5.3.9 Wetland and Riparian Resources

5.3.9.1 Affected Environment

This section presents the wetlands, riparian areas, and potentially jurisdictional waters – defined as being navigable waters of the United States - observed in the area of potential effect. There is some overlap in these features, i.e. one wetland (meeting USACE three-parameter criteria) was found in the study area, and this wetland (in Gould Wash) would no longer be affected by the LPP Project. Many, but not all, riparian areas discussed in this section are identified as potential jurisdictional waters. Potential jurisdictional waters identified in this section include riparian areas and some areas that meet neither criteria. Table 5-82 summarizes the reservoirs, rivers, streams and washes evaluated during the field surveys. Locations of these features are depicted in Figure 5-133 (refer also to Map Key field in Table 5-82).

Table 5-82
Summary of Features Evaluated in Study Area

Map Key	Watershed	Reservoirs, Rivers, Streams, Washes	Location	USGS Topo mapping	Tributary to	Water Observed in Feature During Field Surveys
1	Lower Lake Powell	Lake Powell Intake	Coconino County, Arizona	Reservoir	N/A	Yes
2	Lower Lake Powell	Wash 1 West of Greenehaven	Kane County, Utah	Intermittent stream	Lake Powell	No
3	Lower Lake Powell	Wash 2 West of Greenehaven	Kane County, Utah	Intermittent stream	Lake Powell	No
4	Lower Lake Powell	Blue Pool Wash	Kane County, Utah	Intermittent stream	Wahweap Creek	No
5	Lower Lake Powell	West of Blue Pool Wash	Kane County, Utah	Perennial pond/wetland fed by intermittent stream	Wahweap Creek	No
6	Lower Lake Powell	Wash 2 West of Blue Pool Wash (2nd Wash East of Big Water)	Kane County, Utah	Intermittent stream	Wahweap Creek	No
7	Paria River	Grand Staircase-Escalante National Monument trailhead wash	Kane County, Utah	Intermittent stream	Paria River	No
8	Paria River	Wash west of Grand Staircase-Escalante National Monument trailhead wash	Kane County, Utah	Intermittent stream	Paria River	No
9	Paria River	2nd wash west of Grand Staircase-Escalante National Monument trailhead wash (wash east of Paria River)	Kane County, Utah	Intermittent stream	Paria River	No
10	Paria River	Paria River	Kane County, Utah	Perennial stream	Colorado River	Yes
11	Paria River	Sand Gulch Highway Crossing	Kane County, Utah	Intermittent stream	Paria River	No

Table 5-82
Summary of Features Evaluated in Study Area

Map Key	Watershed	Reservoirs, Rivers, Streams, Washes	Location	USGS Topo mapping	Tributary to	Water Observed in Feature During Field Surveys
12	Paria River	Sand Gulch west of Cockscomb	Kane County, Utah	Intermittent stream	Buckskin Gulch	No
13	Paria River	Sand Gulch 2nd crossing west of Cockscomb	Kane County, Utah	Intermittent stream	Buckskin Gulch	No
14	Paria River	Buckskin Gulch (also known as Kitchen Corral Wash, Kaibab Gulch)	Kane County, Utah	Perennial stream	Paria River	No
15	Kanab Creek	Petrified Hollow Wash (drainage west of HS-1)	Kane County, Utah	Perennial stream	White Sage Wash	No
16	Kanab Creek	Johnson Wash	Kane County, Utah	Perennial stream	Kanab Creek	No
17	Kanab Creek	Kanab Creek at Fredonia	Mohave County, Arizona	Perennial stream	Colorado River	No
18	Kanab Creek	Cottonwood Creek	Mohave County, Arizona	Perennial stream	Kanab Creek	No
19	Kanab Creek	3rd wash east of Two Mile wash	Mohave County, Arizona	intermittent stream	Sand Wash -> Two Mile Wash	No
20	Kanab Creek	2nd wash east of Two Mile wash	Mohave County, Arizona	Perennial stream	Sand Wash -> Two Mile Wash	No
21	Kanab Creek	1st wash east of Two Mile Wash	Mohave County, Arizona	Perennial stream	Sand Wash -> Two Mile Wash	No
22	Kanab Creek	Two Mile wash	Mohave County, Arizona	Perennial stream	Bitter Seeps Wash	No
23	Kanab Creek	Drainage west of Pipe Springs National Monument	Mohave County, Arizona	Perennial stream	Bitter Seeps Wash	No
24	Kanab Creek	1st drainage west of Kaibab-Paiute Indian Reservation	Mohave County, Arizona	Perennial stream	Pipe Valley Wash -> Bulrush Wash -> Kanab Creek	No
25	Kanab Creek	2nd drainage west of Kaibab-Paiute Indian Reservation	Mohave County, Arizona	Perennial stream	Pipe Valley Wash -> Bulrush Wash -> Kanab Creek	No
26	Kanab Creek	White Sage Wash 1 (access road)	Coconino County, Arizona	Perennial stream	Johnson Wash	No
27	Kanab Creek	White Sage Wash 2 (access road)	Coconino County, Arizona	Perennial stream	Johnson Wash	Small dammed pond with water ~3 feet deep
28	Kanab Creek	White Sage Wash	Coconino County, Arizona	Perennial stream	Johnson Wash	No
29	Kanab Creek	Jacob Canyon on Kaibab-Paiute Indian Reservation	Coconino County, Arizona	Perennial stream	Kanab Creek	No

Table 5-82
Summary of Features Evaluated in Study Area

Map Key	Watershed	Reservoir, Rivers, Streams, Washes	Location	USGS Topo mapping	Tributary to	Water Observed in Feature During Field Surveys
30	Kanab Creek	Jacob Canyon South of Kaibab-Paiute Indian Reservation	Coconino County, Arizona	Perennial stream	Kanab Creek	No
31	Kanab Creek	Jacob Canyon at Kanab Creek	Coconino County, Arizona	Perennial stream	Kanab Creek	No
32	Kanab Creek	Kanab Creek at Jacob Canyon	Mohave County, Arizona	Perennial stream	Colorado River	Some ponding in channel, flow not continuous
33	Kanab Creek	Bitter Seeps Wash	Mohave County, Arizona	Perennial stream	Bulrush Wash -> Kanab Creek	No
34	Kanab Creek	Two Mile Wash at Mt. Trumbull Road	Mohave County, Arizona	Perennial stream	Bitter Seeps Wash	No
35	Kanab Creek	Moonshine Ridge Wash	Mohave County, Arizona	Intermittent stream	Pipe Valley Wash -> Bulrush Wash -> Kanab Creek	No
36	Kanab Creek	Wash west of Moonshine Ridge (Big Sand Wash)	Mohave County, Arizona	Perennial stream	Pipe Valley Wash -> Bulrush Wash -> Kanab Creek	No
37	Fort Pierce Wash	Cane Bed Wash	Mohave County, Arizona	Intermittent stream	Cottonwood Wash -> Lakes of Short Creek (dry lakes)	No
38	Fort Pierce Wash	Short Creek, Colorado City	Mohave County, Arizona	Intermittent stream	Fort Pierce Wash -> Virgin River	No
39	Fort Pierce Wash	Short Creek, East Canaan Gap	Washington County, Utah	Intermittent stream	Fort Pierce Wash -> Virgin River	No
40	Fort Pierce Wash	Short Creek, West Canaan Gap	Washington County, Utah	Intermittent stream	Fort Pierce Wash -> Virgin River	No
41	Fort Pierce Wash	Wash South of Forebay	Washington County, Utah	Intermittent stream	Fort Pierce Wash -> Virgin River	No
42	Virgin River	Gould Wash	Washington County, Utah	Intermittent stream	Virgin River	No

Figure 5-133

5.3.9.1.1 Wetlands.

Only one feature, Gould Wash, met the three-parameter criteria for wetland determination. Gould Wash is an intermittent stream that drains to the Virgin River. The 0.01-acre wetland occurs within and adjacent to the well-defined drainage channel.

5.3.9.1.2 Riparian Areas.

Riparian areas in the study area are those areas supporting riparian vegetation; including hydrophytic vegetation as identified in the National List of Plant Species that Occur in Wetlands (Lichvar et al 2016a and 2016b). Riparian plant species observed in riparian areas in the study area included saltcedar (*Tamarix ramosissima*), narrowleaf willow (*Salix exigua*), Russian olive (*Elaeagnus angustifolia*), Fremont cottonwood (*Populus fremontii*), rough cocklebur (*Xanthium strumarium*), and pale spikerush (*Eleocharis macrostachya*). Table 5-83 lists the riparian areas within the study area evaluated, along with the acreage of each riparian area.

Table 5-83
Riparian Areas Within the Study Area

Riparian Area Name	Alternative	Land Ownership[2]	Riparian Area Acreage
Wash west of Blue Pool Wash	All Alternatives	NPS – GCNRA	0.21
Paria River	All Alternatives	UDOT/Private	0.38
Johnson Wash	All Alternatives	UDOT/Private	0.04
White Sage Wash	Proposed Action	BLM - ASFO	0.09
Kanab Creek at Fredonia	Existing Highway Alternative	Private	0.03
Cottonwood Creek	Existing Highway Alternative	ADOT/KBPI	0.01
Two Mile Wash	Existing Highway Alternative	KBPI	0.02
Kanab Creek at Jacob Canyon	Proposed Action	BLM – ASFO	0.06
Kanab Creek	Southeast Corner Alternative	BLM – ASFO	Not evaluated[3]
Bitter Seeps Wash	Proposed Action	BLM – ASFO	0.01
Short Creek, Colorado City	All Alternatives	ADOT/Private	0.09
Short Creek, East Canaan Gap	All Alternatives	BLM - SGFO/Private	0.07
Short Creek, West Canaan Gap	All Alternatives	BLM - SGFO	0.04
Total:			**1.05**

Notes:
[1]Effects were assumed to be restricted to a 50-foot pipeline corridor
[2]ADOT – Arizona Department of Transportation
ASFO = Arizona Strip Field Office
BLM = U.S. Department of the Interior, Bureau of Reclamation
KBPI – Kaibab-Paiute Indian Reservation lands
NPS - GCNRA = National Park Service – Glen Canyon National Recreation Area
SGFO – St. George Field Office
UDOT = Utah Department of Transportation
[3]Presumed to be similar to Kanab Creek effects for Proposed Action

Table 5-84 summarizes Properly Functioning Condition (PFC) ratings and trends for riparian areas evaluated in the area of potential effect. PFCs were evaluated using BLM Technical Reference 1737-15 (BLM 1998).

Table 5-84
Summary of Properly Functioning Condition Ratings and Trends for Riparian Areas in the Study Area

Riparian Area Name	PFC Functional Rating	Trend
Wash West of Blue Pool Wash	Nonfunctional	Not Apparent
Paria River	Functional - At Risk	Downward
Johnson Wash	Nonfunctional	Downward
Kanab Creek at Fredonia	Functional - At Risk	Downward
Cottonwood Creek	Functional - At Risk	Not Apparent
Two Mile Wash	Nonfunctional	Downward
White Sage Wash	Nonfunctional	Not Apparent
Kanab Creek at Jacob Canyon	Functional - At Risk	Not Apparent
Bitter Seeps Wash	Functional - At Risk	Not Apparent
Short Creek, Colorado City	Nonfunctional	Downward
Short Creek, East Canaan Gap	Nonfunctional	Downward
Short Creek, West Canaan Gap	Nonfunctional	Downward

Table 5-85 summarizes functional assessment ratings for riparian areas in the area of potential effect.

Table 5-85
Summary of Functional Assessments for Riparian Areas in the Study Area

Riparian Area Name	Percent Total Functional Points	Functional Units	Red Flag	Wetland Category
Wash West of Blue Pool Wash	36%	2.184		III
Paria River	53%	173.143	X	II
Johnson Wash	17%	0.507		IV
Kanab Creek at Fredonia	45%	4.095		III
Cottonwood Creek	40%	8.711		III
Two Mile Wash	23%	2.376		IV
White Sage Wash	23%	0.09		IV
Kanab Creek at Jacob Canyon	27%	0.966		IV
Bitter Seeps Wash	22%	0.663		IV
Short Creek, Colorado City	15%	0.492		IV
Short Creek, East Canaan Gap	27%	2.708		IV
Short Creek, West Canaan Gap	21%	0.784		IV

Notes:
[1]Percent Total Functional Point and Functional Units are calculated from the Wetland/Riparian Assessment Form modified from Utah Department of Transportation (see Appendix B).
[2]Red Flag is the highest category for an assessment area and is used when a threatened and/or endangered species is documented
[3]Category I - wetlands of exceptionally high quality or that are important from a regulatory standpoint; total functional points should be greater than 80%.
Category II - wetlands that are more prevalent than Category I wetlands, and are those that provide habitat for sensitive plants or animals, function at very high levels for wildlife/fish/amphibian habitat or are assigned high ratings for many of the assessed functions and values; total functional points should be greater than 65%.
Category III - wetlands that are more prevalent, they generally have moderate to low Plant Community Composition rating and have a higher level of disturbance than Category I and II wetlands. They can provide many functions and values, although they may not be assigned high ratings for as many parameters as are Category I and II wetlands. Total functional points should be between 30-65%.
Category IV - wetlands that are generally small, isolated, and are rated low for Plant Community Composition. These sites provide little in the way of wildlife habitat. Total functional points should be less than 30%.

Table 5-86 summarizes values for riparian areas in the area of potential effect.

Table 5-86
Summary of Values for Riparian Areas in the Study Area

	Riparian Area Name	Wash West of Blue Pool Wash	Paria River	Johnson Wash	Kanab Creek at Fredonia	Cottonwood Creek	Two Mile Wash	White Sage Wash	Kanab Creek at Jacob Canyon	Bitter Seeps Wash	Short Creek, Colorado City	Short Creek, East Canaan Gap	Short Creek, West Canaan Gap
Visual Quality	Is the wetland in public ownership (city, county, state or federal)?	+	+					+	+	+	+		+
	Has wetland experienced moderate to low level of disturbance?		+					+	+	+			
	Is there an absence of human structures or other human induced disturbances?							+	+				
Recreational/Educational Quality	Is the wetland in public ownership (city, county, state or federal)?	+	+					+	+	+	+		+
	Is the wetland presently used for recreation/education?										+		
	Is the wetland ¼ mile or less from and elementary school?												
	Is the wetland five miles or less from a high school?				+								
	Is there vehicular, trail, boat or canoe access to the site?	+	+	+		+	+				+		
	Has the wetland experienced a moderate to low level of disturbance?		+				+		+	+			
	Is the wetland visible from a county, state or federal highway, heavily used recreation trail, residential development or other situations where large numbers of people would have visual access to the wetland?	+	+	+		+	+				+		
	Total:	**4**	**6**	**2**	**1**	**2**	**3**	**4**	**5**	**4**	**5**	**0**	**2**

5.3.9.1.3 Stream Scour and Sediment Deposition.

Streams and washes monitored for scour and sediment deposition associated with peak runoff events yielded data on the depth of scour, depth of sediment deposition following a peak runoff event, and channel bed aggradation and degradation. Scour chains and crest gages were installed in July 2009 and monitored in October 2009, April 2010 and December 2010.The following subsections summarize the scour chain and crest gage data obtained from the streams and washes selected for monitoring.

5.3.9.1.3.1 South Forebay Wash.

The South Forebay Wash scour chain and crest gage site was selected based on the approximate location of the LPP crossing. No runoff flow was evident during six monitoring trips to this site. The peak runoff flow in the South Forebay Wash throughout the monitoring period was estimated at 40 cfs. The crest gage recorded 11 inches of water, and there was 2.5 inches of sediment deposited over the bottom cap and inside the gage. The scour chain was lost at this site. The channel bed substrate consisted of small gravel and well-graded sand in a loose matrix. Channel bed aggradation at this site was estimated between 1.0 and 2.5 inches, based on the sediment deposited in the crest gage.

5.3.9.1.3.2 Bitter Seeps Wash.

The Bitter Seeps Wash scour chain and crest gage site was selected based on the approximate location of the Proposed Action crossing. No runoff flow was evident during five monitoring trips to this site. The peak runoff flow at the Bitter Seeps Wash crossing site throughout the monitoring period was estimated at 145 cfs. The crest gage recorded 19 inches of water, matching debris lines on the banks. The scour chain indicated 9.6 inches of scour at the crossing site. The channel bed substrate consisted of fine sand. The scour chain had 9.6 inches of sand deposited over the chain, indicating no net aggradation or degradation of the channel occurred during the monitoring period.

5.3.9.1.3.3 Jacob Canyon at Kanab Creek.

The Jacob Canyon scour chain and crest gage site was selected based on the approximate location of the Proposed Action crossing. No runoff flow was evident during five monitoring trips to this site. The peak runoff flow at the Jacob Canyon crossing site throughout the monitoring period was estimated at 85 cfs. The crest gage recorded 8.5 inches of water, matching debris lines on the banks. The scour chain indicated no scour at the crossing site. The channel bed substrate consisted of medium cobble, gravel, coarse sand, and fine sand, in a well graded, tight matrix. The scour chain had 0.75 inch of silty clay deposited over the chain, indicating a net aggradation of the channel occurred during the monitoring period.

5.3.9.1.3.4 Kanab Creek in Kanab Creek Canyon.

The Kanab Creek Canyon scour chain and crest gage site was located in a straight reach of Kanab Creek approximately 500 feet downstream of the Proposed Action crossing. The Proposed Action crossing site is characterized by dense tamarisk. Runoff flow was encountered during two of six monitoring trips to this site. The peak runoff flow in Kanab Creek Canyon throughout the monitoring period was estimated at 450 cfs. The crest gage was completely inundated, with a measured high water level 3.9 feet above the bottom end cap, matching debris lines on the banks. The scour chain indicated no scour at the monitoring site. The channel bed substrate consisted of coarse to fine gravel, coarse sand, and fine sand and silt, in a well graded matrix. The crest gage had 3 inches of fine sediment deposited inside and surrounding the end cap, indicating a net aggradation of the channel occurred during the monitoring period.

5.3.9.1.3.5 Two-Mile Wash.

The Two-Mile Wash scour chain site on the Kaibab-Paiute Indian Reservation was selected based on the approximate location of the Existing Highway Alternative crossing. Runoff flow was encountered during the second of two monitoring trips to this site. The peak runoff flow in Two-Mile Wash throughout the monitoring period was estimated at 0.2 cfs, based on debris flow lines along the channel banks. The scour chain was installed with the Kaibab Tribe's permission, observed by a Kaibab Tribe monitor, and indicated no scour at the crossing site throughout the monitoring period. The channel bed substrate consisted of sandy, clayey soil with moderately

high cohesion. There was no indication that either aggradation or degradation of the channel occurred during the monitoring period. The scour chain was removed in the presence of a Kaibab Tribe monitor.

5.3.9.1.3.6 Cottonwood Wash.

The Cottonwood Wash scour chain site on the Kaibab-Paiute Indian Reservation was selected based on the approximate location of the Existing Highway Alternative crossing. No runoff flow was encountered during either of the two monitoring trips to this site. The peak runoff flow in Cottonwood Wash throughout the monitoring period was estimated at 0 cfs, based on lack of debris flow lines along the channel banks. The scour chain was installed with the Kaibab Tribe's permission, observed by a Kaibab Tribe monitor, and indicated no scour at the crossing site throughout the monitoring period. The channel bed substrate consisted of sandy, clayey and silty soil with moderately high cohesion. There was no indication that either aggradation or degradation of the channel occurred during the monitoring period. The scour chain was removed in the presence of a Kaibab Tribe monitor.

5.3.9.1.3.7 Johnson Wash.

The Johnson Wash scour chain and crest gage site was selected based on the approximate location of either the Existing Highway Alternative or Kane County pipeline crossing. Runoff flow was encountered during the last of five monitoring trips to this site. The peak runoff flow in Johnson Wash throughout the monitoring period was estimated at 3 cfs. The crest gage was damaged by livestock during the monitoring period and no flow stages were recorded. The scour chain indicated no scour at the crossing site throughout the monitoring period. The channel bed substrate consisted of clayey soil with high cohesion. There was no indication of either aggradation or degradation of the channel occurred during the monitoring period.

5.3.9.1.3.8 Sand Gulch Near Confluence with Paria River.

The Sand Gulch scour chain site was selected based on the approximate location of the LPP crossing. This site is in Utah and is common to all of the LPP Project alternatives. No runoff flow was encountered during four monitoring trips to this site. The peak runoff flow in Sand Gulch throughout the monitoring period was estimated at 90 cfs. Debris lines on the channel banks indicated a maximum flow depth of 1 foot. The scour chain indicated scour and/or deposition occurred repeatedly at the crossing site throughout the monitoring period. After the first monitoring period, there was no scour and deposition of 0.125 inches of silt. After the second monitoring period, the scour depth was 2.4 inches and 2.5 inches of sand was deposited over the scour chain. After the third monitoring period, the scour depth was 2.4 inches and 4 inches of sand was deposited over the chain. The channel bed substrate consisted of uniform sand. The scour chain data indicated net aggradation of the channel occurred during the monitoring period.

5.3.9.1.3.9 Paria River at U.S Highway 89.

The Paria River scour chain and crest gage site was selected based on the approximate location of the LPP crossing. This site is in Utah and is common to all of the LPP Project alternatives. Stream flow was encountered during all four monitoring trips to this site. The peak runoff flow in the Paria River throughout the monitoring period was estimated at greater than 450 cfs, based on USGS gage records at the Highway 89 Bridge. The scour chain indicated scour and/or deposition occurred repeatedly at the crossing site throughout the monitoring period. After the first monitoring period, the scour depth was 2.4 inches and deposition of 1.0 inch of sand (net degradation of 1.4 inches), and the crest gage indicated 5.4 inches of flow depth. After the second monitoring period, the scour depth was 1.2 inches and 1 inch of sand was deposited over the scour chain (net degradation of 0.2 inch), and the crest gage indicated 5.5 inches of flow depth. During the third monitoring period and highest estimated river flow, the scour chain was lost along with the crest gage. The depth of scour was at least 38 inches and estimated to be at least 6 feet deep, based on remnant pools in the east portion of the floodplain. The river channel and floodplain had been scoured to 340 feet wide and the active channel shifted from the east side to the

west side. The channel bed substrate consisted of well-graded fine gravel and coarse to fine sand throughout the monitoring period.

5.3.9.1.3.10 Wash West of Blue Pool Wash.

The Wash West of Blue Pool Wash scour chain and crest gage site was selected based on the approximate location of the LPP crossing. This site is in Utah and is common to all of the LPP Project alternatives. No runoff flow was encountered during any of the monitoring trips to this site. A peak flow event occurred prior to the final monitoring site visit, with the highest stage at 22 inches deep recorded in the crest gage, matching debris lines on the banks. The scour chain was lost during the final monitoring period; however, a new 1.5-foot deep channel was formed west of the monitored channel. This indicated that scour depth was between 1.5 feet and 2 feet deep because the crest gage remained vertical. The channel bed substrate consisted of mostly fine sand with clay and silt as a minor fraction. The flow velocity is low at this site and it is occasionally inundated because the flow outlet invert elevation through the Highway 89 embankment is approximately 4.5 feet above the channel invert elevation (i.e., the highway embankment can act as a small dam).

5.3.9.1.3.11 Second Wash West of Greenehaven.

The Second Wash West of Greenehaven scour chain and crest gage site was selected based on the approximate location of the LPP crossing. This site is in Utah and is common to all of the LPP Project alternatives. No runoff flow was encountered during any of the monitoring trips to this site. A peak flow event occurred prior to the final monitoring site visit, with the highest stage at 11.75 feet above the bottom of the crest gage, estimated from debris lines on the surrounding banks and above the 7-foot diameter culvert pipe under Highway 89. The crest gage was tipped over but not covered by the fine sand comprising the channel bed at this monitoring site. This indicates that the scour depth did not exceed 2.5 feet. The scour chain was eroded away by the extreme runoff flow; however, the soil anchor was recovered at the same depth it had been installed. All previous measurements of the scour chain indicated no scour had occurred. The highway culvert invert was covered with 1.5 inches of deposited sand following the final monitoring site visit. Based on these observations, a slight aggradation of the channel occurred during the peak runoff event.

5.3.9.1.3.12 First Wash West of Greenehaven.

The First Wash West of Greenehaven scour chain and crest gage site was selected based on the approximate location of the LPP crossing. This site is in Utah and is common to all of the LPP Project alternatives. No runoff flow was encountered during any of the monitoring trips to this site; however, the site had standing water during the final monitoring site visit. A peak flow event occurred prior to the final monitoring site visit, with the highest stage at 4.25 feet above the bottom of the crest gage. The scour chain did not indicate scour during any of the four monitoring trips to this site. The channel bed substrate consisted of mostly fine sand with clay and silt as a minor fraction. The flow velocity is low at this site and it is occasionally inundated because the flow outlet invert elevation through the Highway 89 embankment is approximately 4.5 feet above the channel invert elevation (i.e., the highway embankment can act as a small dam).

5.3.9.1.4 Potential Jurisdictional Waters.

The effects in linear distance and area of potential jurisdictional waters that would be affected by the proposed action were estimated from digital photography and field data collected in 2016. The limits of potential jurisdiction were assumed to be located at the ordinary high water mark, which was identified based on physical indicators (change in vegetation, change in substrate, break in slope, etc.). A summary of potential jurisdictional waters effects collected and analyzed in 2016 is provided in Appendix C of the Final Wetlands and Riparian Areas Study Report (UDWRe 2016a). These data are preliminary, as they have not yet been evaluated by USACE, which is responsible for making preliminary jurisdictional determinations.

Permitting Requirements.

Permits would be requested for effects on potential jurisdictional waters regulated under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbor Act. Pipeline crossings of potential jurisdictional waters are expected to be addressed under Section 404 Nationwide Permit (NWP) 12, with each crossing being covered under a separate permit. Effects on potential jurisdictional waters at Lake Powell Intake are expected to be addressed under NWP 18. Effects on potential jurisdictional waters within the footprints of the forebay and afterbay may be addressed by individual permits. A list of potential jurisdictional waters affected by the proposed action for which permits would be sought is provided in Appendix C of the Final Wetlands and Riparian Areas Study Report (UDWRe 2016a).

Plants of Cultural Concern to the Kaibab Band of Paiute Indians

Table 5-87 lists plants of cultural concern to the Kaibab Band of Paiute Indians that were documented during LPP Project field surveys. Species observed include upland and wetland/riparian species. These are addressed in more detail in other study reports, as identified in the table.

Table 5-87
Plants of Cultural Concern to the Kaibab Band of Paiute Indians Documented during LPP Project Field Surveys

Species	Common Name	Study Report Reference
Ambrosia dumosa	White bursage	Vegetation Communities[1]
Artemisia bigelovii	Bigelow sagebrush	Vegetation Communities
Artemisia filifolia	Sand sagebrush	Vegetation Communities
Atriplex canescens	Four-wing saltbrush	Vegetation Communities
Baccharis sp.	Seepwillow	Vegetation Communities
Ephedra nevadensis	Nevada Indian tea	Vegetation Communities
Ephedra torreyana	Torrey Indian tea	Vegetation Communities
Ephedra viridis	Indian tea	Vegetation Communities
Fallugia paradoxa	Apache plume	Vegetation Communities
Larrea tridentata	Creosote bush, greasewood	Vegetation Communities
Lycium andersonii	Wolfberry	Vegetation Communities
Populus fremontii	Fremont cottonwood	Vegetation Communities
Rhus trilobata var. *trilobata*	Squaw bush	Vegetation Communities
Salix exigua	Coyote willow	Vegetation Communities
Tamarix chinensis	Tamarisk, salt cedar	Vegetation Communities & Noxious Weed Assessment[2]
Typha latifolia	Broad-leaf cattail	Vegetation Communities
Yucca baccata	Banana yucca	Vegetation Communities

Notes:
[1] UDWRe 2016b.
[2] UDWRe 2016c.

5.3.9.2 Environmental Effects

5.3.9.2.1 Significance Criteria.

Effects on wetlands, riparian areas, and jurisdictional waters are considered significant if construction, operation or maintenance activities would result in any of the following conditions:

- A net loss of wetland area, riparian areas, or potential jurisdictional waters resulting from construction or operational activities
- Changes in the quality or quantity of hydrologic support (either through surface flow or groundwater levels) that would result in an overall loss of or gain in the area of wetlands, riparian areas, or potential jurisdictional waters
- Other indirect effects on wetlands, riparian areas, or potential jurisdictional water resulting from LPP Project construction or operational activities
- Loss of wetland functions or values from changes in water supply affecting wetland plant communities, wetland soils, or hydrology

5.3.9.2.2 Potential Effects Eliminated from Further Analysis.

Riparian areas along the Virgin River would not be directly or indirectly affected by the Lake Powell Pipeline construction or operation. LPP construction activities would terminate at Sand Hollow Reservoir more than three miles east of the Virgin River. LPP Project operation would supply raw water to Sand Hollow Reservoir for treatment in the Quail Creek Water Treatment Plant before distribution throughout the WCWCD service area. Following use in homes, businesses and institutions, the collected wastewater would be treated in wastewater treatment facilities and then further treated in the St. George Regional Water Reclamation Facility for reuse as secondary irrigation water. This water would be stored in existing and approved reservoirs in the St. George metropolitan area and used for outdoor watering. UDWRe has modeled the Virgin River using the Virgin River Daily Simulation Model (VRDSM) for scenarios involving the future with no LPP water and the future with LPP water to determine the potential for return flows to the Virgin River that could potentially affect riparian areas. The VRDSM results indicate that LPP return flows to the Virgin River would be within the measurement accuracy of the USGS gages on the Virgin River and changes in river flows would not be measurable. Therefore, potential effects on riparian areas and wetlands along the Virgin River are eliminated from further analysis. A detailed analysis of the VRDSM model results is included in the final Surface Water Resources Study Report (UDWRe 2015c).

5.3.9.2.3 Proposed Action.

5.3.9.2.3.1 Wetlands.

No wetlands would be affected under the Proposed Action.

5.3.9.2.3.2 Riparian Areas.

A total of 0.99 acre would be directly affected within the Proposed Action study area. Most riparian areas were determined to be nonfunctional. Functional assessment points ranged from 15 percent to 53 percent. The highest rating occurred in the Paria River, which is documented to contain federally listed fish species in reaches downstream from the pipeline crossing. See attached data sheets in Appendices A and B in the Final Wetlands and Riparian Resources Study Report (UDWRe 2016a) for more information.

Effects on riparian areas include direct and indirect effects and would be temporary, with no permanent loss of function or values occurring. Temporary effects may include loss of vegetation, soil disturbance, disturbance of

hydrological processes, sedimentation, and effects on water quality. These would be minimized by the implementation of construction BMPs (see section 5.3.9.3).

5.3.9.2.3.3 Potential Jurisdictional Waters.

Appendix C in the Final Wetlands and Riparian Resources Study Report (UDWRe 2016a) lists the water bodies expected to be considered potentially jurisdictional that would be affected under the Proposed Action. A total of 14.3 acres of potential jurisdictional waters would be affected.

Construction of the pipeline would affect 6.23 acres of potential jurisdictional waters. Effects on potential jurisdictional waters within the pipeline corridor would be temporary, with no permanent loss of function or values occurring. Temporary effects would not affect areas of open water, except where pipeline crossings occur through perennial streams (i.e. the Paria River). Effects may include temporary loss of vegetation, soil disturbance, disturbance of hydrological processes, sedimentation, and effects on water quality. These would be minimized by the implementation of construction BMPs (see section 5.3.9.3).

Construction of the forebay and Afterbay would permanently affect 7.98 acres of potential jurisdictional waters. Lake Powell Intake construction would permanently affect approximately 0.04 acre. More detail is provided in Appendix C in the Final Wetlands and Riparian Resources Study Report (UDWRe 2016a).

5.3.9.2.3.4 Operation and Maintenance Effects.

Operation and maintenance activities are not expected to have measurable effects on wetlands, riparian areas, or jurisdictional waters. Occasional water releases from drain valves at low points along the pipeline and penstock would occur in some years during January when storm runoff is more common and riparian vegetation is dormant. The short-term water releases from drain valves would be controlled and would not cause erosion or downstream sedimentation. Releases would be controlled by LPP Project operations staff by manually adjusting the amount the valves are opened to prevent erosion of the receiving potentially jurisdictional waters. The short-term effects from operation and maintenance activities would not be significant.

5.3.9.2.4 Existing Highway Alternative.

5.3.9.2.4.1 Wetlands.

No wetlands would be affected under the Existing Highway Alternative.

5.3.9.2.4.2 Riparian Areas.

A total of 0.89 acre of riparian area would be directly affected within the Existing Highway Alternative study area. Most riparian areas were determined to be Nonfunctional. Functional assessment points ranged from 15 percent to 53 percent. The highest rating occurred in the Paria River, which is documented to contain federally listed fish species in reaches downstream from the pipeline crossing. See attached data sheets in Appendices A and B in the Final Wetlands and Riparian Resources Study Report (UDWRe 2016a) for more information.

Effects on riparian areas include direct and indirect effects and would be temporary, with no permanent loss of function or values occurring. Temporary effects may include loss of vegetation, soil disturbance, disturbance of hydrological processes, sedimentation, and effects on water quality. These would be minimized by the implementation of construction BMPs (see section 5.3.9.3).

Effects on riparian areas include short-term direct and indirect effects, with no permanent loss of function or values occurring. Temporary effects may include loss of vegetation, soil disturbance, disturbance of hydrological

processes, sedimentation, and effects on water quality. These would be minimized by the implementation of construction BMPs. The short-term effects on riparian areas from construction would not be significant.

5.3.9.2.4.3 Potential Jurisdictional Waters.

Appendix C in the Final Wetlands and Riparian Resources Study Report (UDWRe 2016a) lists the water bodies considered potential jurisdictional waters that would be affected under the Existing Highway Alternative. These calculations were not completed for the Existing Highway Alternative, but total effects are expected to be similar.

5.3.9.2.4.4 Operation and Maintenance Effects.

Operation and maintenance effects would be the same as described for the Proposed Action in Section 5.3.9.2.3.4.

5.3.9.2.5 Southeast Corner Alternative.

The Southeast Corner Alternative would have the same effects on wetland and riparian resources as described for the Proposed Action in Section 5.3.9.2.1.

5.3.9.2.6 Transmission Line System.

5.3.9.2.6.1 Wetlands, Riparian Areas, and Potential Jurisdictional Waters.

There would be no ground disturbance in the areas of wetlands, riparian areas, or potential jurisdictional waters under the Transmission Line Alignments; therefore, no effects would occur on these resources from construction or operation activities. No Lake Powell Water Alternative.

Under the No Lake Powell Water Alternative, there would be no direct effects on wetlands, riparian areas, and potential jurisdictional waters. The No Lake Powell Water Alternative could have significant indirect effects on riparian areas along the Virgin River and its tributary streams under the influence of groundwater recharge from outdoor residential landscape irrigation. Eliminating outdoor irrigation of residential landscapes would reduce irrigation recharge to surface and subsurface soils in the St. George metropolitan area. Reaches of area streams tributary to the Virgin River and some reaches of the Virgin River could have reduced stream flows. Riparian vegetation may not grow along these losing reaches or riparian vegetation communities could diminish as outdoor residential irrigation is eliminated. Decrease of riparian vegetation could result in increased stream water temperatures because shade over these streams could decrease. These indirect effects would be long-term.

5.3.9.2.7 No Action Alternative.

The No Action Alternative would have no direct or indirect effects on wetlands, riparian areas, and potential jurisdictional waters.

5.3.9.3 Protection, Mitigation and Enhancement Measures

Protection and mitigation measures would be implemented to avoid, minimize or reduce project effects on wetlands and riparian areas. Protection and mitigation measures would incorporate the use of BMPs including standard construction practices and standard operating procedures for grading and erosion control, riparian revegetation and monitoring, hazardous materials management, and stormwater pollution prevention.

The following BMPs and standard construction procedures would be used during construction to avoid, minimize, or reduce effects on wetlands and riparian areas.

- Riparian vegetation clearing of pipeline crossings would be minimized.

- Construction of pipeline crossings of dry washes would be performed when the washes are dry.
- Construction of pipeline crossings of perennial or intermittent flowing streams (e.g., Paria River and Kanab Creek) would be performed when the streams are either at low flows or are dry.
- When construction activities would take place upstream from wetlands, silt fences or straw bales would be temporarily installed upstream or up-gradient of wetlands to filter suspended sediments and bedload sediments to avoid sedimentation effects during construction. If necessary, silt fences and/or straw bales would be installed in series to control sediments generated by construction activities.
- Temporary coffer dams upstream of pipeline crossings for diversion of Paria River flows would be used during construction. If necessary, culvert pipes would be installed at the existing slope of the streams to divert flow around the pipeline crossing work area. Stream flows would be diverted through the culvert pipes to control turbidity during construction of the pipeline crossings.
- Equipment usage and operation within temporarily dewatered reaches of stream channels would be minimized to protect stream bed substrates.
- Construction equipment working within the temporarily dewatered reaches of stream channels would be checked and regularly monitored for leaking hydraulic fluid, oil, grease, and fuel.
- All construction equipment refueling would be performed on upland areas within spill containment areas at least 1/8 mile from stream channels to prevent fuel spills from contaminating stream substrates and the dewatered stream reaches.
- Construction trenches within dewatered stream reaches would be pumped as necessary to remove subsurface water. The water would be pumped into settling basins prior to disposal.
- Dewatered construction areas would have a downstream berm to capture any sediment which may be mobilized by precipitation or disturbance during construction activities. As an alternative, silt fences would be installed across the stream channels within the dewatered construction areas downstream of the pipeline crossing excavation to capture sediments that may be mobilized by precipitation events during construction activities. The silt fence toe would be anchored into the stream bed with native material. The silt fence would be removed following completion of the pipeline crossing construction and native material used to anchor the silt fence toe would be returned to pre-construction conditions.
- Streambed substrates at the surface of dewatered stream beds would be removed, stockpiled and replaced on the stream bed as part of the construction site restoration. All disturbed area within the dewatered stream beds would be restored with natural sand, gravel, cobble, and/or boulder material to the same condition, as practical, as before construction.
- All gravel and sand materials used for pipe bedding in pipeline crossings of dewatered stream channels would be clean material free of biological materials, chemicals or other pollutants.
- Concrete placed around steel pipelines to form encasements would be cleaned prior to exposure to live stream flows.
- Pipeline encasements would be placed to a depth below the scour depth of the stream or river, determined by best engineering practice.
- Equipment operators would be trained in appropriate work methods within sensitive aquatic or wetland environments.
- Stream and river bank restoration plans would be prepared before construction begins within live stream channels and in riparian areas. Restoration plans would focus on restoring riparian vegetation and stream bed conditions to the same condition as before construction.

Construction activities may have adverse direct and indirect effects on wetland and riparian areas even with the implementation of BMPs. In these cases, additional mitigation measures, such as additional revegetation of LPP Project disturbed areas, may be necessary to offset effects and could be implemented after appropriate analysis and approval.

Monitoring would be performed during one growing season following construction to make sure riparian revegetation measures result in restoring riparian vegetation cover to stream banks disturbed during construction of pipeline crossings. If riparian revegetation objectives are not met within the first growing season following construction completion, then additional riparian restoration mitigation measures would be implemented after appropriate analysis and approval, and additional monitoring would be performed as applicable.

Operation and maintenance activities would not have any measurable or significant effects on wetlands, riparian areas, or potential jurisdictional waters; therefore, no mitigation measures are proposed.

5.3.9.4 Cumulative Effects

5.3.9.4.1 Proposed Action.

The Proposed Action could have unmeasurable cumulative effects on wetland and riparian resources when combined with past, present and reasonably foreseeable future actions involving operations of Glen Canyon Dam. These potential minor cumulative effects could occur on wetland and riparian resources in Lake Powell and the Colorado River downstream from Glen Canyon Dam.

5.3.9.4.2 Existing Highway Alternative.

The Existing Highway Alternative would have the same cumulative effects on wetlands and riparian resources as described for the Proposed Action in Section 5.3.9.4.1.

5.3.9.4.3 Southeast Corner Alternative.

The Southeast Corner Alternative would have the same cumulative effects on wetlands and riparian resources as described for the Proposed Action in Section 5.3.9.4.1.

5.3.9.4.4 No Lake Powell Water Alternative.

The No Lake Powell Water Alternative would have long-term cumulative effects on wetlands and riparian resources when combined with past, present and reasonably foreseeable future actions associated with diversions from the Virgin River. These long-term cumulative effects could be significant.

5.3.9.4.5 No Action Alternative.

The No Action Alternative would have no cumulative effects on wetlands and riparian resources.

5.3.9.5 Unavoidable Adverse Effects

5.3.9.5.1 Proposed Action.

The Proposed Action would have minimal short-term, direct and indirect, unavoidable adverse effects on riparian resources and potential jurisdictional waters resulting in temporary loss of functions. Potential adverse effects include short-term loss of vegetation, disruptions in hydrologic processes, soil disturbance and sedimentation, and effects on water quality. Unavoidable adverse effects would include short-term term loss of riparian vegetation at pipeline crossings and short-term loss of some riparian area functions. These short-term, unavoidable adverse effects would not be significant.

Operation and maintenance of the Proposed Action would have no unavoidable adverse effects on wetlands and riparian resources.

5.3.9.5.2 Existing Highway Alternative.

The Existing Highway Alternative would have the same unavoidable adverse effects on wetlands and riparian resources as described for the Proposed Action in Section 5.3.9.5.1.

5.3.9.5.3 Southeast Corner Alternative.

The Southeast Corner Alternative would have the same unavoidable adverse effects on wetlands and riparian resources as described for the Proposed Action in Section 5.3.9.5.1.

5.3.9.5.4 No Lake Powell Water Alternative.

The No Lake Powell Water Alternative could have long-term significant unavoidable, adverse, indirect effects on riparian areas along the Virgin River in the St. George metropolitan area. Eliminating residential outdoor irrigation would reduce groundwater recharge and decrease subsurface return flows to the Virgin River within the influence of local groundwater recharge. The decrease in subsurface return flows could adversely affect riparian vegetation corridors and reduce riparian area functions.

5.3.9.5.5 No Action Alternative.

The No Action Alternative could have no unavoidable, adverse, indirect effects on wetlands and riparian resources.

5.3.9.6 References

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016a. Western Mountains, Valleys & Coast 2016 Regional Wetland Plant List. The National Wetland Plant List: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X http://wetland_plants.usace.army.mil/

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016b. Arid West 2016 Regional Wetland Plant List. The National Wetland Plant List: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X http://wetland_plants.usace.army.mil/

U.S. Bureau of Land Management (BLM). 1998. Riparian Area Management TR-1737-15: A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas. U. S. Department of the Interior, BLM, National Applied Resources Center, Denver, Colorado.

Utah Division of Water Resources (UDWRe). 2016a. *Lake Powell Pipeline Project, Final Wetlands and Riparian Resources Study Report*. Prepared by MWH Americas, Inc. April 2016.

_____. 2016b. *Lake Powell Pipeline Project, Vegetation Communities Technical Report.* Prepared by MWH Americas, Inc. April 2016.

_____. 2016c. *Lake Powell Pipeline Project, Final Special Status Plant Species and Noxious Weeds Assessment Study Report*. Prepared by MWH Americas, Inc. April 2016.