George, Utah (BLM 2008a)
- Vermilion Cliffs National Monument ROD Resource Management Plan Map and Report BLM, St. George, Utah (BLM 2008b)
- Sand Hollow Recreation Area Recreation Management Plan, BLM, WCWCD, and Utah Division of Parks and Recreation, St. George, Utah (BLM et al. 2001)
- Virgin River Watershed Management Plan, BLM, WCWCD, Department of Agriculture, Forest Service, Utah DEQ, St. George, Utah (BLM et al. 2006)
- Dixie Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement, BLM - Utah State Office, Cedar City District, Dixie Resource Area (BLM 1998)

- St. George Field Office (formerly Dixie Resource Area) Record of Decision and Resource Management Plan, BLM, St. George Field Office, Utah (BLM 1999a)
- Grand Staircase-Escalante National Monument Approved Management Plan Record of Decision. BLM, GSENM Field Office, Cedar City, Utah (BLM 2000)
- Kanab Field Office Record of Decision and Approved Resource Management Plan and Environmental Impact Statement, BLM Kanab Field Office, Kanab, UT (BLM 2008c)
- Approved Resource Management Plan Amendments/ROD for Designation of Energy Corridors on BLM-Administered Lands in the 11 Western States, BLM, Utah (BLM 2009)
- Cedar-Beaver-Garfield Antimony Resource Management Plan Final Environmental Impact Statement (BLM 1984)
- Draft Environmental Impact Statement: Wild and Scenic River Suitability Study for National Forest System Lands in Utah, Forest Service, Utah (USFS 2007)
- Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States, BLM, Utah (DOE 2007)
- Rivers, Trails, and Conservation Assistance Program, NPS (NPS 2004a)
- Strategic Plan for Glen Canyon NRA and Rainbow Bridge National Monument, NPS (NPS 2008)
- Director's Order #25. Land Protection, NPS (NPS 2001a)
- Utah State Water Plan Kanab Creek/ Virgin River Basin, Salt Lake City, Utah (NPS 1993)
- Kanab General Plan, Cedar Hills, Utah (Utah Community Planners 2007)
- LaVerkin City General Plan, Cedar Hills, Utah (Utah Community Planners Undated)
- Utah State Trust Land Rules, Title R850, Utah (USTL Undated)
- Field reconnaissance for the Land Use Plans and Conflicts Study was performed along public roads and highways within designated Department of Transportation (DOT) Right-of-Ways.

The Kaibab Band of Paiute Indian Tribe was contacted to aquire a resource management plan, land use plan or other management plan(s). The Economic Development/Resource Manager stated that the Kaibab Band of Paiute Indians was currently working to complete a resource management plan; the aniticipated completion date was in 2013 (Robb 2012).

2.3 Assumptions

- The majority of topics to be studied are defined in the Land Use Plans and Conflicts Study Plan, as described in the Pre-Application Document
- The sum of quantities presented in the study conclusions are not representative of the final LPP Project impact, as the final preferred alternative has not been identified and impacts of alternatives would overlap
- Best Management Practices (BMPs) would be developed and implemented during construction and operation of the LPP Project to reduce or eliminate adverse impacts associated with the use of land
- Federal Highway crossing (I-15) construction would use trenchless technologies (no open-cutting) for pipe installation
- State Highway (SR) crossings would use trenchless technologies for pipeline installation, but open-cutting would be considered on a case-by-case basis
- County and local roadways would be open-cut for pipe installation
- New and improved access roads to various facilities would be graveled
- Minor access road upgrades would include clearing and grading to enable access for equipment and vehicles (non 4-wheel drive type)
- New access roads would include clearing, grading, minor excavation for roadways, and placement of roadway gravel

- Imported roadway gravel material would typically be 1-inch minus material and in-situ graded material can vary significantly
- The LPP Project would take into account State, Federal, Tribal, and private land use goals and would not adversely affect the effort to maintain those goals
- Regional roadway projects would not conflict with the LPP Project. Final design and pre-construction efforts would be coordinated with all regional projects to confirm that conflicts would not exist
- Utility easements would be needed for the transmission lines where ROWs cannot be used.

2.4 Impact Analysis Methodology

This study investigates and defines ownership information for land that falls within the LPP Project study area, and it provides land use status and management information based on land use management plans, zoning codes, comprehensive plans, and Geographic Information System (GIS) data from federal, state, and local agencies, and other groups and tribes. The study provides detailed information about existing land management plans and protections associated with land management designations and identifies where conflicts exist between resource management activities and proposed LPP Project activities.

The study area consists of all areas associated with foreseen direct and indirect disturbances from construction, operations, and maintenance pertaining to the LPP Project alignment. It also includes supplementary components that would provide services or utilities to the LPP Project such as construction work areas, borrow pits, access roads and transmission lines.

The following sections describe the methodology for analyzing specific topics in the land use study. Upon evaluation of applicable land use plans and resource management goals and objectives, additional issue topics were identified for further investigation. The following impact topics outline those additional potential impact analysis topics that were not included in the Commission-approved Land Use Plans and Conflicts Study Plan and are addressed in this study report.

2.4.1 Land Ownership and Management

The land uses identified in this study report include open space, rural and urban residential uses, commercial and industrial uses, agricultural uses, and utility use land affected by the LPP Project. Recent aerial photography and GIS data showing land status was utilized to identify primary uses and where the afore-mentioned land use types would be affected. Community General Plans and Resource Management Plans were reviewed and evaluated for conflicts with LPP Project construction and operation plans; The titles and sources of the documents used can be found in the references section.

2.4.2 Farmland

As part of the Farmland Protection Policy Act of 1981, agencies are to examine their actions to ensure they do not contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses or that those conversions are minimized. Prime and Unique farmland, as defined by the Natural Resource Conservation Service, were evaluated for any potential impacts along the alignments and for all LPP Project features. All agency intentions were identified through the inspection of General Plans, Land Use Plans, and Resource Management Plans.

2.4.3 Floodplain

Under Executive Order 11988 of 1977, Federal agencies are to minimize impacts of projects and actions on floodplains. Agencies are to take actions to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out their responsibilities for conducting Federal activities and programs affecting land use. This study identifies designated floodplains and how the LPP Project facilities might impact or alter floodplain function or use. A similar Executive Order regarding wetland protection was addressed in the Wetlands and Riparian Resources study. In addition to evaluating land use plans and land and resource management goals and objectives relevant to the LPP Project placement, construction, and operation, the following impact topics are also addressed in detail.

2.4.4 Waste Disposal and Hazardous Waste

The Arizona Strip BLM Office identified the need to determine what quantities and types of trash, construction debris, solid waste and hazardous waste that might be generated during construction and operations and expressed concern regarding waste disposal within and outside of the proposed LPP Project ROW. BLM asked for clarification of the types of waste that would be deposited and where and how waste deposition would occur.

2.4.5 Wilderness, WSAs, and Land with Wilderness Characteristics

During the scoping period, several individuals and groups expressed general concerns that wilderness and road-less areas would be impacted by the LPP Project. An analysis of all designated land uses and management framework for land within the LPP Project boundary was performed to determine if there are wilderness designations, wilderness study areas, or lands with wilderness characteristics within or adjacent to the study area. LPP Project transmission lines were analyzed for potential effects on these areas.

A Wilderness Study Area (WSA) is defined as a congressionally designated area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, that is protected and managed to preserve its natural conditions and that (1) generally appears to have been affected mainly by the forces of nature, with human imprints substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres or large enough to make practical its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological or other features of scientific, educational, scenic, or historic value (Kanab RMP 2008).

Wilderness Charactaristics are characterized by features of the land associated with the concept of wilderness that specifically deal with naturalness and opportunities for solitude and primitive unconfined recreation. These characteristics may be considered in land use planning when BLM determines that those characteristics are reasonably present, of sufficient value (condition, uniqueness, relevance, importance) and need (trend, risk), and are practicable to manage (from IM-2003-275, Change 1, Considerations of Wilderness Characteristics in LUP, Attachment 1).

2.4.6 Wild and Scenic Rivers

During scoping, BLM St. George Field Office indicated that no designated Wild and Scenic River segments or segments considered to be elegible by BLM are within or adjacent to the proposed alignment within their jurisdiction. BLM Arizona Strip Field Office requested that discussion of Wild and Scenic

Rivers not be contained within the recreation section of the analysis, but rather be included in a "special designations" section. Therefore, Wild and Scenic Rivers are addressed as part of this land use study.

2.4.7 Grazing Land

Coordination with public and private land owners would be necessary to address temporary impacts on livestock grazing management during construction and operation of the LPP Project. The following are issue topics associated with livestock grazing management that require further planning and coordination:

- Impeded access to grazing allotments during construction
- Damage to existing access roads during and following construction
- Damage to grazing facilities (i.e. fences, water pipelines and corrals)
- Disruption to current grazing rotations
- Loss of forage resulting from pipeline construction and access
- Loss of forage at reservoir sites
- Compensation to livestock operators for loss of forage
- Need for rest period to allow disturbed areas to be rehabilitated

All parcels within the LPP Project boundary that are designated for grazing use have been identified via GIS mapping. This study identifies typical LPP Project activities and subsequent impacts anticipated to occur within land managed for grazing. Potential mitigation measures are discussed for consideration in minimizing impacts.

2.4.8 Rights-of-Way

During scoping, BLM provided comment concerning how land and realty activities would be addressed; in particular, who would have authority over LPP Project easements, and the types of monitoring and compliance that would be required of the right-of-way holder. Land and realty issues pertaining to right-of-way requirements and allowances are addressed in this study at the project planning level.

2.4.9 Trails and National Historic Trails

National historic trails have been designated under Section 5 of the National Trails System Act. National historic trails are intended to be "extended trails" which follow as closely as possible and practicable, the original trails or routes of travel of national historic significance. Designation of these trails (or routes) is continuous (meaning there are no mapped breaks in the trails); however, the developed trail itself may not be continuous. National historic trails have as their purpose the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment. Other historic trails are recognized and managed as such by BLM in Utah and Arizona. Areas where the LPP Project may cross trails, nationally designated historic trails and/or other regional historic trails were identified to determine LPP Project impacts on trails in the region. Trails are also addressed in the Recreation Resources Study Report.

2.4.10 Areas of Critical Environmental Concern (ACEC)

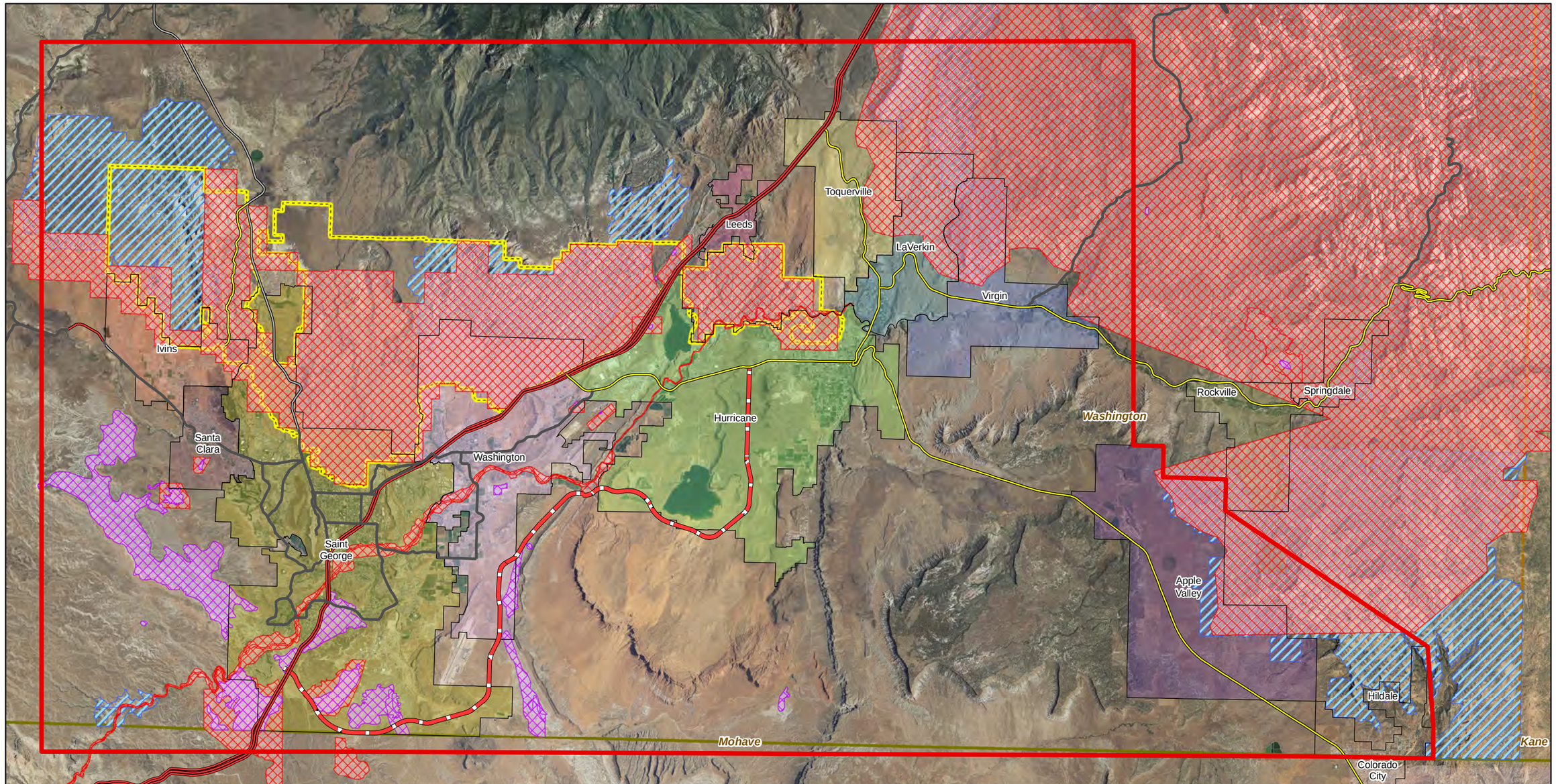
ACECs are defined in the Federal Land Policy and Management Act (FLPMA) (BLM 2001), Section 103(a), as areas where special management attention is required to protect and prevent damage to a particular resource. Regulations for implementing ACEC provisions of FLPMA are located in 43 CFR 1610.7-2 (43 CFR 1610.7-2). ACECs are considered for designation as part of BLM land use process and

must meet certain relevance and importance criteria to be considered for designation. ACEC areas are managed to protect certain resources within a specific area, but the designation itself does not automatically prohibit other uses within that area.

A literature and mapping review was performed to verify the location of all ACECs that are within or adjacent to the boundary of the LPP Project area. The LPP Project South Alternative alignment would cross the Kanab Creek ACEC and would be situated nearby other ACECs. Further review is provided to identify potential constraints or conflicts within the Kanab Creek ACEC.

2.4.11 Growth

This section of the land use study was intended to identify land in southern Washington County, Utah that may have the potential for growth and development resulting from the LPP Project or associated with the No Lake Powell Water or No Action alternatives. Figure 2-1 shows the land areas evaluated in the growth study. The municipalities within the growth study area include: St. George, Ivins, Santa Clara, Washington City, Hurricane, Leeds, Toquerville, LaVerkin, Virgin, Hildale and Apple Valley. This growth study area does not encompass the entire area potentially affected by the LPP Project in terms of providing water to cities; however, it would likely be the area that experiences the largest future growth and thus was the focus of this growth analysis. Criteria for determining potentially developable lands were identified by reviewing local, state, and federal general plans and associated development policies and historical practices. Developable lands were generally undeveloped or existing agricultural land that could be used or converted to new urban, suburban, rural residential, commercial, industrial and recreational uses. Future growth patterns and rates of growth may change based on future public policy decisions, implemented through general plans, and community zoning. These changes could not be predicted in this analysis but it was recognized that these decisions would be made based on managing growth in the region. This growth study analysis was focused on utilizing geographic-based criteria to identify potential growth areas with current development codes and standards identified in the region to project the siting of new urban and suburban development. The identification of future growth areas was intended to assist in assessing potential indirect effects and potential growth-inducing impacts of LPP alternatives in land use and other resource areas.



Growth Analysis Study Area
BLM TES Occupied Habitat
USFWS Critical Habitat
Wilderness
National Conservation Area

Apple Valley
Hurricane
Ivins
LaVerkin
Leeds
Rockville

Saint George
Santa Clara
Toquerville
Virgin
Washington

Interstate
US Highway
ST Highway
Hwy
Major Road
Southern Corridor

Cities
State Boundaries

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

Coordinate System: NAD 1983 UTM Zone 12N

UDWRe **Figure 2-1** MWH

Growth Analysis Study Area Critical and Occupied Habitat

The following land use plans and planning documents were used to identify developable land areas available for growth:

- City of Hurricane General Plan (City of Hurricane 1999)
- City of Hurricane Sensitive Lands Ordinance (City of Hurricane undated)
- Confluence Nature Park Final Plan (Washington County Commission 2007)
- Dixie Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement (BLM 1998)
- Ivins City General Plan (Ivins City 1998)
- LaVerkin City General Plan (Utah Community Planners 2005)
- Santa Clara General Plan (Santa Clara 2001)
- Santa Clara River Reserve Recreation and Open Space Management Plan (BLM 2005)
- St. George Field Office Record of Decision and Resource Management Plan (BLM 1999a)
- St. George General Plan (City of St. George 2002)
- Town of Leeds General Plan (Town of Leeds 2004)
- Vision Dixie Land-Use and Transportation Vision (Vision Dixie 2007)
- Vision Dixie Suggested Comprehensive Planning Checklist (Vision Dixie 2008)
- Washington City General Plan (Washington City 2005)
- Washington County, Utah Critical Lands Resource Guide (Washington County 2008a)

Upon review of these plans, a list of screening factors was developed. Some of the factors were identified as limiting areas of potential growth. These factors were used to exclude land areas from future growth in the analysis, thus categorizing them as undevelopable. For this analysis undevelopable is defined as: land which may be developable, but is subject to physical and/or regulatory constraints. Excluding these areas of land from development provides a conservative estimate of land available for development. The exclusion criteria proposed in this analysis include:

- Slopes greater than 25 percent
- Dry washes
- 100-year flood plains
- 100-foot setback from ridgelines and mesa tops
- Existing Conservation Areas
- State Parks
- Federally managed land (lands held in trust by Federal agencies)
    - BLM Administered Land
    - BLM Land set for disposal (Not yet disposed/sold)
    - Indian Reservations
- Threatened and Endangered Species (TES) Critical Habitat Areas
- Open Water
- Wetlands
- Lava Beds
- Hazardous Rock and Soil

The exclusion criteria utilized in this study report screens land use based on “smart growth” planning concepts and typical “sensitive” land planning factors. Many of these practices and concepts were outlined in the existing general plans and were incorporated or are intended to be incorporated into zoning and building ordinances. In addition to the approved general plans, other planning documents such as the “Vision Dixie Suggested Comprehensive Planning Checklist”, “Vision Dixie Land-Use and Transportation Vision”, “Washington County, Utah Critical Lands Resource Guide”, and the

"Endangered Species Act" were evaluated for verification and review of the screening criteria identified for the analysis.

The Endangered Species Act defines critical habitat in section 3(5)(A) as;

> "*(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with provisions of section 4 of this act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and*
> *(ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this act, upon a determination by the Secretary that such areas are essential for the conservation of the species*" (16 USC Sec. 1531).

The Endangered Species Act does not apply to listed plant species growing on private land.

Older developed areas (more than 14 years old) were first identified and digitized by using aerial photograph interpretation techniques. Aerial photography included 1993- to 1995-era black and white Digital Ortho Quadrangle (DOQ) mosaics at 1-meter pixel resolution. Existing developed areas were categorized using 2011 aerial photos from the National Agriculture Imagery Program (NAIP) at 1-meter pixel resolution and were digitized using on screen digitizing techniques. In both cases a "developed area" was identified as an area, of about 1/4-acre or more in size that had existing residential, commercial, industrial, or developed recreation uses on it. If an area showed signs of basic infrastructure for residential or commercial uses, but did not have a structure on it, the land was not included as developed. This allowed the analysis to consider in-filling of developed areas.

A set of four scenarios were examined in this study to allow consideration of a range of possible growth patterns. Scenario 1 considered developable land areas applying all of the exclusion criteria except for hazardous rock and soil (locations that indicate expansive rock and soil). Scenario 2 (A and B), identified developable land areas applying all of the exclusion criteria. In Scenario 1 and Scenario 2, two types of developable areas were determined; highly favorable and moderately favorable. Highly favorable land was land that was closer to existing utilities, schools hospitals, retail stores, business centers, and existing development. This was determined using GIS and spatial analysis to establish Euclidean distances to the local amenities. Scenario 3 (A and B) identified areas of potential land use conflict which could have an effect on growth. Scenario 4 (A and B) identified areas of land use preference and conflict. This scenario showed where land use preferences may occur under a given set of criteria and analysis.

The intent of examining both Scenarios 1 and 2 was to identify possible developable land by following historical patterns (not limiting development based on hazardous rock or soil types) and following more modern planning techniques using sound engineering methods and practices, but avoiding the most hazardous soil and rock types. Historically, the municipalities in Washington County had allowed residential and business developments to build on moderate and highly expansive rock and soil areas. The hypothesis contemplated was that if this practice continues, a much larger amount of land would be available for development (Scenario 1) than if development were curtailed based on these hazards (Scenario 2 (A and B)). For the moderately expansive soils, there would be engineering and mitigation solutions that could be employed at a higher cost but could allow for additional development in high soil hazard areas. This analysis was not intended to predict future policies and practices of the county and municipal planning agencies, but rather present a range of possibilities based on available information.

The growth analysis was performed using GIS modeling. Raster-based GIS analysis was performed using a 10-meter cell size. The land use and growth conflict-based analysis (Scenarios 3 and 4) was conducted using the Land-Use Conflict Identification Strategy (LUCIS®) methodology (Carr and Zwick 2007). The

LUCIS® model method is a goal-driven GIS model which spatially represents probable future land use patterns and probable areas of future land use conflict and preference. It was developed over a period of 10 years at the University of Florida. Geospatial data for this analysis were obtained from Bureau of Land Management (BLM), Washington County, City of Santa Clara, City of St. George, Washington City, Hurricane City, Utah Department of Natural Resources (DNR), and Utah Automated Geographic Reference Center (AGRC). The methodology of the LUCIS® model incorporates multiple layers of data that are ranked and weighted for determining land use suitability and then combined to create final output analysis raster data. In the LUCIS® model, three general goals are set: identify lands most suitable for agricultural use; identify lands most suitable for conservation and protection strategies; and identify lands most suitable for urban development. Ranked beneath these goals are objectives and sub-objectives which ultimately represent the raster layers to be ranked and weighted for use in the analysis model. Once this is completed, the model can be run to determine areas of potential land use conflict and preferences. Through this analysis model, land use conflicts and preferences can be identified to better aid in visualization and planning.

Chapter 3
Affected Environment (Baseline Conditions)

3.1 Impact Area

Although federal, state owned, managed land, and recreation areas comprise much of the landscape associated with the LPP Project, other land ownership types and uses occur as well. Federal and state areas near and within the LPP Project alignment are utilized for recreation, grazing, mineral exploration and mining, resource harvesting, wildlife habitat, and scientific research, as well as other uses. These same activities often occur on private land within the LPP Project boundaries. Agricultural, urbanized, utility rights-of-way, and open space land are noted uses within the LPP Project alignment. In addition to land, the LPP Project lies within the water bodies of Lake Powell and Sand Hollow Reservoir. These water resources are utilized for recreation, habitat, urban water supply, as well as other beneficial uses. The primary land uses within the Arizona Strip, which constitutes a large portion of land associated with the LPP Project, is livestock grazing (which occurs on both private and public land) and recreation. South of the Utah/Arizona border, the LPP Project alternatives would traverse either south of the Kaibab-Paiute Indian Reservation or through it (depending on the alternative), where the landscape includes desert, open range, pinyon pine, juniper, springs, and ephemeral washes. In Utah, land uses consist of urban use, agricultural use (mainly irrigated farmland), recreation, livestock grazing, and protected land such as state or national parks and monuments. As development in southern Utah continues and urbanization increases, some existing land used for grazing and agriculture is likely to be converted to urban land use (NRCS 2007 and UDWRe 2007a).

In areas not irrigated for agricultural use or used as urban space or ROWs, the general land cover consists of desert scrub, desert grassland, desert shrub, sagebrush pinyon-juniper shrub land, and pinyon-juniper woodlands.

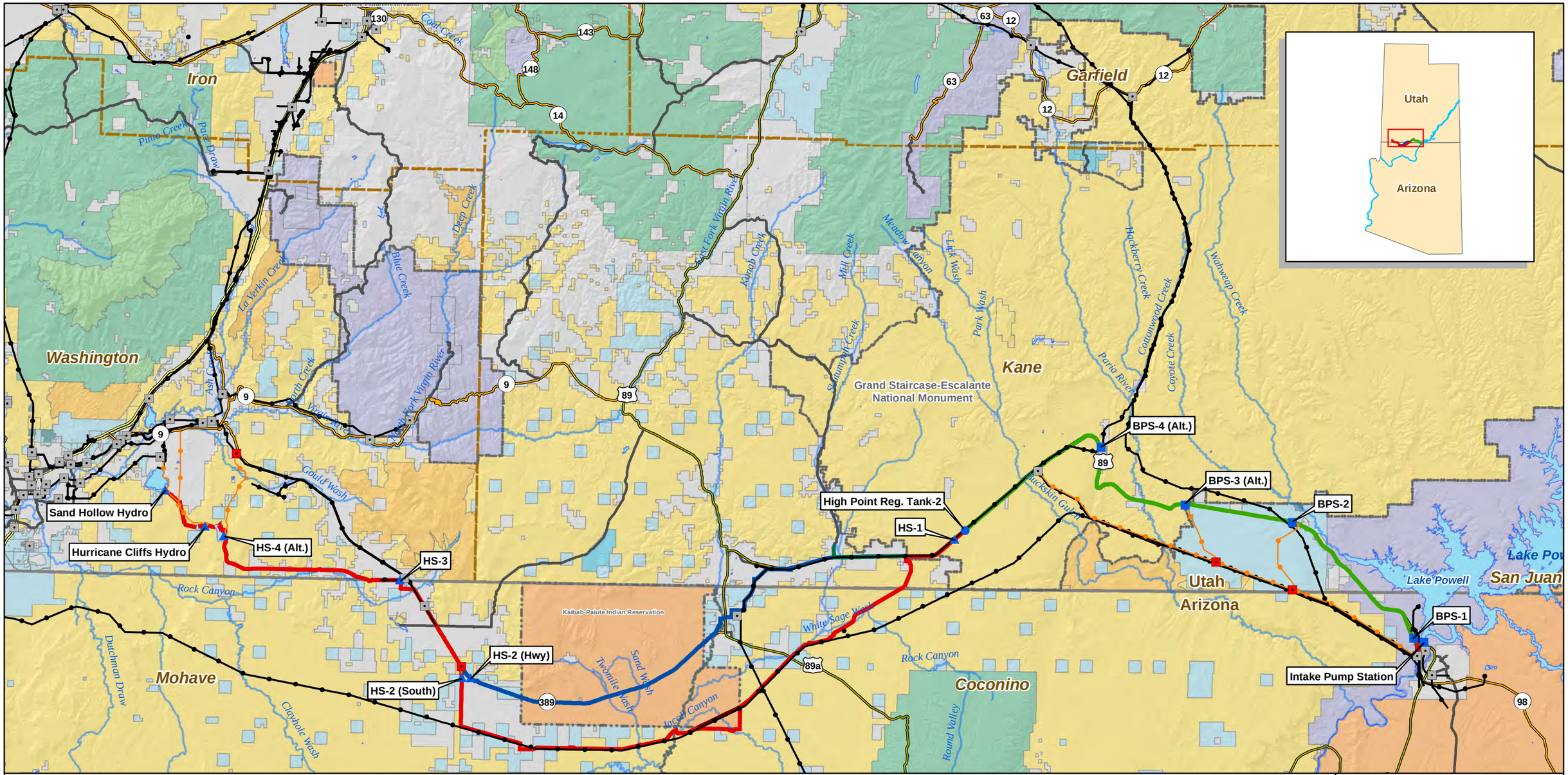
The Federal and state land crossed by the LPP Project includes: Reclamation – Bureau of Reclamation; BLM – Grand Staircase - Escalante National Monument; BLM – Kanab Field Office; BLM – Arizona Strip Field Office; BLM – St. George Field Office; Kaibab–Paiute Indian Reservation; Arizona State Land Department; School and Institutional Trust Lands Administration – SITLA, Utah; GCNRA; Utah State Parks and Recreation; and the WCWCD – Washington County Water Conservancy District; Kane County Water Conservancy District - KCWCD. Figure 3-1 shows land ownership along all LPP Project alternatives.

3.2 Description of Baseline Conditions

Land use includes the following topics that are generally associated with land management plans and policies.

- Land ownership and management
- Farmland
- Floodplain
- Waste disposal and hazardous waste
- DesignatedWilderness and WSAs
- Wild and scenic rivers
- Grazing land
- Rights-of-way
- Trails and national historic trails
- Areas of critical environmental concern
- Growth

The following sections describe the baseline conditions for these land use topics.



Project Pump Station
Project Regulating Tank
Project Hydro Station
Substation
Proposed Substation

Water Conveyance System
Hydro System - South Alternative
Hydro System - Southeast Corner Alternative
KCWCD System
Hydro System - Existing Highway Alternative
Project Transmission Line
Existing Transmission Lines

Interstate
US Highway
ST Highway
Hwy
Major Road
Major Rivers & Streams

National Park/Monument
Tribal Lands
State Boundaries
County Boundaries
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs

LPP Land Ownership

BLM
Bureau of Reclamation
State
Private
Tribal
National Park Service

USFS
State Park
BLM Wilderness
State Wildlife Reserve
USFS Wilderness Area
USFWS

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

UDWRe **Figure 3-1** MWH

Lake Powell Pipeline General Land Ownership

3.2.1 Land Ownership and Management

3.2.1.1 NPS-Administered Land

Glen Canyon National Recreation Area was established by Act of Congress in 1972. It is located in northern Arizona and southern Utah. Containing 1.25 million acres, the park was established "... in order to provide for public outdoor recreation use and enjoyment of Lake Powell and land adjacent thereto in the States of Arizona and Utah and to preserve scenic, scientific, and historic features contributing to public enjoyment of the area..." (NPS 2008). The Glen Canyon National Recreation Area and Rainbow Bridge National Monument five-year Strategic Plan was completed in December 2006 to fulfill the requirements of Section 104 of the National Parks Omnibus Management Act of 1998.

3.2.1.2 Reclamation-Administered Land

Established in 1902, Reclamation is responsible for developing and conserving the Nation's water resources in the western United States. Reclamation’s original purpose was "to provide for the reclamation of arid and semiarid land in the West." Today Reclamation covers a wide range of interrelated functions. These include providing municipal and industrial water supplies, hydroelectric power generation, irrigation water for agriculture, water quality improvement, flood control, river navigation, river regulation and control, fish and wildlife enhancement, outdoor recreation, and water-related research (Reclamation 2001). Reclamation administers the public land surrounding Glen Canyon Dam Hydropower station and the subsequent substation downstream of the dam. The LPP Project would occupy a portion of the federal land administered by Reclamation upstream of Glen Canyon Dam.

3.2.1.3 BLM-Administered Land

Grand Staircase – Escalante National Monument (GSENM) was established on September 18, 1996 when President Clinton issued a Proclamation under the provisions of the Antiquities Act of 1906. GSENM includes about 1.87 million acres of Federal land in south-central Utah. There are approximately 15,000 acres of land within GSENM boundary that are privately owned. GSENM Monument Management Plan (MMP) and Record of Decision (ROD) were signed in November, 1999 and became effective in February, 2000 (BLM 2000). GSENM was created to protect historic, biological, geological, paleontological, and archaeological objects. Protection and support of each of these characteristics are discussed throughout GSENM MMP.

Kanab Field Office

The Kanab Field Office signed a ROD approving a Resource Management Plan (RMP) in October, 2008. The Kanab Field Office approved RMP replaces public land decisions within the Escalante Management Framework Plan (MFP) (1981), Paria MFP (1981), Vermilion MFP (1981), Zion MFP (1981), Cedar-Beaver-Garfield-Antimony (CBGA) RMP (1986) and amendments (BLM 2008c). The planning area contains historical communities, diverse terrains, scenic landscapes, and recreational attractions which figure prominently in the settlement, history, culture, and enjoyment of southern Utah. The approved plan describes the land use and management objectives for the Kanab Field Office including:

- Manage public land for multiple uses of public resources within the framework of applicable laws, regulations, and agency policies
- Use adaptive management to meet resource objectives
- Apply rangeland standards and guidelines to the decision area

- Implement ecosystem management in an open, cooperative, responsive atmosphere to involve agencies, groups, and individuals in monitoring and addressing resource issues on public land—issues that often span administrative and ownership boundaries
- Maintain, improve, and restore (where needed) healthy ecosystems and habitat to support viable populations of fish, plants, and wildlife species while reducing habitat loss and fragmentation
- Protect and enhance cultural and natural resources and values using the diversity of tools available to BLM
- Provide a variety of recreational, educational, and interpretive opportunities for people to experience public land resources and values
- Reduce conflicts between uses and user groups
- Recognize the unique cultural, historical, and social values of the decision area in developing a plan that manages the land and protects the heritage it engenders

St. George Field Office

The St. George Field Office administers 635,000 acres of public lands in the southwest corner of Utah. A merging point of three unique ecosystems, the Mojave Desert, the Great Basin, and the Colorado Plateau, these publics lands are a rich mix of geologic formations, biological habitats, scenic landscapes, and cultural history. Most public land in Washington County is managed by the St. George Field Office.

Arizona Strip Field Office

In 2008, BLM signed RODs approving the Resource Management Plans (BLM 2008d) for the Arizona Strip Field Office.

BLM Arizona Strip Field Office manages nearly 2 million acres in northwestern Arizona. The field office manages all or part of four WAs, the Old Spanish National Historic Trail, nine Areas of Critical Environmental Concern, and two river segments suitable for Wild & Scenic River designation.

3.2.1.4 Arizona State Land Department

Since the State Land Department's inception, its mission has been to manage the Land Trust and to maximize its revenues for the beneficiaries (ASLD Current). ASLD administers land owned by, belonging to, and under the control of the state through the rules outlined in the Arizona Revised Statues within the Arizona State Legislature.

3.2.1.5 Utah School and Institutional Trust Lands Administration (SITLA)

The Utah Trust Lands Administration is legally obligated to manage trust land to optimize the financial return for Utah's schools and the other 11 beneficiaries. SITLA manages a 3.5 million-acre real estate portfolio of both surface land and mineral land (USTL Undated). SITLA leases and sells land to provide revenue for the beneficiaries. SITLA administers the land entrusted to it by the federal government through a set of guidelines called 'Utah State Trust Land Rules.'

3.2.1.6 Utah State Parks and Recreation

The Sand Hollow Recreation Area is managed cooperatively between the Washington County Water Conservancy District (WCWCD), the Utah Division of State Parks (State Parks) and BLM's St. George Field Office (BLM). These agencies work through a Recreation Management Plan to manage the WCWCD's 4,047-acre Sand Hollow reservoir site together with 16,564 acres of BLM's 40,725-acre Sand Mountain Special Recreation Management Area (BLM et al. 2001). Sand Hollow State Park is managed on land owned by WCWCD based upon two agreements between the District and State Parks.

3.2.1.7 Kaibab - Paiute Indian Reservation

Tribal land is held in trust by the U.S. Department of the Interior, Bureau of Indian Affairs. The Energy Transport Corridor Siting for Tribal Planners Guidance Manual (BIA 2010) provides guidance for energy development both for tribes and private organizations. Construction of conveyance projects within Tribal land is limited to designated energy transport corridors, which ensures that future development occurs in a planned manner with minimal environmental impacts. For this reason, a tribe may require that future right-of-way applicants locate their proposed project in a designated energy transport corridor.

3.2.1.8 Local and Private Land

The LPP Project would cross through four counties and 8 incorporated municipalities. Following is a list of the municipalities and counties and the land use and general plans that were used to identify potential conflicts with LPP Project construction, operation, and maintenance. A list of applicable land management plans is included in Section 2.2.

Cities

- Greenhaven, AZ
- Big Water, UT
- Church Wells, UT
- Colorado City, AZ
- Hildale City, UT
- City of Kanab, UT
- Fredonia, AZ
- City of Hurricane, UT

Counties

- Washington County, UT
- Kane County, UT
- Mohave County, AZ
- Coconino County, AZ

3.2.2 Farmland

3.2.2.1 Natural Resource Conservation Service (NRCS)

The Farmland Protection Policy Act (FPPA) of 1981 is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that, to the extent possible, federal programs are administered to be compatible with state, municipal government, and private programs and policies to protect farmland. Federal agencies are required to develop and review their policies and procedures to implement the FPPA every two years (NRCS 2011b).

The FPPA does not authorize the Federal Government to regulate the use of private or nonfederal land or affect the property rights of owners in any way. For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water storage or urbanized land (NRCS 2011a). Each of the above farmland terms are defined as follows:

- Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary of the Interior. Prime farmland includes land that possesses the above characteristics but is being used currently to produce livestock and timber. It does not include land already in or committed to urban development or water storage.

- Unique farmland is land other than prime farmland that is used for production of specific high-value food and fiber crops, as determined by the Secretary of the Interior. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Examples of such crops include citrus, tree nuts, olives, cranberries, fruits, and vegetables.

- Farmland, other than prime or unique farmland, that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops, as determined by the appropriate state or unit of local government agency or agencies, and that the Secretary of the Interior determines should be considered as farmland for the purposes of this subtitle.

3.2.2.2 Incorporated Areas

The municipal and county general plans have general consensus on conserving and preserving agricultural land. Development is permitted, but urban sprawl is discouraged. Inefficient urban development patterns on agricultural land are discouraged.

3.2.3 Floodplain

In the 1980s, the Federal Emergency Management Agency (FEMA) performed hydrologic and hydraulic studies to identify and map special flood hazard areas. The areas are defined as a 100-year storm event, or a 1 percent chance of a flood occurring in any given year. The 100-year flood is designated as the flow rate or water surface elevation during a 100-year stream or river flood. These studies resulted in the development of Flood Insurance Rate Maps (FIRMs) that depict the floodplains identified for each river and stream analyzed.

3.2.3.1 FEMA

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities" for the following actions (FEMA 2011):

- Acquiring, managing, and disposing of federal land and facilities
- Providing federally-undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities

Where the LPP Project would cross or have facilities sited within a designated floodplain, the effects must be considered. Following avoidance techniques, measures would need to be developed to minimize the impacts and restore and preserve the floodplain, as appropriate (FEMA 2011).

3.2.3.2 BLM

Public land within floodplains would generally be managed so as to preserve or restore the natural and beneficial values served by the floodplains. Structural developments within the floodplain that would be subject to recurring flood damage or which, in turn, would create adverse impacts to land, resources, or

developments in or adjacent to the floodplain would be discouraged or not authorized. Multiple uses of the floodplain, including recreation, would be encouraged where such uses would not disrupt the broad purposes for which the floodplain is being managed by Executive order 11988-Flood Plain Management.

Prior to taking actions within designated floodplains, BLM would work with LPP Project sponsors to seek alternatives that involve no floodplain disturbance. Where suitable alternatives do not exist, BLM would work with local and state agencies to evaluate the potential effects of such actions and apply measures needed to minimize the impact of floods on human safety, health, and welfare and to maintain the functionality of the floodplain and related natural values. Where suitable mitigation cannot be applied to eliminate unacceptable impacts, BLM would not approve the action by Executive order 11988-Flood Plain Management.

3.2.3.3 Incorporated Areas

Each LPP Project-affected municipality desires to discourage or address the potential effects of development within the 100-year floodplain, except development that would be compatible with periodic flooding, i.e. golf courses, crops, and orchards.

3.2.4 Waste Disposal and Hazardous Waste

3.2.4.1 Waste

Review of BLM and state land resource management plans revealed no specific policies regarding waste, except that which involves illegal dumping. Research was completed through telephone calls to the municipalities of Page, Arizona; Kanab, Utah; Colorado City, Utah; LaVerkin, Utah; Washington City, Utah; and St. George, Utah; regarding the availability of landfills that would accept materials generated from both construction and operation of the LPP Project. These investigations revealed the availability of several transfer stations near the alignment alternatives, and a landfill in Washington, Utah and Kanab, Utah. The Washington site is a class I landfill located in Washington County Utah. The facility owner is Washington County Special Services District #1 and has a remaining capacity of 535,961 cubic yards (UDEQ 2007). The Kanab site is a class II landfill in Kane County, Utah. The facility owner is Western Kane County Special Service District No. 1 and has a remaining capacity of 250,000 cubic yards (UDEQ 2011).

LPP Project waste may be defined by both materials that are typically considered trash and by excess soil left over from pipe displacement and bedding or backfill. There are no known active or abandoned landfills or waste transfer sites directly within the impact area of the LPP Project, its alternative alignments, and associated facilities. There are, however, several borrow and spoil pits near the alignments that are anticipated to be utilized for spoils stockpiling and permanent spoil deposition. Borrow and spoil is discussed more thoroughly in the Geology and Soil Resources study report (UBWR 2011a).

3.2.4.2 Hazardous Waste

There are no known occurrences of hazardous waste, remediation sites, nor active hazardous waste sites within the study area. For this analysis, the study area is defined as those areas impacted by LPP Project construction and operation for all proposed alignments and associated facilities. Issues of concern that are typically associated with such sites are:

- Short- and long-term liability associated with the acquisition of environmentally distressed properties
- Spread of existing soil or groundwater contamination caused by construction activities
- Worker health and safety
- Construction cost impacts

The Utah Division of Environmental Response and Remediation (DERR) maintain environmental databases of sites with known contamination and sites that are regulated according to the requirements of state or federal laws. Following is a list of environmental databases maintained by DERR:

- Superfund Sites, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- National Priorities List (NPL), priority CERCLA sites
- Underground Storage Tanks (UST), Resource Conservation and Recovery Act (RCRA)
- Leaking Underground Storage Tanks (LUST)
- Brownfield Projects
- Toxic Release Inventory (TRI)
- Voluntary Cleanup Program (VCP)

Based upon a review of DERRs data and interactive maps (ADEQ 2012, UDEQ 2011a) (which includes links to the databases listed above) on the Utah and Arizona Department of Environmental Quality (UDEQ and ADEQ) web pages (UDEQ 2011b), no known areas of hazardous waste are present along any of the LPP Project alignments. Also, there were no DEUR (declaration of environmental use restriction) sites, nor LQG (large quantity generator) sites. These databases represent both public and private land records.

3.2.5 Wilderness, WSAs, and Land with Wilderness Characteristics

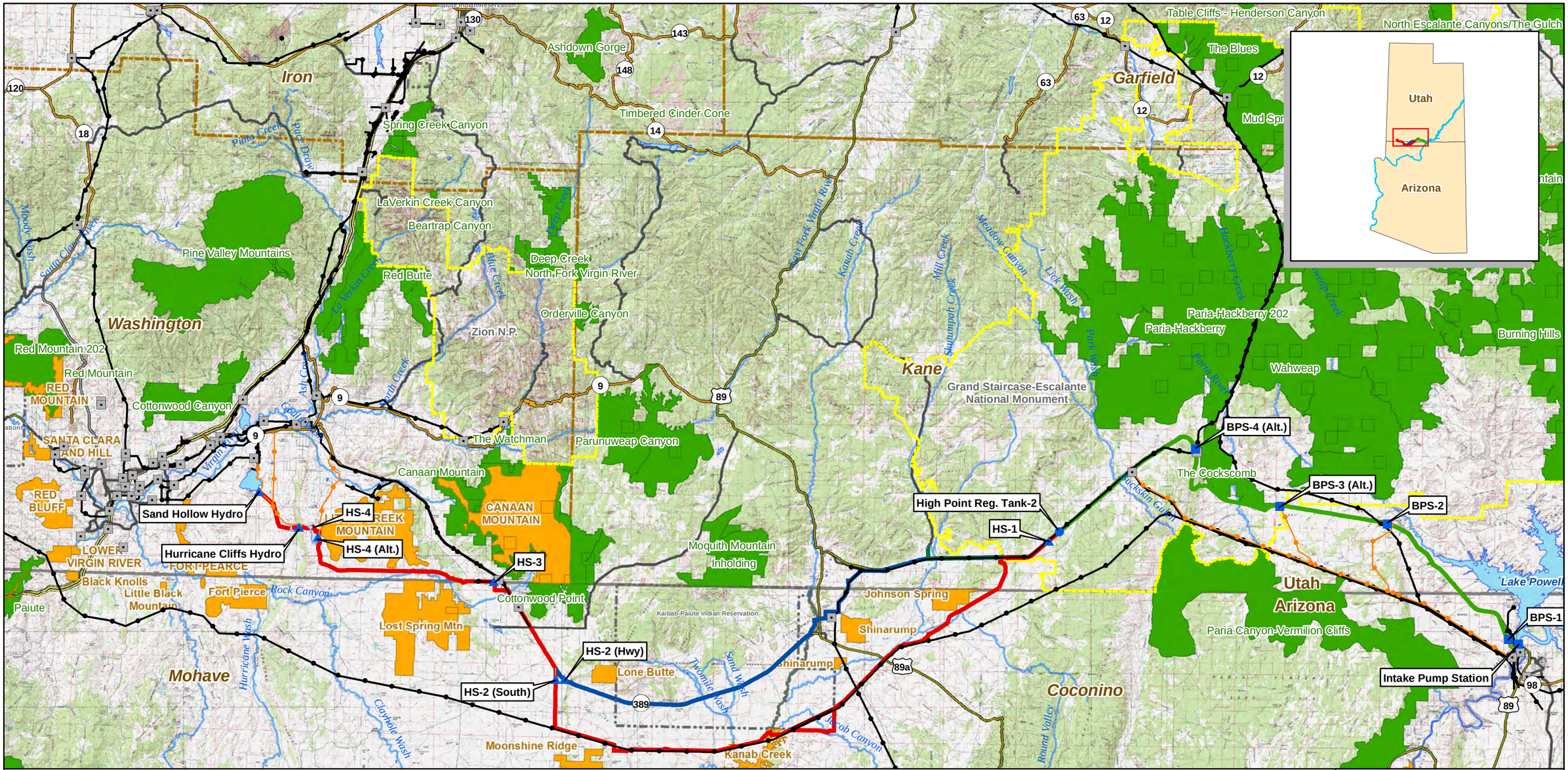
This study considers wilderness as designated Wilderness Areas, Wilderness Study Areas (WSAs) and land with wilderness characteristics. The LPP Project alignment alternatives would be located near several Wilderness Areas, WSAs, and land with wilderness characteristics. However, the LPP Project alternatives would not physically intersect any designated wilderness areas, land with wilderness characteristics or WSAs. Wilderness Areas and WSAs in close proximity to the LPP Project features include Paria Canyon-Vermilion Cliffs, The Cockscomb, Paria-Hackberry, Cottonwood Point, Canaan Mountain, Spring Creek Canyon, and Wahweap (BLM 1999b and BLM 2000).

The congressionally authorized utility corridor that the LPP Project would be constructed within is adjacent to The Cockscomb WSA. The Cockscomb WSA covers 10,827 acres and was recommended suitable for designation as wilderness to Congress in 1991. WSAs are managed under BLM's Interim Management Policy and Guidelines for Lands Under Wilderness Review (BLM Manual H-8550-1) (BLM 2012). Under these guidelines, WSAs are administered as designated wilderness areas. Figure 3-2 shows the location of the WSAs within proximity of the LPP Project.

3.2.6 Wild and Scenic Rivers

A literature review has been performed for all drainages that would be directly crossed by LPP Project components. In 2009, Congress designated approximately 165.5 miles of segments of the Virgin River and tributaries of the Virgin River across federal land within and adjacent to Zion National Park, listed in Table 3-1. In Arizona, only the Verde River, which is outside of the LPP Project footprint, is a designated

Wild and Scenic River. In Utah, BLM has considered the Paria to be eligible and suitable for designation into the Wild and Scenic Rivers (WSR) System.



Area of Critical Environmental Concern (ACEC)
Wilderness, Wilderness Study Area (WSA) & Designated Wilderness
Project Pump Station
Project Regulating Tank
Project Hydro Station
Substation
Water Conveyance System
Hydro System - South Alternative
Hydro System - Southeast Corner Alternative
KCWCD System
Hydro System - Existing Highway Alternative
Project Transmission Line
Existing Transmission Lines
Interstate
US Highway
ST Highway
Hwy
Major Road
Major Rivers & Streams
National Park/Monument
GSENM-Boundary
Tribal Lands
State Boundaries
County Boundaries
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs

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

UDWRe **Figure 3-2** MWH

Areas of Critical Environmental Concern (ACEC) - Wilderness, Wilderness Study Areas (WSA) & Designated Wilderness Areas

The LPP Project pipeline and transmission line alignments were evaluated for potential conflicts with the Congressional designations in Washington County, for which a Resource Management Plan (RMP) is currently underway, and through review of the GSENM MMP for the Paria River, also listed in Table 3-1.

Table 3-1
Wild and Scenic Rivers

Page 1 of 6

Name	Location/Description	Class	Affected by LPP Project	Administering Agency
Taylor Creek	4.5-mile segment from the junction of the north, middle, and south forks of Taylor Creek, west to the park boundary and adjacent land rim-to-rim	Scenic	No	St George BLM
N. Fork Taylor Creek	Segment from the head of North Fork to the junction with Taylor Creek and adjacent land rim-to-rim	Wild	No	St George BLM
Middle Fork Taylor Creek	Segment from the head of Middle Fork to the junction with Taylor Creek and adjacent land rim-to-rim	Wild	No	St George BLM
S. Fork Taylor Creek	Segment from the head of South Fork to the junction with Taylor Creek and adjacent land rim-to-rim	Wild	No	St George BLM

Table 3-1
Wild and Scenic Rivers

Name	Location/Description	Class	Affected by LPP Project	Administering Agency
Timber Creek and tributaries	3.1-mile segment from the head of Timber Creek and tributaries of Timber Creek to the junction with LaVerkin Creek and adjacent land rim-to-rim	Wild	No	St George BLM
LaVerkin Creek	16.1-mile segment beginning in T. 38 S., R. 11 W., sec. 21, on Bureau of Land Management land, southwest through Zion National Park, and ending at the south end of T. 40 S., R. 12 W., sec. 7, and adjacent land 1/2-mile wide	Wild	No	St George BLM
Willis Creek	1.9-mile segment beginning on Bureau of Land Management land in the SWSW sec. 27, T. 38 S., R. 11 W., to the junction with LaVerkin Creek in Zion National Park and adjacent land rim-to-rim	Wild	No	St. George BLM
Beartrap Canyon	2.3-mile segment beginning on Bureau of Management land in the SWNW sec. 3, T. 39 S., R. 11 W., to the junction with LaVerkin Creek and the segment from the headwaters north of Long Point to the junction with LaVerkin Creek and adjacent land rim-to-rim	Wild	No	St. George BLM
Hop Valley Creek	3.3-mile segment beginning at the southern boundary of T. 39 S., R. 11 W., sec. 20, to the junction with LaVerkin Creek and adjacent land 1/2-mile wide	Wild	No	St. George BLM
Current Creek	1.4-mile segment from the head of Current Creek to the junction with LaVerkin Creek and adjacent land rim-to-rim	Wild	No	St. George BLM
Cane Creek	0.6-mile segment from the head of Smith Creek to the junction with LaVerkin Creek and adjacent land 1/2-mile wide	Wild	No	St. George BLM
Smith Creek	1.3-mile segment from the head of Smith Creek to the junction with LaVerkin Creek and adjacent land 1/2-mile wide	Wild	No	St. George BLM
North Creek Left and Right Forks	Segment of the Left Fork from the junction with Wildcat Canyon to the junction with Right Fork, from the head of Right Fork to the junction with Left Fork, and from the junction of the Left and Right Forks southwest to Zion National Park boundary and adjacent land rim-to-rim	Wild	No	St. George BLM

Table 3-1
Wild and Scenic Rivers

Name	Location/Description	Class	Affected by LPP Project	Administering Agency
Wildcat Canyon (Blue Creek)	Segment of Blue Creek from the Zion National Park boundary to the junction with the Right Fork of North Creek and adjacent land rim-to-rim	Wild	No	St. George BLM
Little Creek	Segment beginning at the head of Little Creek to the junction with the Left Fork of North Creek and adjacent land 1/2-mile wide	Wild	No	St. George BLM
Russell Gulch	Segment from the head of Russell Gulch to the junction with the Left Fork of North Creek and adjacent land rim-to-rim	Wild	No	St. George BLM
Grapevine Wash	2.6-mile segment from the Lower Kolob Plateau to the junction with the Left Fork of North Creek and adjacent land rim-to-rim	Scenic	No	St. George BLM
Pine Spring Wash	4.6-mile segment to the junction with the left fork of North Creek and adjacent land 1/2-mile	Scenic	No	St. George BLM
Wolf Springs Wash	1.4-mile segment from the head of Wolf Springs Wash to the junction with Pine Spring Wash and adjacent land 1/2-mile wide	Scenic	No	St. George BLM
Kolob Creek	5.9-mile segment of Kolob Creek beginning in T. 39 S., R. 10 W., sec. 30, through Bureau of Land Management land and Zion National Park land to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim	Wild	No	St. George BLM
Oak Creek	1-mile stretch of Oak Creek beginning in T. 39 S., R. 10 W., sec. 19, to the junction with Kolob Creek and adjacent land rim-to-rim	Wild	No	St. George BLM

Table 3-1
Wild and Scenic Rivers

Name	Location/Description	Class	Affected by LPP Project	Administering Agency
Goose Creek	4.6-mile segment of Goose Creek from the head of Goose Creek to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim	Wild	No	St. George BLM
Deep Creek	5.3-mile segment of Deep Creek beginning on Bureau of Land Management land at the northern boundary of T. 39 S., R. 10 W., sec. 23, south to the junction of the North Fork of the Virgin River and adjacent land rim-to-rim	Wild	No	St. George BLM
North Fork Virgin River	10.8-mile segment of the North Fork of the Virgin River beginning on Bureau of Land Management land at the eastern border of T. 39 S., R. 10 W., sec. 35, to Temple of Sinawava and adjacent land rim-to-rim	Wild	No	St George BLM
North Fork Virgin River	8-mile segment of the North Fork of the Virgin River from Temple of Sinawava south to the Zion National Park boundary and adjacent land 1/2-mile wide	Recreational	No	St George BLM
Imlay Canyon	Segment from the head of Imlay Creek to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim	Wild	No	St George BLM
Orderville Canyon	Segment from the eastern boundary of Zion National Park to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim	Wild	No	St George BLM
Mystery Canyon	Segment from the head of Mystery Canyon to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim	Wild	No	St George BLM
Echo Canyon	Segment from the eastern boundary of Zion National Park to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim	Wild	No	St George BLM
Behunin Canyon	Segment from the head of Behunin Canyon to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim	Wild	No	St George BLM
Heaps Canyon	Segment from the head of Heaps Canyon to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim	Wild	No	St George BLM

Table 3-1
Wild and Scenic Rivers

Name	Location/Description	Class	Affected by LPP Project	Administering Agency
Birch Creek	Segment from the head of Birch Creek to the junction with the North Fork of the Virgin River and adjacent land 1/2-mile wide	Wild	No	St George BLM
Oak Creek	Segment of Oak Creek from the head of Oak Creek to where the forks join and adjacent land 1/2-mile wide	Wild	No	St George BLM
Oak Creek	1-mile segment of Oak Creek from the point at which the 2 forks of Oak Creek join to the junction with the North Fork of the Virgin River and adjacent land 1/2-mile wide	Recreational	No	St George BLM
Clear Creek	6.4-mile segment of Clear Creek from the eastern boundary of Zion National Park to the junction with Pine Creek and adjacent land rim-to-rim	Recreational	No	St George BLM
Pine Creek	2-mile segment of Pine Creek from the head of Pine Creek to the junction with Clear Creek and adjacent land rim-to-rim	Wild	No	St George BLM
Pine Creek	3-mile segment of Pine Creek from the junction with Clear Creek to the junction with the North Fork of the Virgin River and adjacent land rim-to-rim	Recreational	No	St George BLM
East Fork Virgin River	8-mile segment of the East Fork of the Virgin River from the eastern boundary of Zion National Park through Parunuweap Canyon to the western boundary of Zion National Park and adjacent land 1/2-mile wide	Wild	No	St George BLM

Table 3-1
Wild and Scenic Rivers

Name	Location/Description	Class	Affected by LPP Project	Administering Agency
Shunes Creek	3-mile segment of Shunes Creek from the dry waterfall on land administered by the Bureau of Land Management through Zion National Park to the western boundary of Zion National Park and adjacent land 1/2-mile wide	Wild	No	St George BLM
North Fork Virgin River—Segment 48-49	Northwest of Mt Carmel - Kolob Terrace - T39S, R9W - Zion National Park	Wild	No	Kanab BLM
East Fork Virgin River—Segment 37-40a	West of Mt Carmel - White Cliffs - T42S, R8W - Zion National Park	Scenic	No	Kanab BLM
East Fork Virgin River—Segment 40a-41	West of Mt Carmel - White Cliffs - T42S, R9W - Zion National Park	Wild	No	Kanab BLM
Orderville Gulch (Esplin Gulch)—Segment 44-45	Northwest of Mt Carmel - T40S, R9W - Zion National Park	Wild	No	Kanab BLM
Meadow Creek/Mineral Gulch— Segment 33-35, 35-38	West of Mt Carmel - White Cliffs - T41S, R8W - Zion National Park	Wild	No	Kanab BLM
Paria River — Segment 68-69	Adairville - The Rimrocks - T43S, R1W	Wild	No	Kanab BLM
Upper Paria River - 1	T38S, R2W, Sec 21 to T41S, R1W, Sec 7 - Little Dry Valley	Wild	No	GSENM BLM
Upper Paria River - 2	T41S, R1W, Sec 7 to T42S, R1W, Sec 28 - Crosses US Highway 89	Rec	No	GSENM BLM
Lower Paria River - 1	T43S, R1W, Sec 10 to T43S, R1W, Sec 23 – from U.S. Highway 89 south to the Wilderness Boundary	Rec	Yes	GSENM BLM

During scoping, BLM St. George Field Office indicated that no designated, eligible, or suitable WSR segments are within or adjacent to the proposed alignment within their jurisdiction.

The only river segment considered by the GSENM MMP as eligible that is within the LPP Project area is Lower Paria River -1. The Paria River upstream and downstream of the US Highway 89 bridge flows through privately-owned land. The Water Conveyance System pipeline would cross the Paria River through the private land, and the transmission line alignment would cross over the Paria River above the private land. The Water Conveyance alignment crosses Buckskin Gulch along US Highway 89. This reach of Buckskin Gulch would not be directly affected because the segment considered elegible by BLM begins far downstream of the US 89 highway crossing. The Glen Canyon to Buckskin transmission line alternative (230 kV) would cross the Lower Paria River – 1 segment parallel to the existing Navajo-McCullough Transmission Line and Glen Canyon to Buckskin transmission line. The GSENM MMP articulates plans for the Paria River segment to curtail motorized use, enhance southwestern willow

flycatcher habitat, enhance deer and other wildlife populations, and close the area to cross-country vehicle use (BLM 2000).

3.2.7 Grazing Land

Upon review of the GIS mapping information retained from information obtained from BLM and the states of Utah and Arizona (Utah AGRC 2011, AGIC 2011), it was concluded that approximately 33 percent (65 miles) of the LPP Project pipeline alternatives would cross land available for grazing. Also, about 24 percent (48 miles) of the LPP Project transmission line alignments would cross land administered by BLM and states. Following is a list of agencies that administer public grazing land within the LPP Project area:

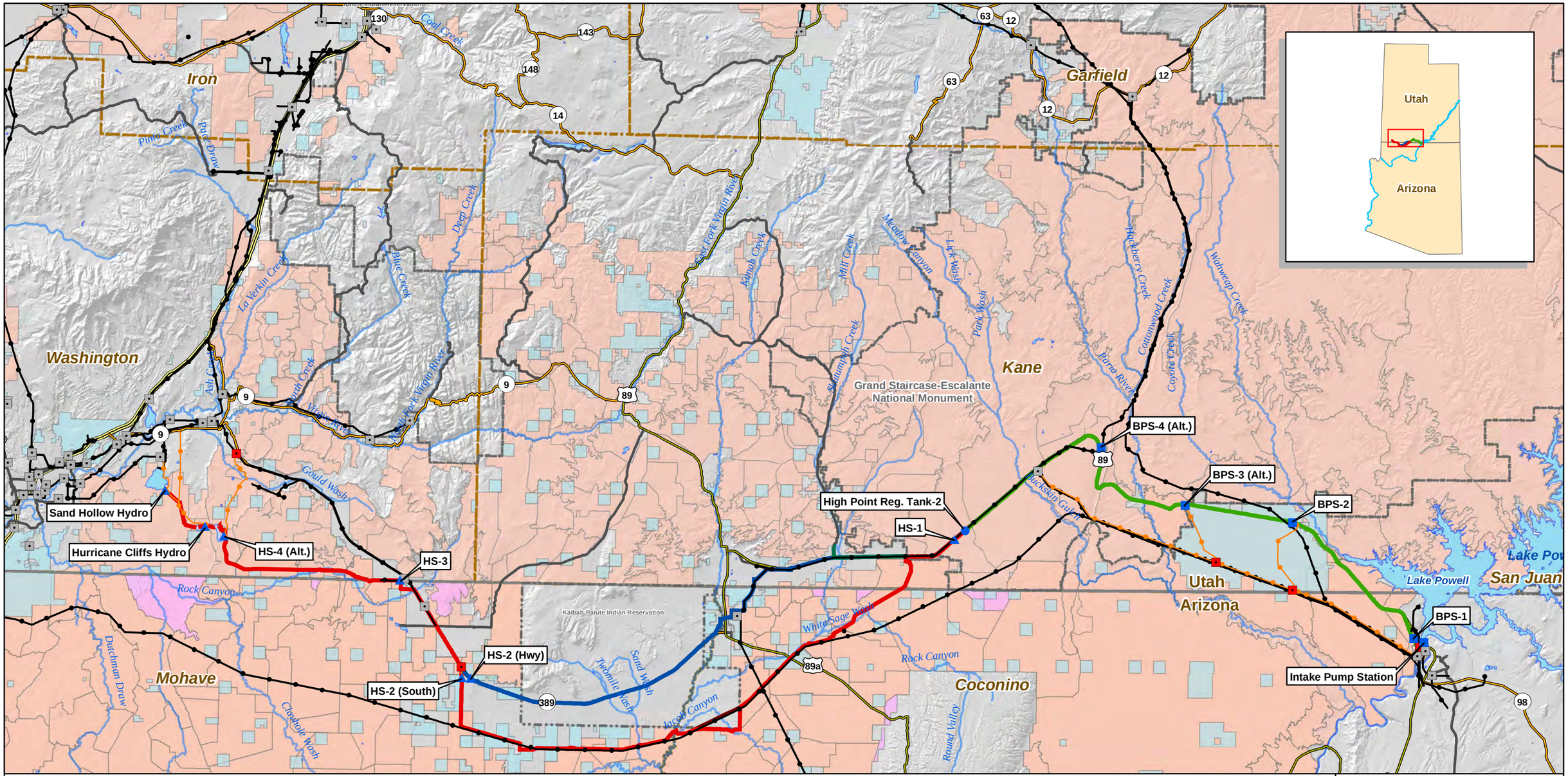
- BLM Arizona Strip Field Office (ASFO)
- BLM Grand Staircase-Escalante National Monument (GSENM)
- BLM Kanab Field Office (KFO)
- BLM St. George Field Office (SGFO)
- National Park Service (NPS)
- School Institutional Trust Lands Administration, Utah (SITLA)
- Arizona State Land Department (ASLD)
- Utah Division of Parks and Recreation

The LPP Project as a whole would affect 21 ASFO grazing allotments, 8 GSENM grazing allotments, 16 SGFO grazing allotments, 11 SITLA grazing allotments, and 10 ASLD grazing allotments (Figure 3-3). Following is a list of issues that could be encountered during the construction and operation of the LPP Project facilities:

- Need for continued access to grazing allotments during construction
- Loss of use or damage to access roads during and following construction
- Destruction of fences, water pipelines, corrals or other range improvements
- Disruption to grazing rotations
- Loss of forage resulting from pipeline construction and reclamation processes at reservoir sites

In establishing the Glen Canyon National Recreation Area (GCNRA) in 1972, Congress directed that, "The administration of…grazing leases within the recreation area shall be by BLM. The same policies followed by BLM in issuing and administering…grazing leases on other land under its jurisdiction shall be followed in regard to land within the boundaries of the recreation area, subject to provisions of Section 3(a) and 4 of this Act." BLM administers grazing on the GCNRA subject to this enabling legislation and in accordance with the NRA Strategic Plan, Grazing Management Plan, and interagency agreements, and Memoranda of Understanding. The GCNRA administers livestock grazing on three allotments that occur on public land and within Glen Canyon NRA: the Ferry Swale, Wahweap, and Bunting Well allotments (BLM 2008a).

Each of the applicable BLM field offices follows a set of standards for managing rangeland: Utah Standards for Rangeland Health and Guidelines for Grazing Management; Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (both approved in 1997). The guidelines are used to evaluate all surface disturbing activities on public land where BLM administers grazing privileges (BLM 2008a, BLM 2008b, BLM 2008c). SITLA rules do not specifically identify suggested measures to



Project Pump Station
Project Regulating Tank
Project Hydro Station
Substation
Proposed Substation
Water Conveyance System
Hydro System - South Alternative
Hydro System - Southeast Corner Alternative
KCWCD System
Hydro System - Existing Highway Alternative
Project Transmission Line
Existing Transmission Lines
Interstate
US Highway
ST Highway
Hwy
Major Road
Major Rivers & Streams
National Park/Monument
Tribal Lands
State Boundaries
County Boundaries
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
State Land
Available
Managed by Other Federal Agency

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

UDWRe **Figure 3-3** MWH

Lake Powell Pipeline Grazing Allotment Boundaries

follow in the event of disruption of grazing land. The rules identify rangeland management and permitting procedures.

The Arizona State Legislature does not specifically identify measures to follow or limitations in the event of disruption of grazing land during construction within the jurisdiction of ASLD-administered land. The rules identify rangeland management, permitting procedures, and laws governing the lease of state land.

Utah State Parks and Recreation administers two grazing allotments within the Sand Hollow Recreation Area. The allotments are managed according to the Utah Standards for Rangeland Health and Guidelines for Grazing Management (BLM 1999a).

3.2.8 Rights-of-Way

The proposed LPP Project or alternatives would require right-of-way (ROW) grants and approvals from NPS, Reclamation, BLM, BIA and state and local agencies including agreements with ADOT, UDOT and various transmission organizations in the region. Research was performed on ROW acquisition and issues with crossing other ROWs through approved Resource Management Plans (RMPs) and Records of Decision (RODs) of the land management agencies mentioned above. Following are BLM field offices affected by the LPP Project that have approved RMPs:

- Arizona Strip Field Office
- Grand Staircase-Escalante National Monument Field Office
- Kanab Field Office
- St. George Field Office

Upon reviewing the appropriate BLM RMPs pertaining to the LPP Project construction limits, it was determined the Utah and Arizona BLM field offices have provisions accommodating utilities within identified utility corridors with appropriate site-specific environmental analysis. Much of the LPP Project construction would take place within several existing highway ROWs while other portions lie within existing utility corridors. Using existing ROWs is encouraged as it helps restrict construction and associated disturbance to the least sensitive areas.

The St. George Field Office RMP provides a general overview statement on ROWs:

> "*This plan will continue to make public land available for a variety of rights-of-way where consistent with planning goals and prescriptions for other resources. Where possible, BLM will encourage project sponsors to locate new rights-of-way in existing or designated utility and transportation corridors.*" (BLM 1999a).

This mandate is consistent across BLM jurisdictions that could be crossed by the LPP Project. Applications for ROWs are analyzed on a case-by-case basis, and compared to planning decisions within the agency and to the standards of NEPA. All applications would be subject to applicable standards for surface disturbing activities. Consideration of a plan amendment if conflicts arise with the introduction of a new ROW corridor is mentioned in this RMP and those following.

The GSENM MMP has planning measures in place that allow for issuing a ROW within a portion of the Congressionally-designated utility corridor along U.S. 89. It states that planning and environmental studies would be necessary, along with conformance on specific ROW guidelines and NEPA standards, all considered on a case-by-case basis (BLM 2000).

BLM Kanab Field Office RMP directs BLM to expedite processes involving ROW acquisition for legitimate uses of public land. All ROWs are issued with use stipulations and other mitigation measures to minimize resource impacts (BLM 2008c).

Within NPS administered land, the LPP Project would require ROW grants on Federal land within the Glen Canyon National Recreation Area (GCNRA) along the State Highway 89 corridor, which bisects the GCNRA in Coconino County, Arizona. The portion of State Highway 89 that bisects the GCNRA is managed by a ROW agreement that ADOT and UDOT have with NPS. Section 7 of Public Law 92-593 (GCNRA Enabling Act), passed in October 27, 1972, says that the Secretary of the Interior has the right to "grant easements and rights-of-way on a nondiscriminatory basis upon, over, under, across, or along any component of the recreation area unless he finds that the route of such easements and rights-of-way would have significant adverse effects on the administration of the recreation area". The ROWs that ADOT and UDOT hold do not allow them to issue easements or ROWs to other entities; rather they may only issue encroachment permits that have been previously approved by NPS. Therefore, the State of Utah must apply for a NPS ROW as well as an encroachment permit from ADOT and UDOT to construct and operate the LPP Project.

The proposed LPP Project would include the Lake Powell intake pump station facilities and a short initial pipeline section on Reclamation-managed land adjacent to Glen Canyon Dam. Reclamation has provided the State of Utah an initial agreement to allow for access to Reclamation land and/or facilities to conduct site investigations in connection with LPP Project permit and licensing activities. Once final design requirements are known, the right-of-way or use and occupancy agreement can be finalized with Reclamation.

UDOT has indicated that acquisition of an LPP Project ROW within the Highway 89 ROW is possible. But where possible, it is the preference of UDOT that the LPP Project ROW lie outside the Utah highway ROWs. Both open cut and trenchless boring technologies are available, and would be used based on permitting requirements, best practices, cost and construction efficiency. In many cases, the method of pipeline construction across a highway will be permitted by the responsible managing agency in coordination with UDWRe.

Acquisition of ROW easements within Arizona would require the applicant to follow guidelines set forth by the Arizona Revised Statutes (ARS) and all applicable federal regulations. These guidelines apply to ADOT-administered land as well as state, tribal, federal, and private land. ADOT has indicated that boring is mandatory unless extreme circumstances exist where LPP Project highway crossings would occur. The LPP Project is currently intended to stay within ADOT ROWs at all times when traversing US Highway 89 and Arizona State Route 389.

In Section 368 of the Energy Policy Act of 2005, Congress directed the Secretaries of Agriculture, Commerce, Defense, Energy, and the Interior to designate, under their respective authorities, corridors for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities on Federal land in the 11 contiguous Western States (BLM 2009). This action led to the identification of the West Wide Energy Corridor, which the LPP Project would make use of in several areas along the pipeline alignments. The West Wide Energy Corridor does not cross land administered by Reclamation.

The proposed Southern Corridor Highway will be a four-lane, limited-access highway beginning at Interstate 15 (I-15) roughly 2 miles north of the Arizona border near the southwest end of St. George (at the proposed Atkinville interchange) and connecting with State Route 9 (SR 9) near Hurricane (USDOT et al. 2005). The highway will be 26 miles long. A multiple-use trail for pedestrians, bicyclists, and equestrians would parallel the highway. The primary purpose of the Southern Corridor is to provide a regional transportation facility between St. George, Washington City, and Hurricane that would

complement local land use plans. Portions of the highway have been constructed and construction would be complete on the entire corridor before construction begins on the LPP Project.

Utah State Parks and Recreation administers 4,047-acres of WCWCD-owned land called the Sand Hollow Recreation Area. Therefore, within that area, ROW acquisition is managed by WCWCD.

Tribal lands are vested in a particular tribe, community, or individual (allottee), but the land itself is held in trust by the Bureau of Indian Affairs (BIA). The approval of Indian land usage or ROW acquisition requires consent of the tribal council of the tribe whose lands would be affected and the authorizing document from BIA. The State of Utah would have to negotiate an easement with the Kaibab Band of Paiute Indians to obtain access through the Kaibab-Paiute Indian Reservation. All such acquisitions would need to be in accordance with 16 U.S.C. §§ 797 and 803 (U.S.C. 2011, 2011a).

The Arizona Steip Field Office RMP emphasizes protection and restoration of the natural and cultural resources while still providing for resource use and enjoyment. The RMP proposes a combination of management actions including allowing natural processes to continue, and protecting the remote settings that currently exist in the field office. The RMP encourages the use of designated utility corridors to the extent possible, but allows variances consistent with other RMP provisions. The RMP discourages new ROWs in avoidance areas (such as ACECs, national historic trails, and riparian areas).

3.2.9 Trails and National Historic Trails

There are three historic trails within the LPP Project area: The Honeymoon Trail, The Dominguez-Escalante Trail and The Old Spanish National Historic Trail. Of these trails, the Old Spanish National Historic Trail is a National Historic Trail. “The National Trail System Act of 1968” was established to designate and protect national scenic trails, national historic trails and national recreational trails. Each of the trails is managed by the designated federal agency whose administered land the trail resides on (USFS, BLM, or NPS). The pipeline would be the only feature that would cross the Historic Trails.

The Honeymoon Trail is a four-hundred mile long trail through the desert of Arizona and Utah that connected the Latter Day Saint (LDS) settlers to the St. George LDS Temple. The trail crosses public land administered by BLM and NPS, and also crosses tribal, state and private lands. The St. George Temple was built in 1877, and the first trip on the trail to the Temple took place in 1881.

The Dominguez-Escalante Trail is managed by BLM. The trail is approximately two thousand miles long and defines the route of the 1776 expedition led by Father Francisco Atanasio Dominguez and Father Silvestre Velez de Escalante. It originated in Santa Fe, NM and headed northwest along the San Juan, Dolores, Gunnison, and White Rivers in Colorado. It then headed west to Utah Lake where it turned south to Arizona before returning the loop back to Santa Fe. Only general mapping of the trail is available making it difficult to determine exactly where the crossings would be located. The marked portion of the National Historic Trail is located 30 miles northwest of Cedar City. The marked portion is approximately 25 miles long (BLM 2011).

The Old Spanish National Historic Trail is managed by Bureau of Land Management (BLM) and National Park Service. Currently, the two agencies are working on a Comprehensive Management Plan and Draft Environmental Impact Statement. When the planning is complete the two agencies will jointly administer the national historic trail which crosses New Mexico, Colorado, Arizona, Utah, Nevada and California (NPS 2012).

The Old Spanish National Historic Trail (NHT) includes roughly 2,700 miles from Abiquiu and Santa Fe, NM through Colorado, Utah, Nevada, and Arizona to its terminus in Los Angeles, CA. During the height of its use between 1829 and 1848 mule pack-trains and traders brought woolen goods west and herds of stock east. The trail was added to the National Trails System in 2002 in coordination with the National Trails System Act, to "promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open air, outdoor areas and historic resources of the Nation" (BLM et al. 2006, NPS 2009).

3.2.10 Areas of Critical Environmental Concern (ACEC)

ACECs are outlined in the Federal Land Policy and Management Act (FLPMA) of 1976. Section 103(a) of FLPMA, defines ACECs as areas where special management attention is required to protect and prevent damage to a particular resource. Regulations for implementing ACEC provisions of FLPMA are outlined in 43 CFR 1610.7-2 (43 CFR 1610.7-2). ACECs are considered for designation as part of BLM land management planning process and must meet certain relevance and importance criteria to be considered for designation (BLM 1999a). ACECs are managed to protect certain resources within that area, but the designation does not automatically prohibit other uses in the designated area. The following restrictions generally apply to all Arizona Strip ACEC:

- Motorized and mechanized vehicle use will be limited to existing or designated routes
- BLM will authorize only temporary upgrading or existing roads
- New roads will be authorized on a temporary basis only
- New mineral material disposal sites are not to be authorized

LPP Project facilities have been sited outside of most ACECs to avoid unnecessary impacts on sensitive habitats and riparian areas. However, the South Alternative would cross the Kanab Creek ACEC in two places. The crossing locations would have a temporary impact to riparian resources in the ACEC that would be rehabilitated and having a minimal effect to the Kanab Creek ACEC areas where the penstock crosses. Table 3-2 shows the ACECs that are within or adjacent to the LPP Project area.

Table 3-2 ACECs Within Project Vicinity			
Name	**Size (ac)**	**Admin.**	**Resource**
Johnson Spring	3444	AZ Strip	T/E Plants (Siler's pincushion and cultural resources)
Shinarump	3237	AZ Strip	T/E Plants (Siler's pincushion)
Water Canyon South Fork Indian Canyon	222	St. George	T/E Wildlife, Riparian Resources
Kanab Creek	13075	AZ Strip	T/E Wildlife (SWFC) Riparian Resources
Moonshine Ridge	9310	AZ Strip	T/E Plants (Siler's pincushion and cultural resources)
Lone Butte	1762	AZ Strip	T/E Plants (Jones Cyclad)
Lost Spring Mtn	19247	AZ Strip	T/E Plants (Siler's pincushion)
Canaan Mountain	31355	St. George	Topography and Scenic Values
Little Creek Mountain	19302	St. George	Historic Values, Cultural Resources
Fort Pierce	5560	AZ Strip	T/E Plants (Siler's pincushion)
Fort Pierce	164	AZ Strip	T/E Plants (Siler's pincushion)
Little Black Mountain	241	AZ Strip	Cultural Resources
Warner Ridge Fort Pierce	4281	St. George	T/E Plants (Siler's pincushion) soils/riparian

T/E = Threatened and Endangered

3.2.11 Growth

Development in the study area was started by Mormon settlers in the 1800s. In the 1970s land use began to change from rural, agricultural and open space to more urban developed area. A principal reason for this change was an increase in population as people began to migrate from colder climates to a warmer year-round climate. A large number of those migrants were retirees. According to the U.S. Census Bureau National and State Census Counts between 2010 and 2011, Utah was ranked third in the nation for percent change in population, with a 1.9% increase. It is expected that Utah will continue to experience population growth at a rate higher than most states in 2012 on account of strong natural increase in addition to in-migration. Natural increase is anticipated to add 39,000 people to Utah's population (GOPB 2012). In 2010 there were a total of 9,344 new housing units (including single, multi-family, and mobile homes) in Utah. The 2012 Governor's Office of Planning and Budget report estimates 8,700 units for 2012 and forecasts 10,000 units for 2012 (GOPB 2012).

Between 2000 and 2009, Washington County Utah was the 16th fastest growing county in the nation in terms of housing units with an increase of 20,571 new units, an increase of 56.4 percent (U.S. Census Bureau, 2010) According to 2012 GOPB, the population growth rate for Washington County from 2000 to 2010 was 52.9% The population in Washington County increased from 90,354 to 138,115 from 2000 to 2010 (GOPB 2011). The communities in Washington County have responded to the current and projected growth with infrastructure development and expansion including the Dixie Regional Medical Center, St. George Regional Airport in 2011, Quail Creek Reservoir, Sand Hollow Reservoir, the Southern Corridor Highway, State Highway 9 upgrades, I-15 upgrades through the St. George metropolitan area, and other transportation infrastructure additions and upgrades in Washington County.

Table 3-3 shows the population and housing unit trends for the counties in the growth study from 2000 to 2020 (GOPB 2012). The 2012 Baseline Projections completed by the GOPB is the most recent and best available data for population projection and household projections by area.

Table 3-3 GOPB Population Prediction Comparison							
Total Population by Area							
	2000	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Kane County	6,077	7,125	8,357	10,259	12,601	15,314	18,583
Washington County	91,090	138,748	196,762	280,558	371,743	472,567	581,731
State of Utah	2,246,214	2,774,283	3,309,234	3,914,984	4,570,433	5,257,239	5,965,658
Household Population by Area							
	2000	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Kane County	6,010	7,025	8,228	10,090	12,378	15,043	18,264
Washington County	89,718	136,887	194,115	276,508	366,132	465,265	572,691
State of Utah	2,205,419	2,727,953	3,253,854	3,848,136	4,491,810	5,167,414	5,861,563
Group Quarters Population by Area							
	2000	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Kane County	67	100	129	169	223	271	319
Washington County	1,372	1,861	2,647	4,050	5,611	7,302	9,040
State of Utah	40,795	46,330	55,380	66,848	78,623	89,825	104,095
Number of Households by Area							
	2000	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Kane County	2,254	2,900	3,353	3,945	4,681	5,634	6,823
Washington County	30,191	46,545	70,919	112,378	151,647	192,884	237,065
State of Utah	705,588	880,926	1,088,997	1,373,259	1,641,340	1,909,039	2,185,563
Sources: U.S. Census Bureau (2010) Governor's Office of Planning & Budget, 2012 Baseline Projections							

Washington County has experienced extensive growth and development including some areas of urban sprawl and strip-type commercial development. The general definition of sprawl by Robert W. Burchell (Burchell et al. 1998) is development that expands in an unlimited and noncontiguous (leapfrog) manner outward from the solidly built-up core of a metropolitan or downtown area and includes both residential and nonresidential development. A common trait of sprawl is the consumption of agricultural and sensitive lands in abundance found at the periphery of development. The loss of large amounts of agricultural land is significant and often occurs because it is the cheapest land available for development and sensitive lands are often lost due to a lack of environmental protection. The conversion of land to more urban uses has historically taken place on open space, agricultural land, along major transportation routes, and on sensitive resource land such as steep slopes, hillsides and ridgelines.

In a report titled “Costs of Sprawl – 2000” (Burchell et al. 2002) Iron County Utah, Washington County, Utah and Mohave County, Arizona were depicted with significant sprawl status (Figure 3-4). As urban sprawl continues, some urban decay is becoming apparent in the core areas as populations move farther away from city centers and downtown areas (Figure 3-5).

However, during the last decade, Washington County has experienced more infill and city center revitalization. Additional planning, zoning, development requirements, and regulation as well as a commitment to the Vision Dixie principles of smart growth (www.visiondixie.org) by the major municipalities in Washington County, show what may be the beginning of "smart growth" practices, which would help reduce and control sprawl and strategically plan where development should take place to reduce impacts on sensitive land resources, reduce the conversion of agricultural land and open space land, and reduce the costs associated with infrastructure expansion and maintenance (Figure 3-6; Figure 3-7).

The growth analysis study area for purposes of this analysis includes 540,155 acres within the more highly populated areas encompassing the cities of Ivins, Santa Clara, St. George, Washington City, Hurricane, Virgin, LaVerkin, Toquerville, Leeds, and Apply Valley (Figure 2-1). In the mid 1990s there were approximately 15,381 acres of developed land, of which, 1,972 acres was on high hazard rock and soil areas (Figure 3-8). In 2009, there were approximately 33,714 acres of developed land. At the time of the study, there were 5,295 acres of developed land that were on what is considered high hazard rock and soil areas (Figure 3-9). In 2011, there were approximately 34,773 acres of developed land. At the time of the study, there were 5,474 acres of developed land that were on what is considered high hazard rock and soil areas (Figure 3-10). Historically, the presence of hazardous rock and soil did not appear to constrain development. However, in more recent years, land use plans appear to be pushing more stringent engineering practices along with policies which would constrain use and development on the higher hazard rock and soil areas.

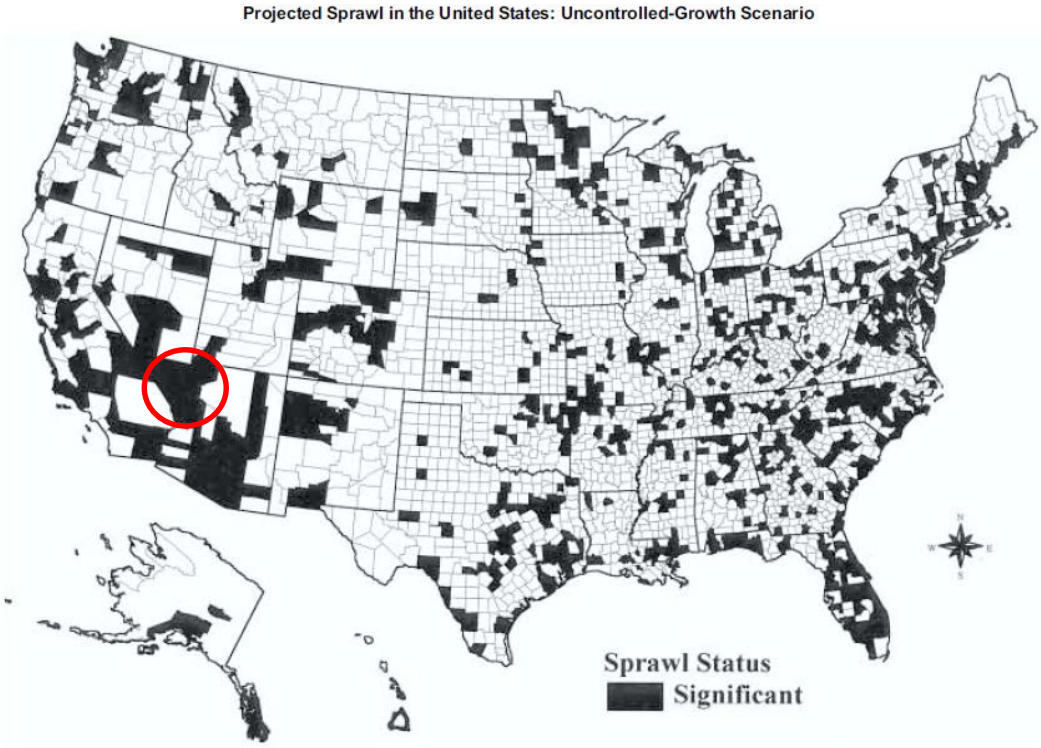
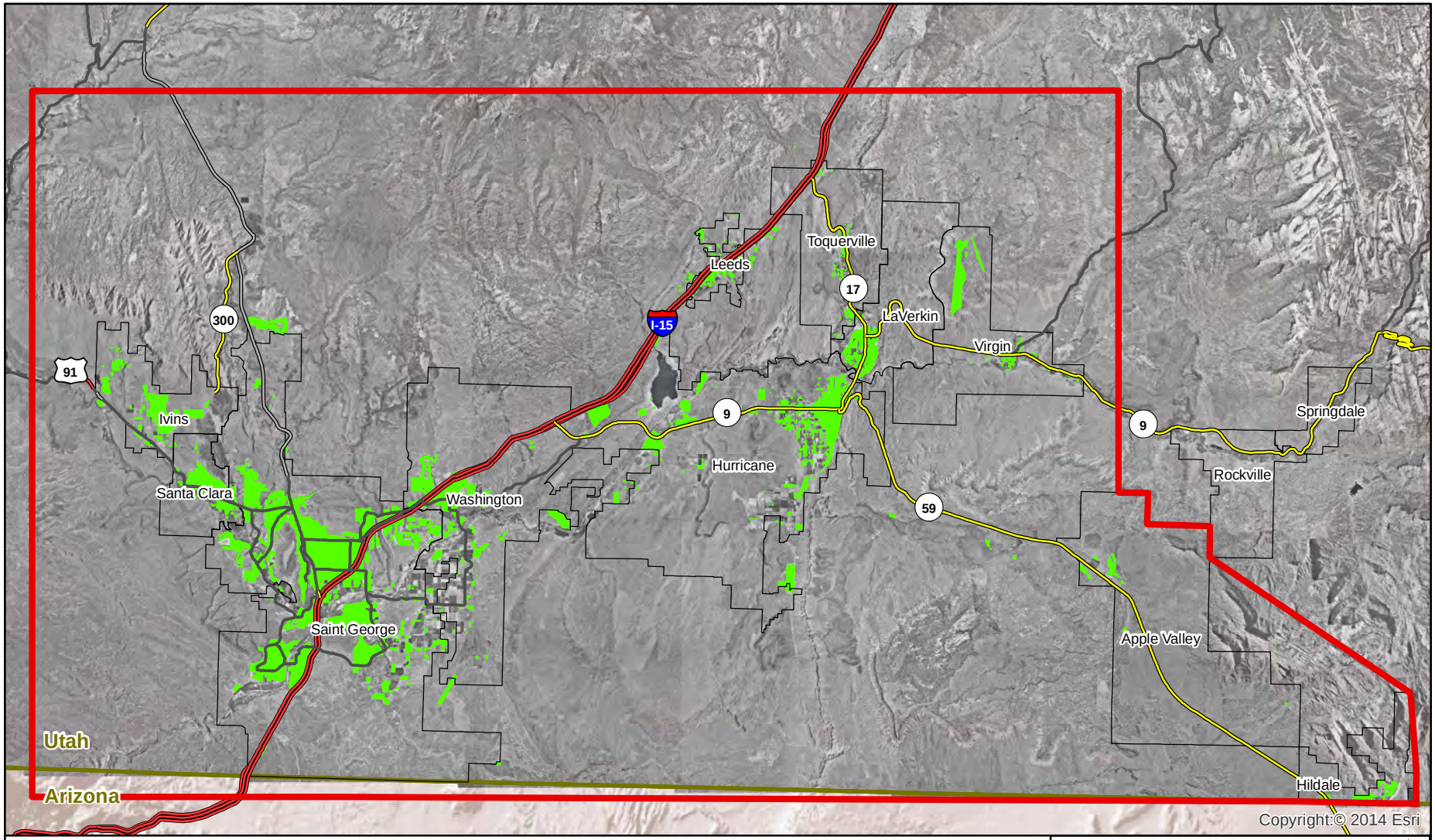


Figure 3-4
Projected Sprawl in the United States: Uncontrolled-Growth Scenario

This figure was obtained from TCRP Report 74 "Cost of Sprawl 2000" (Burchell et al. 2002)



Cities
State Boundaries
Developed Area - 15,381 Acres (1993)
Growth Analysis Study Area

Interstate
US Highway
ST Highway
Hwy
Major Road

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

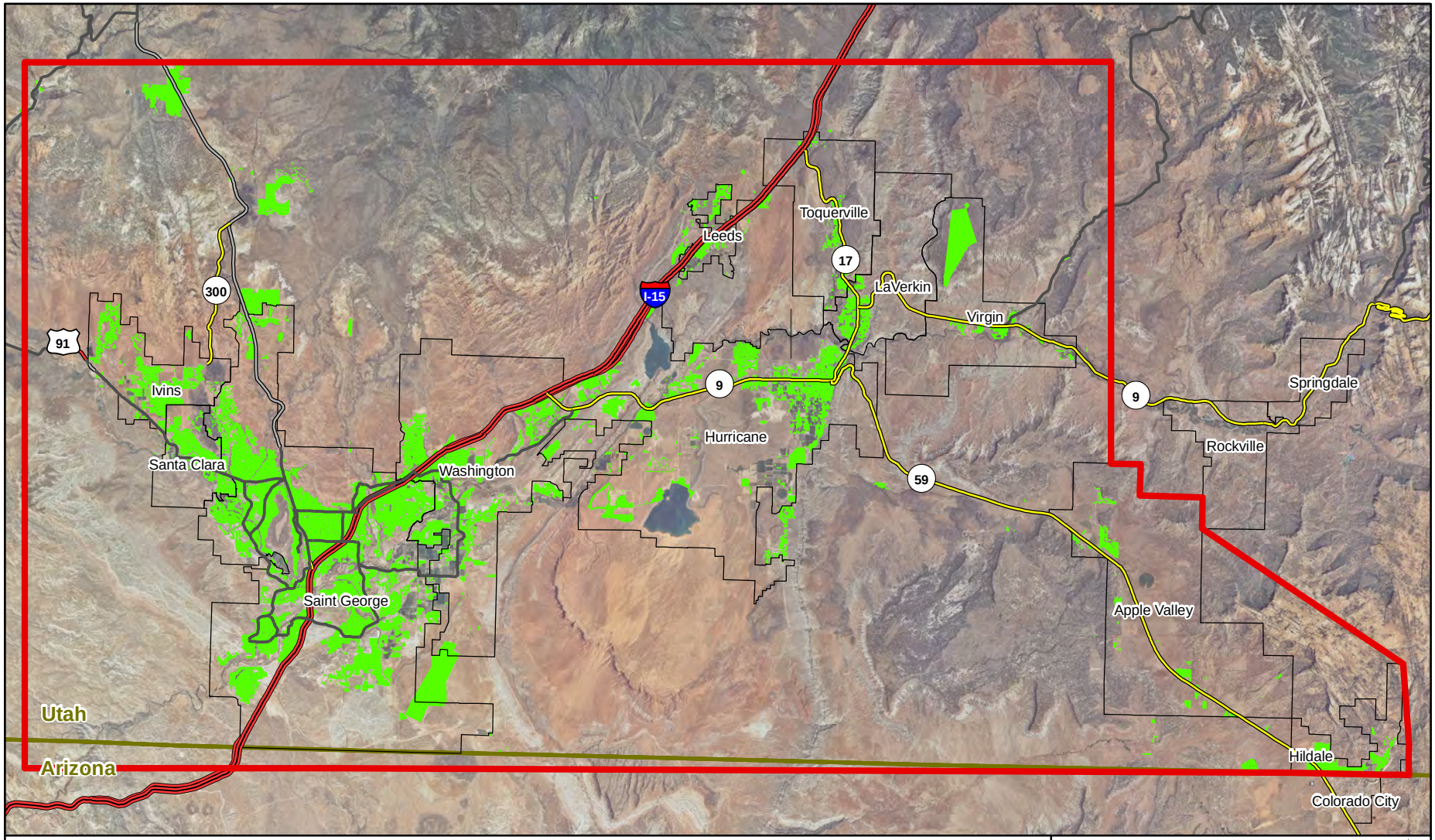
0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: DOQ 1993
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe Figure 3-5 MWH

Developed Areas 1993



Cities
State Boundaries
Developed Area - 33,714 Acres (2009)
Growth Analysis Study Area

Interstate
US Highway
ST Highway
Hwy
Major Road

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

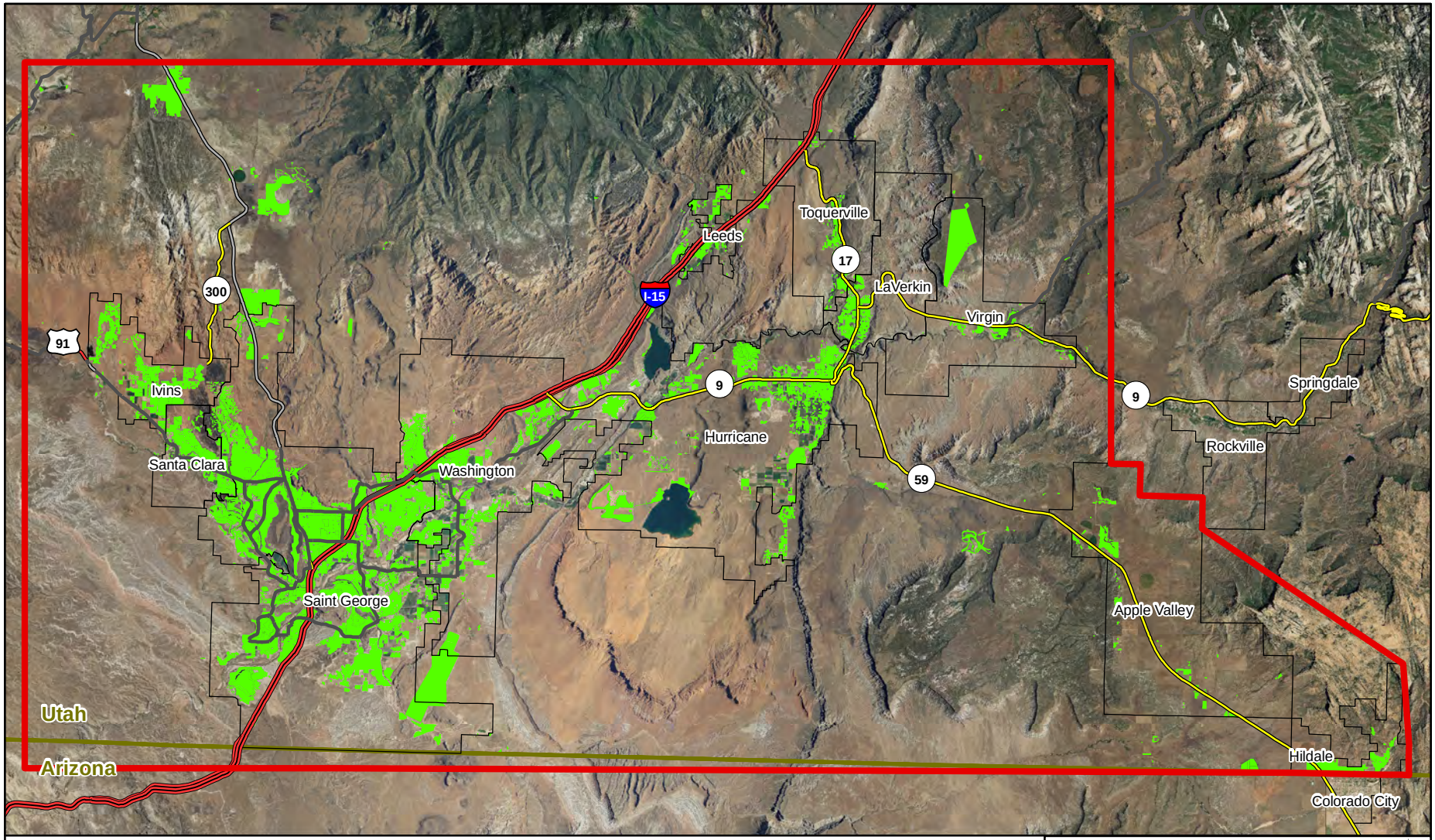
0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2009
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe **Figure 3-6** MWH

Developed Areas 2009



Growth Analysis Study Area
Cities
State Boundaries
Developed Area - 34,773 Acres (2011)

Interstate
US Highway
ST Highway
Hwy
Major Road

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

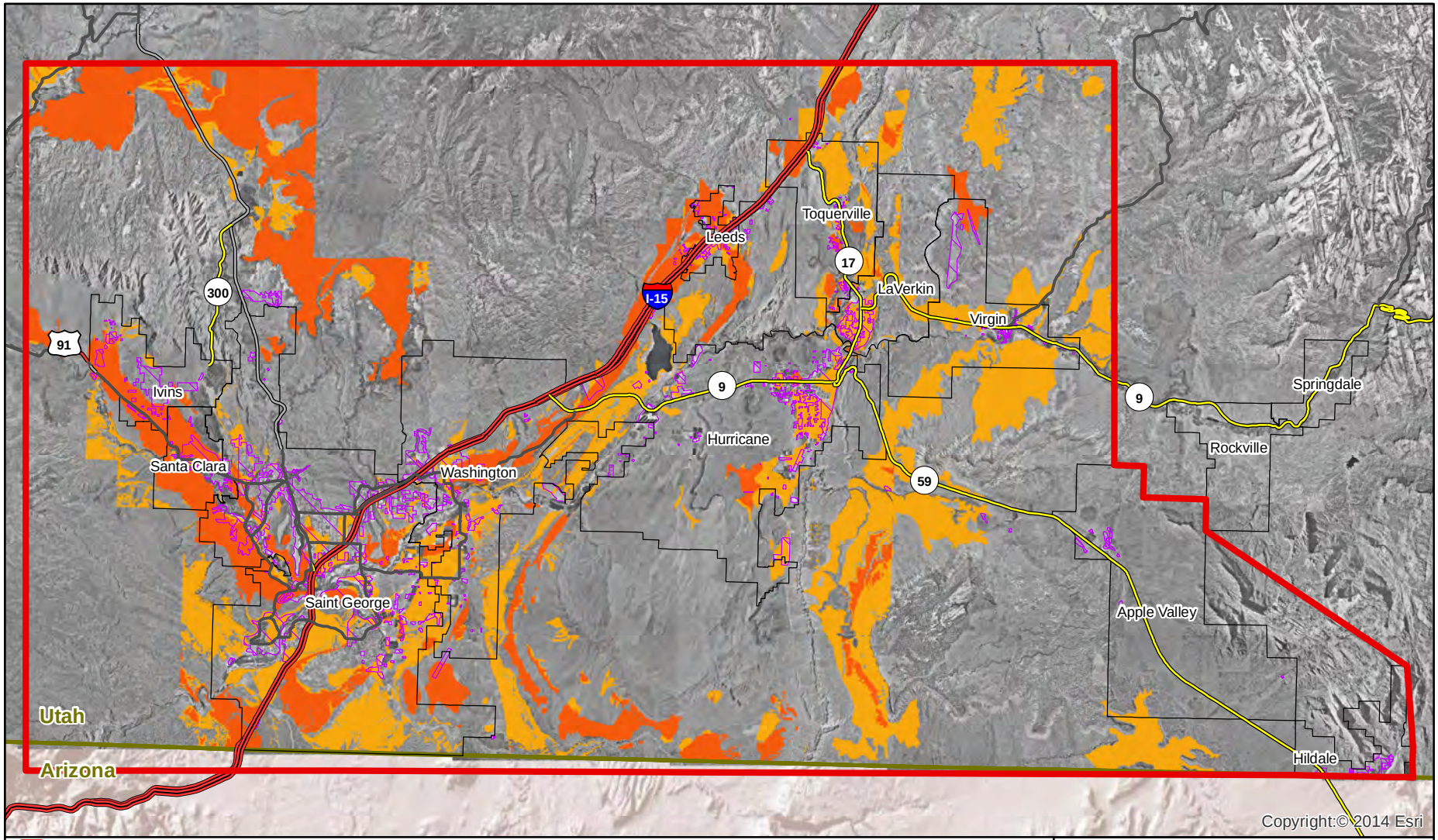
0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2011
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe **Figure 3-7** MWH

Developed Areas 2011



Growth Analysis Study Area
Cities
State Boundaries
Developed Area - 15,381 Acres (1993)
High Expansive Rock and Soil Hazard Area
Moderate Expansive Rock and Soil Hazard Area

Interstate
US Highway
ST Highway
Hwy
Major Road

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

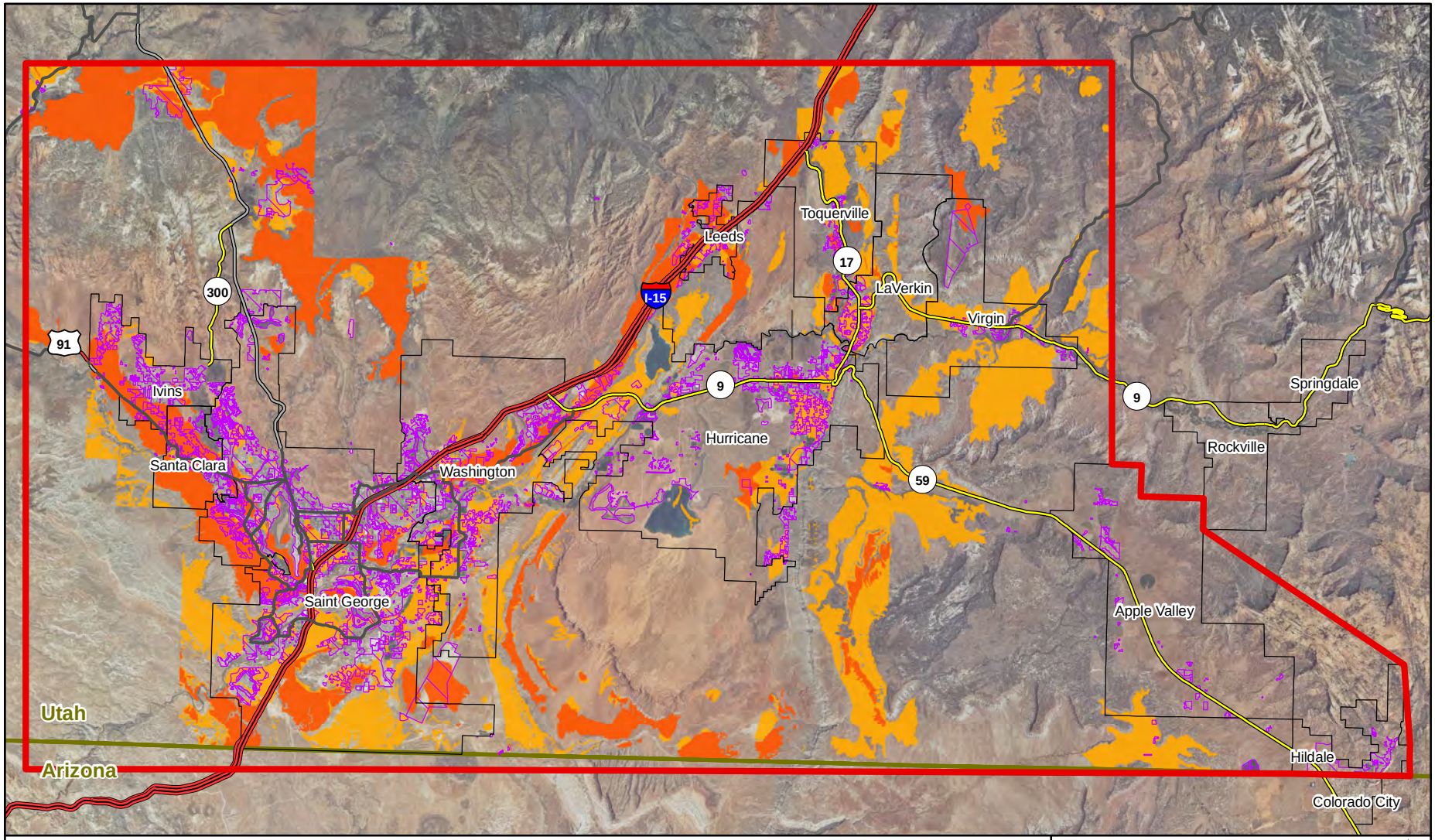
0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: DOQ 1993
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe Figure 3-8 MWH

Developed Area 1993 - Expansive Rock and Soil Hazard Areas



Growth Analysis Study Area
Cities
State Boundaries
Developed Area - 33,714 Acres (2009)
High Expansive Rock and Soil Hazard Area
Moderate Expansive Rock and Soil Hazard Area

Interstate
US Highway
ST Highway
Hwy
Major Road

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

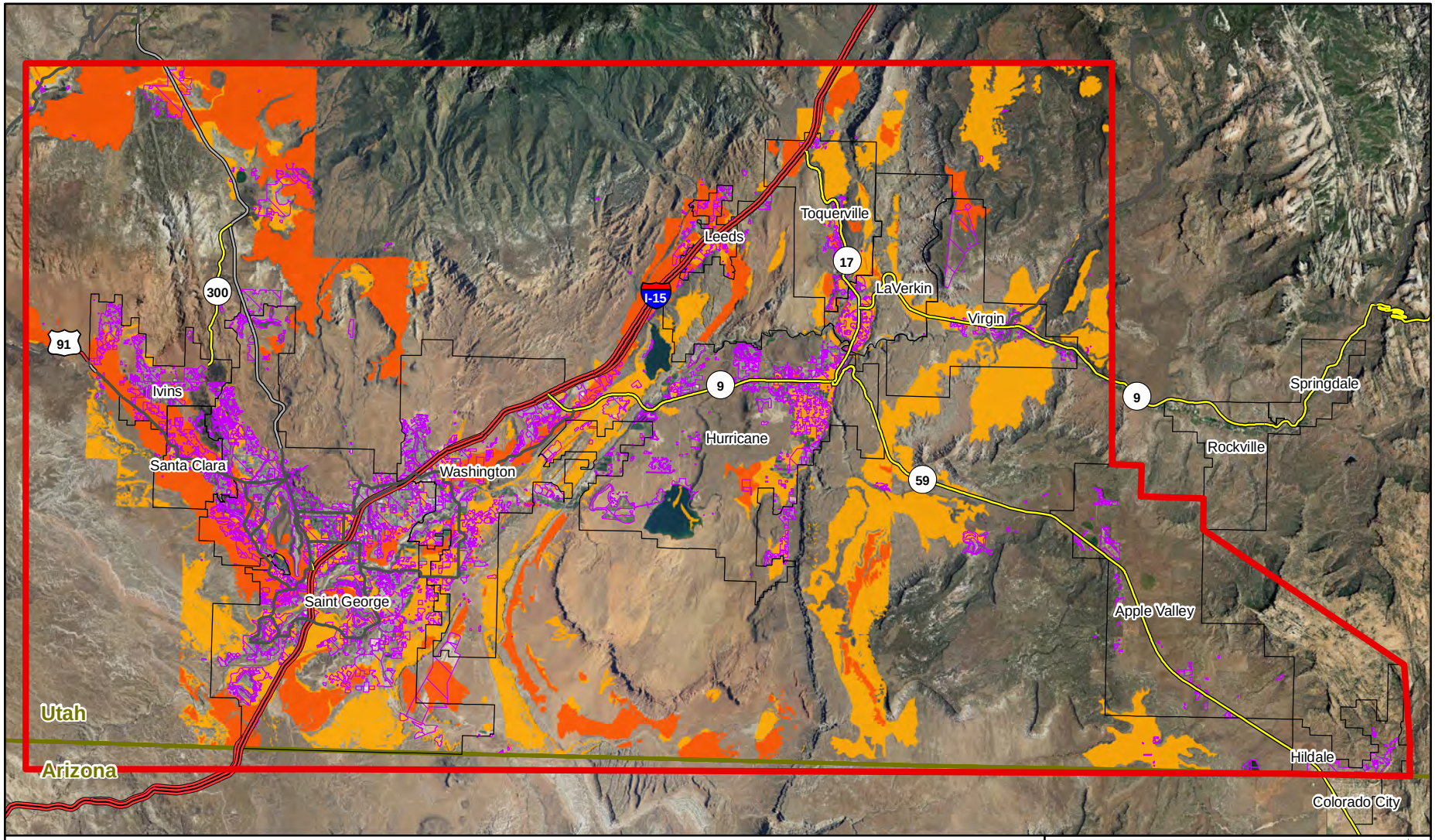
0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2009
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe **Figure 3-9** MWH

Developed Area 2009 - Expansive Rock and Soil Hazard Areas



Growth Analysis Study Area
Cities
State Boundaries
Developed Area - 34,773 Acres (2011)
High Expansive Rock and Soil Hazard Area
Moderate Expansive Rock and Soil Hazard Area

Interstate
US Highway
ST Highway
Hwy
Major Road

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

0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2011
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe **Figure 3-10** MWH

Developed Area 2011 - Expansive Rock and Soil Hazard Areas

Chapter 4
Environmental Consequences

4.1 Significance Criteria

The following would be significant impacts on land use and land use plans.

4.1.1 Land Ownership and Management

- LPP Project activities that would not be in conformance with management direction set forth in federal RMPs, and state and local general plans
-
- LPP Project activities resulting in the rendering of a portion of land as not-useable by the current land-administering agency

4.1.2 Farmland

- LPP Project activities that would convert designated farmland from one level to another (prime, unique, and state-important) or to a non-farm land use

4.1.3 Floodplain

- LPP Project activities that would permanently alter floodplain characteristics

4.1.4 Waste Disposal and Hazardous Waste

- LPP Project activities resulting in the production of unmanageable quantities of waste

4.1.5 Wilderness, WSAs, and Land with Wilderness Characteristics

- LPP Project activities resulting in converting land characterized as ‘wilderness’ or road-less land to any other type of land characterization

4.1.6 Wild and Scenic Rivers

- LPP Project activities resulting in crossing any land or waterway designated as Wild, Scenic, or Recreational under the National Wild and Scenic Rivers System

4.1.7 Grazing Land

- LPP Project activities resulting in reduction in AUMs (or available forage)

4.1.8 Trails and National Historic Trails

- LPP Project activities resulting in permanent disturbance and impacts on the values for which the trail was created

4.1.9 Areas of Critical Environmental Concern

- LPP Project activities that would permanently disturb the relevant and important values for which the area was designated

4.1.10 Growth

- LPP Project operation causing growth outside of existing infrastructure and designated municipal boundaries, resulting in conversion of agricultural, conservation and open space land to additional urban land use

4.2 Potential Impacts Eliminated From Further Analysis

There are no potential impacts eliminated from further analysis.

4.3 Impacts

The permanent ROW for the pipeline components of the LPP Project would be 100-feet wide. Land use would be affected by construction in the short-term of the LPP Project in several different ways, all of which are reviewed and explained in the following sections. However, the direct impact of the permanent LPP Project footprint would only involve the area needed for above-ground facilities which may affect existing land use plans. These facilities include the intake pump station, booster pump stations, storage and regulating tanks, hydropower stations, forebays, and afterbays. Cumulatively, these facilities would require approximately 785-acres of land transfers or leases, mostly from SITLA, BLM, and ASLD. The land would be converted from generally open space use to utility use.

Much of the pipeline would be sited within existing utility corridors, transportation corridors, and within existing highway ROWs. However, a significant portion of private land and as well as public land incorporated within municipal boundaries would be disturbed. Illustrations of the temporary and permanent impacts on both public and private land are shown in Figures 4-1, 4-2, and 4-3.

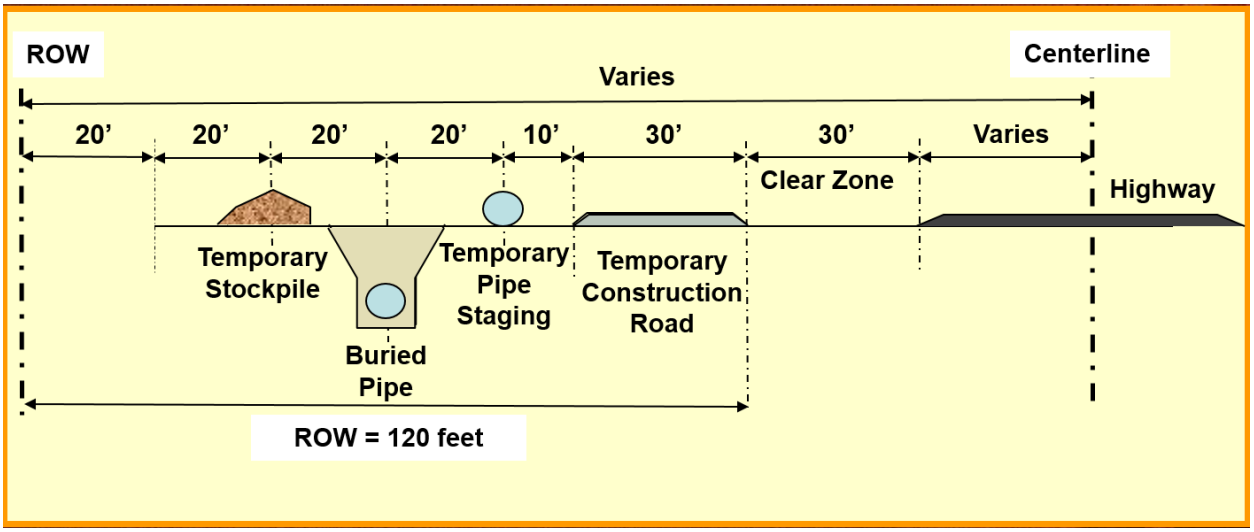


Figure 4-1
Highway Right-of-Way Construction

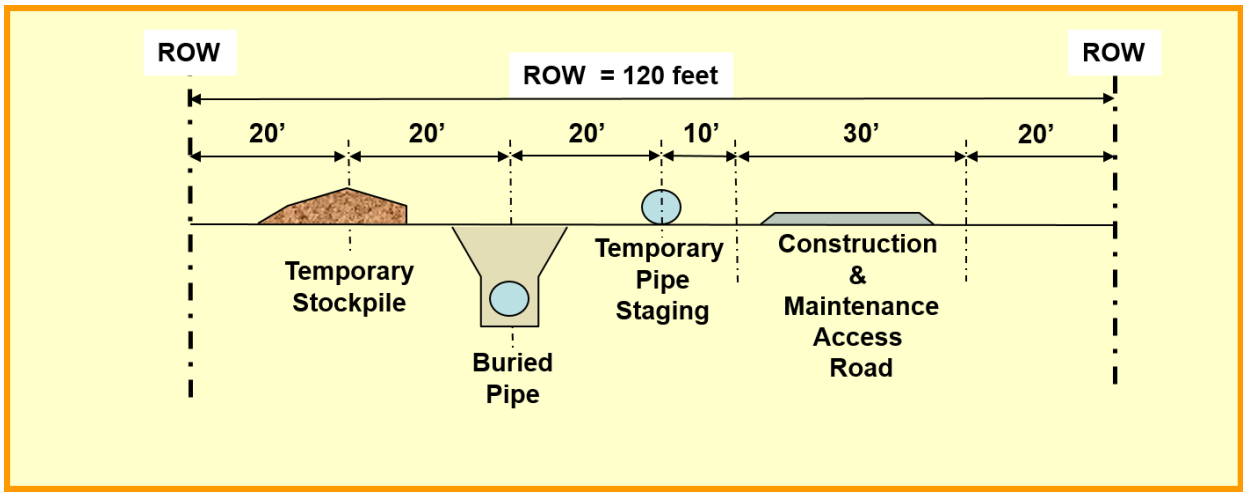


Figure 4-2
Not Adjacent to Highway Right-of-Way Construction

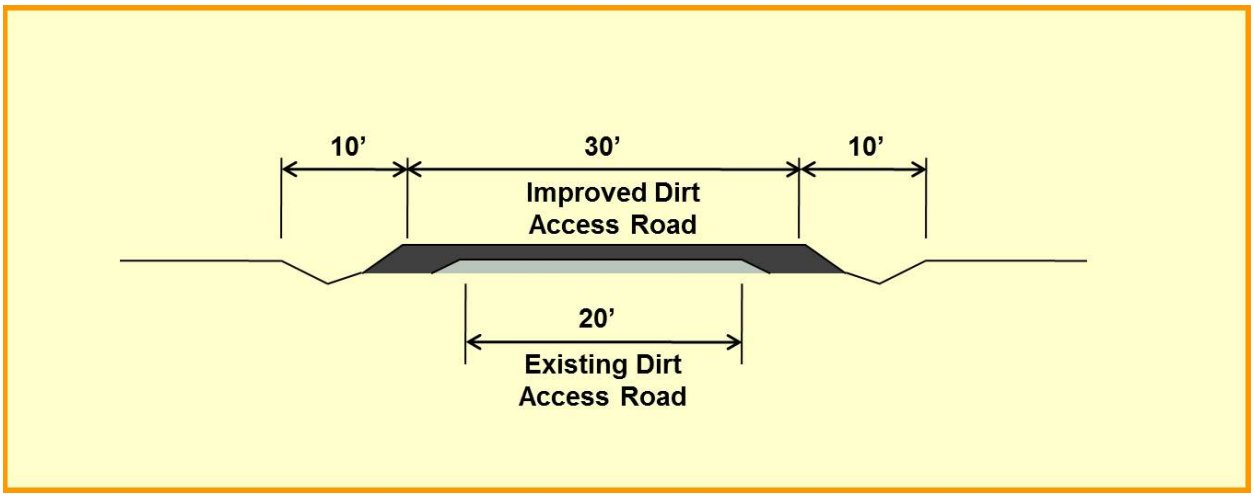


Figure 4-3
Typical Access Road Improvement

4.3.1 Land Ownership and Management

The LPP Project would require authorization of use on both public and private land, and in some facility locations, land acquisition would be necessary. Figure 3-1 illustrates the Federal, state, tribal and private land that would be affected by LPP Project alternatives. All land acquisitions, leases and associated studies would need to occur on an as-needed basis upon final determination of the preferred alignment. The Water Conveyance System would require five acres of private land acquisition for BPS-4 (Alt.). All other Water Conveyance System facilities would be located on public land and the land could be acquired or leased. The South Alternative would require approximately 17 acres of private land for two permanent access roads and Hydro Station-2. The Existing Highway Alternative would require approximately nine acres of private land for one permanent access road and Hydro Station-2. The Southeast Corner Alternative would have the same private land acquisition requirements as the South Alternative. The transmission line alignments would require approximately nine acres of private land for one permanent transmission line access road.

LPP Project construction would affect approximately 16.5 miles of Kaibab-Paiute Indian Reservation land under the Existing Highway Alternative. The Arizona Department of Transportation (ADOT) maintains a transportation ROW along the Arizona State Route 389; however, ADOT has requested the construction limits be set outside the ROW through the Reservation land. This would result in a significant land use impact on Reservation land because of there is no energy corridor in the vicinity. Therefore, LPP Project sponsors would need to complete all necessary applications and studies outlined in the Energy Transport Corridor Siting for Tribal Planners Guidance Manual (BIA 2010).

The Energy Transport Corridor Siting for Tribal Planners Guidance Manual (Mannual) defines a energy transport corridor as a designated strip of land across the landscape that is determined to be most appropriate for siting energy transmission facilities based on the opportunities or needs for transmission connectivity, environmental considerations, and other siting concerns (BIA 2010).

The review process for utility requests or plans for energy transportation ROWs across tribal lands includes the following procedure (BIA 2010):

(1) Identify an Unrestricted Energy Transport Corridor(s)
    a. Identify straight-line (shortest distance) paths connecting energy generation areas with energy demand areas while considering the locations of existing energy transport infrastructure and future energy planning activities.
(2) Revise the Unrestricted Corridor Route to Avoid Siting Constraints
    a. Revise the unrestricted energy transport corridor to avoid known environmental and regulatory constraints while still meeting the specified need for the corridor. In addition, the location of the unrestricted corridor is also examined for opportunities to follow existing utility and transportation ROWs (e.g., roads and rail lines), thereby minimizing the placement of future energy transport projects in 'greenfield' (undeveloped) locations where there could be greater impacts to valued natural and cultural resources.
    b. Potential Engery Corridor Constraints: Existing laws, regulations and policies; resources that are ecologically, culturally, scientifically, educationall and/or recreationally important; military installations and training and testing areas; and public concerns.
(3) Refine the Preliminary Corridor Route Using Site-Specific Resource Information and Environmental Impact Analyses
    a. The tribal and, if appropriate, federal, state, and local land and resource managers and their staffs examine the preliminary energy transport corridor.
    a. In addition, environmental impact analyses should be conducted that examine the potential for valued resources to be adversely affected by any projects developed within the preliminary corridor route.
(4) Finalize the Proposed Engery Transport Corridor Using Input from Tribal and Non-Tribal Stakeholders
    a. The tribal planners may make adjustments to the proposed corridor or ROW route to address comments and concerns raised by tribal and non-tribal stakeholders on the corridor route proposed in Step 3 of the siting process. The corridor planners should examine the comments received from the public, tribal, federal, state and local governments; nongovernment organizations (e.g., The Wilderness Society); and other stakeholders.
(5) Oversight of Use and Occupancy of Corridors or Right-of-Ways
    a. Once a tribe has designated an energy corridor or ROW route, all applications for use of the corridor or ROW will be evaluated by the appropriate tribal authority. Through this review, appropriate BMPs and mitigation measures will be identified to ensure that the proposed energy transmission project is planned, implemented, operated, and eventually removed in a manner that protects natural and cultural resources.

The Southeast Corner Alternative would affect Reservation land for a distance of approximately 4 miles and would follow an established energy corridor. The South Alternative would avoid all land use impacts on Reservation land.

In an effort to account for tribal resource management goals the Kaibab Band of Paiute Indians was contacted to aquire a resource management plan, land use plan or other management plan(s). The Economic Development/Resource Manager stated that the Kaibab Tribe was working to complete a resource management plan; the anticipated completion date was 2013 (Robb 2012).

4.3.2 Farmland

Farmland impacts were identified based on GIS analysis of data from the Geospatial Data Gateway collected by NRCS soil surveys (NRCS 2011a). The soil surveys have been performed in the counties of Washington, Utah, and Mohave and Coconino, Arizona. Within Kane County, only GSENM has been surveyed, with data available to the public. The NRCS is currently performing a survey within the remainder of Kane County, but data is not yet available to the public. Upon request, the NRCS evaluated the LPP Project areas, and provided preliminary conclusions based on their most current data. The LPP Project would not affect any prime farmland affected within Kane County.

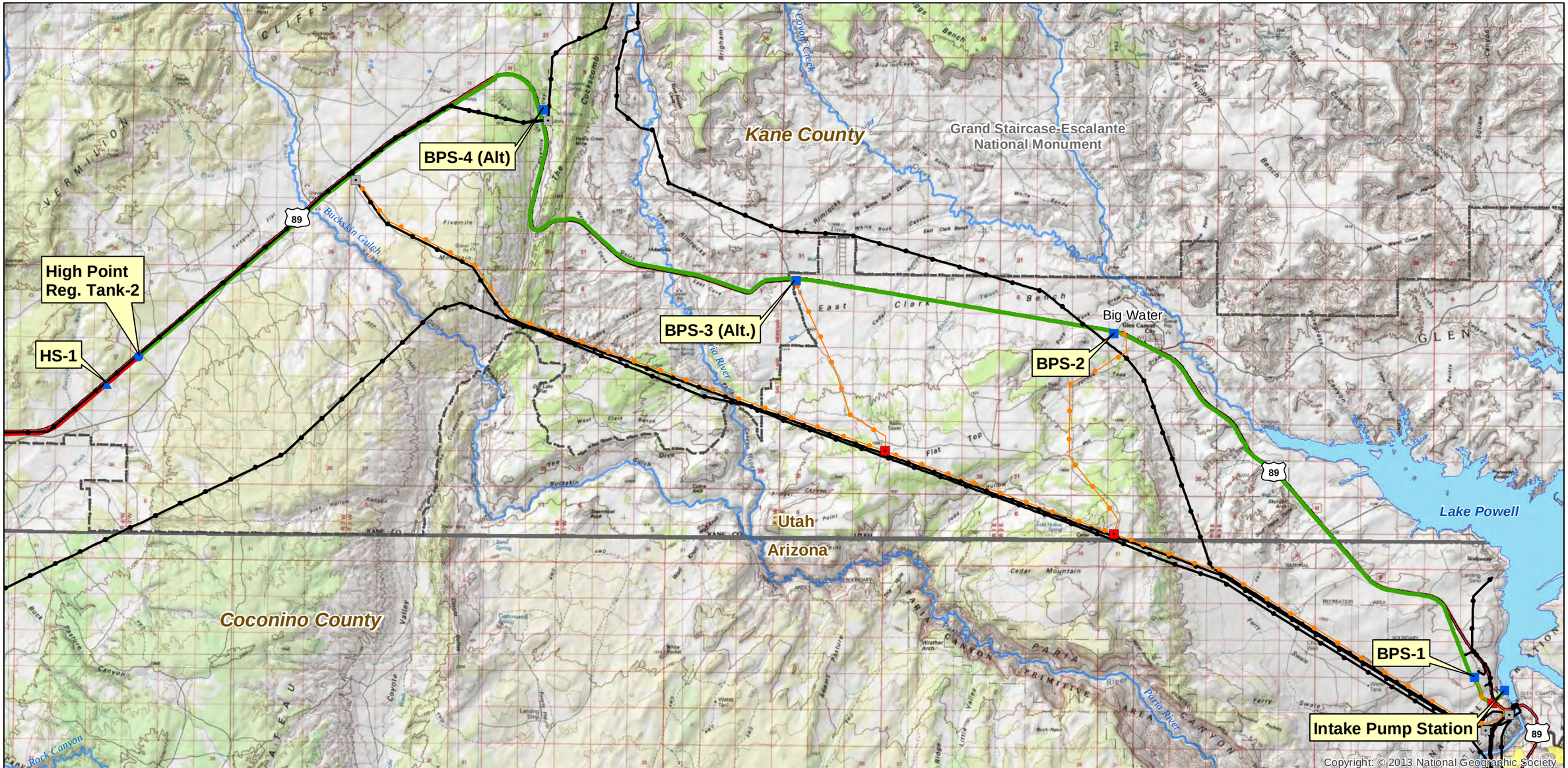
LPP Project construction would have a short-term effect on farmland; land would be disrupted within the Temporary Construction Easement (TCE), but shortly after installation of the pipeline, topsoil would be replaced to the original contours and to a condition as good as the existing. Farmland would not be converted to nonagricultural use unless a new access road is constructed above the pipeline, or a permanent LPP Project facility is planned within the farmland. Figures 4-4 and 4-5 illustrate soils designated as prime farmland that would be traversed by the LPP Project.

There would be no impacts on existing farmland along the transmission line alignment for two reasons: First, the area where transmission lines would cross farmland near Sand Hollow Reservoir is adjacent to the new Southern Corridor transportation route and would not require excessive excavation. Second, all other transmission line alignments would either not cross farmland or an existing access road would be utilized during construction, operation, and maintenance.

LPP Project operation would a have a significant impact upon farmland where planned facilities and access roads would convert the land from agricultural to nonagricultural use. Development of the alternative alignments was based in part on preventing unnecessary and irreversible conversion of farmland to nonagricultural uses. Upon submittal and evaluation of USDA's AD 1006 Farmland Impact Rating Form, mitigation options would be explored and implemented.

The following site-specific facilities would require a conversion of prime farmland soil to industrial use and would result in significant impacts on prime farmland soil:

- Hydro Station-2 South Alternative (5.0 acres)
- Hydro Station-2 Existing Highway Alternative (8.7 acres)



Prime Farmland Soil
Substation
Proposed Substation
Project Transmission Line
Existing Transmission Lines
Project Pump Station
Project Regulating Tank
Project Hydro Station
Hydro System
Water Conveyance
Interstate
US Highway
ST Highway
Hwy
Major Road
Lakes & Reservoirs
Major Rivers & Streams
National Park/Monument
GSENM Boundary
State Boundaries

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

N

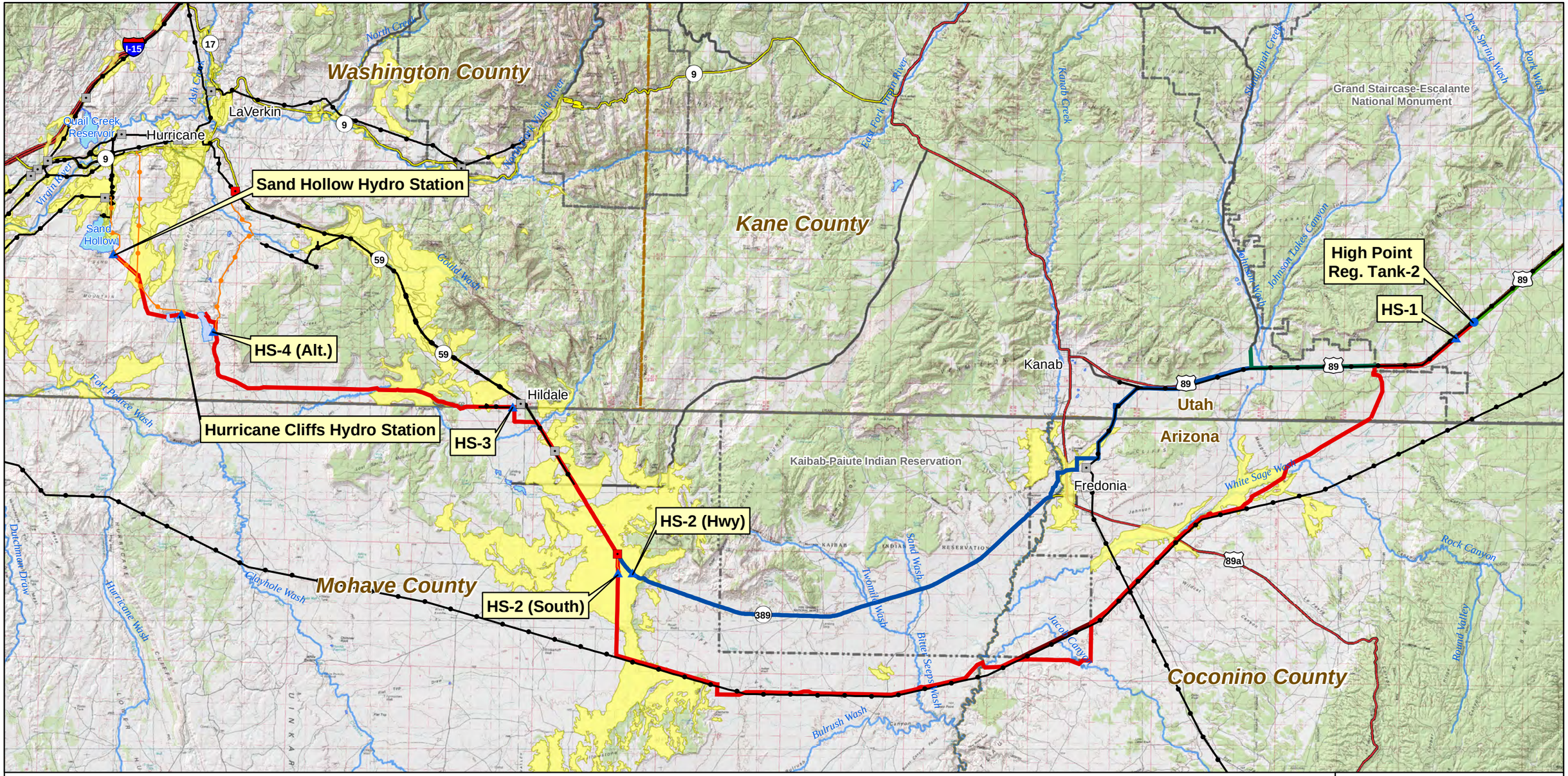
0 1 2 3 4 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 4-4** MWH

Lake Powell Pipeline Water Conveyance Systems Potential Prime Farmland



Prime Farmland Soil
Project Pump Station
Project Regulating Tank
Project Hydro Station
Substation
Proposed Substation
Project Transmission Line
Existing Transmission Lines
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams
Water Conveyance System
Hydro System - South Alternative
Hydro System - Southeast Corner Alternative
KCWCD System
Hydro System - Existing Highway Alternative
Interstate
US Highway
ST Highway
Hwy
Major Road
National Park/Monument
Tribal Lands
State Boundaries
County Boundaries

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

N

0 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 4-5** MWH

Lake Powell Pipeline Hydro System Potential Prime Farmland

4.3.3 Floodplain

An analysis of Flood Insurance Rate Maps (FIRMs) by the Federal Emergency Management Agency (FEMA) within the LPP Project vicinity and its alternatives led to the identification of several waterways with associated floodplains that would be crossed during construction. There are several dry washes that convey storm water runoff, however, it was determined that these washes have no defined floodplain regulatory boundaries. Table 4-1 defines the impacted waterways and quantifies the affected areas of designated floodplains.

Table 4-1
100-Year Floodplain Crossings

County	Waterway	Alternative Alignment	Disturbance Area (Acres)
Mohave	Short Creek	South/Exist. Highway	0.5
Mohave	Cottonwood Wash	Exist. Highway	16.4
Mohave	Pipe Valley Wash	South	1.7
Mohave	Sand Wash	Exist. Highway	1.9
Mohave	Two Mile Wash	Exist. Highway	1.4
Mohave	Bitter Seeps Wash	South	1.1
Mohave	Kanab Creek	South/Exist. Highway	1.1
Kane	Johnson Canyon	Exist. Highway	2.0
Kane	Buckskin Gulch	Water Conveyance	1.1
Kane	Sand Gulch	Water Conveyance	0.8
Kane	Paria River	Water Conveyance	10.6
Coconino	Lost Spring Wash	Exist. Highway	8.5
Coconino	Kanab Creek	South/Exist. Highway	0.9
Coconino	White Sage Wash	South	9.5

The Existing Highway Alignment Alternative is the only LPP Project alternative that is proposed to parallel a waterway (Lost Spring Wash), thus potentially affecting the floodplain for an extended length of the stream. However, the alignment is located outside of the floodplain to avoid disturbance of existing floodplain functions and riparian habitat.

Any project in a floodplain must be reviewed to determine if the project would significantly increase flood heights (FEMA 2011). The No-rise Certification for Floodways under the National Flood Insurance Program (NFIP) is met by the LPP Project because of the nature of construction and operation. Within all floodplains, the pipeline would be installed underground and the landscape would be reclaimed to the original contours of the area. Surface water flows, flooding risk increase, and significant encroachments would not be experienced either during LPP Project construction or during operation and maintenance. The LPP Project would have minor impacts on vegetation and habitat of each of the floodplains crossed, as disturbed vegetation in floodplains and riparian areas would be rehabilitated.

4.3.4 Waste Disposal and Hazardous Waste

4.3.4.1 Waste Disposal

During construction, cardboard, steel, plastic, asphalt, general trash, and pipe remnants would be transported to the appropriate local landfills, transfer stations, and recycling stations by truck. There would be an estimated 19 cubic yards of waste per project mile resulting in an estimated total of 2,508 cubic yards of waste for pipeline construction. Research indicates that there is availability for disposal of all anticipated trash, including large pieces of steel, within designated facilities in Washington City, and Kanab. It appears that all of the above jurisdictions have adequate landfills and/or transfer stations that would accommodate construction waste.

Excess soil resulting from trench excavation would be spread in an approximately nine-inch thick layer over most of the temporary construction easement where appropriate. Where the spoils do not provide for adequate re-vegetation of the area, they would be transported by truck to nearby spoil disposal pits, which are discussed in the Geology and Soils study report. Negligible effects on local transfer sites or landfills are expected from operations and maintenance of the LPP Project. There are no apparent conflicts found with provisions and policies of relevant land use plans regarding the waste disposal aspects of the LPP Project.

4.3.4.2 Hazardous Waste

Construction, operation, and maintenance activities would not be expected to create any measureable amounts of hazardous wastes. However, some oils and solvents would likely be used for maintenance and operation of construction equipment. Construction Best Management Practices (BMPs) would be followed by the contractors and would be expected to avoid or minimize potential problems with on-site spills of equipment fuels and oils. BMPs would require that any soils contaminated with pollutants be removed from the site and properly disposed of in an approved facility. Disposal of some types of hazardous materials would be possible through the solid waste landfill in St. George, Utah, which accepts oil/fuel-contaminated soils.

If a previously unidentified hazardous waste site is encountered in Utah, the construction contractor would be required to complete a remedial work plan to clean up the site with approval from Utah DEQ and/or EPA. Within Arizona, if a previously unidentified hazardous waste site is encountered, construction work would stop and testing would be undertaken to determine disposal and handling requirements following Arizona DEQ standards and guidelines. In the event that an unidentified hazardous waste site is encountered on or adjacent to the Kaibab-Raiute Indian Reservation, the Kaibab Band of Paiute Indians would be contacted.

4.3.5 Wilderness, WSAs, and

Currently, no wilderness characteristics inventory exists for GSENM south of Highway 89. Additionally, the project does not cross any land designated with wilderness characteristics. The Cockscomb Wilderness Study Area (WSA) is the only wilderness area that the LPP Project may affect. The LPP Project could have indirect impacts on the Cockscomb WSA including residual noise, air pollutants, and visual changes because of the close proximity to construction and operation. Further documentation of potential indirect impacts are contained in the Visual Resources (UBWR 2011b), Noise (UBWR 2011c), Recreation Resources (UBWR 2011d) and Air Quality study reports (UBWR 2011e). There are no apparent conflicts with the Grand Staircase-Escalante National Monument, Monument Management Plan (GSENM MMP) regarding uses adjacent to a WSA.

4.3.6 Wild and Scenic Rivers (WSR)

No designated WSRs would be affected by the LPP Project. The Upper Paria River at the US Highway 89 crossing is the only river deemed by BLM to be suitable for designation as a WSR that could be affected by the Water Conveyance System pipeline. This portion of the Paria River flows through privately-owned land. The Upper Paria River-2 crossing is located west of Church Wells at LPP Project station 1510+00 of the Water Conveyance System Alignment (BLM 2000). The temporary construction easement is expected to require approximately eight-acres of land and water where it crosses the Paria River.

The proposed Glen Canyon to Buckskin transmission line alignment (230 kV) would cross over the Lower Paria River – 1 segment, parallel to two existing transmission lines (Navajo-McCullough 500 kV transmission line and Glen Canyon to Buckskin 169 kV transmission line) north of the Paria Canyon Wilderness boundary. The new transmission line would have direct visual impacts on the Paria River corridor, although it would be difficult to visually distinguish the Glen Canyon to Buckskin transmission line alignment from the two existing transmission lines from observation points within the deep canyon.

Typical construction practices include restoring the temporary construction area to original conditions and functions, with the exception of facility locations and new access roads.

4.3.7 Grazing Land

The construction ROW, along a non-highway ROW would be 120-feet wide (100-foot permanent ROW plus a 20-foot TCE) throughout most of the alignment, except near aboveground LPP Project facilities and at select areas where extra workspace is required. Access to grazing allotments and local access roads could be temporarily restricted because of open trenches, pipe material stockpiling, and spoil stockpiling. Fences, water lines, corrals, water tanks, loading chutes, and reservoirs that need to be removed would be replaced with equal or better materials. There would be intermittent disruption to grazing activities depending on the location of the crossing with respect to the specific allotment. The constructed areas are expected to be void of vegetation for a minimum of one growing season during re-vegetation and reclamation activities. In many or most locations, re-establishment of vegetation may take several growing seasons. LPP Project sponsors would notify and coordinate with all grazing permittees and landowners prior to construction activities to identify potential concerns and reduce potential impacts on grazing activities. All fences crossed during construction would be braced and secured prior to cutting. Temporary gates would be used if construction were to result in damage to natural barriers used for livestock control.

Following construction, affected areas would be reseeded with approved seed mix and then allowed to re-vegetate naturally. The length of time to restore vegetation to preconstruction conditions may take several years, depending on available soil moisture and growing season temperatures. Following construction and restoration, grazing activity could return to its pre-construction pattern, except near facilities. Typical cross section profiles illustrating the limits of construction disturbance are shown in Figures 4-1, 4-2 and 4-3.

Construction along an existing highway ROW would require an additional 30-foot path of disturbance beyond the highway ROW (120-foot permanent ROW plus a 30-foot TCE(Figure 4-1)). However, this extra workspace is not expected to be needed for all of the pipeline alignments paralleling highways. Using the typical ROW construction layouts, the amount of impacted grazing land area by allotment can be calculated. Tables 4-2 and 4-3 present a summary of the affected areas by allotment names and numbers for Utah and Arizona respectively. The tables outline the impact areas associated with construction. After construction, all land would be restored to original conditions or better except where

12-foot wide access roads would be retained along the pipeline centerline outside the highway ROW areas.

Table 4-2
Utah Grazing Allotments (BLM/State) – East to West

Allotment Name	Number	Desc.	Area (ac)	% Total	Admin.	Align. Alt.	Comments
Five Mile Mount	24043	New	91	0.51	GSENM	Conv.	Buckskin Wash
Mollies Nipple	24083	New	80	0.29	GSENM	Conv.	Buckskin Wash
Vermilion	4130	New	27	1.33	GSENM	Conv.	
Vermilion	4130	New	42	4.51	GSENM	South/Hwy	
White Sage	4134	New	22	8.20	GSENM	South/Hwy	
Rock Reservoir	5345	New	32	0.31	AZ Strip	South	Seaman Wash
Perkins	5205	Rehab	2	0.12	St George	South/Hwy	Colorado City
Canaan Flat	4099	New	11	0.64	St George	South/Hwy	
Canaan Gap	4141	New	22	0.99	St George	South/Hwy	
Short Creek	5270	New	13	0.42	St George	South/Hwy	
Haslem Spr	5239	New	16	0.37	St George	South/Hwy	
West Canyon	4074	Rehab	36	0.70	St George	South/Hwy	Hurricane Hydro
Lost Creek	4028	New	10	0.07	St George	South/Hwy	
Middle Canyon	4082	new	11	0.05	St George	South/Hwy	
Lakeside	4028	Rehab	25	1.36	St George	South/Hwy	
Allen Bsn/Snd Mt	4045	New	31	0.20	St George	South/Hwy	
West Grassy	4042	New	8	0.10	St George	South/Hwy	

Notes: The 'Desc' field describes whether the affected land lies in an area where a new 120-foot wide path is necessary or if the construction lies on top of an existing roadway that would be rehabilitated and widened. The 'Area' field consists of the total acreage of land that is expected to be disturbed during construction, and is computed with a variable width directly relating to the aforementioned cross sections. The '% Total' column consists of the ratio of the construction-affected allotment to the entire allotment.

Table 4-3
Arizona Grazing Allotments (BLM/State) – East to West

Allotment Name	ID	Descr.	Area (ac)	% Total	Admin.	Align. Alt.	Comments
Fuller Road	185	New	46	0.16	AZ Strip	South	Seaman Wa.
Chatterly	62	New	37	0.65	AZ Strip	South	Muggins Fla.
Muggins Flat	63	New	14	0.11	AZ Strip	South	
Button	58	Rehab	33	0.57	AZ Strip	South	
Sunshine	57	Rehab	15	0.40	AZ	South	Hwy 89
Highway	58	Rehab	15	0.09	AZ	South	
Highway	58	Rehab	13	0.08	AZ Strip	South	
	1041	Rehab	44	0.66	AZ Strip	South	
	337	Rehab	45	0.03	Kaibab R.	South	
	1041	New	21	0.32	AZ Strip	SE Corner	
Rock C. Tank	53	New	79	0.06	AZ Strip	SE Corner	
Loco Point	217	Rehab	53	0.81	AZ Strip	South	Bitter Seeps
Valley Wash	951	Rehab	12	0.37	AZ	South	
Valley Wash	952	Rehab	21	0.66	AZ Strip	South	
Pipe Spring	951	Rehab	6	0.57	AZ Strip	South	
Scotties Seep	215	Rehab	10	0.15	AZ Strip	South	
Pipe Valley	950	Rehab	13	0.19	AZ Strip	South	
Pipe Valley	212	Rehab	12	0.75	AZ	South	Indian Knoll
Pipe Valley	205	Rehab	15	0.66	AZ	South	
Sand Wash	207	Rehab	13	0.67	AZ	South	
	337	Rehab	12	0.01	AZ	South	Cedar Ridge
Cane Beds	203	Rehab	7	0.05	AZ Strip	South	
Lost Spring	46	New	19	0.75	AZ	Highway	
Cowboy Butte	49	New	28	0.58	AZ	Highway	
Cowboy Butte	49	New	8	0.16	AZ Strip	Highway	
Fredonia West	219	Rehab	7	0.40	AZ	Highway	
	337	New	240	0.18	Kaibab R.	Highway	
Short Creek	193	Rehab	20	0.18	AZ Strip	South/Hwy	
	334	Rehab	3	0.15	AZ Strip	South/Hwy	Co. City
Caanan Gap	189	Rehab	3	0.06	AZ Strip	South/Hwy	Co. City

Notes: The 'Desc' field refers to weather the affected land lies in an area where a new 120-foot wide path is necessary or if the construction lies on top of an existing roadway that would be rehabilitated and widened. The 'Area' field consists of the total acreage of land that is expected to be disturbed during construction, and is computed with a variable width directly relating to the aforementioned cross sections. The '% Total' column consists of the ratio of the construction-affected allotment to the entire allotment.

The LPP Project would affect private property with active grazing operations between the crossings of state and federal land. Construction, operation, and maintenance activities for private property would follow the same standard techniques as those followed on public land, including minimizing construction and operational footprints and construction of access roads as much as possible.

Most of the transmission lines serving the LPP Project would be constructed within existing transmission corridors, within a highway ROW, or directly within the pipeline ROW. For the proposed transmission lines, existing access roads may need to be upgraded to accommodate construction traffic, which is not expected to significantly disturb grazing land. Where new transmission lines would cross land with little-to-no access, a new 12-foot wide access road would be constructed along the new transmission line ROW. Table 4-4 quantifies the effects of the new and upgraded access roads for transmission line construction in Utah. Transmission line access road construction is not anticipated to disturb grazing land in Arizona. Table 4-5 summarizes temporary and permanent impacts of LPP Project construction on BLM and state grazing land along all alignments.

Table 4-4
Utah Grazing Allotments (BLM/State) – East to West – Transmission

Allotment Name	Number	Descr.	Area (ac)	% Total	Admin.	Align. Alt.	Comments
Ferry Swale	5336	Rehab	8	0.02	SITLA	Trans Line	Blue Pool Wash
Bunting Well	25026	Rehab	10	0.08	SITLA	Trans Line	Judd Hollow
Wiregrass	4145	Rehab	7	0.11	SITLA	Trans Line	S Wiregrass
Bunting Well	25026	New	6	0.05	SITLA	Trans Line	Judd Hollow
Bunting Well	25027	New	11	0.08	SITLA	Trans Line	Judd Hollow
Wiregrass	4145	New	26	0.44	SITLA	Trans Line	S Wiregrass
Bunting Well	25026	Rehab	8	0.07	SITLA	Trans Line	Cedar Mt
Bunting Well	25026	Rehab	10	0.08	SITLA	Trans Line	Judd Hollow
State Block	25002	Rehab	12	0.09	SITLA	Trans Line	
Bunting Well	25026	Rehab	7	0.10	GSENM	Trans Line	East Clark Bench
State Block	25001	Rehab	2	0.02	GSENM	Trans Line	
State Block	25002	Rehab	21	0.17	SITLA	Trans Line	
State Block	25002	Rehab	1	0.01	GSENM	Trans Line	Outback
Clark Bench	15003	Rehab	22	0.09	GSENM	Trans Line	Outback
Five Mile Mount	2403	Rehab	9	0.05	SITLA	Trans Line	Front Country
Five Mile Mount	2403	Rehab	22	0.12	SITLA	Trans Line	Outback
Mollies Nipple	24083	Rehab	2	0.27	GSENM	Trans Line	Passage
Allen Basin	4045	Rehab	7	0.04	GSENM	Trans Line	

Table 4-5
Total Disturbed Grazing Land (acres)

	Utah		Arizona	
Alternative	**Pipeline Const.**	**Roads (new/old)**	**Pipeline Const.**	**Roads (new/old)**
South	423	27	604	22
Highway	422	18	357	8
Water Conveyance	198	0	N/A	N/A
Southeast Corner	423	27	659	37
Kane County Pipeline	0	0	N/A	N/A
Transmission Line	0	25	0	0

Notes: The 'Pipeline Const.' column indicates the grazing land that would be affected by the 120-foot wide temporary construction easement. Affected grazing land on the Kaibab-Paiute Indian Reservation is included in the Arizona 'Pipeline Const.' column as applicable. The 'Roads (new/old)' column indicates the total land that would be permanently affected by roads construction/reconstruction.
N/A = Not Applicable

The permanent right-of-way for the pipeline components of the LPP Project would be 100-feet wide. Above-ground facilities such as the hydropower stations, regulating tanks, and booster pump stations would require additional land with some permanently affecting grazing land. Impacts on grazing allotments from above-ground facility placement are presented in Table 4-6.

Table 4-6
Grazing Allotments By Above-Ground Facilities

Allotment Name	Number	Facility	Area (ac)	% Total	Admin.
Wahweap	05340	BPS-1	15	0.26	AZ Strip BLM
Wiregrass	4145	BPS-2	5	0.08	SITLA
Five Mile Mount	24043	BPS-4 Alt.	5	0.02	GSENM BLM
Vermilion	4130	Tank-2	2	0.10	GSENM BLM
Vermilion	4131	Hydro-1	5	0.24	GSENM BLM
West Canyon	4074	Hydro-4 Alt.	5	0.10	St. George BLM
Middle Canyon	4082	Hurricane Cliffs Hydro	5	0.02	St. George BLM
Middle Canyon	4083	Hurricane Cliffs Forebay	500	2.45	St. George BLM
Middle Canyon	4084	Hurricane Cliffs Afterbay	200	0.98	St. G. BLM/SITLA
West Grassy	4042	SH Hydro	5	0.06	WCWCD

Notes: The '% Total' column indicates the amount of land that would be affected by construction of facilities compared to the total size of the affected grazing allotment.

The loss of grazing forage from access road improvement and the addition of new access roads is expected to be minor. However, the affected areas have been quantified in the “roads” columns of summary Table 4-5. A typical access road improvement section is shown in Figure 4-3, which illustrates most of the long-term effects of the LPP Project access roads.

Some existing range resources would be lost on land occupied by aboveground LPP Project facilities, and coordination with landowners and grazing lessees would be necessary before construction begins. Each permit holder’s impacted animal unit months (AUMs) quantity and other land improvements would need to be negotiated on a case-by-case basis to determine potential compensation. In areas affected by permanent facilities, mitigation measures would entail modification or termination of leases and some form of compensation. For those areas where complete reclamation would occur after construction, mitigation measures would be implemented on an as-needed basis. These actions would be consistent between the states of Utah and Arizona and all BLM field offices.

From the two grazing allotments administered by Utah Parks and Recreation, only one would be affected by the LPP Project. Approximately 31-acres of the Sand Mountain grazing allotment would be affected by the Sand Hollow Hydro Station and the pipeline. There would be no conflict with the current management plan because the area is managed under BLM guidelines.

4.3.8 Rights-of-Way

Detailed ROW centerline alignments within BLM jurisdiction have not been identified at this time. However, each of the BLM Resource Management Plans (RMPs) generally states that ROW issues would be resolved on an as-needed basis. Utilization of existing ROWs is planned for both public and private land uses. Existing utility corridors would be utilized to the maximum extent possible. Typical ROW impacts on surrounding land are illustrated in Figures 4-1, 4-2 and 4-3. Table 4-7 identifies four known corridors within the LPP Project vicinity that would be utilized.

Table 4-7
Designated Utility Corridors Within the Project Area

Administration	Width (ft)	Location	Type	Alternative Alignment
Kanab BLM	750	From GSENM boundary west and north to Mt. Carmel Junction along Highway 89	Utility	Existing Highway
GSENM BLM	750	Along US Highway 89 from east GSENM boundary to west GSENM boundary	Utility	Water Conveyance and Hydro System/LPP Facility
AZ Strip BLM	5280	Overlaps West Wide Energy Corridor in AZ from Page to near Colorado City	Utility	Transmission Lines
BLM	5280	West Wide Energy Corridor from Page to St. George	Utility	Transmission Lines/South/Exist. Highway/Conv./SE
UDOT	4 Lanes	Southern Corridor (St. George/Hurricane)	Transportation	Highway/South

Where the pipeline traverses land within GSENM, the alternative paralleling the highway would be constructed and operated entirely within the congressionally-designated utility corridor. The utility

corridor is situated within GSENM front country management zone, which is the focal point for monument visitation. This zone accommodates primary interpretation areas, overlooks, trails, and associated facilities. This is the least sensitive zone within the monument in terms of preserving GSENM's primary focus of protecting monument resources, but is the most frequented by the public and the most utilized for recreation (BLM 2000).

The LPP Project would make use of GSENM utility corridor beginning at BPS-3 Alt. and following US Highway 89 to the western boundary of GSENM along U.S. Highway 89.

The transmission line alignment would be within the Arizona Strip Utility Corridor for approximately 11 miles near Lake Powell within BLM Arizona Strip district. The transmission line alignment then follows the West Wide Energy Corridor for approximately 8 miles within the state of Utah. The South Alternative would follow the Arizona Strip Utility Corridor for approximately 32 miles; the Southeast Corner Alternative would leave the Arizona Strip Utility Corridor for approximately 4 miles.

Reclamation administers a small land area which extends approximately 2000-feet downstream of Glen Canyon Dam and approximately 2500-feet north of the dam on the west side of Lake Powell. The LPP Project intake pump station lies within Reclamation-administered area. A use agreement would need to be authorized by Reclamation.

The LPP Project Hydro System facilities would cross the UDOT Southern Corridor Highway near Sand Hollow Reservoir. Through coordination with UDOT, an agreement was reached to install a sleeve under the corridor in preparation for the LPP Project penstock crossing.

The LPP Project would follow approximately 31 miles of US Highway 89 and approximately 4 miles of Arizona State Route 389 within ADOT-administered roadways. ADOT has indicated that it would be acceptable to place the LPP Project within their ROW. Therefore an easement could be acquired following the proper filing and fees procedure. However, ADOT has indicated that it would be necessary to bore the pipeline under the highway at all highway crossings to avoid unnecessary disruption of traffic.

On private land, the land required for each of the above-ground facilities may be leased or purchased. Public access to the land occupied by the above-ground facilities would be permanently restricted. Further discussions with BLM would be necessary to determine if other compensating actions are needed to allow for LPP Project use of these lands. Table 4-8 presents the public land in rights-of-way that would be required for above-ground facilities.

Table 4-8
Land Required for Above-Ground Facilities

Facility	Area (acres)	Administration
IPS	34	Reclamation
BPS-1	15	NPS
BPS-2	5	SITLA
BPS-3 Alt.	5	GSENM BLM (or Kanab BLM)
BPS-4 Alt.	5	GSENM BLM
Regulating Tank-2	2	GSENM BLM
Hydro-1	5	GSENM BLM
Hydro-4	5	St. George BLM
Hurricane Cliffs Hydro	5	St. George BLM
Hurricane Cliffs Forebay	500	St. George BLM
Hurricane Cliffs Afterbay	200	St. George BLM/SITLA
Sand Hollow Hydro	5	WCWCD

Notes: The 'Area (acres)' column is an approximate facility footprint upon the public land administered by the designated agency under 'Administration'. Facility names are: Intake Pump Station (IPS), Booster Pump Station (BPS), Regulating Tank (Tank), Hydropower Facility (Hydro).

The LPP Project would cross approximately 16.5 miles of Kaibab Tribal land if the Existing Highway Alternative is selected for construction. The State of Utah would have to negotiate an easement with the Kaibab Band of Paiute Indians to obtain access though the Kaibab-Paiute Indian Reservation, who would then have to contact the BIA. A study of the area and alternatives would be requested by the BIA, then a decision would be made regarding the granting of an easement for the LPP Project.

4.3.9 Trails and National Historic Trails

The Honeymoon Trail would be crossed by the South and Existing Highway Alternatives as part of the Hydro System. The Existing Highway Alternative would cross the trail near Pipe Spring, Arizona at approximately milepost 17 along Arizona highway 389. The South Alternative would cross the trail about three miles south of Arizona State Route 389 on BLM road #239.

The Dominguez-Escalante Trail would be crossed by the LPP Project in several locations. The South Alternative would cross the trail at White Sage Wash approximately four miles northeast of mile marker 603 on US Highway 89 Alt. The second crossing would be approximately 1.6 miles southwest of the southwest corner of the Kaibab Indian Reservation. All LPP Project alternatives would cross the trail where the penstock runs west of the Hurricane Cliffs approximately two miles south of the Sky Ranch Airfield.
The Water Conveyance System would cross the Old Spanish National Historic Trail (NHT) just south of Big Water, Utah, where the Paria River intersects US Highway 89 and would also cross the trail near mile post 30 along US Highway 89. The Existing Highway Alternative would potentially cross the trail northwest of Fredonia, Arizona where it goes through Lost Spring Wash. The South Alternative would cross the trail near mile post 49 on US Highway 89 and just north of HS-2 (South Alt.)

Construction BMP guidelines would be followed through each of the trail crossings. Following construction, affected areas would be reseeded with species adapted to the region and then allowed to re-vegetate naturally. The re-establishment of vegetation to preconstruction conditions would likely take more than one growing season depending on available soil moisture and temperatures during the growing season. Typical cross section profiles illustrating the limits of pipeline and penstock construction disturbance are shown in Figures 4-1, 4-2 and 4-3.

Where the LPP Project would cross historic trails the following criteria would be met as stipulated in BLM RMPs for the LPP Project area:

- Where significant trail corridor segments and associated sites are documented, viewsheds, as observed from these areas, would be maintained in the existing condition
- Any changes to the characteristic landscape must be low in the Old Spanish NHT corridor on public land (Visual Resource Management Class II)
- Reduce and minimize potential visual (including night sky conditions), audible, and recreation setting impacts associated with surface disturbing activities and construction of above ground structures. Exceptions to these measures may be specifically authorized through a permit issued by the federal surface management agency if it is shown to the satisfaction of the authorized officer that the proposed operations and occupancy would not adversely affect the recreation opportunities in the vicinity of the trails.

4.3.10 Areas of Critical Environmental Concern (ACEC)

The LPP Project would avoid crossing into ACECs to the maximum extent possible; however, the South Alternative would cross the Kanab Creek ACEC in Arizona. The ACEC is administered by BLM Arizona Strip Field Office and is the only ACEC that would be directly affected by the LPP Project (BLM 2008a). The Kanab Creek ACEC is located on the south side of the Kaibab-Paiute Indian Reservation; Kanab Creekis a headwater of the Colorado River. The Arizona Strip BLM management direction for this ACEC includes the following provisions:

- Individual land use authorizations (ROWs, permits, easements) will be evaluated on a case-by-case basis in accordance with RMP provisions and NEPA conformance
- New land use authorizations will be discouraged in ACECs,
- Motorized and mechanized vehicle use will be limited to existing or designated routes.
- BLM will authorize only temporary upgrading of existing roads.
- New roads will be authorized on a temporary basis only.
- New mineral material disposal sites will not be authorized.

The South Alternative would cross the Kanab Creek ACEC in two places; on the east side crossing through Kanab Creek Canyon for a distance of approximately 2,990 feet and again where it traverses through Bitter Seeps Wash crossing approximately 1,350 feet of the ACEC. The two crossings would temporarily disturb 8-acres and 4-acres, respectively. A permanent ROW would be established, however, a permanent access road would not be necessary within the ACEC. BLM would continue to work with the Utah Division of Water Resources to further identify and analyze the most suitable route for the LPP Project based on botanical and wildlife surveys.

4.3.11 Growth

The study area considered for future growth and development potential consists of private land, existing agricultural land, School and Institutional Trust Lands Administration (SITLA) and BLM land designated

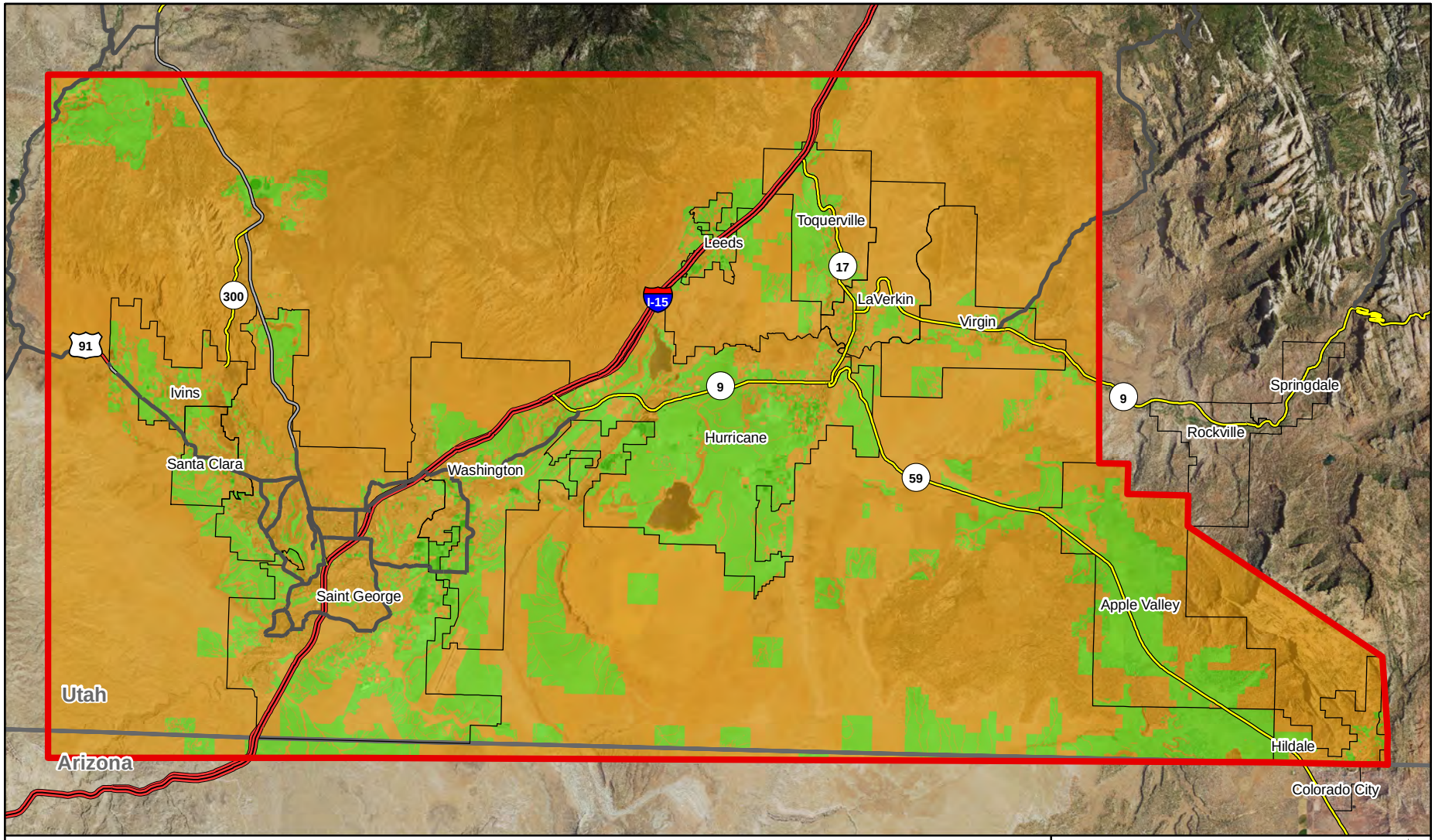
for disposal. In the initial screening, land excluded from potential development includes existing developed land, state parks, BLM land, Indian Reservations, conservation land, Red Cliffs Desert Reserve, U.S. Forest Service land, wilderness areas/wilderness study areas, open water, flood plains, wetlands, slopes greater than 25 percent, ridgelines, streams, dry washes, and threatened and endangered species (TES) critical habitat areas. The total study area is 540,155 acres. The land excluded from future development potential consists of 431,411 acres, with 108,744 acres of land potentially available for urban and suburban development (Figure 4-6). Regardless of scenario, the existing acreage available for infill within current municipal boundaries would require a water resource that exceeds the amount of water provided by LPP Project.

In Scenario 1, there would be 108,744 acres of land available for growth and development. Scenario 1 excludes the lands described above. Of the 108,744 acres, 45,968 acres are considered highly favorable for growth and development, and 62,776 are considered favorable for growth and development (Figure 4-7). The highly favorable land is identified based on its proximity to features such as existing utilities, schools, hospitals, retail stores, business centers, and existing development. Closer proximity to existing features is more favorable for development because of the availability of existing infrastructure. The proximities are determined using geospatial analysis to calculate Euclidian distances from each of the given features. The Euclidian distance data is then categorized into a set of bands at given distances which are ranked and weighted for computer analysis in the model. The computer model then combines the multiple data sets to calculate the more favorable land. Table 4-9 shows the projected population, housing units and average household size for the study area. It also shows the housing density in number of housing units per square mile and the number of housing units per acre for the existing developed land and land available for development in Scenario 1 in ten year increments. Future development on 108,744 acres of land would result in converting some agricultural land to urban land and the increased conversion of current undesignated open space areas to developed areas. Zoning ordinances may have to be modified to accommodate higher density residential areas depending on the rate of expected growth. Additional BLM land could possibly be transferred to private uses for future land development, however, potential additional land disposal by BLM is not considered in the scenario analysis.

Table 4-9
Scenario 1

Demographic Indicator	2020	2030	2040	2050	2060
Growth Study Area Population	196,762	280,558	371,743	472,567	581,731
Growth Study Area Housing Units	70,919	112,378	151,647	192,884	237,065
Growth Study Area Household Size	2.74	2.46	2.41	2.41	2.42
Growth Study Area HU/mi^2	316	501	676	860	1,057
Growth Study Area HU/acre	0.49	0.78	1.06	1.34	1.65

Notes: HU/mi^2 = Housing Units per square mile; values include existing and future development
HU/Acre = Housing Units per acre; values include existing and future development
Population and housing data were compiled using the Governor's Office of Planning and Budget, 2012 Baseline Projections.



Cities
State Boundaries
Growth Analysis Study Area - 540,155 Acres
Land Excluded from Development - 431,411 Acres
Potentially Developable Land - 108,744 Acres

Interstate
US Highway
ST Highway
Hwy
Major Road

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

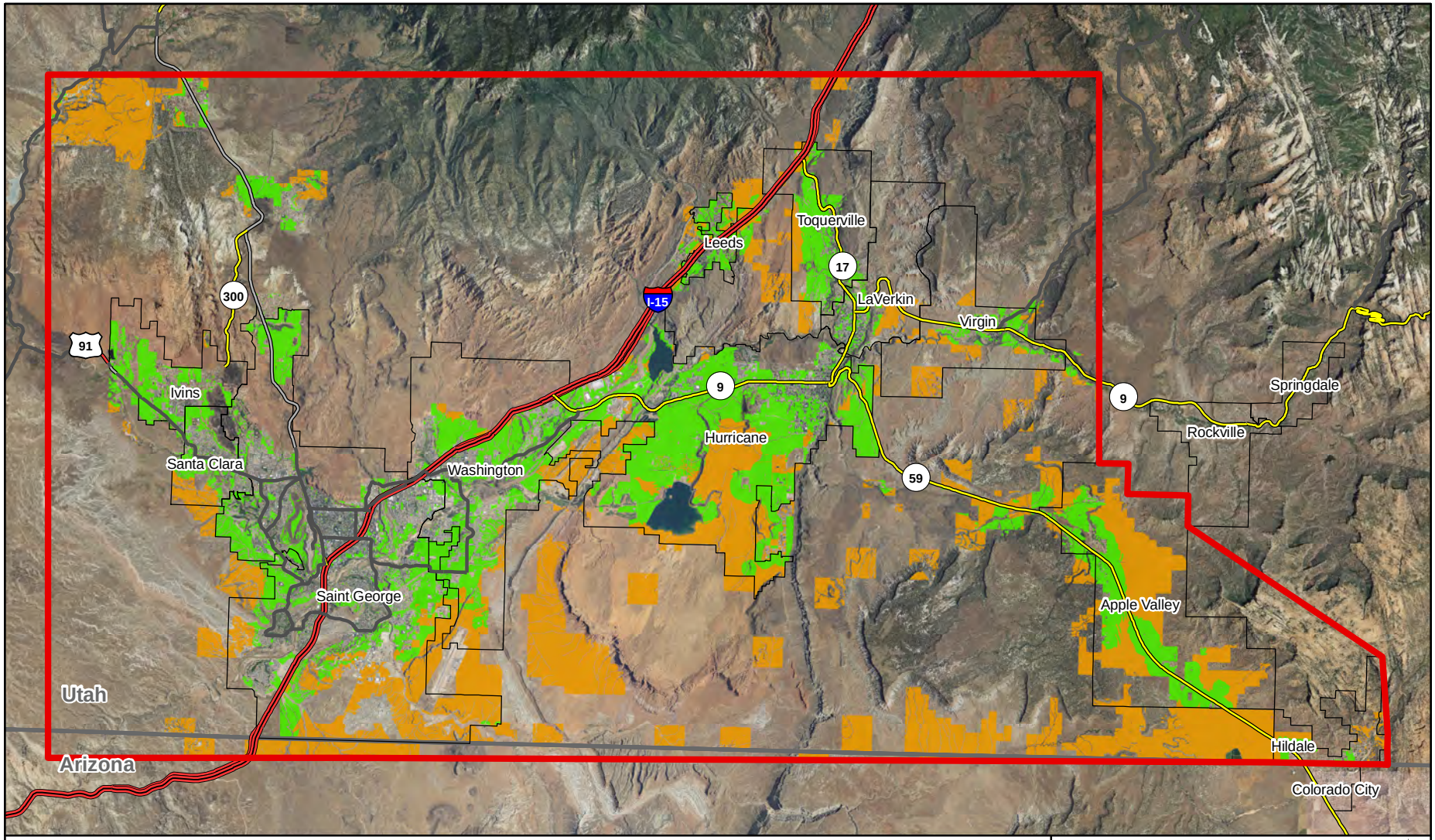
0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2014
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe **Figure 4-6** MWH

Developable and Development Exclusion Areas



Cities
State Boundaries
Growth Analysis Study Area - 540,155 Acres
Favorable Development Area - 62,776 Acres
Highly Favorable Development Area - 45,968 Acres

Interstate
US Highway
ST Highway
Hwy
Major Road

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

0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2011
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe **Figure 4-7** MWH

Scenario 1
Developable Areas

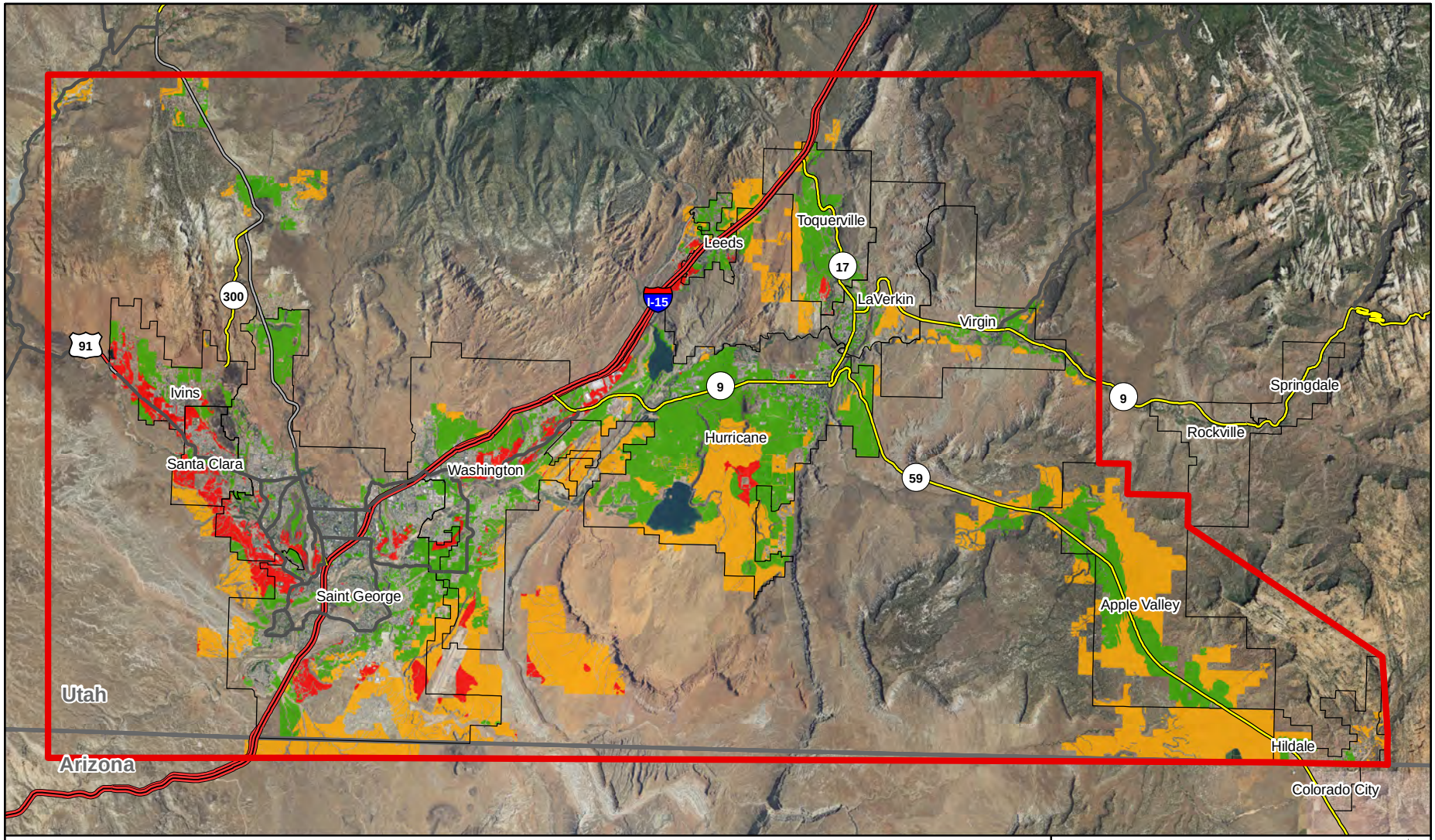
Developable land within the growth study area not connected to municipal boundaries, not proximate to existing or planned transportation networks, and not having infrastructure to support new development are excluded from Scenarios 2 (A and B), 3 (A and B), and 4 (A and B). Excluding these developable lands focuses the growth analysis on areas that would infill with development to accommodate future housing and population.

Scenario 2A excludes land that is categorized as having high hazard rock and soils and would provide about 82,693 acres of land available for growth and development. Under this scenario, 26,051 fewer acres of land is available for development compared to Scenario 1 because land with highly expansive rock and soil is excluded. Highly expansive rock and soil can cause foundation and structural damage to businesses and dwellings, resulting in expensive or irreparable damage and economic loss. If mitigation were not possible or too costly, this land may be better suited for recreation, open space, or agriculture rather than development. Scenario 2A includes 39,010 acres that would be highly favorable for growth and development, based on proximity analysis, and 43,683 acres that would be favorable for growth and development (Figure 4-8). The highly favorable land receives a higher rating because it has closer proximity to features such as existing utilities, schools, hospitals, retail stores, business centers, and existing development. The highly favorable land is closer to developed features, and would help to promote infill, smart growth and minimize sprawl. The impacts of growth and development on 82,693 acres of land would include an increase of agricultural land conversion to urban land and the conversion of current undesignated open space areas to developed areas. Table 4-10 shows the projected population, housing units and average household size for the study area. It also shows the housing density in number of housing units per square mile and number of housing units per acre for the existing developed land and land available for development in Scenario 2A in ten year increments.

Table 4-10
Scenario 2A

Demographic Indicator	2020	2030	2040	2050	2060
Growth Study Area Population	196,762	280,558	371,743	472,567	581,731
Growth Study Area Housing Units	70,919	112,378	151,647	151,647	237,067
Growth Study Area Household Size	2.74	2.46	2.41	2.41	2.42
Growth Study Area HU/mi^2	386	612	826	1,051	1,292
Growth Study Area HU/acre	0.60	0.96	1.29	1.64	2.02

Notes: HU/mi^2 = Housing Units per square mile; values include existing and future development
HU/acre = Housing Units per acre; values include existing and future development
Population and housing data was compiled using the Governor's Office of Planning and Budget, 2012 Baseline Projections.



Cities
State Boundaries
Growth Analysis Study Area - 540,155 Acres
Unfavorable Development Area - 8,190 Acres
Favorable Development Area - 44,775 Acres
Highly Favorable Development Area - 39,926 Acres

Interstate
US Highway
ST Highway
Hwy
Major Road

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

0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2011
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe **Figure 4-8** MWH

Scenario 2A Developable Areas

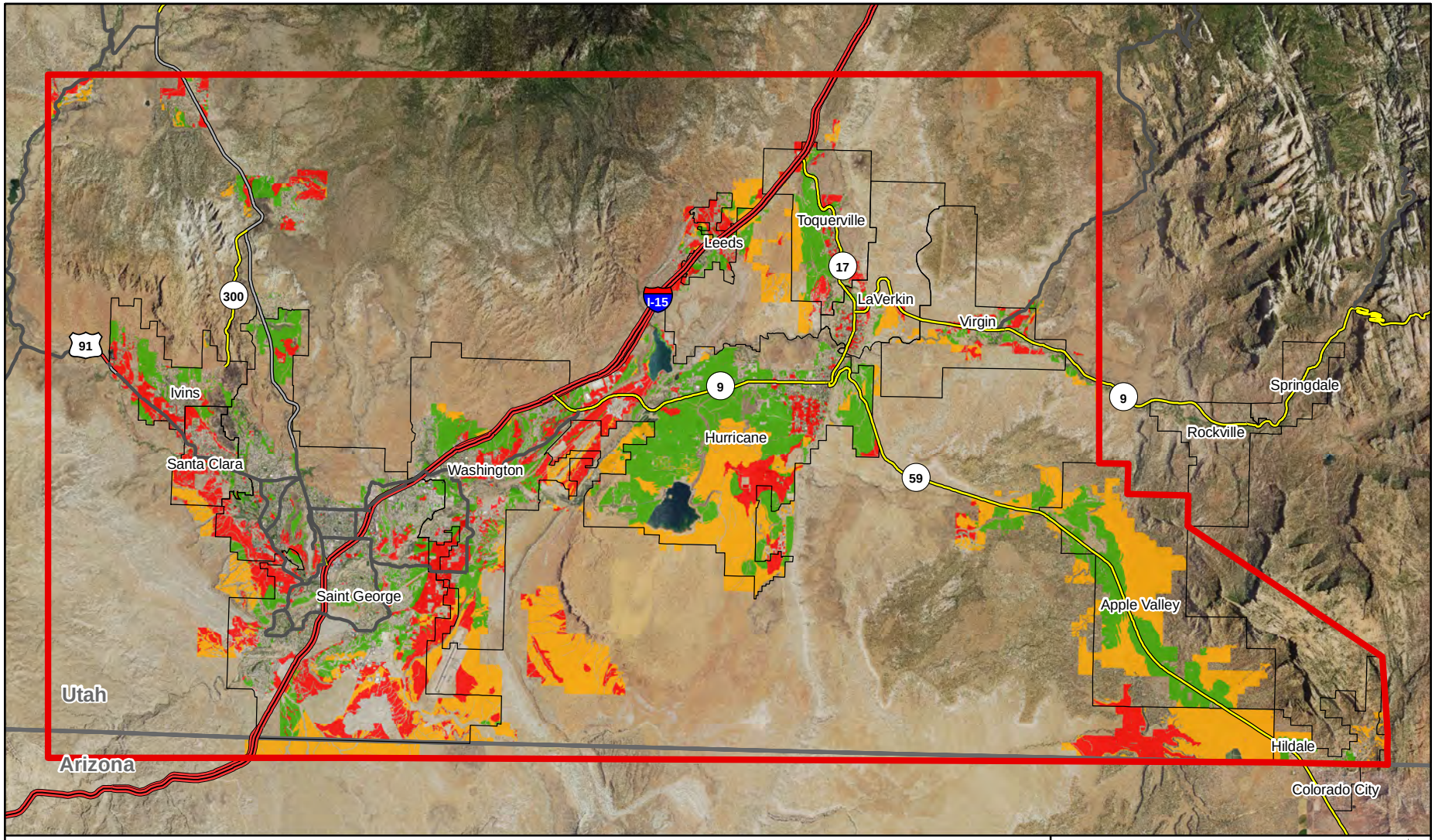
Scenario 2B excludes high and moderate hazard rock and soil areas and would provide about 68,567 acres of land available for growth and development. Under this scenario, 40,177 fewer acres of land would be available for development than Scenario 1 and by excluding moderately expansive rock and soil areas, Scenario 2B would have 14,126 fewer acres of land available for development than Scenario 2A. Moderately expansive rock and soil do not have as great a potential for foundation and structural damage or severity of damage compared to highly expansive rock and soil; however, it is hazardous and is excluded in Scenario 2B to provide a broader range of future development possibilities depending on how future growth would be constrained or managed. Scenario 2B includes 32,107 acres that would be highly favorable for growth and development, based on proximity analysis, and 36,460 acres would be favorable for growth and development (Figure 4-9). The highly favorable land receives a higher rating because it is closer in proximity to features such as existing utilities, schools, hospitals, retail stores, business centers, and existing development. The impacts of growth and development on 68,567 acres of land would include an increase of agricultural land conversion to urban land and the conversion of current undesignated open space areas to developed areas. Table 4-11 shows the projected population, housing units and average household size for the study area. It also shows the housing density in number of housing units per square mile and the number of housing units per acre for the existing developed land and land available for development in Scenario 2B in ten year increments.

Table 4-11
Scenario 2B

Demographic Indicator	**2020**	**2030**	**2040**	**2050**	**2060**
Growth Study Area Population	196,762	280,558	371,743	472,567	581,731
Growth Study Area Housing Units	70,919	112,378	151,647	192,884	237,065
Growth Study Area Household Size	2.74	2.46	2.41	2.41	2.42
Growth Study Area HU/mi^2	439	696	939	1,194	1,468
Growth Study Area HU/acre	0.69	1.09	1.47	1.87	2.29

Notes: HU/mi^2 = Housing Units per square mile; values include existing and future development
HU/acre = Housing Units per acre; values include existing and future development
Population and housing data was compiled using the Governor's Office of Planning and Budget, 2012 Baseline Projections.

Scenarios 3A and 3B are land use and growth conflict-based analyses which fully incorporate the Land-Use Conflict Identification Strategy LUCIS® (Carr, et al. 2007) model. These two scenarios include the total developable land from Scenario 2 (A and B) and analyze where land conversion conflicts would most likely occur. Developable land within the growth study area not connected to municipal boundaries, not proximate to existing or planned transportation networks, and not having infrastructure to support new development are excluded from Scenarios 3A and 3B.



Cities
State Boundaries
Growth Analysis Study Area - 540,155 Acres
Unfavorable Development Area - 24,331 Acres
Favorable Development Area - 36,460 Acres
Highly Favorable Development Area - 32,107 Acres

Interstate
US Highway
ST Highway
Hwy
Major Road

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

0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2014
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe **Figure 4-9** MWH

Scenario 2B Developable Areas

Scenario 3A considers potential land use conflicts that could impede conversion of agricultural or conservation land to more urbanized uses. This scenario identifies where the greatest probability of conflicts between land uses would likely occur within the growth study area. Rock and soil hazard areas are not excluded from the Scenario 3A analysis. Available land is ranked according to agricultural, conservation and urban suitability to identify areas of potential land use conflict. Land with high suitability for more than one type of use would have a higher potential for land use conflicts. Land with high suitability for only one type of use would have low or no potential land use conflicts. Developable land areas with no land use conflict total 52,792 acres. The existing developed land and developable land areas would have a 2060 housing density of 1,733 housing units per square mile (2.71) housing units per acre). Areas with major land use conflicts total 244 acres. Areas with urban/conservation land use conflicts total 2,552 acres. Areas with urban/agriculture land use conflicts total 37,309 acres. Areas with agriculture/conservation land use conflicts total 26 acres. The Scenario 3A analysis identifies the land use conflicts that may be more controversial for future development (Figure 4-10).

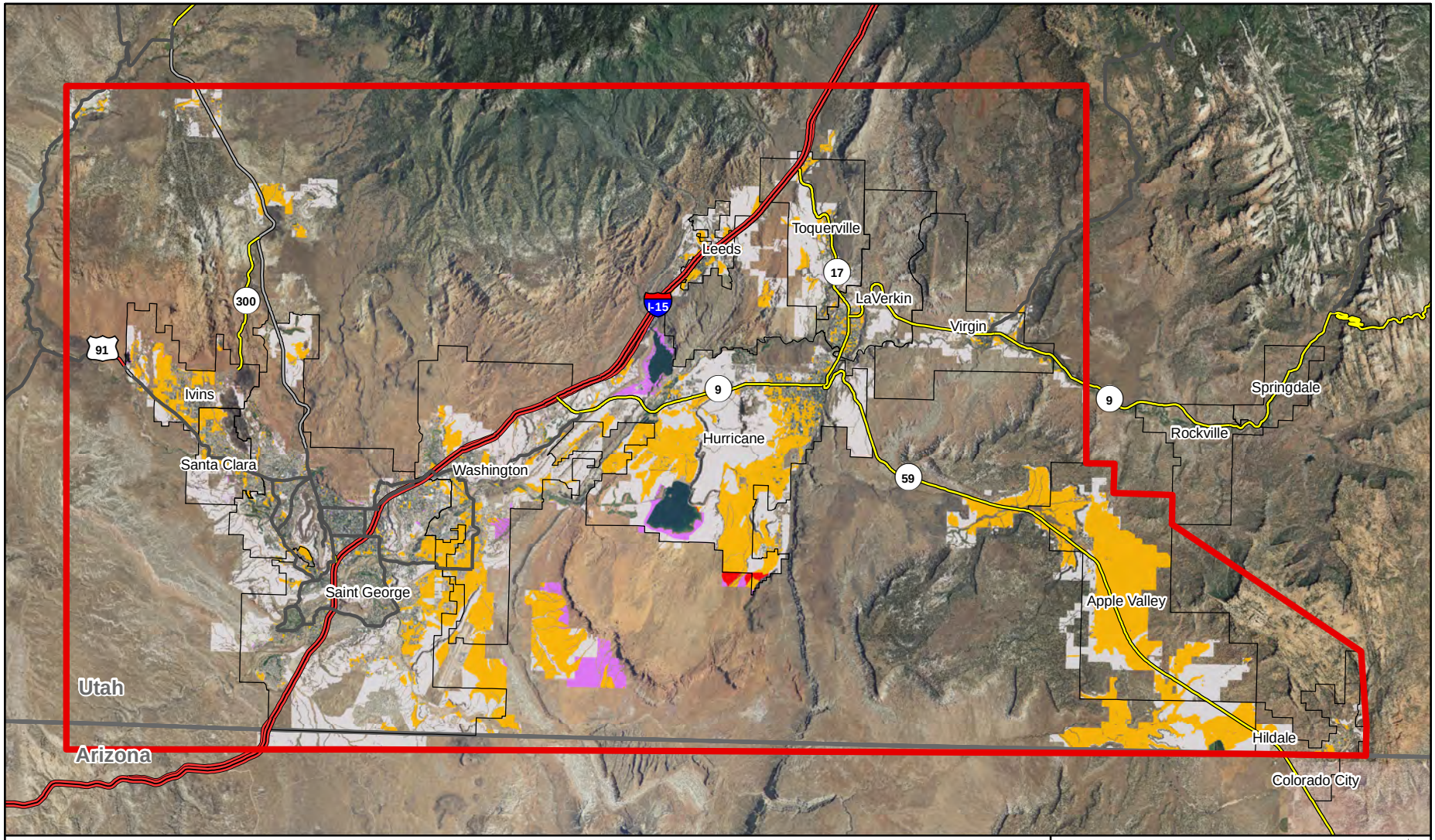
Scenario 3B is similar to Scenario 3A; however, rock and soil hazard areas are excluded from the Scenario 3B analysis. The Scenario 3B hazard areas consist of highly and moderately expansive rock and soil. Developable land areas with no land use conflict total 24,981 acres. The existing developed land and developable land areas would have a 2060 housing density of 2,538 housing units per square mile (3.96 housing units per acre). Areas with major land use conflicts total 2,963 acres. Areas with urban/conservation land use conflicts total 32,895 acres. Areas with urban/agriculture land use conflicts total 32,059 acres. Areas with agriculture/conservation land use conflicts total 22 acres. The Scenario 3B analysis identifies the land use conflicts that may be more controversial for future development (Figure 4-11).

Scenarios 4A and 4B are land use preference and conflict-based analyses which fully incorporate the LUCIS® model. These two scenarios include the total developable land from Scenario 2 (A and B) and analyze where land use preference and conflicts would most likely occur. Developable land within the growth study area not connected to municipal boundaries, not proximate to existing or planned transportation networks, and not having infrastructure to support new development are excluded from Scenarios 4A and 4B.

Scenario 4A identifies areas of land use preference and conflict. Available land is ranked according to agricultural, conservation and urban suitability. Land areas with high and medium potential for land use conflicts, as demonstrated by high suitability for multiple use types, are designated as high or moderate conflict areas, respectively. Land showing high suitability for only one type of use is designated as having either an agricultural, conservation or urban preference. Rock and soil hazard areas are not excluded from the Scenario 4A analysis. The analysis results indicate there would be 244 acres of land with high land use conflicts; 19,146 acres of land with moderate land use conflicts; 53,487 acres of land with an urban land use preference; 19,962 acres of land with an agricultural land use preference; and 85 acres with a conservation land use preference (Figure 4-12). The existing developed land and developable land areas would have a 2060 housing density of 1,719 housing units per square mile (2.69 housing units per acre).

Scenario 4B is similar to Scenario 4A; however, rock and soil hazard areas are excluded from the Scenario 4B analysis. The Scenario 4B hazard areas consist of highly and moderately expansive rock and soil. The analysis results indicate there would be 2,963 acres of land with high land use conflicts; 33,341 acres of land with moderate land use conflicts; 44,493 acres of land with an urban land use preference; 11,888 acres of land with an agricultural land use preference; and 235 acres with a conservation land use preference (Figure 4-13). The existing developed land and developable land areas would have a 2060 housing density of 1,915 housing units per square mile (2.99 housing units per acre).

An increase in urban and suburban growth and development around the Southern Corridor highway alignment (Figure 4-14) would likely occur as demonstrated along other regional transportation routes. The phased construction of the Southern Corridor highway and the results of this growth analysis demonstrate the continued need for strong regional cooperation and planning among communities and municipalities to determine what land should and could be available for growth.



Growth Analysis Study Area - 540,155 Acres
Major Conflict Area - 244 Acres
Agriculture / Conservation Conflict Area - 26 Acres
Urban / Agricultural Conflict Area - 37,309 Acres
Urban / Conservation Conflict Area - 2,552 Acres
No Conflict Area - 52,792 Acres

Cities
Interstate
US Highway
ST Highway
Hwy
Major Road

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

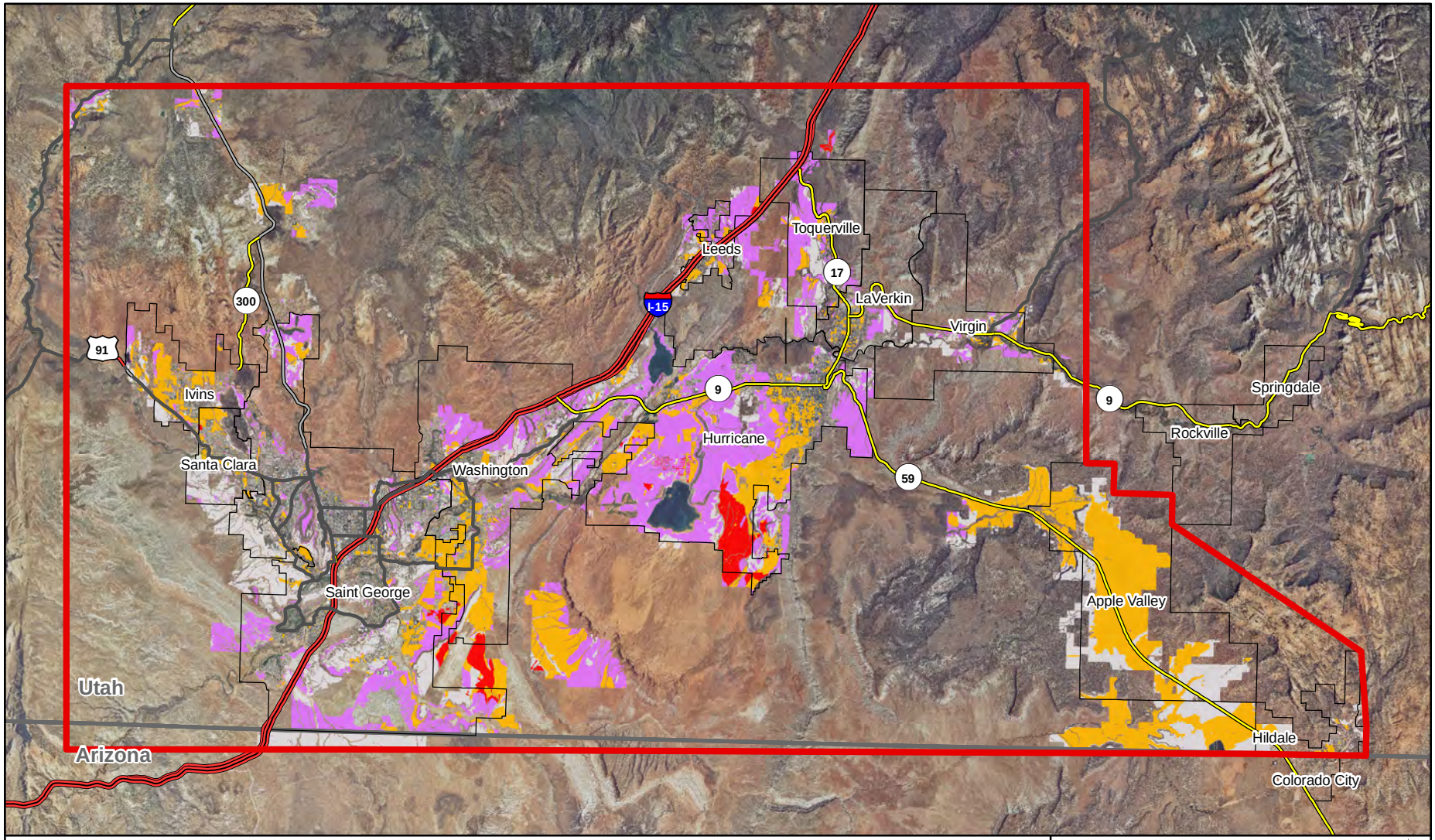
0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2011
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe Figure 4-10 MWH

Scenario 3A
Areas of Potential Land-Use Conflict (w/o Rock & Soil Hazards)



Growth Analysis Study Area - 540,155 Acres
Major Conflict Area - 2,963 Acres
Agriculture / Conservation Conflict Area - 22 Acres
Urban / Agriculture Conflict Area - 32,059 Acres
Urban / Conservation Conflict Area - 32,895 Acres
No Conflict Area - 24,981 Acres

Cities
Interstate
US Highway
ST Highway
Hwy
Major Road

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

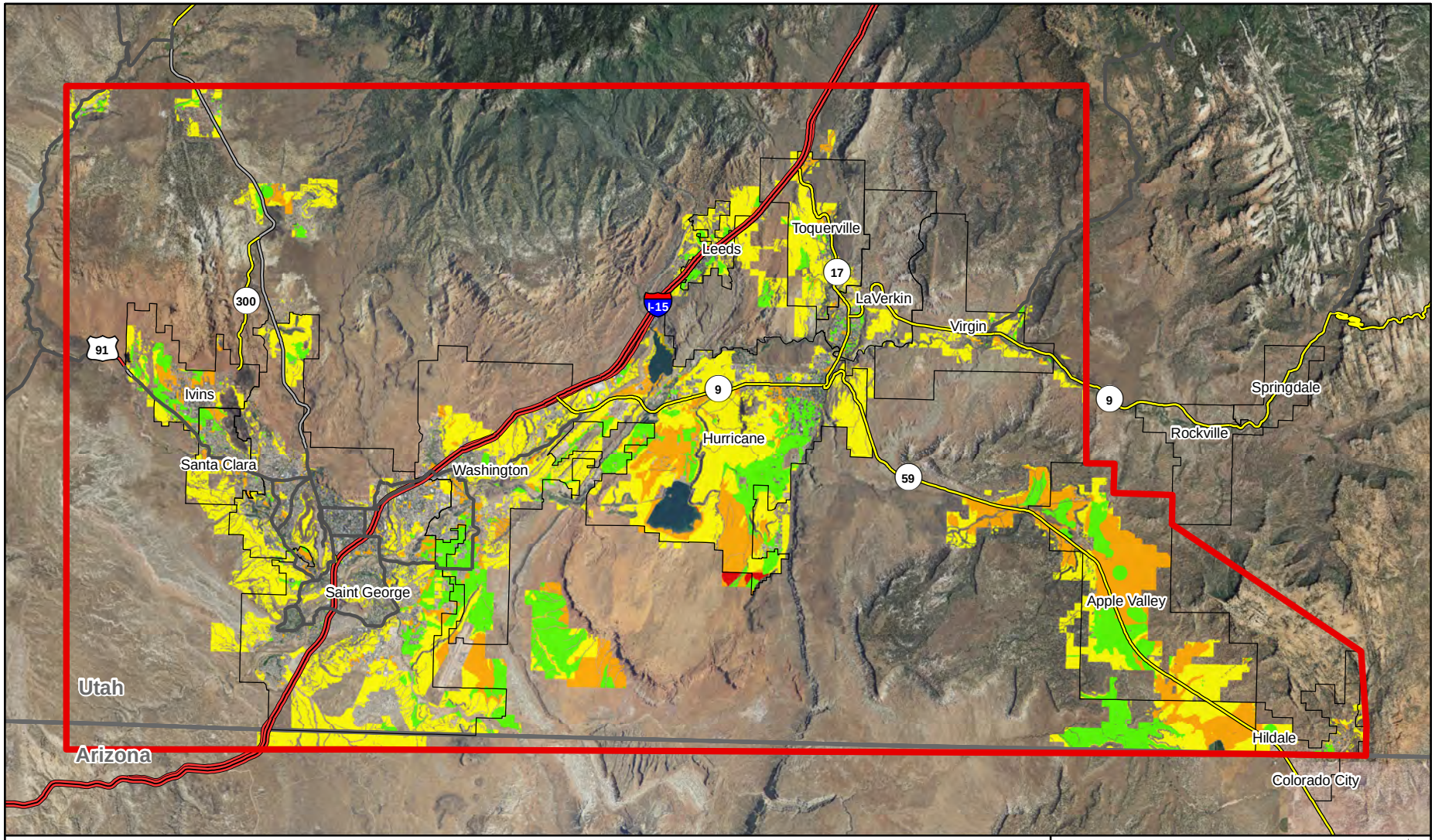
0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2014
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe Figure 4-11 MWH

Scenario 3B
Areas of Potential Land-Use Conflict



Growth Analysis Study Area - 540,155 Acres
Urban Preference Area - 53,487 Acres
Agriculture Preference Area - 19,962 Acres
Conservation Preference - 85 Acres
High Conflict Area - 244 Acres
Moderate Conflict Area - 19,146 Acres

Cities
Interstate
US Highway
ST Highway
Hwy
Major Road

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

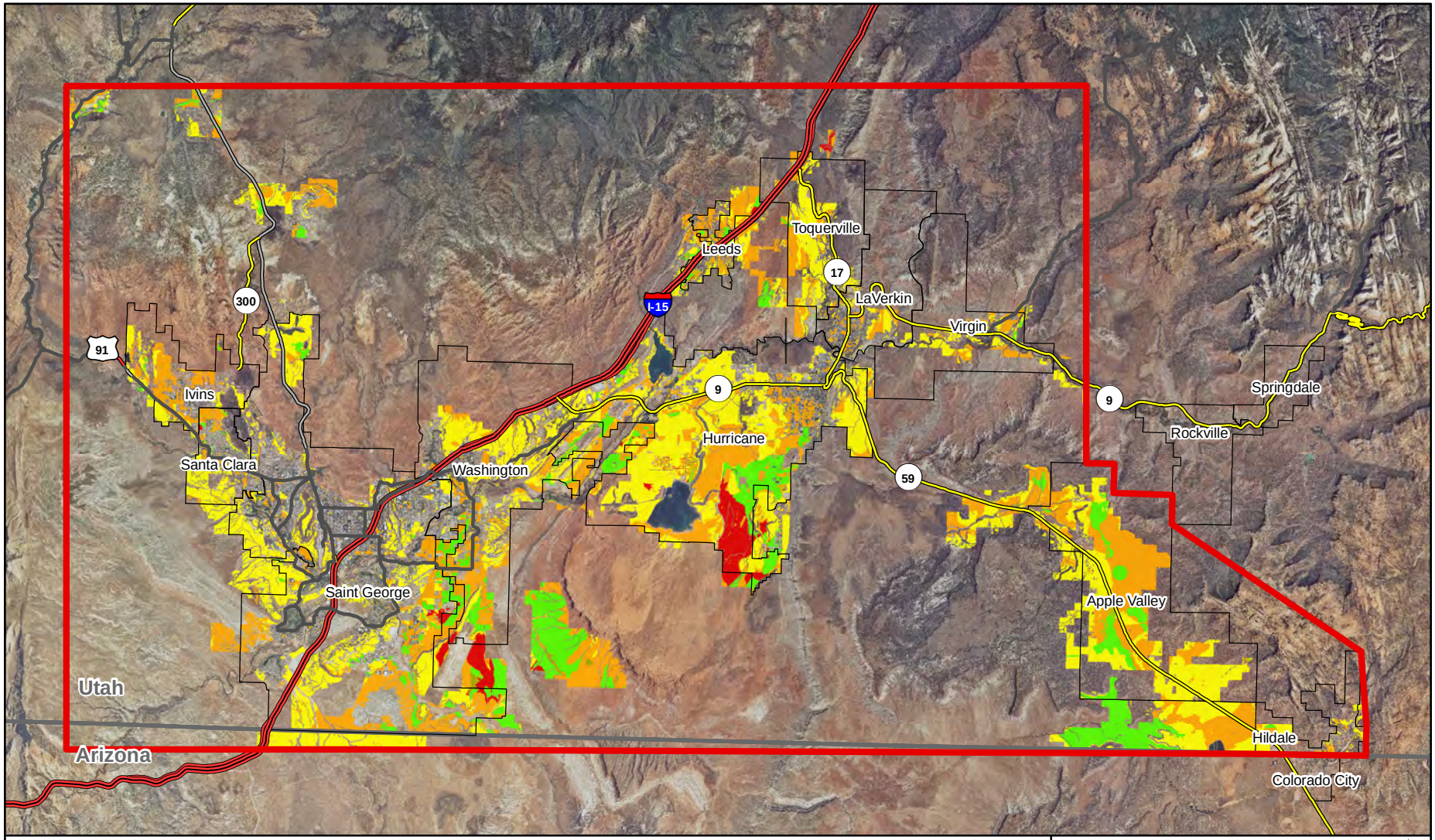
0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2011
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe Figure 4-12 MWH

Scenario 4A
Areas of Land-Use Preference and Conflict (w/o Rock & Soils Hazards)



Growth Analysis Study Area - 540,155 Acres
Urban Preference Area - 44,493 Acres
Agriculture Preference Area - 11,888 Acres
Conservation Preference Area - 235 Acres
High Conflict Area - 2,963 Acres
Moderate Conflict Area - 33,341 Acres

Cities
Interstate
US Highway
ST Highway
Hwy
Major Road

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

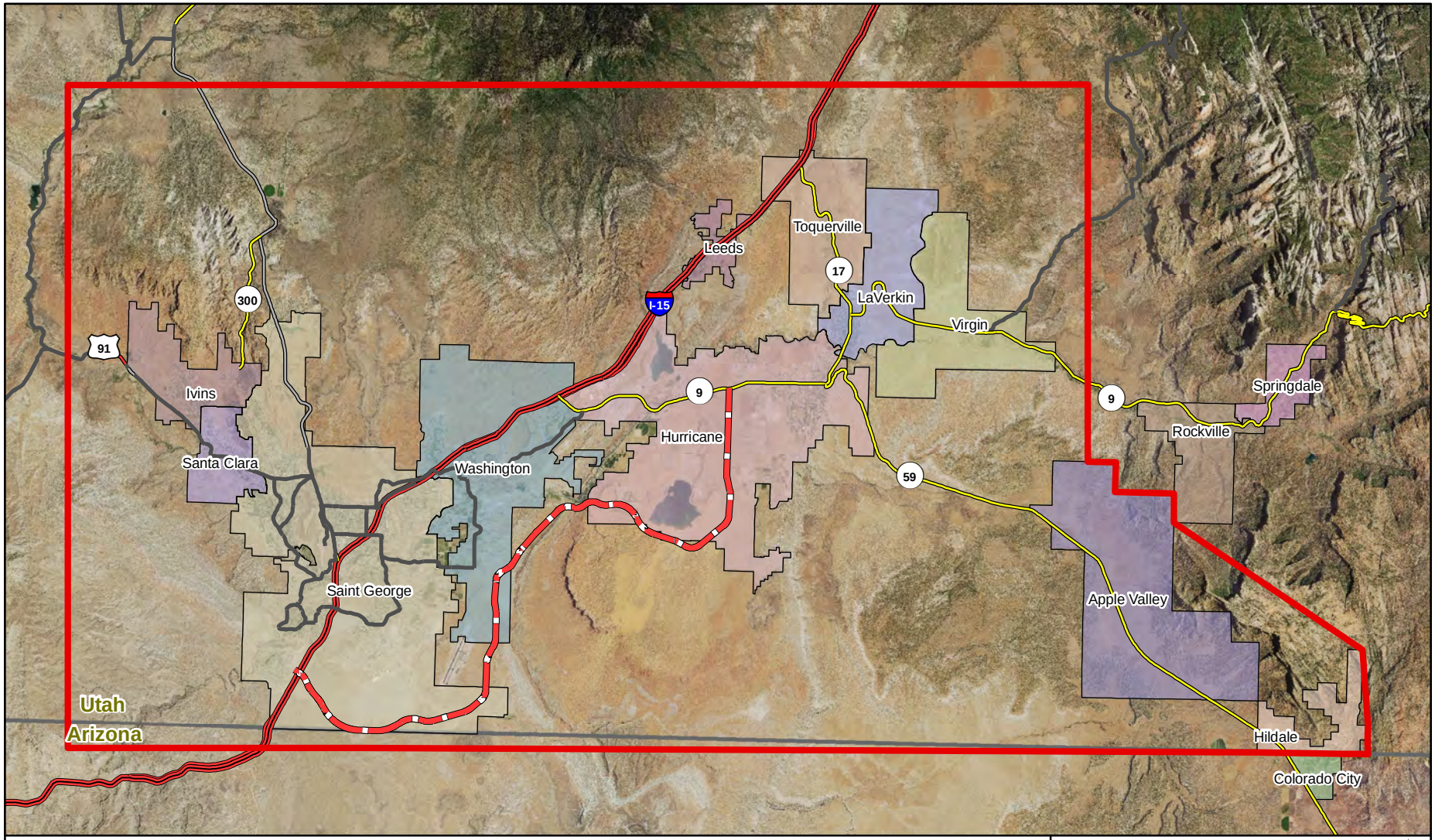
0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2014
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe Figure 4-13 MWH

Scenario 4B
Areas of Land-Use
Preference and Conflict



Growth Analysis Study Area - 540,155 Acres
Southern Corridor
Cities
State Boundaries

Interstate
US Highway
ST Highway
Hwy
Major Road

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

0 1 2 4 6 Miles

Lake Powell Pipeline
Aerial Imagery: NAIP 2014
Spatial Reference: UTM Zone 12N, NAD-83

N

UDWRe Figure 4-14 MWH

Southern Corridor Highway

4.4 Impact Analysis Conclusions

4.4.1 Water Conveyance System

The Water Conveyance System is common to all LPP Project alignment alternatives. This section summarizes the impact analysis conclusions for the land use impact topics.

4.4.1.1 Land Ownership and Management

There are locations along the Water Conveyance System that could involve transfer of land ownership because of permanent facility construction, operation, and maintenance. Permanent facilities would cover a total of 74 acres, with five acres on private land and 69 acres on public land. Access roads and pipelines would not require potential transfer of land ownership. Pipeline and access road construction would not permanently affect land ownership, thus a minimum amount of land title transfer would be necessary.

4.4.1.2 Farmland

The Water Conveyance System would have no significant direct or indirect impacts on farmland.

4.4.1.3 Floodplain

The Water Conveyance System alignment was identified to minimize disturbance of land character or scenic designation. Pipeline alignments parallel to floodplains were moved outside of them to avoid impacts. Potentially affected floodplains would be at pipeline crossings along waterways, which would be reclaimed and placed back to original contours to avoid long term impacts on floodplains. The Water Conveyance System would have temporary direct impacts on 12.5 acres of floodplains at pipeline crossings during construction and no measurable impacts during operation. The Water Conveyance System would have no significant impacts on floodplains.

4.4.1.4 Waste Disposal and Hazardous Waste

The Water Conveyance System construction, operation, and maintenance actions would result in manageable waste disposal for excess fill and hazardous water materials. Local and regional disposal facilities are available to accept both types of waste materials. There are no apparent hazardous waste sites within the Water Conveyance System alignment. The Water Conveyance System would have no significant impacts on waste disposal and hazardous waste management.

4.4.1.5 Wilderness and Land with Wilderness Characteristics

The Water Conveyance System would be constructed adjacent to The Cockscomb WSA, which is managed as wilderness. The Water Conveyance System would have no direct impacts on the Cockscomb WSA; there could be minor temporary indirect impacts from residual noise, air pollutants, and changes in views from the WSA. There would be no land use constraints associated with the WSA on the Water Conveyance System. The Water Conveyance System would have no significant impacts on wilderness or land with wilderness characteristics.

4.4.1.6 Wild and Scenic Rivers

The Water Conveyance System would have no direct impacts and no significant impacts on Wild and Scenic Rivers or eligible WSR segments.

4.4.1.7 Grazing Land

Water Conveyance System construction would directly impact a narrow band of grazing land covering 198 acres and removing it from utilization during the following growing season(s), depending on available soil moisture and temperatures. Operation and maintenance activities would have minimal impacts on grazing land along the pipeline. Permanent facilities would remove currently grazed lands from future livestock grazing. The Water Conveyance System would not have significant impacts on grazing land.

4.4.1.8 Rights-of-Way

The Water Conveyance System construction and operation would involve ROW acquisition throughout much of its length. Easement acquisition would be necessary where utility ROWs are currently available. These impacts on rights-of-way would be minor.

4.4.1.9 Trails and National Historic Trails

The Water Conveyance System would cross a National Historic Trail in two places. These pipeline crossings would temporarily impact the trail during construction. The trail and surrounding areas would be restored back to original condition. Water Conveyance System operation would have no direct or indirect impacts on the trail. The Water Conveyance System would have no significant impacts on National Historic Trails.

4.4.1.10 Areas of Critical Environmental Concern

The Water Conveyance System construction and operation would have no direct impacts and no significant impacts on ACECs.

4.4.1.11 Growth

The Water Conveyance System construction would have no direct impacts on growth. Water Conveyance System operation, in conjunction with the Hydro System delivering water to the St. George metropolitan area, would support continued population growth and in-fill development within municipal boundaries served by transportation networks, schools, power, water distribution, sewer collection and other infrastructure. The growth scenario analysis excludes threatened and endangered species (TES) critical habitat areas, existing developed land, state parks, BLM land, Indian reservations, conservation land, Red Cliffs Desert Reserve, U.S. Forest Service land, wilderness areas/wilderness study areas, open water, flood plains, wetlands, slopes greater than 25 percent, ridgelines, streams, and dry washes. Scenario 1 includes all developable land and demonstrates the potential for urban and suburban sprawl. Potentially developable land on high- and moderate-hazard rock and soil areas are successively excluded in Scenarios 2A and 2B, respectively. Developable areas not connected to municipal boundaries, not proximate to existing or planned transportation networks, and that would not have infrastructure to support new

development are excluded from Scenarios 2A, 2B, 3A, 3B, 4A and 4B. Scenarios 2A, 3A and 4A include development in rock and soil hazard areas; Scenarios 2B, 3B and 4B exclude development in rock and soil hazard areas. The Scenario 2B analysis indicates the resulting developable land areas for future growth would have an average housing unit density of 1,468 per square mile (2.29 housing units per acre) to support the growth study area population of 581,731 people in 2060 using smart growth principles. The Scenario 3B analysis indicates the resulting developable land with no land use conflicts based on current land uses would have an average housing unit density of 2,538 per square mile (3.96 housing units per acre) to support the growth study area population of 581,731 people in 2060 using smart growth principles. The Scenario 4B analysis indicates the resulting developable land based on urban preference with no land use conflicts would have an average housing unit density of 1,915 per square mile (2.99 housing units per acre) to support the growth study area population of 581,731 people in 2060 using smart growth principles. The housing unit densities indicated under Scenarios 2B, 3B and 4B are within the densities for urban development and would be consistent with smart growth principles. These analyses demonstrate the 2060 population could be accommodated within the growth study area and within areas already served by infrastructure, incorporating conservative development assumptions. The LPP project would supply water to meet Washington County needs through approximately 2052, when the growth study area population would be slightly less than 500,000 with an average housing unit density of 2 units per acre. Regardless which of the scenarios or combination thereof ultimately occurs, the projected growth is based on past and current trends in growth and local land use planning. The proposed LPP Project is not driving this growth. Therefore, there are no reasonably foreseeable potential indirect effects of the LPP operation on urban and suburban growth within the Washington County growth study area. Sensitive habitat areas and resources would be outside of the areas developed to support population growth from 2020 through 2060, based on using smart growth principles.

4.4.2 Hydro System South Alternative

4.4.2.1 Land Ownership and Management

There are numerous locations along the South Alternative that could involve transfer of land ownership because of permanent facility construction, operation, and maintenance. Permanent facilities would cover a total of 757 acres, with 17 acres on private land and 740 acres on public land. Access roads and pipelines would not require transfer of land ownership. Penstock, pipeline and access road construction would not permanently affect land ownership, thus a minimum amount of land title transfer would be necessary. The South Alternative would have no direct land use impacts on the Kaibab-Paiute Indian Reservation.

4.4.2.2 Farmland

LPP Project construction, operation and maintenance would require converting approximately five acres of designated prime farmland soil to industrial use for one proposed permanent facility (HS-2), which would be a significant impact on designated prime farmland soil. Farmland disrupted during penstock construction (393 acres) would be rehabilitated back to original condition by replacing removed topsoil to the original contours and to a condition as good as or better than existing.

4.4.2.3 Floodplain

The South Alternative alignment was identified to minimize disturbance of floodplains. Potentially affected floodplains would be at pipeline crossings along waterways, which would be reclaimed and placed back to original contours to avoid long term impacts on floodplains. The South Alternative would

have temporary direct impacts on 14.8 acres of floodplains at pipeline crossings during construction and no measurable impacts during operation. The South Alternative would have no significant impacts on floodplains.

4.4.2.4 Waste Disposal and Hazardous Waste

The impacts would be the same as described in Section 4.4.1.4.

4.4.2.5 Wilderness, WSAs, and Land with Wilderness Characteristics

The South Alternative would not cross any designated wilderness, land with wilderness characteristics or WSA's. The South Alternative would have no direct impacts and no significant impacts on wilderness, land with wilderness characteristics or WSA's.

4.4.2.6 Wild and Scenic Rivers

The South Alternative would not cross any designated Wild and Scenic Rivers or eligible segments. The South Alternative would have no direct impacts and no significant impacts on Wild and Scenic Rivers.

4.4.2.7 Grazing Land

South Alternative construction would directly impact a narrow band of grazing land covering 1,027 acres and remove it from utilization during the following growing season(s), depending on available soil moisture and temperatures. Operation and maintenance activities would have minimal impacts on grazing land along the penstock. Permanent surface facilities would remove 757 acres of currently grazed lands from future livestock grazing. The South Alternative would have no significant impacts on grazing land.

4.4.2.8 Rights-of-Way

The impacts would be the same as described in Section 4.4.1.8.

4.4.2.9 Trails and National Historic Trails

The South Alternative would cross trails and National Historic Trails in several places. These pipeline crossings would temporarily impact the trails during construction. The trails and surrounding areas would be restored back to original condition. South Alternative operation would have no direct or indirect impacts on the trails. The South Alternative would have no significant impacts on trails and National Historic Trails.

4.4.2.10 Areas of Critical Environmental Concern

The Kanab Creek ACEC is the only ACEC that would be directly impacted by the LPP Project. The two penstock crossings would temporarily disturb approximately 12 acres of land and water. Long term impacts would be avoided by implementing construction BMPs and the area would be rehabilitated to its original condition and contours. The South Alternative would have no significant land use impacts on the Kanab Creek ACEC.

4.4.2.11 Growth

The impacts would be the same as described in Section 4.4.1.11.

4.4.3 Hydro System Existing Highway Alternative

4.4.3.1 Land Ownership and Management

There are numerous locations along the Existing Highway Alternative that could involve transfer of land ownership because of permanent facility construction, operation, and maintenance. However, access roads and pipelines would not require transfer of land ownership. Penstock, pipeline and access road construction would not permanently affect land ownership, therefore a minimum amount of land title transfer would be necessary.

The Existing Highway Alternative would have temporary direct land use impacts on the Kaibab-Paiute Indian Reservation. The penstock alignment parallel to the Arizona State Route 389 ROW would not follow a designated energy corridor. Therefore, LPP Project sponsors would need to complete all necessary applications and studies outlined in the Energy Transport Corridor Siting for Tribal Planners Guidance Manual (BIA 2010). The review process and compliance needs with respect to the Energy Transport Corridor Siting for Tribal Planners Guidance Manual are outlined in Section 4.3.1.

4.4.3.2 Farmland

LPP Project construction, operation and maintenance would require converting approximately five acres of designated prime farmland soil to industrial use for one proposed permanent facility (HS-2), which would be a significant impact on designated prime farmland soil. Farmland disrupted during penstock construction would be rehabilitated back to original condition by replacing removed topsoil to the original contours and to a condition as good as or better than existing.

4.4.3.3 Floodplain

The Existing Highway Alternative alignment was identified to minimize disturbance of land character or scenic designation. Pipeline alignments parallel to floodplains were moved outside of them to avoid impacts. Potentially affected floodplains would be at pipeline crossings along waterways, which would be reclaimed and placed back to original contours to avoid long term impacts on floodplains. The Existing Highway Alternative would have temporary direct impacts on 32.7 acres of floodplains at pipeline crossings during construction and no measurable impacts during operation. The Existing Highway Alternative would have no significant impacts on floodplains.

4.4.3.4 Waste Disposal and Hazardous Waste

The impacts would be the same as described in Section 4.4.1.4.

4.4.3.5 Wilderness and Land with Wilderness Characteristics

The Existing Highway Alternative would not cross any designated wilderness, land with wilderness characteristics or WSA's. The Existing Highway Alternative would have no direct impacts and no significant impacts on wilderness, land with wilderness characteristics or WSA's.

4.4.3.6 Wild and Scenic Rivers

The Existing Highway Alternative would not cross any designated Wild and Scenic Rivers or segments considered by BLM to be eligible for designation. The Existing Highway Alternative would have no direct impacts and no significant impacts on Wild and Scenic Rivers.

4.4.3.7 Grazing Land

Existing Highway Alternative construction would directly impact a narrow band of grazing land covering 779 acres and remove it from utilization during the following growing season(s), depending on available soil moisture and temperatures. Operation and maintenance activities would have minimal impacts on grazing land along the penstock. Permanent surface facilities would remove 749 acres of currently grazed lands from future livestock grazing. The Existing Highway Alternative would have no significant impacts on grazing land.

4.4.3.8 Rights-of-Way

The impacts would be the same as described in Section 4.4.1.8.

4.4.3.9 Trails and National Historic Trails

The impacts would be the same as described in Section 4.4.2.9.

4.4.3.10 Areas of Critical Environmental Concern

The Existing Highway Alternative would not cross any Areas of Critical Environmental Concern. The Existing Highway Alternative would have no direct impacts and no significant impacts on Areas of Critical Environmental Concern.

4.4.3.11 Growth

The impacts would be the same as described in Section 4.4.1.11.

4.4.4 Hydro System Southeast Corner Alternative

4.4.4.1 Land Ownership and Management

The Southeast Corner Alternative alignment would have similar impacts on land management to the South Alternative alignment described in Section 4.4.2.1. The Southeast Corner Alternative would have temporary direct land use impacts on the Kaibab-Paiute Indian Reservation where the penstock would parallel the Navajo-McCullough Transmission Line corridor for 3.8 miles across the southeast corner of the Reservation. This would not be a significant impact on land use and management within the Kaibab-Paiute Indian Reservation boundaries because the penstock would be within an established energy corridor and consistent with the Energy Transport Corridor Siting for Tribal Planners Guidance Manual (Manual) (BIA 2010). The Manual's compliance needs regarding Energy Transport Corridors is specified in section 4.3.1.

In an effort to account for tribal resource management goals the Kaibab Band of Paiute Indian Tribe was contacted to aquire a resource management plan, land use plan or other management plan(s). The Economic Development/Resource Manager stated that the Kaibab Tribe was working to complete a resource management plan; the aniticipated completion date was in 2013 (Robb 2012).

4.4.4.2 Farmland

The impacts would be the same as described in Section 4.4.2.2.

4.4.4.3 Floodplain

The impacts would be the same as described in Section 4.4.2.3.

4.4.4.4 Waste Disposal and Hazardous Waste

The impacts would be the same as described in Section 4.4.1.4.

4.4.4.5 Wilderness, WSAs, and Land with Wilderness Characteristics

The impacts would be the same as described in Section 4.4.2.5.

4.4.4.6 Wild and Scenic Rivers

The impacts would be the same as described in Section 4.4.2.6.

4.4.4.7 Grazing Land

Southeast Corner Alternative construction would directly impact a narrow band of grazing land covering 1,082 acres and remove it from utilization during the following growing season(s), depending on available soil moisture and temperatures. Operation and maintenance activities would have minimal impacts on grazing land along the penstock. Permanent surface facilities would remove 757 acres of currently grazed lands from future livestock grazing. The Southeast Corner Alternative would have no significant impacts on grazing land.

4.4.4.8 Rights-of-Way

The impacts would be the same as described in Section 4.4.1.8.

4.4.4.9 Trails and National Historic Trails

The impacts would be the same as described in Section 4.4.2.9.

4.4.4.10 Areas of Critical Environmental Concern

The impacts would be the same as described in Section 4.4.2.9.

4.4.4.11 Growth

The impacts would be the same as described in Section 4.4.1.11.

4.4.6 Transmission Line Alignments

4.4.6.1 Farmland

LPP Project transmission line construction, operation and maintenance would require converting narrow corridors of prime farmland to permanent access roads. The prime farmland soils that would be disturbed by permanent access roads are located between the Hurricane Cliffs and Sand Hollow Reservoir. Farmland disrupted during transmission line construction would be rehabilitated back to its original condition by replacing removed topsoil to the original contours and to a condition as good as or better than existing.

4.4.6.2 Floodplain

Construction and operation of transmission line alignments would have no direct impacts on floodplains. Indirect impacts could occur on existing access roads extending across dry washes for transmission line inspection and repair activities. Transmission line access roads would have no significant impacts on floodplains and their functions.

4.4.6.3 Waste Disposal and Hazardous Waste

The impacts would be the same as described in Section 4.4.1.4.

4.4.6.4 Wilderness, WSAs, and Land with Wilderness Characteristics

Construction and operation of transmission line alignments would have no direct impacts on designated wilderness, land with wilderness characteristics, and WSAs. Several transmission line alignments could be visible from the boundaries of WSAs, potentially resulting in indirect visual impacts on users of these areas. The transmission line alignments would not have any significant impacts on wilderness, land with wilderness characteristics or WSAs.

4.4.6.5 Wild and Scenic Rivers

The transmission line alignments would not cross any designated WSR segments. The Glen Canyon to Buckskin transmission line alignment would cross the Paria River in a segment considered by BLM to be eligible for designation as a Wild and Scenic River for recreational values. This alternative would have direct visual impacts on the Lower Paria River – 1 eligible segment; however, the transmission line would be installed parallel to two existing transmission lines and would be difficult to distinguish from the existing transmission lines crossing the Paria River canyon, which ranges from 230 to 290 feet deep at the crossing. Therefore, the impacts of the proposed transmission line would not be considered significant.

4.4.6.6 Grazing Land

Access road construction and improvement along transmission line alignments would directly impact up to 25 acres of grazing land. Most of the transmission line alignments have existing access roads along them that would be used during the construction. New access roads along transmission line alignments would be constructed between the Hurricane Cliffs peaking and pumped storage hydro stations and Sand Hollow hydro station. Following transmission line construction, the access roads would be periodically used for transmission line inspection and maintenance activities. The transmission line alignments and associated access roads would not have significant impacts on grazing land or specific grazing allotments.

4.4.6.7 Rights-of-Way

The impacts would be the same as described in Section 4.4.1.8.

4.4.6.8 Trails and National Historic Trails

The impacts would be the same as described in Section 4.4.2.9.

4.4.6.9 Areas of Critical Environmental Concern

The Transmission line alignments would not cross any Areas of Critical Environmental Concern. The transmission line alignments would have no direct impacts and no significant impacts on Areas of Critical Environmental Concern.

4.4.6.10 Growth

The impacts would be the same as described in Section 4.4.1.11.

4.4.7 No Lake Powell Water Alternative

4.4.7.1 Land Ownership and Management

The No Lake Powell Water Alternative would not directly change residential land use to another type of land use. However, residential landscapes and the physical uses of those landscapes would be indirectly changed by converting residential landscapes to non-irrigated landscapes resulting from eliminating outdoor watering with potable supplies. Residential landscapes including shade trees, shrubs, gardens, lawns, and other water consuming vegetation would be converted to non-irrigated landscapes, which would support only the type of vegetation that naturally grows in the St. George metropolitan area. Typically, only weeds naturally grow in areas where soil has been disturbed and native vegetation has been removed. Individual private lots and residential common areas would no longer be allowed to use the water supply for outdoor watering because it would need to be used only for indoor uses to meet the growing population demands. Therefore, outdoor use of residential land by residents would change and likely decrease or diminish to a minimum level, except for those residents with access to existing secondary water supplies. The restrictions on residential outdoor water use would have an indirect impact on local general plans and would be a significant impact. Land use management restrictions resulting from the No Lake Powell Water Alternative would have indirect impacts on more than 9,000 acres of existing developed land within the growth analysis study area. By 2060, land use management restrictions resulting from the No Lake Powell Water Alternative would have indirect impacts on more than 25,000 acres of projected developed land.

4.4.7.2 Farmland

The No Lake Powell Water Alternative would have no direct impacts on farmland because eliminating outdoor watering with potable supplies would be applied only to residential areas. However, prime farmland and other farmland currently receiving agricultural grade irrigation water could sell water rights to convert that water to raw water supply for treatment in the reverse osmosis water treatment facility comprising part of the No Lake Powell Water Alternative. Therefore, prime farmland and other farmland in the St. George metropolitan area could be indirectly impacted by converting agricultural irrigation water to culinary water supply through treatment by reverse osmosis processes. The conversion of agricultural irrigation water supply to culinary water supply would be a significant indirect impact on applicable prime farmland in the St. George metropolitan area.

4.4.7.3 Other Land Uses

The No Lake Powell Water Alternative would have no direct or indirect impacts on the following other land uses:

- Floodplains
- Waste Disposal and Hazardous Waste
- Wilderness, WSAs, and
- Wild and Scenic Rivers
- Grazing Land
- Rights-of-Way
- Trails and National Historic Trails
- Areas of Critical Environmental Concern

4.4.7.4 Growth

The No Lake Powell Water Alternative would have no direct impact on growth in the St. George metropolitan area. The water developed from local surface water and groundwater supplies, conserved by eliminating residential outdoor watering, and treatment of Virgin River water and reuse effluent using reverse osmosis treatment would meet the population growth projected by the Utah Governor's Office of Planning and Budget through 2052.

The No Lake Powell Water Alternative would not have reasonably foreseeable indirect impacts on growth in the St. George metropolitan area. The growth scenario analysis set forth in 4.3.11 and 4.4.1.11 above applies equally here. The areas of St. George identified for future growth would continue to infill with population as long as infrastructure is not prohibited.

4.4.8 No Action Alternative

Under the No Action Alternative, there would be no construction of the water intake, conveyance, hydroelectric, or transmission system facilities. Therefore, the No Action Alternative would not result in construction, operation, or maintenance impacts on land use and land use plans.

Chapter 5
Mitigation and Monitoring

All of the alignment alternatives have been developed to avoid or minimize environmental impacts on land use resulting from LPP Project construction and operation. Mitigation may be necessary to reduce an impact below a significance criterion threshold or to minimize impacts on land use and natural resources. Monitoring is performed as necessary following implementation of mitigation measures to evaluate them for effectiveness and determine the need for any adjustments to meet mitigation objectives.

Mitigation measures and monitoring would be implemented in addition to applying Best Management Practices (BMPs) during construction, operation, and maintenance of the LPP project. The following BMPs would be incorporated into the LPP project construction, operation and maintenance to control impacts on land use.

- Fences and gates removed during construction will be replaced with fences and gates of equal or better construction and materials. Temporary fences and gates will be installed as necessary to control livestock and human access during construction.

- Erosion control measures will be implemented in disturbed areas to minimize soil erosion and sedimentation. Temporary slope breakers will be placed to reduce runoff velocity and divert water and sediments away from construction areas within the rights-of-way and easements. Temporary slope breakers would be constructed with materials such as soil, silt fence, staked hay or straw bales, sandbags, biologs, or similar at 300 foot spacing on 5 to 15 percent slopes, 200 foot spacing on 15 to 30 percent slopes, and 100 foot spacing on greater than 30 percent slopes.

- Erosion control matting or crimped mulch will be installed on soil slopes greater than 15 percent as necessary to help retain soil during revegetation periods following final grading.

- Farmland topsoil will be carefully removed and stored prior to pipeline trenching and replaced after pipeline trenches are backfilled. Topsoil stripping will not be performed during excessively wet weather. Topsoil will not be stockpiled in one location for longer than two years. Topsoil stockpiles maintained longer than one growing season will be planted with an annual seed mix to help control erosion and keep soil micro-organisms active. Farmland topsoil replaced over backfilled pipeline trenches will be ripped and left bare for the landowner to cultivate and plant at the same time as adjacent farmland, unless other arrangements are negotiated with the landowner.

- Maintain livestock watering outside of construction rights-of-way if access to livestock watering is interrupted by construction activities.

- Vegetated areas disturbed during construction will be revegetated following construction, with the objective of returning the surface land use back to the original condition.

- Existing land uses will be continued over buried pipeline rights-of-way following construction; however, trees and shrubs will not be allowed to re-grow above pipelines.

The following sections define the mitigation measures and monitoring efforts that would be proposed to avoid and minimize LPP project impacts on land use.

5.1 LPP Project Alternative - Water Conveyance System, Hydro System, and Transmission Lines

5.1.1 Mitigation

5.1.1.1 Land Ownership and Management

Potential impacts on land use within Temporary Construction Easements (TCEs) would be anticipated and agreements would be negotiated between LPP project sponsors, landowners, and public land administrators, excluding BLM. The negotiated agreements with private grazers and landowners could include compensation for lost use during construction.

5.1.1.2 Farmland

Owners of farmland within the LPP Project TCE would be compensated according to the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (URAA), as amended (FHA 2010).

5.1.1.3 Floodplain

No mitigation measures are identified for construction and operation of the LPP project. Floodplain areas temporarily disturbed during construction would be restored to original conditions and functions.

5.1.1.4 Waste Disposal and Hazardous Waste

It is recommended during construction that final surveying and of the pipeline alignments and facility locations that visual inspection of soils in previously disturbed areas be performed to check for the potential presence of contaminated soils. If contaminated soil areas are identified, proper sampling and waste disposal procedures would need to be followed in coordination with either Arizona's or Utah's Department of Environmental Quality. The LPP Project sponsors must notify waste disposal facility operators in advance of transferring a large series of waste loads to each corresponding disposal facility, per requests from waste disposal facility operators. In the event that an unidentified hazardous waste site is encountered on or adjacent to the Kaibab-Raiute Indian Reservation, the Kaibab Band of Paiute Indians will be contacted.

If significant amounts of irrecoverable hazardous materials are encountered during LPP Project construction, a land disposal plan by the land administering agency (State or Federal) could become necessary. BLM policy in the St. George Field Office states: *"To eliminate potential long-term public liability, BLM policy does not authorize public land to be used for hazardous waste disposal unless such lands are first transferred out of public ownership."* (BLM 1999a). This statement was written to comply with all applicable state and federal laws and regulations pertaining to the use and storage of hazardous materials on public land.

5.1.1.5 Wilderness, WSAs, and Land with Wilderness Characteristics

No mitigation measures are identified for construction and operation of the LPP project because it would not have any significant impacts on designated wilderness, land with wilderness characteristics or wilderness study areas.

5.1.1.6 Wild and Scenic Rivers

No mitigation measures are identified for construction and operation of the LPP project because it would not have any significant impacts on designated or suitable segments of eligible Wild and Scenic Rivers. Construction and operation of the Glen Canyon to Buckskin Transmission Line would cross over the top of the Paria River canyon in the Lower Paria River-1 segment considered by BLM to be eligible for designation as a Wild and Scenic River, parallel to two existing high-voltage transmission lines. Non-reflective conductor wire would be installed over the Paria River canyon at the proposed transmission line crossing to minimize potential visual impacts.

5.1.1.7 Grazing Land

Prior to construction, grazing permits on public lands directly affected by permanent surface features of the LPP Project would be modified or terminated. If necessary, all permit-issuing land administration agencies, except BLM, would review each permit holder's impacted Animal Unit Months (AUMs) and other land improvements on a case-by-case basis to determine potential compensation to lessees. Private grazing land directly and permanently impacted by project construction would be evaluated for AUM compensation and negotiations would be held between the LPP project sponsors and private landowners to reach agreements on use of the land.

5.1.1.8 Rights-of-Way

All rights-of-way (ROWs) would be surveyed to meet BLM, National Park Service, Utah SITLA, BIA, Arizona State Land Department and other agency requirements. All pipeline segments, aboveground facilities, extra workspace, staging areas, contractor yards and access roads would be mapped on 1:24,000-scale or larger maps, with milepost marker locations indicated. Mileposts or engineering stationing would be used to locate and specify mitigation measures for significantly impacted resources. ROW surveys would be used to help negotiate agreements to use ROWs with Federal, State, and Tribal agencies and private land owners to establish ROWs or easements.

5.1.1.9 Trails and National Historic Trails

No mitigation measures are identified for construction or operation of the LPP project because there would be no significant impacts on national historic trails. Temporary construction crossings of national historic trails would involve restoring the affected trail areas to original condition following construction.

5.1.1.10 Areas of Critical Environmental Concern

The State of Utah would identify site-specific mitigation measures in a plan submitted to the Arizona Strip BLM as part of the application for special use permit and ROW to construct, operate and maintain the LPP project. Construction impacts on the Kanab Creek ACEC would be mitigated by restoring disturbed areas to original condition and ecological functions. Pipeline trenches on slopes above the riparian area would be backfilled to original grade and re-vegetated with upland species. The pipeline crossing the riparian area at the bottom of Kanab Creek Canyon would be encased in concrete at an elevation below the scour depth of the stream channel. Riparian vegetation areas disturbed by the construction would be restored to original contours and re-vegetated with non-invasive riparian plant species. Trees growing over the top of the pipeline alignment would be removed during operations to protect the pipeline from deep roots.

5.1.1.11 Growth

Given the lack of reasonably foreseeable direct or indirect impacts on growth, mitigation measures are not called for. Furthermore, measures that affect growth such as Vision Dixie smart growth commitments,

planning, zoning, re-zoning, community involvement, and strictly-enforced policies are within the purview of government entities with general planning and zoning authority not possessed by the WCWCD.

5.1.2 Monitoring

5.1.2.1 Land Ownership and Management

No specific monitoring of mitigation measures would be necessary.

5.1.2.2 Farmland

No specific monitoring of mitigation measures would be necessary.

5.1.2.3 Floodplain

Restored floodplains would be monitored using visual observations of stream flow, vegetation and erosion for one year following construction to document that original conditions and functions have been achieved.

5.1.2.4 Waste Disposal and Hazardous Waste

No specific monitoring of mitigation measures would be necessary.

5.1.2.5 Wilderness, WSAs, and Land with Wilderness Characteristics

No specific monitoring of mitigation measures would be necessary.

5.1.2.6 Wild and Scenic Rivers

No specific monitoring of mitigation measures would be necessary.

5.1.2.7 Grazing Land

Grazing land directly affected by project construction would be monitored using visual observations of vegetation cover for two-growing seasons following construction to document that original conditions and functions have been achieved.

5.1.2.8 Rights-of-Way

No specific monitoring of mitigation measures would be necessary.

5.1.2.9 Trails and National Historic Trails

Restored portions of national historic trails affected by project construction activities would be monitored using visual observations of vegetation cover and erosion control for two growing seasons following construction to document that original conditions and functions have been achieved.

5.1.2.10 Areas of Critical Environmental Concern

The restored pipeline corridors across the Kanab Creek ACEC would be monitored using visual observations of the land surface, vegetation cover, stream channel alignment, and erosion control for two growing seasons following construction to document that original conditions and functions have been

achieved. The pipeline alignment crossing the riparian area would continue to be monitored annually during operations to identify and remove small trees that could grow roots down to the pipeline.

5.1.2.11 Growth

Community planners and zoning authorities could annually utilize land use growth models and land use conflict models to monitor where potential conflicts may occur, determine zoning and housing density standards, and plan smart growth more efficiently and accurately. Modeling results could be mapped and used to visually and spatially analyze projected development scenarios to guide government leaders and community constituents to aid in making decisions regarding zoning, re-zoning, future public land disposal, land transfer, and general plan updates.

5.2 No Lake Powell Water Alternative

5.2.1 Mitigation Measures

5.2.1.1 Land Ownership and Management

Mitigation measures for the No Lake Powell Water Alternative would include implementing dust and particulate suppression and controls on residential landscapes and common areas converted to desert xeriscapes. Prevailing winds from the southwest and other wind storm events would mobilize soil particles throughout residential areas, resulting in soil erosion, reduced visibility, and particulate air pollution. Water would not be available for particulate suppression and control, and chemical stabilizers applied to soil may not be compatible with non-irrigated desert vegetation species, limiting the effectiveness of particulate suppression mitigation measures. Individual landowners would be responsible for managing their non-irrigated landscapes and particulate suppression, with management actions ranging from none to full.

5.2.1.2 Farmland

The only mitigation measure to avoid indirect impacts of converting prime farmland agricultural irrigation water to raw water supply for reverse osmosis treatment would be to compensate water right holders and users for the value of their irrigation water. Agreements would be negotiated individually between the water district and water right holders/users to determine acceptable compensation.

5.2.1.3 Growth

The mitigation measures would be the same as described in Section 5.1.1.11.

5.2.2 Monitoring

5.2.2.1 Land Ownership and Management

Individual landowners would be required to install water meters at their connections with water distribution systems, and the meters would be regularly monitored and recorded to determine if residential water users are within or exceeding per capita water use levels. Residential water customers found to be exceeding per capita water use levels based on monitoring records would receive violation notices and would be successively fined for each violation until water service is turned off for non-conformance.

5.2.2.2 Growth

Monitoring would be the same as described in Section 5.1.2.11.

5.3 No Action Alternative

No specific mitigation or monitoring measures would be necessary.

Chapter 6
Unavoidable Adverse Impacts

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

6.1 LPP Project Alternatives - Water Conveyance System, Hydro System, and Transmission Lines

6.1.1 Land Ownership and Management

The LPP project would have unavoidable adverse impacts on land ownership and management because of permanent facilities constructed for the Water Conveyance System, the Hydro System alternative alignments, and transmission line alignments. Land ownership would be permanently affected on five acres for the Water Conveyance System. The South Alternative of the Hydro System would permanently affect private land ownership of 17 acres and permanently affect the public land management of 757 acres. The Existing Highway Alternative of the Hydro System would permanently affect private land ownership of nine acres, permanently affect the public land management of 749 acres, and require compliance with the Energy Transport Corridor Siting for Tribal Planners Guidance Manual (BIA 2010). The Southeast Corner Alternative of the Hydro System would permanently affect private land ownership of 17 acres and permanently affect the public land management of 757 acres. The transmission line alignments would permanently affect private land ownership of nine acres.

6.1.2 Farmland

The Hydro System South and Southeast Corner alignment alternatives each would have unavoidable adverse impacts on five acres of prime farmland soil that would be converted to use as a hydro station. The Existing Highway Alternative would have unavoidable adverse impacts on 8.7 acres of prime farmland soil that would be converted to use as a hydro station.

6.1.3 Wild and Scenic Rivers

The Glen Canyon to Buckskin Transmission Line would have an unavoidable adverse indirect impact on the Lower Paria River-1 segment considered by BLM to be eligible for designation as a Wild and Scenic River. The proposed 230 kV transmission line would cross over the Paria River Canyon parallel to two existing high voltage transmission lines, resulting in potential visual impacts from observation points in the canyon.

6.1.4 Grazing Land

The Water Conveyance System would have unavoidable adverse impacts on five acres of grazing land. The South and Southeast Corner alternatives of the Hydro System would have unavoidable adverse

impacts on 757 acres of grazing land. The Existing Highway Alternative of the Hydro System would have unavoidable adverse impacts on 749 acres of grazing land. The Transmission line alignments would have unavoidable adverse impacts on 25 acres of grazing land. The grazing land impacts would result from converting grazing land use to permanent features of the LPP project.

6.1.5 Areas of Critical Environmental Concern

The South and Southeast Corner alternatives of the Hydro System would have temporary unavoidable adverse impacts on the Kanab Creek ACEC where it would be crossed by the pipeline in two places. Wildlife habitat would be temporarily unavailable within the construction corridor in Kanab Creek Canyon and Bitter Seeps Wash until construction activities are completed and re-vegetation objectives are accomplished.

6.2 No Lake Powell Water Alternative

6.2.1 Land Ownership and Management

Land management actions on privately-owned residential properties and common areas in residential developments converted to desert xeriscapes would result in uncontrolled particulate emissions causing chronic unavoidable adverse impacts on soil erosion, visibility, and air quality during wind storm events.

Monitoring of restrictions on residential outdoor watering would be difficult to implement and enforce, resulting in unavoidable adverse impacts on residential water users. These impacts could include higher rates to pay for enforcement activities, fines for violations of potable water use for outdoor irrigation, and no water service for successive violations of potable water use for outdoor irrigation.

6.3 No Action Alternative

There would be no unavoidable adverse impacts resulting from not constructing, operating, and maintening the LPP Project. The No Action Alternative would have no impacts on resources.

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 LPP Project Alternatives - Water Conveyance System, Hydro System, and Transmission Lines

7.1.1 Proposed Action (South Alternative)

The Proposed Action effects would have no measurable cumulative effects when combined with the effects of the following actions:

- Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead EIS and ROD
- Operation of Glen Canyon Dam EIS and ROD
- Interim Surplus Criteria EIS and ROD
- Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona, 2011 through 2020 EA
- Bureau of Reclamation and National Park Service LTEMP EIS

The Proposed Action effects on Lake Powell elevations and Glen Canyon Dam releases would not be measurable on a daily basis as demonstrated by the results of CRSS modeling. Therefore, there would be no measurable cumulative effects with these listed past, present and reasonably foreseeable future actions.

The Proposed Action would have minimal short-term direct cumulative effects on land use with the effects of the Southern Corridor Highway. The Proposed Action penstock would cross the Southern Corridor Highway through a carrier pipe already installed under the future intersection of both alignments. The Proposed Action would have significant long-term indirect cumulative effects on land use with the Southern Corridor Highway effects. The combined effects of providing a regional transportation route and providing water to meet projected population increases associated with in-fill development would change existing land uses from open space and livestock grazing to semi-urban and urban development in areas suitable for development as defined with the exclusions described in Section 4.3.11, particularly along the Southern Corridor Highway alignment.

The Proposed Action would have long-term cumulative effects on land use with the effects of the BLM and Department of Energy West-Wide Energy Corridor Final Programmatic EIS and ROD. Proposed Action electrical transmission lines and penstock segments would be aligned within preferred locations for existing and future utility rights-of-way, Segments 68-116 and 113-116, which are parallel with and

encompass portions of the Navajo-McCullough Transmission Line. This long-term cumulative effect would be beneficial because the energy corridor is suitable to accommodate the Proposed Action ROW with compatible and identical features. The preferred energy corridor provides the following expected benefits in combination with the Proposed Action:

- Streamlining and expediting the processing of energy related permits and projects
- Providing applicants for ROW within designated corridors with a clear set of actions required by the BLM to implement projects in designated corridors
- Reducing duplicative assessment of generic environmental effects by focusing further impact assessment on site-specific environmental studies to determine route suitability and appropriate mitigation
- Ensuring needed inter-agency coordination as part of the application process
- Encouraging new and innovative technologies to increase corridor capacity

The Proposed Action would have potential cumulative effects on land use when combined with the effects of the proposed Kern River-Hurricane Natural Gas Pipeline, which would be constructed parallel to the Southern Corridor Highway. The Proposed Action would have direct cumulative effects with the Kern River-Hurricane Natural Gas Pipeline where the two projects would intersect. The Proposed Action penstock would be buried deeper than the natural gas pipeline. Direct cumulative effects on land use would be minimal where the two project alignments intersect.

The Proposed Action could have cumulative effects on land use when combined with the effects of the proposed BLM St. George Field Office Resource Management Plan and Amendments (proposed RMP). The Proposed Action effects on land use could cause beneficial or adverse cumulative effects, depending on the BLM decisions regarding specific land use administration and management for motorized off-highway vehicle travel and biological conservation actions. Some of the BLM land use and management decisions could be in conflict with the indirect Proposed Action land use effects regarding recreation and other land uses in the Sand Mountain SRMA. These cumulative effects are expected to be minimal and long-term.

7.1.2 Existing Highway Alternative

The Existing Highway Alternative would have the same cumulative effects on land use as described for the Proposed Action in Section 7.1.1 and would have the following additional cumulative effects on land use.

The Existing Highway Alternative could have short-term cumulative effects on land use when combined with the effects of the Jackson Flat Reservoir south of Kanab. The Existing Highway Alternative alignment would be proximate to the Jackson Flat Reservoir, which converted upland vegetated areas used as open space and wildlife habitat to a reservoir and earthen embankment. The Existing Highway Alternative construction would temporarily change land use in the vicinity of the Jackson Flat Reservoir. The resulting cumulative effect would be minimal and not measurable in terms of overall land use in the Kanab area.

The Existing Highway Alternative and Fredonia Natural Resource Conservation District/Town of Fredonia Flood Retarding Structure would have short-term cumulative effects on land use. The Existing Highway Alternative penstock would be constructed under a portion of the earthen embankment forming the flood retarding structure, which would provide flood protection for the Town of Fredonia and its

residents. The short-term cumulative effects would occur during the Existing Highway Alternative construction and would be minimal and not measurable.

7.2 No Lake Powell Water Alternative

The No Lake Powell Water Alternative would have cumulative effects on land use plans and land management when combined with the effects of a proposed land exchange involving 1,200 acres on land administered by the BLM St. George Field Office. Approximately 1,900 acres of BLM-administered land would be used to implement components of the No Lake Powell Water Alternative, and when added to the potential cumulative effect of the land exchange, a total of approximately 3,100 acres of BLM-administered land would be affected.

The No Lake Powell Water Alternative would have cumulative effects on land ownership involving purchase of approximately 2,300 acres of SITLA land for the Warner Valley Reservoir and the brine evaporation and management ponds, combined with the effects of the proposed land exchange of 1,200 acres of BLM-administered land. The cumulative effect of these actions would involve changes in land ownership totaling approximately 3,500 acres.

7.3 No Action Alternative

The No Action Alternative would have no cumulative impacts.

References Cited

16 U.S.C. Sec. 1531, *Endangered Species Act of 1973.*

25 CFR 169 Code of Federal Regulations; *Title 25 – Indians; Chapter I – Bureau of Indian Affairs, Department of the Interior; Subchapter H – Land and Water; Part 169 – Rights-of-Way over Indian Lands.*

43 CFR 1610.7-2. Code of Federal Regulations; *Title 43 – Public Lands: Interior; Subtitle B – Regulations Relating to Public Lands; Chapter II – Bureau of Land Management, Department of the Interior; Subchapter A – General Management (1000); Part 1600 – Planning, Programming, Budgeting; Subpart 1610 – Resource Management Planning; 1610.7-2 – Designation of Areas of Environmental Concern.*

ADOT (see Arizona Department of Transportation).

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Abbreviations and Acronyms

Abbreviation/Acronym	Meaning/Description
ACEC	Area(s) of Critical Environmental Concern
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AGRC	Automated Geographic Reference Center
Alt.	Alternative
ARS	Arizona Revised Statutes
ASFO	Arizona Strip Field Office
ASLD	Arizona State Land Department
AUM	Animal Unit Month
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMPs	Best Management Practices
BPS	Booster Pump Station
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Commission	Federal Energy Regulatory Commission
DEQ	Department of Environmental Quality
DOE	United States Department of Energy
DERR	Division of Environmental Response and Remediation
DEUR	Declaration of Environmental Use Restriction
DNR	Department of Natural Resources
DOQ	Digital Ortho Quadrangle
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIRMs	Flood Insurance Rate Maps
FLPMA	Federal Land Policy and Management Act
FPPA	Farmland Protection Policy Act
GIS	Geographic Information System
GOBP	Governor's Office of Planning and Budget
gpcd	gallons per capita per day
GSENM	Grand Staircase-Escalante National Monument
HS	Hydro System
HU	Housing Unit
KCWCD	Kane County Water Conservancy District
KFO	Kanab Field Office
kV	Kilovolt
LDS	Latter Day Saint
LPP	Lake Powell Pipeline
LQG	large quantity generator
LUCIS®	Land-Use Conflict Identification Strategy

LUST	Leaking Underground Storage Tanks
M&I	Municipal and Industrial
MFP	Management Framework Plan
MMP	Monument Management Plan
MSL	Mean Sea Level
NAD	North American Datum
NAIP	National Agriculture Imagery Program
NFIP	National Flood Insurance Program
NHT	National Historic Trail
NPS	National Park Service
ORVs	Off Road Vehicles
PAD	Pre-Application Document
PFYC	Potential Fossil Yield Classification
RCRA	Resource Conservation and Recovery Act
Reclamation	US Bureau of Reclamation
RMP	Resource Management Plan
RO	Reverse Osmosis
ROD	Record of Decision
ROW	Right-of-Way
SGFO	St. George Field Office
SITLA	School and Institutional Trust Lands Administration
SR	State Route
STIP	State Transportation Improvement Program
TCE	Temporary Construction Easement
TCRP	Transit Cooperative Research Program
TDS	Total Dissolved Solids
TES	Threatened and Endangered Species
TRI	Toxic Release Inventory
UBWR	Utah Board of Water Resources
UDEQ	Utah Department of Environmental Quality
UDOT	Utah Department of Transpiration
UDWRe	Utah Division of Water Resources
UGS	Utah Geological Survey
URAA	Uniform Relocation Assistance and Real Property Acquisition Policy Act
USDA	United States Department of Agriculture
USFS	United States Forest Service (Department of Agriculture)
USNPS	United States National Park Service
UST	Underground Storage Tanks
USTL	Utah State Trust Land
UTM	Universal Transverse Mercator
VCP	Voluntary Cleanup Program
VRM	Visual Resource Management
WCH	Water Conveyance Hydro
WCWCD	Washington County Water Conservancy District

WSA	Wilderness Study Area
WSR	Wild and Scenic River

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GLOSSARY

3-ring switch station: A particular type of substation where energy is routed either from different sources or lines.

Afterbay reservoir: A downstream pond or reservoir for conducting water away from a hydroplant, re-regulating flows from the plant or temporarily holding water.

Areas of Critical Environmental Concern (ACEC): are part of a conservation ecology program outlined in the Federal Land Policy and Management Act (FLPMA) of 1976. Section 103(a) of FLPMA, defines ACECs as areas where special management attention is required to protect and prevent damage to a particular resource.

Biologs: are made of compressed coconut fiber wrapped in rope webbing, commonly use for erosion control. They are staked along or near the toe of the slope and protect from flow velocities on streams, protect from wave action on lakeshores and can be used as a wave break in the near-shore area. The coconut fiber material can support plant growth if placed in an area of nearly constant saturation. Aquatic plant plugs can be placed directly into the log.

Bore: To make a hole in or through, with or as if with a drill. To form a tunnel, for example, by drilling, digging, or burrowing.

Conduit: A pipeline or tunnel used to convey water or a tube or pipe for enclosing electric wires or cables.

Conveyance: The process of water moving from one place to another. .

Culinary water: also referred as potable water, domestic water and/or drinking water.

Desert xeriscapes: trademark for a method of landscaping developed for dry and semiarid climates that stresses saving of water and requires very little or no irrigation for maintaining plants and trees.

Dissolved solids (TDS): (See also, Total Dissolved Solids) is a measure or the total ions in solution, analysed by filtering out the suspended material, evaporating the filtrate and weighing the remaining residue.

Dry washes: the dry bed of an intermittent stream (as at the bottom of a canyon).

Endemic species: Endemism is the ecological state of being unique to a particular geographic location, such as a specific island, habitat type, nation or other defined zone. To be endemic to a place or area means that it is found only in that part of the world and nowhere else.

Euclidean distances: The Euclidean distance is the geometric distance in that multidimensional space. It is computed as distance(x,y)=$\{\sum_i (x_i - y_i)^2\}^{1/2}$. Euclidean (and squared Euclidean) distances are computed from raw data, and not from standardized data.

Farmland: is land other than prime or unique farmland, that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops, as determined by the appropriate state or unit of local government agency or agencies, and that the Secretary of the Interior determines should be considered as farmland for the purposes of this subtitle.

Forage: is plant material, mainly plant leaves and stems, eaten by grazing livestock.

Forebay reservoir/tank: The water intake area for a canal, penstock, or turbine designed to reduce water velocity and turbulence in order to settle suspended material and keep it from entering the system. It can also be a pond or reservoir area used to hold or store water for later use.

In-fill development: involves building and developing in vacant areas in city centers or urban settings. This promotes the betterment of these city centers and leaves rural areas and open spaces undeveloped. Advocates state that infill development can reduce traffic congestion, save open space, and create more livable communities. Closely related to the principle of smart growth.

Intake System: A structure to divert water into a conduit or conveyance system.

Penstock: A high-pressure conduit extending from the first upstream water surface or source to the turbine.

Pipeline: A line of connected pipes used for carrying water over a long distance.

Prime farmland: is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary of the Interior. Prime farmland includes land that possesses the above characteristics but is being used currently to produce livestock and timber. It does not include land already in or committed to urban development or water storage.

Reverse osmosis (RO): High pressure membrane filtration used for removal of dissolved submicrometer particles (0.001 to 0.0015µm) by solution/diffusion and exclusion

Rights-of-way (ROWs): grants that authorize rights and privileges for a specific use of the land for a specific period of time.

Riparian areas: Land areas directly influenced by a stream, river or body of water. Usually such areas have visible vegetation or physical characteristics showing this water influence. Stream sides, lake borders, and marshes are typical riparian areas. Generally refers to such areas along flowing bodies of water.

Sleeve (hydraulic): a tubular piece that is forced or shrunk into a cylindrical bore to reduce the diameter of the bore or to line it with a different material.

Smart growth: is an established approach to land use and development that strives to create communities that are environmentally responsible, economically viable and well-designed. It provides a framework for decision-making about how and where a community will grow.

Temporary Construction Easement (TCE): are easements that are temporary in nature to allow legal access to land for the duration of a projects construction.

Threatened and Endangered Species (TES) Critical Habitat: (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with provisions of section 4 of this act, on which are found those physical or biological features (I) essential to the

conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

Total Dissolved Solids: (See also, Dissolved Solids) is a measure or the total ions in solution, analysed by filtering out the suspended material, evaporating the filtrate and weighing the remaining residue.

Unique farmland: is land other than prime farmland that is used for production of specific high-value food and fiber crops, as determined by the Secretary of the Interior. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Examples of such crops include citrus, tree nuts, olives, cranberries, fruits, and vegetables.

Urban sprawl: low density, automobile dependent development beyond the edge of service and employment areas. It is ubiquitous and its effects are impacting the quality of life in every region of America, in large cities and small towns.

Utility corridor: a linear strip of land identified for the present or future location of utility features within its boundaries.

Wild, Scenic, and Recreational River Classifications:

Wild river areas — Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic river areas — Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational river areas — Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.