DIAMOND FORK SYSTEM ENVIRONMENTAL UPDATE PROJECT

FINDING OF NO SIGNIFICANT IMPACTS

AND

FINAL ENVIRONMENTAL ASSESSMENT

CENTRAL UTAH WATER
CONSERVANCY DISTRICT

UTAH RECLAMATION
MITIGATION
AND CONSERVATION
COMMISSION

DIAMOND FORK SYSTEM ENVIRONMENTAL UPDATE PROJECT

FINAL ENVIRONMENTAL ASSESSMENT

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LIST OF ABBREVIATIONS

°C	degrees Celsius
BCT	Bonneville cutthroat trout
BMP	best management practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CUP	Central Utah Project
CUPCA	Central Utah Project Completion Act
District	Central Utah Water Conservancy District
DNR	Utah Department of Natural Resources
DWQ	Utah Division of Water Quality
DWR	Utah Division of Wildlife Resources
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
FONSI	finding of no significant impact
FS-FEIS	*Diamond Fork System Final Supplement to the Final Environmental Impact Statement*
HDPE	high-density polyethylene
Interior	U.S. Department of the Interior
ITA	Indian Trust Assets
JLAs	Joint Lead Agencies
JSRIP	June Sucker Recovery Implementation Program
Mitigation Commission	Utah Reclamation Mitigation and Conservation Commission
mg/L	milligrams per liter
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
Proposed Action	Diamond Fork System Environmental Update
Reclamation	U.S. Bureau of Reclamation
SVP	Strawberry Valley Project
SWPPP	stormwater pollution prevention plan
SWUA	Strawberry Water Users Association
UAC	Utah Administrative Code
UDFFCS	Upper Diamond Fork Flow Control Structure

µg/L	micrograms per liter
ULS	Utah Lake Drainage Basin Water Delivery System
ULT	Ute ladies'-tresses
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
USU	Utah State University
WOTUS	waters of the U.S.
WYBC	western yellow-billed cuckoo

CHAPTER 1. PURPOSE AND NEED

1.1 INTRODUCTION

The Central Utah Water Conservancy District (District), the U.S. Department of the Interior (Interior), Central Utah Project (CUP) Completion Act Office, and the Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission), as Joint Lead Agencies (JLAs), are preparing an environmental assessment (EA) for the Diamond Fork System Environmental Update (the Project) to meet the requirements of the National Environmental Policy Act (NEPA).

1.1.1 National Environmental Policy Act

This EA has been prepared in accordance with 43 Code of Federal Regulations (CFR) 46.300 and 40 CFR 1501.5 to disclose and analyze the potential impacts of updates to the Diamond Fork System of the Bonneville Unit of the CUP. The EA will assist the JLAs in complying with NEPA and in determining whether any significant impacts could result from the analyzed actions. An EA provides evidence for determining whether to prepare a finding of no significant impact (FONSI) or an environmental impact statement (EIS). If the selected alternative is determined to have no significant adverse impacts on the natural and human environment, a FONSI would be prepared and included in the decision record, which would briefly present the reasons why implementation of the selected alternative would not result in significant environmental impacts. If the decision-maker determines that the selected alternative would have non-mitigable significant impacts based on the analysis in the EA, an EIS would be prepared.

This EA analyzes the impacts of modifying the minimum stream flows in Diamond Fork and Sixth Water Creeks as established in Section 303(c) of the Central Utah Project Completion Act (CUPCA) legislation (Public Law 102-575). Should the analysis result in a determination that the flows should be changed to support and sustain functional fluvial, geomorphic, and ecological process, additional steps would then follow prior to modifying flows. The EA also analyzes a collection system for several hydrogen sulfide springs near the Upper Diamond Fork Flow Control Structure (UDFFCS) that continually corrode features of that structure. In addition, this EA analyzes the impacts of changing the inspection and maintenance schedules for parts of the Diamond Fork System: the Strawberry Tunnel and Sixth Water Flow Control Structure.

1.1.2 Joint Lead Agencies and Cooperating Agencies

The District is a political subdivision of the state created in response to the 1956 Colorado River Storage Act. It manages the Bonneville Unit of the CUP and its network of water facilities, in addition to District-owned water facilities. Under the terms of CUPCA Section 205(b) and a 1993 compliance agreement between the District and the Secretary of the Interior (Secretary), the District is considered a federal agency "for purposes of compliance with all Federal fish, wildlife, recreation, and environmental laws with respect to the use of such funds, and to comply with [CUPCA]" (District 2016). Interior is a federal entity that oversees completion of the Bonneville Unit of the CUP and administers the CUPCA program including funding, legal compliance, and environmental work. The Mitigation Commission is a federal entity that coordinates mitigation and conservation activities for the Bonneville Unit of the CUP.

In accordance with 40 CFR 1501.8, the JLAs invited the following agencies to participate in the NEPA process as cooperating agencies: the U.S. Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS)-Spanish Fork Ranger District, Utah County, the Utah Division of Water Quality (DWQ), and the Utah Division of Wildlife Resources (DWR). Reclamation, the USFS-Spanish Fork Ranger District, and DWQ accepted the invitation. A cooperating agency actively participates in the NEPA process, provides information for preparing environmental analyses for which the cooperating agency has jurisdiction by law or special expertise, and is part of the proposed project's interdisciplinary team.

1.1.3 Project Location

The Project is located within the Bonneville Unit of the CUP and involves Sixth Water and Diamond Fork Creeks, Strawberry Reservoir, Diamond Fork Canyon, Spanish Fork River, Utah Lake, Jordanelle Reservoir, Deer Creek Reservoir, and the Provo River (Figure 1.2-1).

1.2 PROJECT BACKGROUND

1.2.1 Strawberry Valley Project

The Strawberry Valley Project (SVP), completed in 1922, is a forerunner of the CUP. The principal features of the Strawberry Valley Project related to the Diamond Fork System include Strawberry Dam (replaced by Soldier Creek Dam in the mid-1980s to enlarge Strawberry Reservoir), Strawberry Reservoir, and Strawberry Tunnel. The Strawberry Dam was constructed to impound flows of the Strawberry River, a tributary of the Duchesne River (which eventually flows to the Colorado River) located to the northeast of Diamond Fork Creek, for storage in the reservoir. The Strawberry Tunnel serves as an outlet for the reservoir and historically conveyed water through the Wasatch Mountains to Sixth Water Creek for irrigation uses in the Bonneville Basin. Following completion of the SVP, the hydrology of Sixth Water and Diamond Fork Creeks changed substantially because the creeks were used to convey irrigation flows far greater and for much longer durations than natural base flows. These very high flows continued until the completion of the Diamond Fork System in 2004 when most irrigation flows were shifted out of Sixth Water Creek and Diamond Fork Creek and into the constructed conveyance system, substantially reducing the peak and duration of high flows. Since 2004, the Strawberry Tunnel has conveyed water to Sixth Water Creek to supply the CUPCA-mandated minimum flows to Sixth Water Creek and Diamond Fork Creek.

Historically, prior to when the District took over the Strawberry Tunnel, it had a limited capacity of approximately 460 cubic feet per second (cfs) and conveyed an average of 61,500 acre-feet (61,000 is the current operating agreement) from May to September each year of SVP water (pre-Diamond Fork System). The Strawberry Tunnel is 3.8 miles in length. From the tunnel outlet, the water flows into Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River to points of diversion and use in southern Utah Valley. The tunnel inlet was rehabilitated for use with the enlarged Strawberry Reservoir, a feature of the Bonneville Unit (U.S. Department of the Interior and Bureau of Reclamation 1984).

1.2.2 Central Utah Project

The CUP is a United States federal water project authorized for construction under the Colorado River Storage Project Act of April 11, 1956 (Public Law 84-485, 70 Stat. 105) as a participating project of the Colorado River Storage Project. Constructed by Reclamation and the District, the CUP is located in the central, east-central, and northeast parts of Utah and is the largest water resources development project in the state. The CUP makes use of a portion of Utah's share of the Colorado River yield, as set out in the Colorado River Compact of 1922. Water developed by the CUP is used for municipal, industrial, and agricultural supplies; hydroelectric power generation; fish and wildlife; and recreation needs. The CUP also improves flood control capability and helps to control water quality. The CUP was originally divided into six units to facilitate planning and construction: Vernal, Bonneville, Jensen, Upalco, Uinta, and Ute Indian. The Upalco, Uinta, and Ute Indian units were subsequently deauthorized. The Vernal and Jensen units are completed.

1.2.2.1 Bonneville Unit

The Bonneville Unit, the largest unit of the CUP, involves water storage and conveyance features in portions of Salt Lake, Utah, Wasatch, Summit, and Duchesne Counties, and uses trans-basin water diversions for irrigation, municipal and industrial uses, maintenance of aquatic habitats, and recreation purposes, as well as flood control. The Bonneville Unit has six component systems: Starvation Collection System, Strawberry Aqueduct and Collection System, Diamond Fork System, Utah Lake Drainage Basin Water Delivery System (ULS), Municipal and Industrial System, and the Wasatch County Water Efficiency/Daniel Replacement Project. These systems consist of a large network of reservoirs, aqueducts, tunnels and canals, pipelines, pumping plants (Wasatch County Water Efficiency/Daniel Replacement Project only), conveyance facilities, and hydroelectric power plants (Interior n.d. [2020]; Mitigation Commission n.d. [2020]) (see Figure 1.2-1).

Utah Lake is an important component of the Utah Lake/Jordanelle Reservoir exchange. To make the Bonneville Unit work, there must be an exchange of water between Strawberry and Jordanelle Reservoirs with Utah Lake as the centerpiece of that exchange. Jordanelle Reservoir stores Provo River water that historically flowed into Utah Lake. Utah Lake water originating from the Provo River is replaced by Bonneville Unit return flows to the lake, water rights previously acquired by the District in Utah Lake, direct releases of water from Strawberry Reservoir to Utah Lake, and flows that are surplus to Utah Lake rights. The exchange water is stored in Jordanelle Reservoir for municipal and industrial and irrigation deliveries to Salt Lake County, Wasatch County, and northern Utah County under existing contracts.

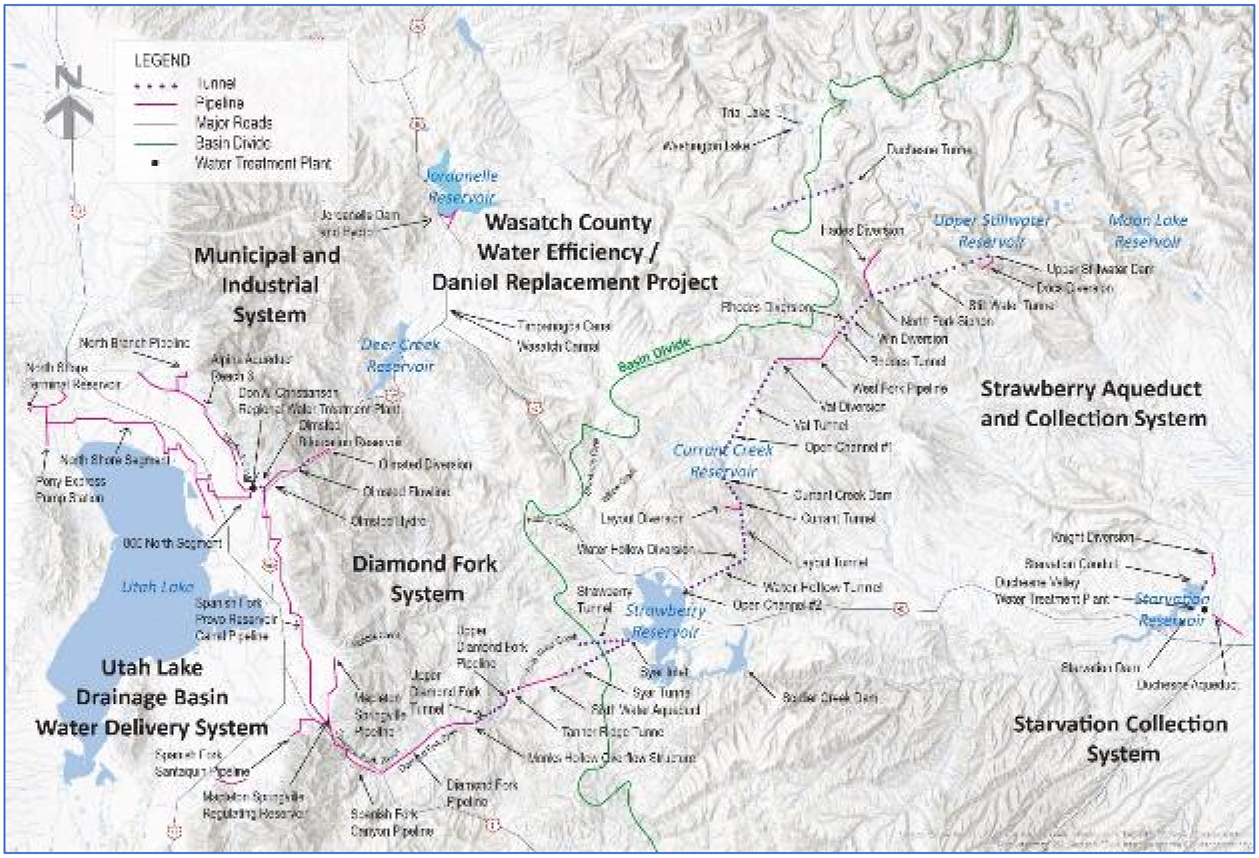

Figure 1.2-1. Bonneville Unit of the Central Utah Project.

1.2.2.2 Diamond Fork System

The Diamond Fork System of the Bonneville Unit (Figure 1.2-2) conveys Colorado River basin water collected by the Strawberry Aqueduct and Collection System, which delivers into Strawberry Reservoir, to the Wasatch Front through a system of underground pipelines, tunnels, and siphons. The Diamond Fork System, completed in 2004, descends approximately 2,600 feet from the reservoir through the Wasatch Range. It consists of the Syar Inlet, Syar Tunnel, Sixth Water Aqueduct, Diamond Fork Pipeline, Strawberry Tunnel, and other features.

Upon completion of the Diamond Fork System and the passage of CUPCA, initial releases were made from the Strawberry Tunnel and Sixth Water Flow Control Structure to help maintain minimum instream flows in Sixth Water and Diamond Fork Creeks that were reduced from previous Strawberry Valley Project levels.

Water from Strawberry Reservoir moves through the Syar Inlet into the Syar Tunnel, enters the Sixth Water Aqueduct, and flows through the Sixth Water Flow Control Structure where water can be released for instream flows (Figures 1.2-2 and 1.2-3). It then enters the Tanner Ridge Tunnel, Upper Diamond Fork Pipeline, and UDFFCS, where it is released into the Upper Diamond Fork Tunnel to the Monks Hollow Overflow Structure and Diamond Fork Pipeline. The Monks Hollow Overflow Structure provides releases of water to Diamond Fork Creek during irrigation season as needed to assist minimum instream flows. The start of irrigation season changes from year to year depending on the hydrologic conditions of the Diamond Fork drainage basin. It has started as early as mid-April and as late as mid-

June. Generally, the irrigation season runs through the end of September. Farther downstream at the confluence of Diamond Fork Creek and the Spanish Fork River, the Spanish Fork Flow Control Structure (part of the ULS) delivers water for the SVP[1] to the Spanish Fork River to be diverted by SVP facilities for its customers and for CUP deliveries to Utah Lake for the Utah Lake/Jordanelle Reservoir exchange, and for ULS water per the *Supplement to the 1998 Definite Plan Report for the Bonneville Unit* (District 2004b). Bonneville Unit water continues down the Spanish Fork Canyon Pipeline and into the Spanish Fork Canyon-Provo Reservoir Canal Pipeline, Spanish Fork Canyon-Santaquin Pipeline (under construction), and/or the Mapleton-Springville Lateral Pipeline, which are part of the ULS. In addition, Bonneville Unit temporary agricultural water is delivered to South Utah County.

Another part of the Diamond Fork System is the Strawberry Tunnel, which was the original conveyance method for the trans-basin delivery from Strawberry Reservoir. Water diverted into the Strawberry Tunnel conveys the minimum instream flows to Sixth Water Creek and can deliver water for Bonneville Unit and/or SVP purposes under emergency conditions. When the Syar Tunnel West Gate is closed and the Sixth Water Aqueduct is not in operation, the Strawberry Tunnel turnout can be used to convey up to 200 cubic feet per second (cfs). The turnout was completed in June 1998 and connects the Strawberry Tunnel with the Syar Tunnel. When the Syar Tunnel Inlet Gate is closed and Syar Tunnel is dewatered (downstream of the Syar Inlet structure), a 20-inch bypass pipe, which also connects Syar Tunnel to the Strawberry Tunnel, can be used to deliver approximately 20 cfs. Depending on the water year, the Strawberry Tunnel also produces approximately 2 to 7 cfs of accretion water (known as tunnel make) that discharges into Sixth Water Creek. Dissolved selenium in water quality samples of the Strawberry Tunnel accretion flows collected in 2000 and 2009 during tunnel shutdown varied between 18.7 and 24.1 µg/L (micrograms per liter), concentrations that exceed the Utah acute 1-hour aquatic life numeric criteria (Utah Administrative Code [UAC] R317-2-14) (Wilcock et al. 2019).

Both the Strawberry Tunnel and Sixth Water Flow Control Structure discharge into Sixth Water Creek and require that the upper reach of Syar Tunnel be in operation. As discussed, minimum instream flow deliveries can be made through the

- Strawberry Tunnel (tunnel accretion + supplemental water), and
- Sixth Water Flow Control Structure (which historically has caused damage to the sleeve valves during times of low-flow deliveries).

To inspect and conduct maintenance activities in the upper reach of Syar Tunnel and its associated appurtenances (between the inlet screens located beneath the Strawberry Reservoir water surface) to the Syar Inlet Structure (located about 600 feet east from the shore of Strawberry Reservoir) requires that the entire Diamond Fork System, including Strawberry Tunnel, be completely dewatered. For this reason, the upper reach of the Syar Tunnel has not been inspected since it went into operation in 1996. Based on the age of the facility and the environmental conditions under which it operates there is a need to perform inspection and possibly extensive maintenance activities. The original outlet for Strawberry Reservoir was the Strawberry Tunnel, which moved water from the reservoir through the Wasatch Divide to Sixth Water and Diamond Fork Creeks and on to the Spanish Fork River. Construction of the Strawberry Tunnel began in 1906 and was completed in 1912. The concrete-lined tunnel is 7 feet

[1] The original SVP included a smaller Strawberry Reservoir and the Strawberry Tunnel, constructed from 1906 to 1913, to bring water from the Strawberry River, Indian Creek, and other smaller tributaries to Utah County. The enlarged Strawberry Reservoir and the Strawberry Tunnel are now CUP features (Strawberry Water Users Association [SWUA] 2020). Water is delivered for SVP water users from CUP facilities under a 1991 Strawberry Reservoir Operating Agreement.

wide and 9 feet high. As originally constructed, it had a design capacity of 600 cfs. By the time the District assumed control of the Strawberry Tunnel, it had a limited capacity of approximately 460 cfs. The west portal portion of the tunnel is timber-lined for approximately 4,000 linear feet. The tunnel has received very little maintenance over the last 100 years. The concrete ceiling and floor are cracking and failing in places. Work in the tunnel is challenging due to the constant 20 cfs or more of water being released for instream flow deliveries and the additional tunnel accretion. Access to the tunnel in the winter is not possible.

The District plans to formulate preliminary designs for potential repairs for these portions of the Diamond Fork System. At this time there is not enough information on how repairs would take place, the time frame involved, or the potential impacts; therefore, the inspection and maintenance activities associated with the complete dewatering of the Diamond Fork System are not addressed and evaluated as part of this NEPA effort. The JLAs will coordinate with interested parties, stakeholders, and agencies prior to inspection and maintenance activities that would require the complete dewatering of the Diamond Fork System and when the minimum instream flows could not be provided through the system. Additional NEPA compliance would be completed at that time.

The *Supplement to the 1998 Definite Plan Report for the Bonneville Unit* (District 2004b) predicted that at full demand/build-out, the Diamond Fork System would convey an annual average of 162,900 acre-feet of water from Strawberry Reservoir: 101,900 acre-feet of water for Bonneville Unit municipal and industrial use and agricultural uses in Wasatch County and 61,000 acre-feet of irrigation water for SVP water users. As documented in the ULS EIS and only when required under a water right exchange, the Diamond Fork System can convey an average of 40,310 acre-feet of trans-basin water for the Utah Lake/Jordanelle Reservoir exchange as part of the Municipal and Industrial System (District 2004a). The delivery of Strawberry Reservoir water to Diamond Fork and Sixth Water Creeks is for SVP irrigation deliveries as described above and compliance with CUPCA-mandated minimum instream flow requirements, flow-related ecosystem management, and improvement of water quality.

Delivery of water to maintain minimum flows in Sixth Water and Diamond Fork Creek would receive first priority and would govern release of water to the creek. The remainder of the water needed for SVP irrigation demand and municipal and industrial uses (south Utah County and Salt Lake County as described in the ULS EIS) would flow through the Diamond Fork Pipeline until it is operating at a maximum capacity of 560 cfs. When maximum capacity of the pipeline is reached, water being delivered to SVP water users would be released to Diamond Fork Creek at the Monks Hollow Overflow Structure. The average release to the creek would have a maximum of 100 cfs under normal operations. To date, the system has not been under full demand and the maximum release of 100 cfs has not been needed. This released water would flow through Diamond Fork Creek to the Spanish Fork River (District 1999).

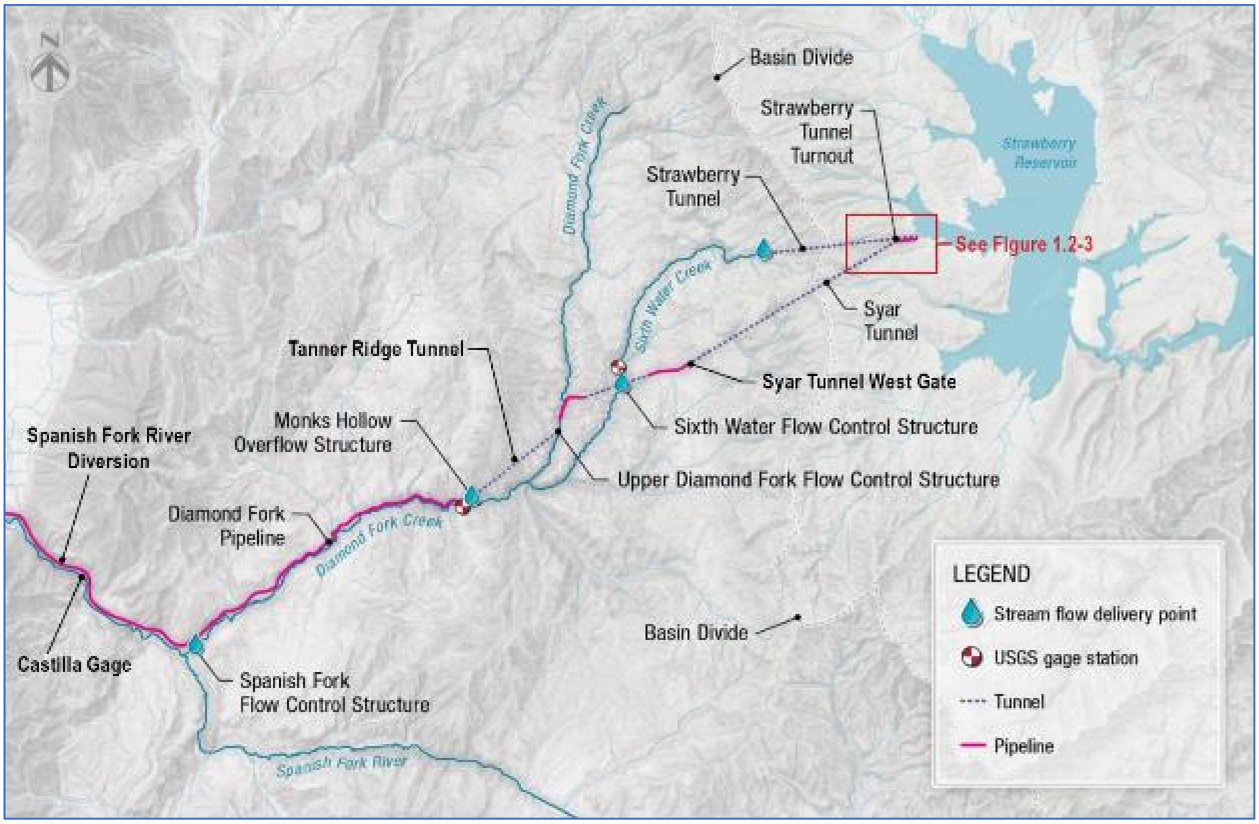

Figure 1.2-2. Diamond Fork System of the Bonneville Unit of the Central Utah Project.

1.2.3 Applicable National Environmental Policy Act Documentation

The following environmental and planning documents for the Diamond Fork System were taken into consideration during the development of this EA:

- Diamond Fork Power System Final Environmental Impact Statement (Reclamation 1984)
- Diamond Fork System Final Supplement to the Final Environmental Impact Statement (Reclamation 1990)
- Diamond Fork System Final Supplement to the Final Environmental Impact Statement (FS-FEIS) (District 1999)
- Final Environmental Assessment for the Diamond Fork System Proposed Action Modifications (District 2000)
- Diamond Fork System 2002 Final Environmental Assessment for the Proposed Action Modifications (District 2002)
- Supplement to the Bonneville Unit Definite Plan Report (District 2004b)
- Utah Lake Drainage Basin Water Delivery System Final Environmental Impact Statement (District 2004a)
- Temporary Change to Winter In-stream Flows in Diamond Fork Creek Categorical Exclusion (District 2011)
- Winter Instream Flows and Flow Studies Categorical Exclusion Checklist (District 2015)

1.2.3.1 Diamond Fork System Final Supplement to the Final Environmental Impact Statement

Section 1.4.2.2 of the Diamond Fork System FS-FEIS (District 1999) described inspection and maintenance processes for the Diamond Fork System components along with timing and duration. Inspection and maintenance operations involve shutdown of all or parts of the Diamond Fork System for short periods of time. Section 1.9.3.2 *Syar Tunnel Guard Gate*[2] *and Cross-Connection Modifications* of the Diamond Fork System FS-FEIS states that Interior "is planning to install a guard gate at the Syar Tunnel outlet. The Syar Tunnel West Gate would allow full charging of the Syar Tunnel to back water up into the Strawberry Tunnel to maintain minimum instream flows when the Sixth Water Aqueduct needs to be inspected and maintained" (District 1999). In addition, the Diamond Fork System FS-FEIS documents that the Strawberry Tunnel Bypass Pipeline would be constructed and could provide another means for delivery of instream flows (District 1999). Interior completed NEPA for the Syar Tunnel West Gate and the Strawberry Tunnel Bypass Pipeline in 1999.

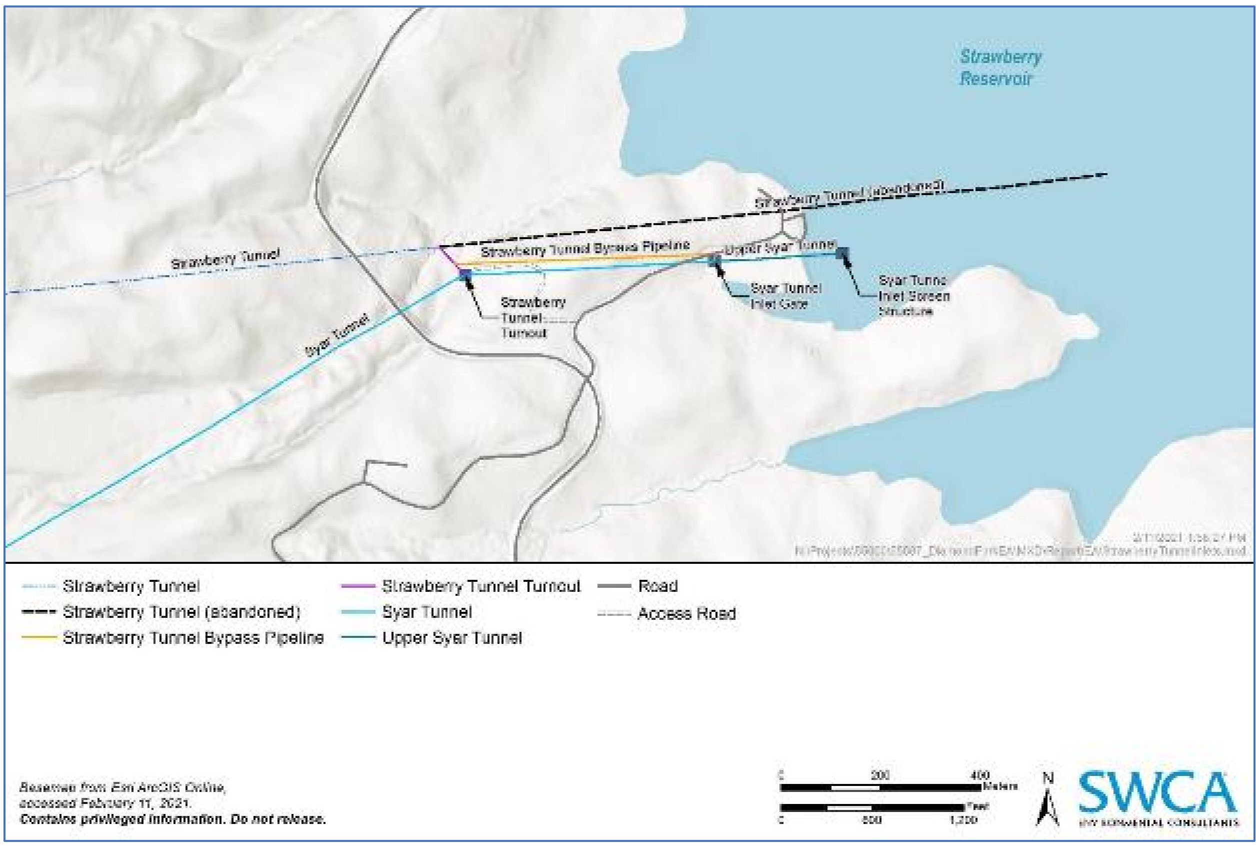

Figure 1.2-3. Upper portion of the Diamond Fork System.

The addition of the Syar Tunnel West Gate (see Figure 1.2-2) and the Strawberry Tunnel Bypass Pipeline (see Figure 1.2-3) allows the Diamond Fork System to deliver instream flows for Sixth Water and Diamond Fork Creeks from the Strawberry Tunnel during inspection and maintenance activities (except inspection and maintenance activities for the Strawberry Tunnel and the portion of the Syar Tunnel above the Syar Tunnel Inlet Gate) (see Figure 1.2-3). Therefore, the inspection and maintenance

[2] The Syar Tunnel outlet gate, as described in the Diamond Fork System FS-FEIS (District 1999), is now called the Syar Tunnel West Gate.

schedule actions, timing, and duration constraints, as outlined in Section 1.4.2.2 of the 1999 Diamond Fork System FS-FEIS (District 1999), are no longer applicable.

Prior to dewatering the Strawberry Tunnel and the portion of the Syar Tunnel upstream of the Syar Tunnel Inlet Gate for maintenance activities, the JLAs would coordinate with interested parties, stakeholders, and agencies regarding the need for shutdown, and the timing and duration of the disruption to instream flows. For maintenance activities, the appropriate level of NEPA documentation would be completed.

1.3 PROPOSED ACTION

The Proposed Action, as developed by the JLAs, would consist of the following three elements:

- Adjust instream flow deliveries to Sixth Water and Diamond Fork Creeks to better support and sustain functional fluvial, geomorphic, and ecological processes
- Prevent the continuous corrosion of the UDFFCS from nearby hydrogen sulfide springs
- Conduct annual inspections, and maintenance as needed, on the Strawberry Tunnel and the valving, flow meter, and appurtenances inside the Strawberry Tunnel Turnout and conduct annual inspections and maintenance of the Sixth Water Flow Control Structure.

1.4 PURPOSE AND NEED

1.4.1 Need

The need for the Proposed Action is to modify instream flow deliveries in Sixth Water and Diamond Fork Creeks to improve ecosystem conditions; address negative impacts on the UDFFCS from nearby hydrogen sulfide springs; and provide the flexibility to inspect annually and perform maintenance activities when necessary to preserve the structural integrity and features of Strawberry Tunnel and the valving, flow meter, and other appurtenances housed in the Strawberry Tunnel Turnout and the Sixth Water Flow Control Structure.

The need for each of the elements of the Proposed Action is described in more detail below, followed by the purposes of the Proposed Action.

1.4.1.1 Need for Adjustment of Instream Flow Deliveries

Section 303(c) of CUPCA mandates that minimum stream flows be provided continuously and in perpetuity in certain sections of Sixth Water and Diamond Fork Creeks. However, those flows were based upon a precondition that involved the construction of Monks Hollow Dam and Reservoir. Although Monks Hollow Dam was not constructed, the JLAs operated the Diamond Fork System to provide minimum stream flows as described in Section 303(c) of CUPCA. Even though these legislated flows are no longer applicable as a statutory requirement, these flows are referred to as CUPCA-mandated instream flows and are required as per previous NEPA documents. The minimum Sixth Water and Diamond Fork Creeks instream flows as per Section 303(c) of CUPCA, are as follows:

- Sixth Water Creek, 32 cfs summer (May–October) and 25 cfs winter (November–April)
- Diamond Fork Creek, 80 cfs summer (May–September) and 60 cfs winter (October–April)

The minimum instream flows to Sixth Water Creek are delivered through the Strawberry Tunnel. The supplemental water added to meet minimum instream flows to Diamond Fork Creek has been delivered through the sleeve valves at the Sixth Water Flow Control Structure; however, the low flow rate of supplemental flows required to meet winter minimum instream flows have damaged the valves, which were not designed for low-flow deliveries. As a result, winter minimum instream flows for both Sixth Water and Diamond Fork Creeks are met through deliveries from the Strawberry Tunnel and from natural flows (see Figure 1.2-2). Because Diamond Fork Creek's winter minimum flow requirement (60 cfs) is much higher than Sixth Water Creek's winter minimum flow requirement (25 cfs), and flows are being released from the Strawberry Tunnel, winter flows in Upper Sixth Water Creek are much higher than originally planned.

Ecological monitoring of the ecosystem conducted by the Mitigation Commission between 2005 and 2012 raised concerns that the CUPCA-mandated minimum flows are too high to promote healthy ecological conditions in both Diamond Fork and Sixth Water Creeks. Subsequent research by Utah State University (USU) from 2015 to 2019 investigated the hydrology, geomorphology, and ecology of Sixth Water and Diamond Fork Creeks and recommended lowering base flows to improve general ecosystem conditions, to improve the recreational and native trout fishery, and to maintain a "mid-size" fishing experience that is rare along the Wasatch Front (Wilcock et al. 2019).

1.4.1.2 Need for Prevention of Hydrogen Sulfide Springs Corrosion

During construction of the Upper Diamond Fork Tunnel in 2002, a fault zone that contained groundwater with high concentrations of hydrogen sulfide was intercepted. The interception of the fault and subsequent efforts to plug the interception caused the groundwater to resurface and produce new hydrogen sulfide springs near the UDFFCS. As a result, the hydrogen sulfide gas emitted from these springs is corroding electronics and other infrastructure at the UDFFCS.

1.4.1.3 Need for Changes to Inspections and Maintenance of the Strawberry Tunnel and the Sixth Water Flow Control Structure

Construction of the Strawberry Tunnel and the Strawberry Tunnel Turnout, which connects Syar Tunnel to Strawberry Tunnel, was completed in 1912 and 1998, respectively. The Strawberry Tunnel Turnout contains valving (e.g., plunger valve and butterfly valve), a flow meter, and other appurtenances. It is the discharge location for the Strawberry Tunnel Bypass Pipeline. Section 1.4.2.2.4 of the Diamond Fork System FS-FEIS discusses the inspection and maintenance of the valving within the Strawberry Tunnel Turnout (District 1999). It states that the valving and tunnel should receive "periodic maintenance every 5-7 years (period to be determined by [the District]). The clamshell valve would be closed and Strawberry Tunnel would be dewatered to allow maintenance crews to move equipment through the tunnel to the valve. This maintenance shutdown would occur following the irrigation season; minimum stream flow requirements in Sixth Water Creek above Sixth Water Aqueduct would not be met during this two-day period" (District 1999:1–38). The JLAs have determined that the Strawberry Tunnel and the appurtenances within the Strawberry Tunnel Turnout should be inspected annually. If it is determined during the annual inspection that maintenance is needed to protect the integrity of the operation of the tunnel, the tunnel may be shut down for up to 5 days for repairs. The Strawberry Tunnel is more than 100 years old and has been in operation since 1912. The Strawberry Tunnel Turnout is a corrosive, wet environment that is harsh on the exposed metals and concrete. It is anticipated that in the future, a long-term solution for preservation of the operation of the tunnel is needed.

In addition, the Sixth Water Flow Control Structure has had a series of maintenance issues that have required repairs that have resulted in the need for annual inspection and maintenance based on current and likely future operations.

1.4.2 Purpose

The purposes of the Proposed Action are as follows:

- Adjust instream flow deliveries to Sixth Water and Diamond Fork Creeks to better support and sustain functional fluvial, geomorphic, and ecological processes
- Prevent the continuous expense of ongoing replacement of aspects of the Upper Diamond Fork facility due to corrosion from the nearby hydrogen sulfide springs
- Conduct an annual inspection, and maintenance as needed, of the Strawberry Tunnel and the valving, flow meter, and other appurtenances inside the Strawberry Tunnel Turnout, and conduct annual inspections and maintenance of the Sixth Water Flow Control Structure

1.5 PERMITS, CONTRACTS, AND AUTHORIZATIONS

Implementation of the selected alternative would comply with all federal, state, and local regulations. Prior to ground disturbance for construction of the hydrogen sulfide collection pipeline, the contractor would be required to obtain a Utah Pollution Discharge Elimination System Permit and follow a stormwater pollution prevention plan. In addition, if wetlands or waters of the U.S. (WOTUS) are impacted, a Section 404 permit of the Clean Water Act (CWA) would be obtained by the District. Since the proposed instream flows would no longer be considered a legislatively required release from the yield of Strawberry Reservoir, an agreement among the JLAs, USFWS, and DWR would be executed prior to changes to address the instream flows being released by the District.

CHAPTER 2. ALTERNATIVES

2.1 INTRODUCTION

NEPA requires federal agencies to evaluate a reasonable range of alternatives for a proposed action when it involves unresolved conflicts concerning alternative uses of available resources. The range of alternatives must meet the purpose and need while addressing environmental effects or conflicts. Reasonable alternatives are defined by the Council on Environmental Quality's (CEQ's) regulations implementing NEPA as those that are technically and economically feasible. NEPA also requires that a no action alternative be evaluated as a baseline for comparing the other analyzed alternatives.

Alternatives are developed to address issues or concerns raised during internal and public scoping. If an alternative is suggested that does not meet the need for the project, does not provide benefits over an alternative already being considered, or is not economically or technically feasible, a detailed analysis of that alternative is not required. However, a rationale for eliminating the alternative from detailed analysis must be provided. The alternatives development and evaluation process for this Project are described in Section 2.2.

This EA analyzes the potential effects of implementing the Proposed Action, which consists of the following:

- Adjust instream flow deliveries to Sixth Water and Diamond Fork Creeks to better support and sustain functional fluvial, geomorphic, and ecological processes
- Prevent the continuous corrosion of the UDFFCS from nearby hydrogen sulfide springs
- Conduct annual inspections, and maintenance as needed, on the Strawberry Tunnel and the valving, flow meter, and appurtenances inside the Strawberry Tunnel Turnout and the Sixth Water Flow Control Structure

In addition, this EA will analyze the No Action Alternative to provide a baseline against which to compare the impacts of the Proposed Action.

2.2 DEVELOPMENT OF ALTERNATIVES

2.2.1 National Environmental Policy Act Scoping

According to the District's *Handbook for the National Environmental Policy Act*, "Scoping is the early and open process for determining the issues to be addressed and for identifying significant issues related to a proposed action" (District 2016). Although public scoping is not required for an EA, the JLAs decided to conduct scoping for this Project because of the complexity of the Proposed Action and the heavy public use of Diamond Fork Canyon. The JLAs will use the EA process to satisfy disclosure requirements as means for public participation mandated by NEPA and CUPCA.

The scoping process was open to agencies, tribes, and the public to help identify the range of issues to be addressed during the EA process. Project information was made available on a website hosted by the District. It contained technical documents and a scoping document explaining the Proposed Action and alternatives. In addition, the JLAs held internal scoping meetings to discuss potential resource issues.

Prior to this NEPA process, the JLAs had already developed a contact list of interested parties and stakeholders for the Diamond Fork System and have been meeting periodically with the stakeholders since 2011. The interested parties and stakeholders were engaged to participate in the scoping process for this EA. A scoping stakeholder meeting in the form of a webinar was held on April 2, 2020 (this meeting was held as a webinar rather than an in-person meeting because of Coronavirus Disease [COVID-19] health concerns). The webinar included presentations on Project background and the Proposed Action elements, including instream flow alternatives. It also included multiple question-and-answer periods and provided information on how to comment.

Public scoping comments were accepted from March 22 to April 24, 2020. Scoping comments were received from the DWR, DWQ, Reclamation, U.S. Environmental Protection Agency (EPA), the Navajo Nation, the Hopi Tribe, Strawberry Water Users Association (SWUA), Trout Unlimited, and a member of the general public. In addition, the Northern Arapaho Tribe sent a letter dated February 17, 2021, stating that the tribe has no comments on the Project. Comments submitted addressed topics such as fisheries, water quality, sediment transport, irrigation water, wildlife, cumulative impacts, stormwater permitting, air quality, and mitigation measures. A scoping report was compiled to summarize the scoping process and identify the substantive issues (Appendix A).

2.2.2 Joint Lead Agencies Alternatives Development Workshop

The JLAs held an alternatives development workshop on January 29, 2020, to determine if alternatives for the Proposed Action were feasible, reasonable, and necessary to address resource impacts or conflicts. The workshop used a collaborative process that incorporated information from previous technical studies and past public outreach to identify issues and concerns with the elements of the Proposed Action. Alternatives were then developed to address the issues and concerns and evaluated for feasibility and reasonableness. Decisions were made to retain or dismiss particular alternatives. The workshop was also used to identify design features or conservation measures to avoid, minimize, or reduce Project impacts.

The workshop resulted in the development of instream flow alternatives as part of the Proposed Action (described in Section 2.3.2). The recommendations of the workshop were revisited following the scoping period that ended on April 24, 2020.

2.3 ALTERNATIVES

The Proposed Action consists of an adjustment to instream flows, correcting hydrogen sulfide springs that are damaging the UDFFCS, and an adjustment to the inspection and maintenance schedule. The instream flow component has two alternatives.

2.3.1 No Action Alternative

2.3.1.1 Instream Flow

Under the No Action Alternative, the Diamond Fork System would continue to operate under the minimum instream flows mandated in 1992 by Public Law 102-575, Title III, Section 303 and are presented in Table 2.3-1 and Figure 2.3-1.

In winter, as defined by CUPCA legislation shown in Table 2.3-1 (non-irrigation season), water needed to meet mandated minimum flows on both Diamond Fork and Sixth Water Creeks is delivered through the Strawberry Tunnel only. This means that approximately 50 cfs needs to be released through Strawberry Tunnel to meet the 60 cfs winter minimum on Diamond Fork Creek. Winter minimum flow deliveries cannot be made via the Sixth Water Flow Control Structure until the new high-pressure control valves, currently under construction, are installed and operational. These new valves will be able to safely handle the high pressures needed to deliver the relatively small quantities of water for instream flows. Currently, the Sixth Water Flow Control Structure sleeve valves cannot safely deliver small quantities of water unless the Diamond Fork System is delivering 70 cfs or more to water users. Construction of the new Sixth Water Flow Control Structure high-pressure valves is anticipated to be complete by the spring of 2022. Once the high-pressure valves are installed and operational, water needed to meet the mandated winter Diamond Fork minimum flows will be typically delivered through Sixth Water Flow Control Structure. However, when the Sixth Water Flow Control Structure is shut down for maintenance, water needed to meet mandated 60 cfs wintertime Diamond Fork flow would need to be delivered through the Strawberry Tunnel only. The analysis of the No Action Alternative in this EA assumes that the high-pressure control valves have been installed and are operational.

In summer, as defined by CUPCA legislation shown in Table 2.3-1 (irrigation season), under the No Action Alternative, when the Diamond Fork System is delivering a minimum of 70 cfs, mandated minimum flows are delivered through the Strawberry Tunnel for Sixth Water Creek and through the Sixth Water Flow Control Structure and Monks Hollow Overflow Structure for Diamond Fork Creek along with natural stream flows.

Table 2.3-1. Mandated Minimum Instream Flows – No Action Alternative

Stream	Mandated Minimum Instream Flows (cfs)	
	Winter	Summer
Sixth Water Creek	25 (November–April)	32 (May–October)
Diamond Fork Creek	60 (October–April)	80 (May–September)

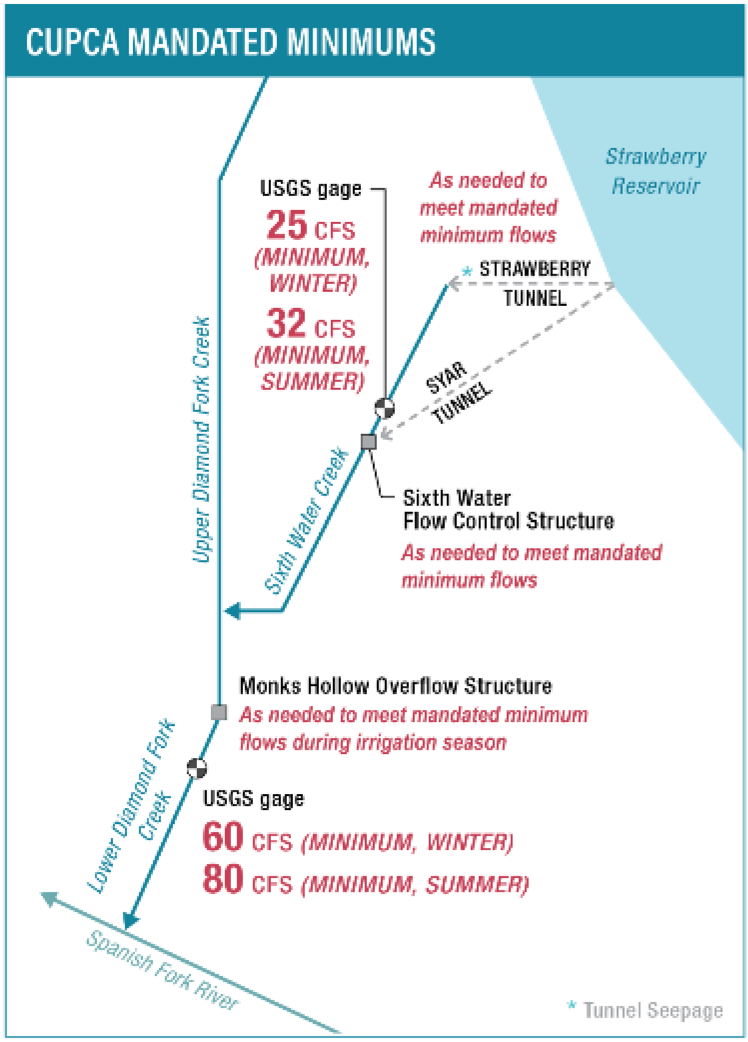

Figure 2.3-1. Instream flow under the No Action Alternative.

2.3.1.2 Hydrogen Sulfide Springs

Under the No Action Alternative, hydrogen sulfide gases emitted from springs near the UDFFCS would continue to corrode electronics, metals, and other materials at the structure. Corroded items would need to be replaced on a regular basis.

2.3.1.3 Inspection and Maintenance

In addition, under the No Action Alternative, the inspection interval of the Strawberry Tunnel and the Strawberry Tunnel Turnout would continue every 5 to 7 years as described in the Diamond Fork System FS-FEIS (District 1999). Without more frequent inspections and maintenance of the Strawberry Tunnel, conditions would likely continue to degrade and, at some point, use of the Strawberry Tunnel for instream flow deliveries may not be possible. This could also have an impact on selenium levels in Sixth Water Creek.

2.3.2 Proposed Action Alternative

2.3.2.1 Instream Flow Alternatives

From 2015 to 2019, the JLAs conducted a study with USU to evaluate the instream flows of Sixth Water and Diamond Fork Creeks and to identify flow regimes that would improve their ecological function. The study included elements such as stream hydrology, geomorphology, and ecology, as well as an evaluation of selenium concentrations (from tunnel make) in water samples and invertebrate and fish tissue samples. The study findings are presented in *Comprehensive Study and Recommendations for Instream Flow Requirements on Sixth Water Creek and Diamond Fork River* (Wilcock et al. 2019). These findings are the basis for the proposed changes to minimum instream flows.

The findings of the USU study indicated that lower baseflows in both Sixth Water and Diamond Fork Creeks would be beneficial for sediment transport and stream geomorphology, benthic macroinvertebrates, fish ecology, and ecosystem health. The study also determined that a minimum release of 20 cfs from Strawberry Reservoir into the tunnel is necessary to dilute naturally occurring selenium concentrations from Strawberry Tunnel (tunnel make) to levels below Utah's numeric criteria for aquatic life.

Two minimum instream flow alternatives were developed for the instream flow component of the Proposed Action. The instream flow alternatives modify minimum instream flows for Sixth Water and Diamond Fork Creeks from the 1992 mandated flows and aim to improve ecological conditions in Sixth Water and Diamond Fork Creeks. Both instream flow alternatives recommend a reduced flow rate in Diamond Fork Creek; both would provide sufficient flow deliveries through Strawberry Tunnel to ensure that selenium levels in upper Sixth Water Creek remain compliant with the Utah water quality standard during typical operations. The instream flow alternatives would not change the amount of water being diverted into Strawberry Reservoir.

2.3.2.1.1 DISTRIBUTION OF INSTREAM FLOW WATER (COMMON TO THE INSTREAM FLOW ALTERNATIVES)

The Diamond Fork Creek non-irrigation season flow water (accounted from October 16 through April 15) is comprised of natural system gains and instream flow deliveries from Strawberry Reservoir through the Strawberry Tunnel and the Sixth Water Flow Control Structure. The water delivered from Strawberry Reservoir flows down Diamond Fork Creek to the Spanish Fork River and on to Utah Lake where it is credited as Utah Lake/Jordanelle Reservoir exchange (further discussed in Section 3.4.2.6). Both instream flow alternatives would result in a smaller volume of water being delivered to the Diamond Fork drainage from Strawberry Reservoir during the non-irrigation season in comparison to CUPCA-mandated flows (No Action Alternative). The JLAs propose to redistribute the volume difference between the higher winter CUPCA-mandated flow rate in Diamond Fork Creek (60 cfs) and the lower Proposed Action instream flow alternatives for instream flow and environmental uses in the Provo River. The modeled flow rates for the two instream flow alternatives measured at the Diamond Fork Creek U.S. Geological Survey (USGS) gage and the anticipated difference from the CUPCA-mandated flows are shown in Table 2.3-2.

Table 2.3-2. Modeled Flow Rate Ranges (25th–75th percentiles) for the Proposed Action's Instream Flow Alternatives and Difference from CUPCA Mandated Flows

Instream Flow Alternative	Anticipated Non-Irrigation Season Flow Rate (cfs) at Diamond Fork USGS Gage	Anticipated Difference between CUPCA Mandated Flows (60 cfs) and Instream Flow Alternatives (cfs)
Alternative 1	33–41	19–27
Alternative 2	41–46	14–19

The District would generally account for the redistributed water as follows:

- The volume difference between CUPCA-mandated flows and the Proposed Action would be calculated on an average daily basis, as measured by the District at the Diamond Fork Creek USGS gage.
- The volume difference would accrue in an account between October 16 and April 15 (the non-irrigation season, as defined above). There may be days when the non-irrigation season flow rate in Diamond Fork Creek would be greater than the CUPCA-mandated 60 cfs. In this case, no additional water would accrue in the account.
- The volume difference for redistribution to the Provo River would be available from either CUP storage in Jordanelle, Deer Creek, or Strawberry Reservoirs, as determined by the District.
- The redistributed instream flow water accrued under this account must be used prior to October 15 of the year during which the water accrued (i.e., from October 16 through April 15 of that operational year).

Anticipated Instream Flow Volumes and Delivery

Based on preliminary calculations, as determined by the accounting described above, the JLAs anticipate approximately 5,300 to 6,500 acre-feet annually of redistributed instream flow water for use in the Provo River. The volume of water available for redistribution to the Provo River depends upon the instream flow alternative selected and the hydrology of the previous year that occurs naturally in the Diamond Fork watershed. The redistributed instream flow water would be in addition to other permanent and temporary water supplies acquired for the federally listed, threatened June sucker and instream flow purposes on the Provo River (further discussed in Section 3.4.2.4). In the spring of each year, the District would inform the June Sucker Recovery Implementation Program (JSRIP) of the redistributed instream flow volume of water accrued in Strawberry Reservoir for that year and the facility(ies) from which the water would be delivered to the lower Provo River. The JSRIP would factor that amount into its decision regarding that year's recommended flow regime.

At the discretion of the District, the delivery of the redistributed instream flow water from Strawberry Reservoir to the Provo River could occur through several paths. First, the United States has a dedicated space of 35 cfs capacity in the Spanish Fork Provo Reservoir Canal Pipeline, which would be delivered through the Olmsted Hydroelectric Power Plant, located at the mouth of Provo Canyon, and discharged to its tail race, which flows directly into the Provo River. In addition, the United States, in consultation with the District, could use available space in the Spanish Fork Provo Reservoir Canal Pipeline above its dedicated 35 cfs capacity. Second, at the District's discretion, deliveries of all or a portion of the accrued redistributed instream flow volume to the Provo River could be made from either Jordanelle or Deer

Creek Reservoirs instead of using the Spanish Fork Provo Reservoir Canal Pipeline. This delivery of water would be from

- Deer Creek Reservoir, down the length of the Provo River to Utah Lake, or from
- Deer Creek Reservoir to the Olmsted Diversion, where it would be diverted into the Olmsted Pipeline and then be released to the Provo River at the Olmsted Hydroelectric Power Plant tail race.

The non-irrigation season instream flow waters in Sixth Water and Diamond Fork Creeks are credited in Utah Lake as part of the Utah Lake/Jordanelle Reservoir exchange (see Section 3.4.2.6). However, redistributed instream flow water released from Jordanelle or Deer Creek Reservoirs to the Provo River instead of Strawberry Reservoir would not be counted as part of the Utah Lake/Jordanelle Reservoir exchange.

2.3.2.1.2 INSTREAM FLOW ALTERNATIVE 1

Under Instream Flow Alternative 1 (Figure 2.3-2), flows of 20 cfs would be released year-round into the Strawberry Tunnel, which feeds into Sixth Water Creek. With tunnel accretion, approximately 22 to 27 cfs would leave Strawberry Tunnel and enter the headwaters of Sixth Water Creek. This alternative is based on the recommendation of the USU study to minimize base flows while mitigating the selenium water quality issue downstream of the Strawberry Tunnel. Additional water may overflow into the creeks from the Sixth Water Flow Control Structure and the Monks Hollow Overflow Structure when the Diamond Fork System is operational during irrigation season. These overflows are needed to ensure that certain components of the Diamond Fork System remain full and can be operated and adjusted safely without developing air pockets. For the purpose of this EA, the irrigation season operational overflows from the Sixth Water Flow Control Structure and the Monks Hollow Overflow Structure were assumed to be 1 cfs and 5 cfs, respectively, for a total of 6 cfs. In the past, operational overflows have often been higher than these amounts, but with recent and anticipated equipment upgrades, the analysis in this EA assumes 1 cfs and 5 cfs is valid.

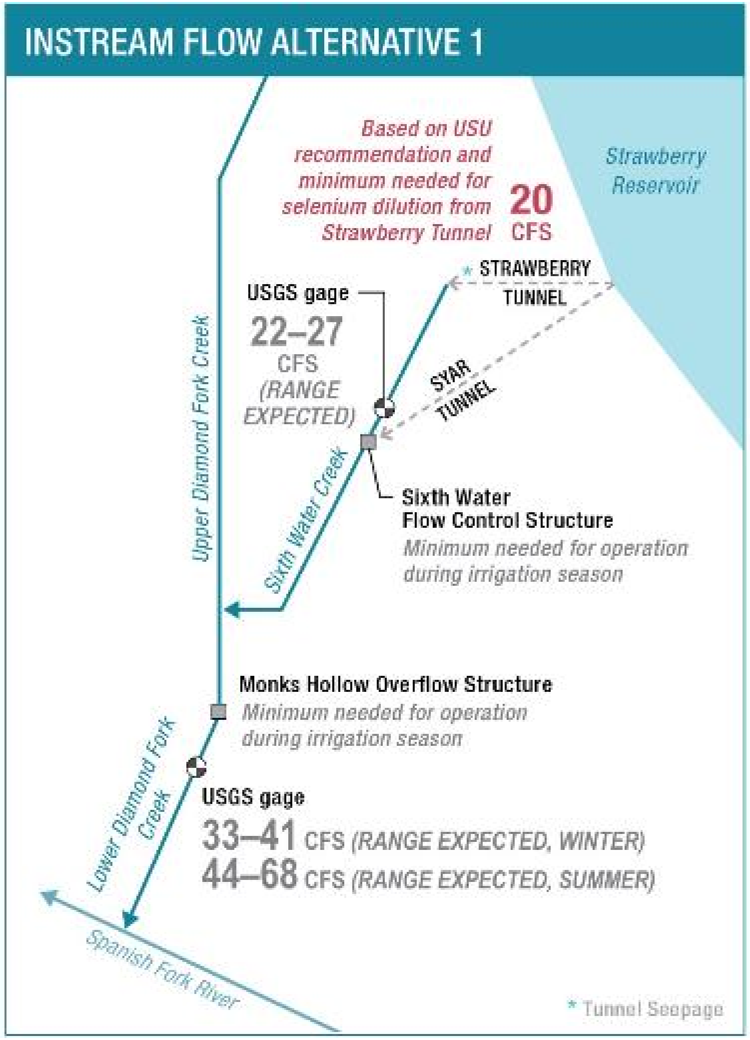

Figure 2.3-2. Instream Flow Alternative 1.

2.3.2.1.3 INSTREAM FLOW ALTERNATIVE 2 (PREFERRED ALTERNATIVE)

The minimum flow requirements under Instream Flow Alternative 2 are structured similarly to the No Action Alternative but would lower the mandated values. Specifically, the mandated minimums would be adjusted downward from the existing values of 25 winter/32 summer cfs for Sixth Water Creek and 60 winter/80 summer cfs for lower Diamond Fork Creek to year-round minimums of 22 cfs on Sixth Water Creek and 40 cfs on Diamond Fork Creek (Figure 2.3-3). The Diamond Fork System would be operated to meet these new lower minimum instream flows. Instream Flow Alternative 2 would also require a year-round minimum release of 20 cfs through Strawberry Tunnel to ensure adequate dilution of tunnel make-associated selenium during times when tunnel make is higher than its 5 cfs average value. Instream Flow Alternative 2 also guarantees that flows in Sixth Water Creek would be maintained at a minimum of 22 cfs in the event tunnel make drops below 2 cfs. This maintains the flow value at the USGS gage that has been demonstrated to keep the selenium concentrations below the Utah numeric criteria for aquatic life. The JLAs have identified Alternative 2 as the preferred alternative because it is consistent with the USU recommendations to improve ecological health while guaranteeing a minimum instream flow value, and it supports a "mid-size" fishing experience, which is rare along the Wasatch Front. Lower base flows are beneficial to the health of Sixth Water and Diamond Fork Creeks.

In irrigation season under Alternative 2, when the Diamond Fork System is delivering 70 cfs or more to water users, water needed to meet the Sixth Water Creek minimum flow of 22 cfs at the USGS Sixth Water Gage would be delivered through the Strawberry Tunnel. Water needed to meet the Diamond Fork Creek minimum flow of 40 cfs would be delivered through the Sixth Water Flow Control Structure and through the Monks Hollow Overflow Structure.

In non-irrigation season, water needed to meet minimum flows on both creeks initially would be delivered through the Strawberry Tunnel only. As discussed previously, winter minimum flow deliveries cannot be made via the Sixth Water Flow Control Structure until the new high-pressure control valves, currently under construction, are installed and operational. Completion is anticipated by spring of 2022. Once the high-pressure valves are complete, water needed to meet the Diamond Fork Creek minimum flow would typically be delivered through the Sixth Water Flow Control Structure. The analysis of both instream flow alternatives assumes that the high-pressure control valves have been installed and are operational.

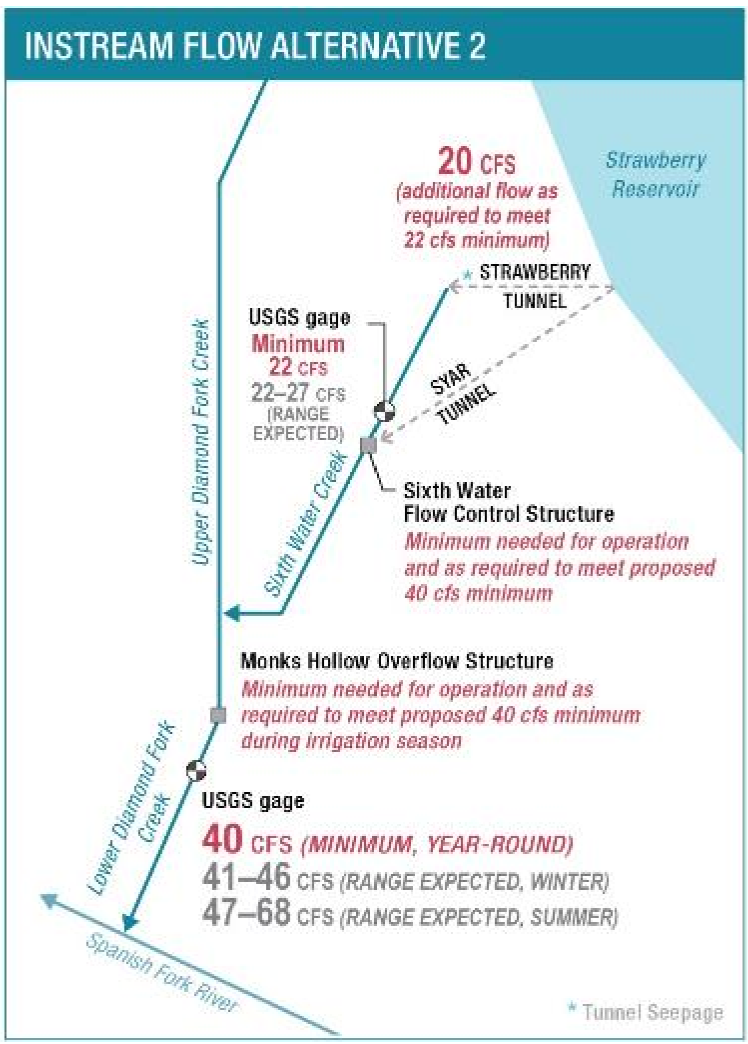

Figure 2.3-3. Instream Flow Alternative 2.

2.3.2.2 Hydrogen Sulfide Springs

Under the Proposed Action, hydrogen sulfide gas would be removed from the vicinity of the UDFFCS by installing spring collection–type boxes at the hydrogen sulfide springs to collect the flow into a single underground pipe and convey it approximately 0.5 mile downstream for discharge into Diamond Fork Creek (Figure 2.3-4). This would move the source of hydrogen sulfide far enough from the UDFFCS to prevent corrosion damage to the structure and its associated equipment. A total flow of approximately 300 to 500 gallons per minute of spring water is expected from 12 springs.

Based on a preliminary design concept, the pipeline would consist of a main pipeline and laterals to each spring (Hansen, Allen & Luce, Inc. 2020). The main pipeline would be approximately 3,500 feet in total length. About 850 feet of the main pipeline would be installed north of the UDFFCS where five springs are located on the east side of the creek. South of the UDFFCS, the main pipeline would be located approximately 5 feet from the west edge of Diamond Fork Road (Hansen, Allen & Luce, Inc. 2020).

The pipeline would likely be a 12-inch diameter flexible high-density polyethylene (HDPE) for both the main pipeline and the laterals. The pipeline would be continuous, with fusion-welded joints. Bi-directional cleanout access ports for inspection, cleaning, and maintenance would be installed directly over the pipeline at approximately 500-foot intervals beginning at each spring. A bypass pipeline has been designed immediately downstream of the springs to allow the District to bypass the collected flows directly to the creek in case the mainline needs to be taken out of service for maintenance (Hansen, Allen & Luce, Inc. 2020).

The outlet for the pipeline would be a discharge/oxidation channel where spring water would be discharged into Diamond Fork Creek approximately 3,500 feet from the most upstream spring. The discharge/oxidation channel would be approximately 50 to 100 feet in length. The purpose of the channel is to expose the collected spring water to air, dissipate energy and create turbulence to facilitate release of hydrogen sulfide gas, and reduce the water velocity before discharging collected spring water into the creek (Hansen, Allen & Luce, Inc. 2020).

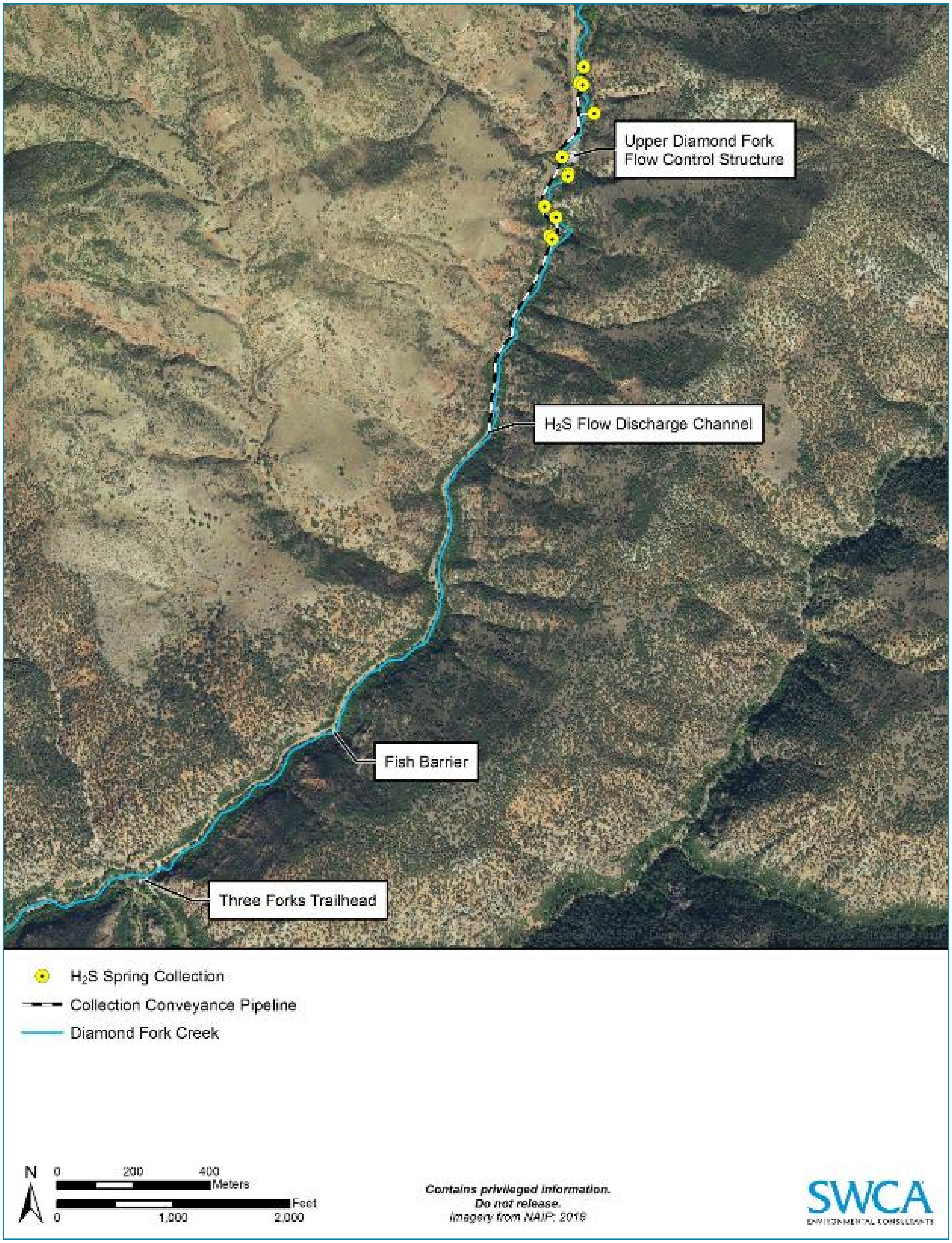

Figure 2.3-4. Hydrogen sulfide springs, proposed conveyance pipeline, and discharge location.

2.3.2.2.1 CONSTRUCTION

Construction of spring development and the main and lateral pipelines would likely be done with open cut excavations approximately 3 feet wide using track hoes or mini excavators. The depth of the excavations would range from 3 to 10 feet, as required to capture the identified seeps and springs and to maintain a constant downward gradient to prevent pipe flow air lock. After excavation is finished at each spring, spring development would be completed using washed gravel, perforated HDPE collection pipes, and a geomembrane to collect spring flow (Figure 2.3-5). During construction of the main pipeline, Diamond Fork Road would be closed. Access to recreation facilities in the canyon below the construction area would remain open. Recreation above the construction area would be available through Sheep Creek Road or Hobble Creek Canyon.

Three pipeline crossings of Diamond Fork Creek are proposed; crossings would be done with conventional open cut excavations, using a trench box or similar approach to stabilize and minimize disruption to the stream bed. Two crossings would be upstream of the UDFFCS and one crossing would be located downstream of the UDFFCS.

Site restoration around spring development would include regrading, restoration of stockpiled native topsoil, and revegetation with native grasses. No deep-rooted vegetation would be allowed in the spring area to avoid intrusion into the buried spring development.

Construction duration is estimated to be about 4 months.

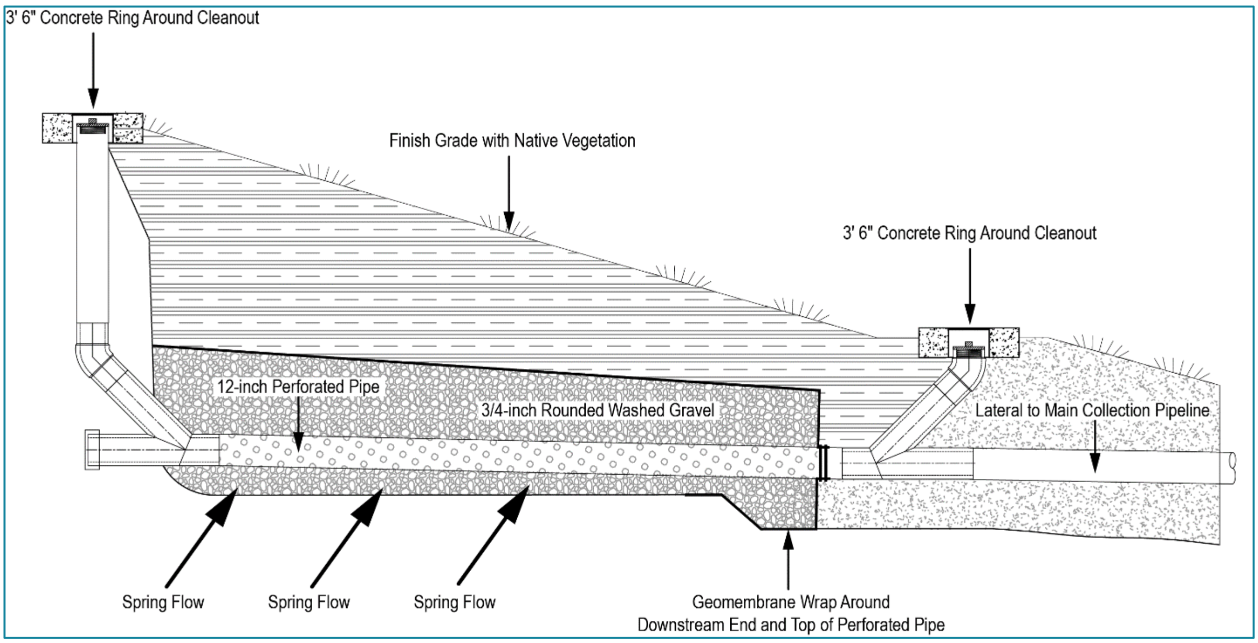

Figure 2.3-5. Detail of hydrogen sulfide spring collection.

2.3.2.2.2 DESIGN FEATURES

The following design features (e.g., best management practices [BMPs], standard operating procedures) to avoid and minimize environmental impacts are incorporated into the hydrogen sulfide spring collection system:

- Implementation by the construction contractor of a stormwater pollution prevention plan (SWPPP) as required by the National Pollutant Discharge Elimination System (NPDES) permit program. The SWPPP would include sediment and erosion control BMPs such as minimizing the disturbed area, preserving topsoil, controlling stormwater runoff with berms, the use of silt fencing or fiber rolls, and revegetation. It would also implement good housekeeping practices such as proper materials handling and provide for septic, construction, and hazardous materials waste management.
- Protection of vegetation that does not need to be removed as part of the Proposed Action.
- Implementation of a stream channel alteration permit, which may provide stipulations for minimizing the impacts of construction activities and protecting Diamond Fork Creek.
- Implementation of dust control measures by the construction contractor (e.g., watering, use of dust palliatives).
- Implementation of a traffic control plan by the construction contractor to protect public health and safety and minimize traffic issues.
- Limitation of noise and vibration during construction activities as much as possible. Construction equipment would be properly muffled according to industry standards and would be in good working condition. Electric air compressors and similar power tools would be used rather than diesel equipment where feasible. Construction equipment, including motor vehicles, would be turned off when not in use for more than 5 minutes. Construction materials would be handled and transported in a manner that does not create any unnecessary noise or vibration.
- Compliance with the District’s Integrated Pest Management Program, which requires ongoing monitoring for invasive species and noxious weeds, as well as treatment on lands administered by the District. In addition, the construction contractor would implement BMPs to limit the introduction or spread of invasive species from equipment, vehicles, and fill (e.g., use of weed-free fill, cleaning of vehicles and equipment).
- Open cut excavations would be signed, flagged, or fenced to protect public health and safety.

2.3.2.3 Inspection and Maintenance

The inspection and maintenance element of the Proposed Action focuses on two areas: Strawberry Tunnel and the Sixth Water Flow Control Structure.

2.3.2.3.1 STRAWBERRY TUNNEL

The JLAs propose to conduct an annual inspection of the Strawberry Tunnel and the valving, flow meter, and appurtenances housed within the Strawberry Tunnel Turnout. Inspections of these features by District operations and maintenance personnel are anticipated to occur over a 12-consecutive-hour period annually. This would require dewatering the Strawberry Tunnel to allow for inspection of the tunnel floor, walls, ceiling, and inspection of the Strawberry Tunnel Turnout appurtenances (e.g., plunger valve, flow meter, bypass pipeline). Therefore, supplemental instream flows would not be provided to Sixth Water Creek from the Strawberry Tunnel during the annual inspection.

Based on the findings of the annual inspection, there may be a need for a longer shutdown period to do maintenance work. Tunnel shutdowns for repairs are anticipated to occur about every 3 years and could last up to 5 days. There would be no instream flows delivered from the Strawberry Tunnel during this time except for the tunnel make flows. However, minimum instream flows could be delivered via the Sixth Water Flow Control Structure. The District will coordinate with agencies, stakeholders, and interested parties when these extended shutdowns need to occur. Figure 2.3-6 illustrates the parts of the Diamond Fork System that would be dewatered during Strawberry Tunnel inspection and maintenance.

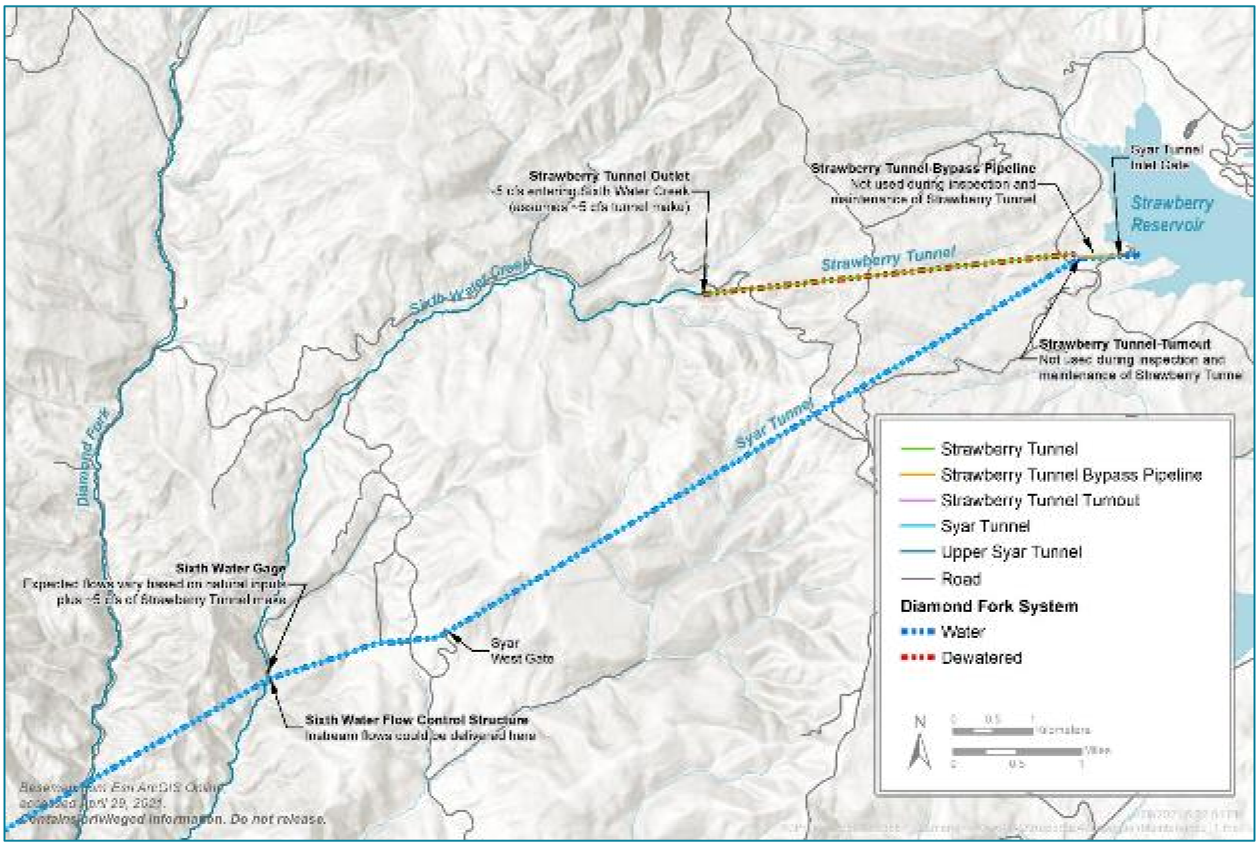

Figure 2.3-6. Strawberry Tunnel inspection and maintenance dewatering.

2.3.2.3.2 SIXTH WATER FLOW CONTROL STRUCTURE

Changes to the inspection and maintenance schedule for the Sixth Water Flow Control Structure would also occur under the Proposed Action. The Sixth Water Flow Control Structure and its piping and valves operate under approximately 580 pounds per square inch (psi) of pressure (about 1,300 feet of head) when Strawberry Reservoir is full. To inspect or maintain the Sixth Water Flow Control Structure, the Diamond Fork System must be dewatered from the Syar Tunnel West Gate down to the Sixth Water Flow Control Structure. This dewatering procedure provides a safe working environment for inspectors, contractors, and maintenance workers. Maintenance on the Sixth Water Flow Control Structure facilities can only take place during the non-irrigation season because the system needs to be operational to deliver irrigation flows. For annual inspection and maintenance, the Sixth Water Flow Control Structure would be shut down for up to 3 weeks and may be shut down for a full non-irrigation season if major maintenance is required. When the Sixth Water Flow Control structure is shut down for maintenance, water needed to meet Diamond Fork Creek minimum flows would need to be delivered entirely through the Strawberry Tunnel. This would mean releases of about 30 cfs into upper Sixth Water Creek to meet the 40 cfs minimum flow required on Diamond Fork Creek.

If the shutdown is for up to 3 weeks, there would be no adjustment to the flows released from the Strawberry Tunnel and flows on Diamond Fork may temporarily drop below the 40 cfs minimum. If the shutdown is for the entire non-irrigation season for major maintenance work, the JLAs would coordinate with stakeholders to determine their preference for increased flows from the Strawberry Tunnel over the non-irrigation season or maintaining flows at the lower flow rate. Figure 2.3-7 illustrates the portions of the Diamond Fork System that would be dewatered during Sixth Water Flow Control Structure inspection and maintenance.

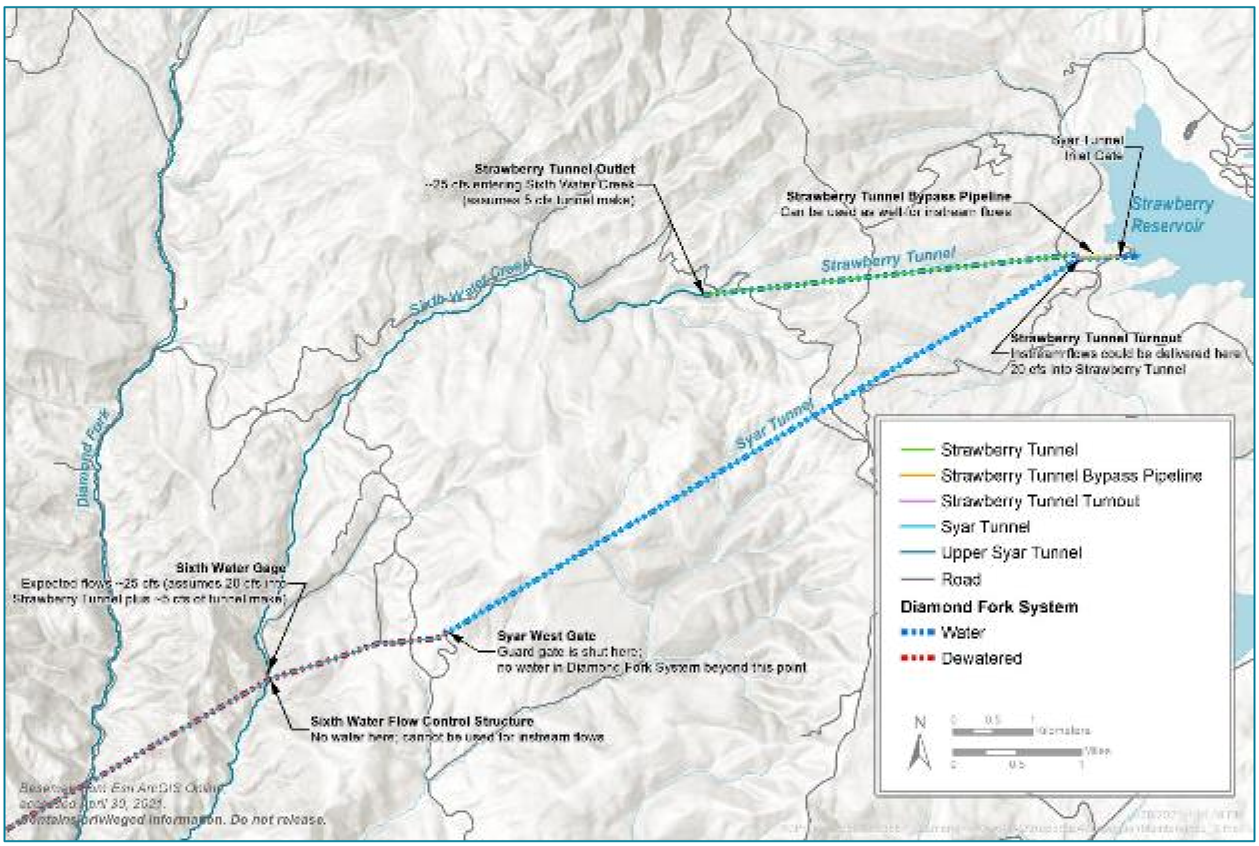

Figure 2.3-7. Sixth Water Flow Control Structure inspection and maintenance.

2.3.3 Alternatives Considered but Eliminated

The JLAs identified one instream flow alternative in addition to the flow alternatives presented in Section 2.3.2.1. That alternative would have provided minimum flows of 20 cfs year-round into Strawberry Tunnel. In Diamond Fork Creek, minimum flow targets would have been 40 cfs at the Diamond Fork gage, requiring supplemental flows from the Sixth Water Flow Control Structure and/or Monks Hollow Overflow Structure in the summer. Modeling of streamflow indicated that flows in Sixth

Water Creek for this alternative would be nearly identical to Alternative 1 and flows in Diamond Fork Creek would be nearly identical to Alternative 2, such that the alternative provided no substantial differences from the other two, and was therefore eliminated from further consideration.

The JLAs identified and considered the following alternatives to address the hydrogen sulfide springs problem; however, these alternatives were eliminated from detailed analysis for the reasons described below:

- On-site treatment system: This alternative was eliminated as not technically or economically feasible because of the lack of a suitable site for construction of a treatment plant, environmental impacts associated with potentially constructing a treatment plant, and health and safety risks associated with treating the spring water.
- Active ventilation of the UDFFCS: This alternative was eliminated because it is not technically or economically feasible.
- Infiltration or injection of spring water underground: This alternative was eliminated because there are no suitable locations to construct this type of facility and the underlying geology is not conducive to injection technologies.
- Development of a drilled well to intercept and drawdown the groundwater feeding the springs around the UDFFCS: Similar to an artesian well, water would flow up into the well and be conveyed in a pipe and discharged downstream a sufficient distance from the UDFFCS to eliminate the damage caused by the hydrogen sulfide springs. This alternative was eliminated as not technically feasible due to risk and uncertainty associated with the lengthy directional boring it would require.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

Chapter 3 describes the existing environment and trends of the project area that would be affected by the Proposed Action and discloses the potential effects of the Proposed Action, including two minimum instream flow modification alternatives. The data used to describe the affected environment and to disclose environmental effects that could result from the alternatives were collected from agency geospatial data sets, field surveys, scientific studies, and modeling.

Agency and public scoping and JLA staff with specific knowledge of resources identified issues to be considered in this EA. In this chapter, these issues are organized by relevant major resource areas. Each resource area section presents the issues for analysis and the impact indicators used, characterizes both the affected environment and environmental effects, and includes analyses needed to address the issues. Effects (or impacts) are "changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance from the proposed action or alternatives" (40 CFR 1508.1(g)).

3.2 PROJECT AREA

The project area for the Diamond Fork System Environmental Update comprises Strawberry Reservoir, Diamond Fork and Sixth Water Creeks, the Spanish Fork River, Utah Lake, Jordanelle Reservoir, Deer Creek Reservoir, and the Provo River (see Figure 1.2-1). The analyses focus on the Sixth Water Creek and Diamond Fork Creek watersheds to the confluence with the Spanish Fork River, the Spanish Fork River from Diamond Fork Creek downstream to Utah Lake, and Jordanelle Reservoir and the Provo River. This project area is the area in which the potential effects of the Proposed Action would occur. For each resource and issue evaluated in detail, an analysis area is defined that is specific to the changes that are anticipated with respect to each resource issue.

3.3 RESOURCES AND ISSUES

3.3.1 Resources and Issues Dismissed from Detailed Analysis

The JLAs considered all phases of the Proposed Action and the impact-causing elements associated with the action alternatives to identify resources potentially affected by the project. The JLAs first considered whether a resource was present in the project area, and if it was not, no further analysis was warranted. For resources present, the JLAs identified preliminary substantive issues based on internal agency and public scoping (e.g., how would minimum instream flow modifications impact critical water quality parameters such as dissolved oxygen in Diamond Fork Creek). Issues were then evaluated to see if they could be addressed through design features or measures to avoid or minimize environmental impacts. The issues that required detailed analysis to make a determination on significance or to make a reasoned choice between alternatives were moved forward for analysis. Those resources and issues that were not significant or did not require detailed analysis were eliminated from further discussion. Table 3.3-1 lists the resources and issues not analyzed in detail and provides the rationale for elimination.

Table 3.3-1. Resources and Issues Not Analyzed in Detail

Resource or Issue Topic	Rationale for Dismissal from Detailed Analysis
Agricultural resources associated with water delivery	Although the Proposed Action would modify instream flows, existing legal water rights would not be changed. Water deliveries would continue as required by existing water rights. Agricultural resources tied to existing water rights would not be impacted.
Air quality	The portion of the project area where potential impacts to air quality would occur is outside of all Utah nonattainment areas, except for the Utah County PM_{10} nonattainment area, which was redesignated to a maintenance area on March 27, 2020. The *PM_{10} Maintenance Provisions for Utah County* indicates that the county is attaining the PM_{10} National Ambient Air Quality Standard (NAAQS); the provisions document demonstrates attainment through the year 2030 (Utah Air Quality Board 2015). Under the Proposed Action, vehicles and equipment would emit criteria pollutants in small quantities during construction, inspection, and maintenance activities. Fugitive dust emissions would also occur during ground disturbance for construction of the hydrogen sulfide spring collection system. The JLAs would adhere to UAC Rule R307-309: Nonattainment and Maintenance Areas for PM_{10} and $PM_{2.5}$: Fugitive Emissions and Fugitive Dust. Based on the small size of the project and the implementation of requirements in UAC Rule R307-309, the Proposed Action would not cause emissions that contribute to an exceedance of the NAAQS.
Climate change	Vehicles and equipment would emit greenhouse gases temporarily and in small quantities during construction, inspection, and maintenance activities. Under the Proposed Action, inspection and maintenance activities would be similar to what is conducted now and would not result in an increase in greenhouse gas emissions. The Proposed Action would not create vulnerability to climate change impacts.
Energy	The SVP generates some energy through hydropower on the Spanish Fork River. Although instream flows would be modified by the Proposed Action, existing legal water rights would not be changed. Hydropower generation is a benefit of the provision of Bonneville Unit water. Any hydropower generation tied to existing legal water rights would not be impacted.
Environmental justice	Most of the Proposed Action would occur in a relatively remote location with no permanent residents nearby; it would not result in disproportionately high and adverse human health or environmental effects on minority or low-income populations. Although instream flow changes would occur in the Spanish Fork River and the Provo River, which pass through highly populated areas, the flow changes would not result in disproportionately high and adverse human health or environmental effects on minority or low-income populations.
Groundwater	The Proposed Action would not affect groundwater. No groundwater use is proposed. The hydrogen sulfide spring collection system would collect existing groundwater-fed spring water (surface water) adjacent to Diamond Fork Creek, but this would not affect the flow of groundwater to the surface.
Hazardous materials and hazardous waste	No known hazardous material or waste facilities, spills, or other issues are in Diamond Fork Canyon. Potentially hazardous materials used during construction of the project (e.g., fuels) would be properly handled according to county, state, and federal regulations. Appropriate BMPs for the handling, storage, and disposal of such materials would be used.
Invasive plant species and noxious weeds	Construction, inspection, and maintenance activities have the potential to introduce or spread invasive species or noxious weeds on equipment and vehicles or through the importation of fill. In addition, ground disturbance may allow for the establishment or spread of invasive species or noxious weeds. BMPs would be used to limit the introduction or spread of invasive species from equipment, vehicles, and fill. Revegetation with native grasses after project construction would limit invasive species and noxious weed establishment in cleared areas. After construction, the District would comply with its Integrated Pest Management Program, which requires ongoing monitoring for invasive species and noxious weeds, as well as treatment on lands administered by the District.
Land use plans and policies	The Proposed Action would be consistent with the *Utah County General Plan*, particularly Objective 14, which states that the county should “Adopt policies for careful use of water and other natural resources” (Utah County Community Development Department 2014:7). In addition, the *Utah County General Plan* states that “any damage to watershed areas should be rehabilitated” (Utah County Community Development Department 2014:26). The Proposed Action would also be consistent with the *Utah County Resource Management Plan*, which supports “projects on public lands that benefit instream uses and protect current water right holders,” “efforts to maintain healthy fisheries within the county for biological diversity as well as recreation and tourism,” and projects on public lands “that protect the riparian corridors and stream ecology” (Rural Community Consultants 2017:89, 38, 77). The project would not require changes to the USFS 2003 *Land and Resource Management Plan* for the Uinta National Forest (USFS 2003). The project area is in a block of lands that have been withdrawn by the Interior for water resource development associated with the CUP. CUP withdrawn lands are reserved by the Secretary for the construction, operation, maintenance, and inspection of the CUP features and are not available for other uses without the approval of the Secretary. The Reclamation Act of 1902 (32 Statute 388) and the Sundry Civil Expenses Appropriation Act (41 Statute 202) govern the Secretary’s authority on withdrawn lands. Where conflicting authorities occur, the Sundry Civil Expenses Appropriations Act establishes the paramount authority of the Secretary to deal with such lands.
Noise and vibration	The Proposed Action would occur in a relatively remote location with no permanent residents. There are no permanent noise receptors in the project area. Construction, inspection, and maintenance noise could disturb wildlife and recreation users in adjacent areas; however, these impacts would be temporary, and BMPs would be used to minimize noise and vibration impacts. There would be no permanent noise or vibration impacts.

Resource or Issue Topic	Rationale for Dismissal from Detailed Analysis
Prime, unique, and statewide important farmland	The Proposed Action would occur on withdrawn lands for the CUP's Bonneville Unit. The area has not been mapped for prime, unique, or statewide important farmland by the Natural Resources Conservation Service. There are no farmlands currently in the withdrawn lands area; therefore, the Proposed Action would not impact any prime, unique, or statewide important farmland.
Public health and safety	Construction activities would require temporary closure of Diamond Fork Road, as well as open cut excavations, which could present safety concerns for the general public. However, signing, flagging, and other safety BMPs would minimize potential impacts.
Roadless areas	Although the Proposed Action would occur in a designated roadless area of the Uinta-Wasatch-Cache National Forest (Diamond Fork #418016); it is in the block of Interior-withdrawn lands for the CUP. Therefore, there would be no impact to roadless areas from the Proposed Action.
Socioeconomics	The Proposed Action would not impact socioeconomics in the county, with the exception of temporary spending related to construction activities. The Proposed Action would not affect water delivery, which is required by existing contracts and water rights. Although the project is expected to improve ecosystem conditions, it is not likely to contribute to a noticeable change in recreation demand or use in this already highly used recreation area.
Soils	The Proposed Action would affect soils through surface disturbance during construction activities for the hydrogen sulfide spring collection system. Potential impacts would include the mixing of soil horizons, soil compaction, and increased susceptibility to wind and water erosion. Topsoil would be conserved during construction activities for reuse in disturbed areas. BMPs would be implemented during construction to prevent erosion. Disturbed areas would also be revegetated and restored. Based on the implementation of these protective measures, the Proposed Action is not expected to significantly affect soils.
Transportation	Construction for the Proposed Action would require closure of Diamond Fork Road for approximately 4 months. However, the closure would occur on a low traffic roadway; access to recreation areas above and below the closure would still be possible; and signing, flagging, and other BMPs would minimize the effects of the closure on vehicles traveling in the area. There would be no permanent impacts to transportation.
Utilities	No new utilities would be constructed for the Proposed Action, and no existing utilities would be impacted by the Proposed Action.
Visual resources	No aboveground structures are planned as part of the Proposed Action, with the exception of pipeline cleanout access ports and the discharge/oxidation channel to be placed at the end of the pipeline for the hydrogen sulfide spring collection system. Because the discharge/oxidation channel would be partly buried and would be located near the already existing disturbance of Diamond Fork Road, it would not significantly affect visual resources. The pipeline cleanout access ports would be a few inches above the ground surface and would also not significantly affect visual resources. Construction activities would have temporary visual impacts in the area around the UDFFCS and along Diamond Fork Road; these impacts would be present during the 4-month construction period, during restoration activities, and until site restoration is complete.
Wildlife (non-aquatic)	Terrestrial wildlife would not be affected by the Proposed Action's changes to instream flows. However, development of the hydrogen sulfide spring collection system would result in approximately 0.05 acre of habitat loss (minor effect), as well as the temporary presence of construction crews, equipment, and vehicles. Based on the small amount of habitat loss and the availability of similar habitat nearby, terrestrial wildlife is not expected to be negatively affected. During construction, inspection, and maintenance, the activity and noise may cause individual animals to temporarily leave the area; however, these impacts would be short term and limited to the immediate area. For migratory birds, impacts from the Proposed Action could include a localized loss of habitat in the analysis area from surface disturbance and removal of vegetation, the displacement of individual birds, and a temporary relocation of prey from the project area because of human activity and noise. Habitat loss would be limited because of the small amount of disturbance discussed above. Human activity and noise would be short term, occurring only during construction, inspection, and maintenance activities. Similar habitat for displaced prey or individual birds would be available in adjacent areas. No long-term impacts to migratory bird populations are expected.

The following resources are not present in the project area:

- Wild and scenic rivers
- Wilderness areas or wilderness study areas

3.3.2 Issues Carried Forward for Detailed Analysis

Issues carried forward for detailed analysis are provided at the beginning of each resource's section in Chapter 3.

3.4 HYDROLOGY

3.4.1 Issues, Impact Indicators, and Analysis Area

Based on the project's internal and external scoping, the following hydrology issues were identified:

- How would minimum instream flow modifications impact the hydrology in Sixth Water Creek, Diamond Fork Creek, the Spanish Fork River, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, and Utah Lake?
- How would minimum instream flow modifications impact downstream water users?
- How would minimum instream flow modifications and associated deliveries through the Strawberry Tunnel impact Strawberry Reservoir operations (timing/magnitude of flows from Strawberry Reservoir to tunnel)?
- How would the proposed hydrogen sulfide spring collection affect hydrology in Diamond Fork Creek?
- How would the proposed inspection and maintenance schedule changes impact the hydrology in Sixth Water and Diamond Fork Creeks?

The impact indicators used to assess these issues are as follows:

- Incremental change in stream flow duration and magnitude.
- The change in flow in Diamond Fork Creek resulting from the collection of the hydrogen sulfide springs.

The analysis area for hydrology comprises Strawberry Reservoir, Sixth Water Creek, and Diamond Fork Creek from the UDFFCS downstream to the confluence with the Spanish Fork River; the Spanish Fork River from Diamond Fork Creek downstream to Utah Lake; Jordanelle Reservoir; Deer Creek Reservoir; Provo River (from Jordanelle Reservoir downstream to Utah Lake); and Utah Lake.

For the analysis of hydrology of Sixth Water and Diamond Fork Creeks, flows were simulated for the period of 2005 through 2017 using a spreadsheet model to reflect system operations (HDR 2021). This time period provides a range of flows, including relatively dry, average, and wet years to illustrate magnitude, duration, and variation of base and peak flows that would be expected under the No Action Alternative and the proposed instream flow alternatives. The following assumptions and parameters were used for the flow simulation:

- Historical streamflow data and operational calculations represented conditions from 2005–2017
- Natural gains at the Sixth Water Flow Control Structure and Monks Hollow Overflow Structure were calculated as described in *Development of Streamflow Data and Surface Water Simulation Results for Diamond Fork System EA* (HDR 2021)
- Strawberry Tunnel was assumed to always release a minimum flow of 20 cfs
- Strawberry Tunnel accretion flow was assumed to be always 5 cfs
- Sixth Water Flow Control Structure was assumed to release at least 1 cfs during irrigation season
- Monks Hollow Overflow Structure was assumed to release 5 cfs during irrigation season

- Additional releases from Strawberry Tunnel and the Sixth Water Flow Control Structure were calculated to exactly meet minimum instream flow requirements (at Sixth Water Flow Control Structure and Monks Hollow Overflow Structure)
- Additional releases from Strawberry Tunnel and the Sixth Water Flow Control Structure to meet minimum instream flow requirements were adjusted once every 10 days
- For purposes of the flow simulation, “Summer” was May 1 through October 31, and “Irrigation Season” was May 1 through September 30

3.4.2 Affected Environment

CUPCA legislation outlines instream flow requirements in Sixth Water and Diamond Fork Creeks. Import water from Strawberry Reservoir is released into Sixth Water Creek through the Strawberry Tunnel and at times the Sixth Water Flow Control Structure where it is conveyed down Sixth Water and Diamond Fork Creeks, down the Spanish Fork River for irrigation, and/or down to Utah Lake for exchange (see Sections 1.2.2.1 and 3.4.2.6).

3.4.2.1 Strawberry Reservoir

Strawberry Reservoir is a high mountain reservoir located in the Wasatch Range and is a key element of the Bonneville Unit of the CUP. The reservoir is made by Soldier Creek Dam on the Strawberry River and has a storage capacity of 1,106,500 acre-feet. The reservoir volumes and surface water elevations fluctuate depending on the amount of moisture received in the upper Strawberry River Basin and on the southeastern slopes of the Uinta Mountains where water can be diverted through the Strawberry Aqueduct and Collection System into the reservoir. Inflow forecasts for Strawberry Reservoir are estimated by the District and used for reservoir planning and project operations prior to and during the flood season, and for optimization and coordination of the water supply for users.

3.4.2.2 Sixth Water and Diamond Fork Creeks

Sixth Water Creek is a small mountain stream that receives trans-basin flow inputs from the Strawberry Reservoir via the Strawberry Tunnel. Sixth Water Creek travels approximately 10 miles from the Strawberry Tunnel to its confluence with Diamond Fork Creek near the Three Forks Trailhead (Three Forks). The creek descends from an elevation of approximately 8,000 feet to an elevation of 5,540 feet. Diamond Fork Creek is a mid-sized mountain stream that flows from an elevation of approximately 8,600 feet at Strawberry Ridge into the Spanish Fork River at U.S. Highway 6 at an elevation of 4,960 feet. The natural hydrology of Diamond Fork and Sixth Water Creeks is driven by snowmelt in the spring and by groundwater through the late summer. Annual high flows typically occur in late April and early May.

A stream’s *base flow* is the amount of flowing water in the stream prior to and after annual snowmelt events, or individual storm events. The natural base flow in Sixth Water Creek and Diamond Fork Creek is relatively low, reflecting the snowmelt-driven hydrology of a mountain stream system. Natural base flows in Sixth Water Creek at USGS gage 10149000 are estimated to be 1 to 2 cfs, and in Diamond Fork Creek at the USGS gage 1014900, they are estimated to be 10 cfs (Wilcock et al. 2019). Supplemental flow releases into the two creeks are guided by CUPCA, which prescribes base flow minimums larger than natural base flows.

Following completion of the SVP in 1912, the hydrology of Sixth Water and Diamond Fork Creeks changed substantially because they were used to convey SVP irrigation flows far greater and for much longer durations than natural base flows. Figure 3.4-1 shows an average annual hydrograph that illustrates the change in flows in Diamond Fork Creek from representative periods before and after the implementation of the SVP. These very high flows continued until the completion of the Diamond Fork System in 2004 when most SVP irrigation flows were shifted out of Sixth Water Creek and Diamond Fork Creek and into the constructed conveyance system, substantially reducing the peak and duration of high flows. Figure 3.4-2 illustrates the change in annual flows in Diamond Fork Creek that occurred following the Diamond Fork System coming on-line and most SVP irrigation deliveries being conveyed in pipes rather than the streams.

Figure 3.4-1. Comparison of pre– and post–Strawberry Valley Project flows in Diamond Fork Creek.

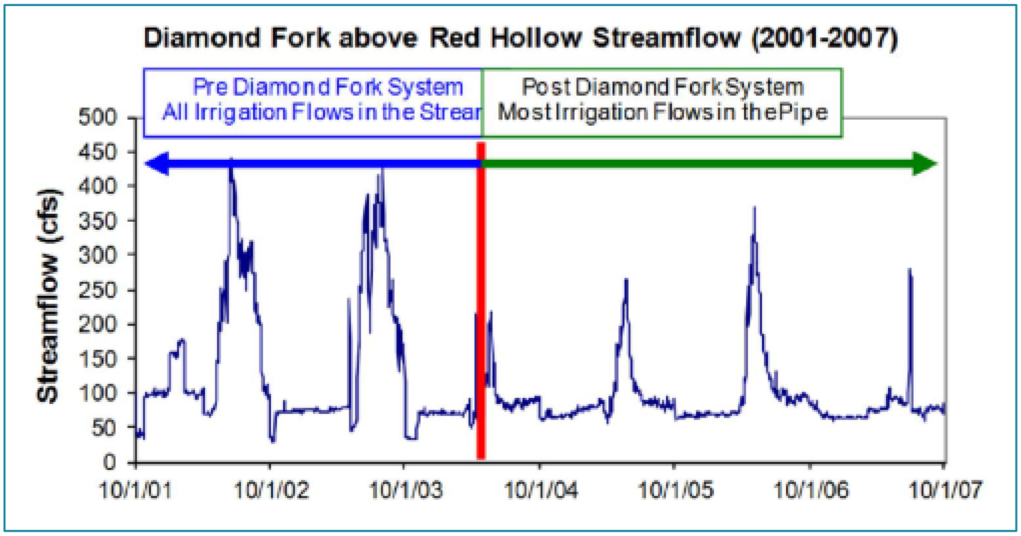

Figure 3.4-2. Comparison of pre– and post–Diamond Fork System flows in Diamond Fork Creek.

The Diamond Fork System is operated to facilitate the delivery of water from Strawberry Reservoir to meet minimum flow requirements in Sixth Water Creek and Diamond Fork Creek, and instream flow targets in Hobble Creek and the Provo River; to supplement Utah Lake for operations of the Bonneville Unit Municipal and Industrial System; and to deliver water to the SWUA and ULS contract holders. Most of the water delivered to the Diamond Fork System from Strawberry Reservoir is conveyed through the Diamond Fork Pipeline for delivery or release downstream, assuming pipeline capacity is available. Water is also released through the Strawberry Tunnel into Sixth Water Creek, from the Sixth Water Flow Control Structure or through the Monks Hollow Overflow Structure (irrigation season only) to maintain minimum instream flows in Sixth Water and Diamond Fork Creeks or to meet other operational needs.

Since its completion in 2004, the Diamond Fork System has been operated to supply the CUPCA-mandated minimum flows to Sixth Water Creek and Diamond Fork Creek. The minimum instream flows for Sixth Water and Diamond Fork Creeks are as follows:

- Sixth Water Creek: 32 cfs summer (May–October) and 25 cfs winter (November–April)
- Diamond Fork Creek: 80 cfs summer (May–September) and 60 cfs winter (October–April)

Stream flows in both Sixth Water and Diamond Fork Creeks are also higher during natural peak events because supplemental releases are typically conveyed year-round and therefore add to naturally occurring spring snowmelt runoff and storm events. In wet years, the supplemental releases comprise only a small percentage of natural peak events, but in drier years—especially on Sixth Water Creek—the supplemental water can be a large proportion of the peak.

Figures 3.4-3 and 3.4-4 present the hydrograph of observed flows at the USGS gages on Sixth Water and Diamond Fork Creeks to illustrate flow conditions since the Diamond Fork System has gone into operation. Tall, single-line peaks and valleys shown in these figures represent unusual system operations where flows were suddenly increased or decreased to accommodate system operation (such as in 2012, 2014, and 2017), the USU research study, or inspection and maintenance activities. Since completion of the Diamond Fork System, the Strawberry Tunnel was dewatered for inspection and maintenance once in 2009 for a short period, resulting in a very short-term reduction in flow in Sixth Water and Diamond Fork Creeks (see Figures 3.4-3 and 3.4-4).

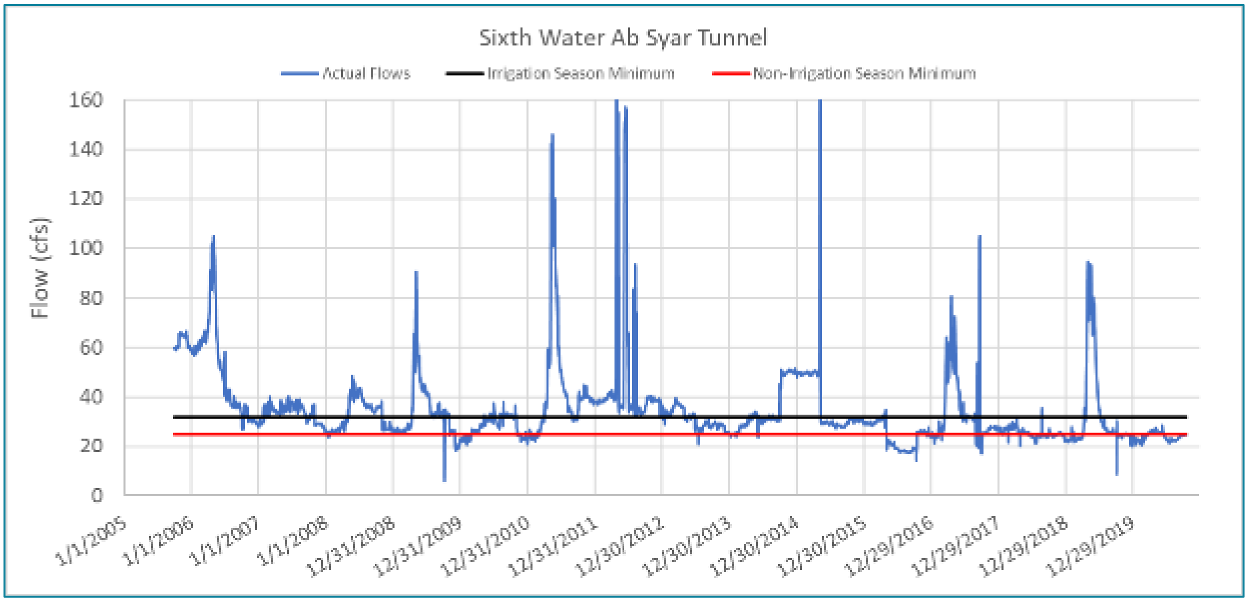

Figure 3.4-3. Hydrograph of measured average daily flows in Sixth Water Creek.

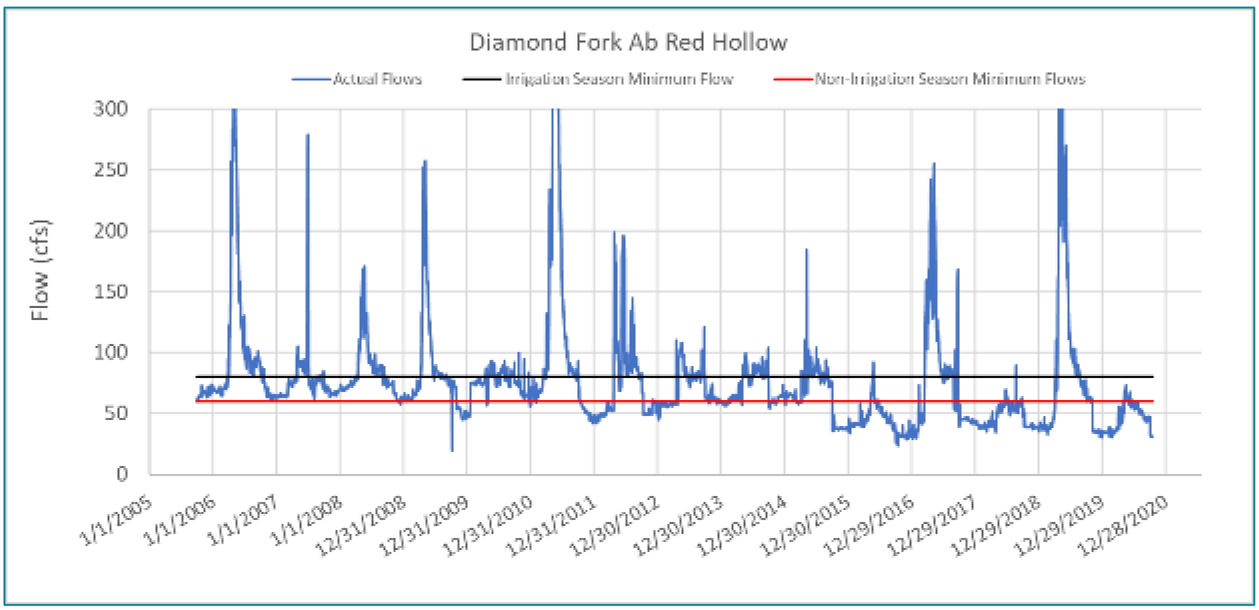

Figure 3.4-4. Hydrograph of measured average daily flows in Diamond Fork Creek.

Based on measurements made by the District in 2019 and 2020, the hydrogen sulfide springs around the UDFFCS contribute approximately 1.67 cfs to the flow in Diamond Fork Creek at Three Forks. This represented approximately 14% of the creek flow when the measurements were taken.

3.4.2.3 Spanish Fork River

The Spanish Fork River is approximately 20 miles long and discharges into Utah Lake. There are numerous irrigation diversions on the river that provide a large supply of agricultural water for southern Utah County.

Instream flows from Diamond Fork Creek, during irrigation season, make up a portion of the contracted water being delivered to the SWUA. The remaining amount of the contracted water is generally delivered to the Spanish Fork River (via Diamond Fork Creek) from the Spanish Fork Flow Control Structure, at the mouth of Diamond Fork Canyon. When capacity in the Diamond Fork System is limited, SVP irrigation water can be delivered through Sixth Water or Diamond Fork Creeks at the Monks Hollow Overflow Structure and Sixth Water Flow Control Structure.

Prior to completion of the Diamond Fork System and CUPCA-mandated minimum flow requirements (i.e., between 1919 and 2004), average monthly flows in the Spanish Fork River during non-irrigation season ranged from 83 cfs in January to 264 cfs in April. Post-CUPCA non-irrigation season flows (between 2005 and 2020), as represented by average Spanish Fork River flows from the USGS gage (10150500 Spanish Fork at Castilla, Utah) have generally been higher than pre-CUPCA levels, ranging from 105 cfs in December (low) to 250 cfs in April (high). Higher post-CUPCA flows are due to non-irrigation flows in winter to meet CUPCA-mandated minimum flows. Table 3.4-1 summarizes pre- and post-CUPCA flows in the Spanish Fork River.

Table 3.4-1. Flows in the Spanish Fork River during Non-Irrigation Season

	October	November	December	January	February	March	April
Pre-CUPCA Flow (cfs): 1919–2004	109	91	84	83	96	134	264
Post-CUPCA Flow (cfs): 2005–2020	110	109	105	117	124	150	250
Difference in Pre- and Post-CUPCA Flow (cfs)	+1	+18	+21	+34	+28	+15	-14

3.4.2.4 Provo River

The Provo River originates in the Uinta Mountains of Utah at an elevation of approximately 10,800 feet and flows through Jordanelle Reservoir, Heber Valley, Deer Creek Reservoir, Provo Canyon, and the cities of Orem and Provo before it outlets into Utah Lake. The annual hydrograph of the Provo River is driven by the amount of wintertime snow accumulation and the rate and timing of snowmelt throughout the watershed, especially in the Uinta Mountains, and the operation of water development facilities and features. Flows are affected by a complicated network of dams and reservoirs, water imports, and water diversions constructed for hydropower, irrigation, and water-supply purposes. In addition to the natural runoff of the Provo River basin, two trans-basin diversions import water into the Provo River basin above Jordanelle Reservoir. In addition, import water from Strawberry Reservoir carried in the Spanish Fork Provo Reservoir Canal Pipeline can be delivered to the Provo River through the Olmsted Hydroelectric Power Plant at the mouth of Provo Canyon. Other important water development features include Deer Creek Dam and Reservoir, Salt Lake Aqueduct, the Olmsted Diversion, the Murdock Diversion, and several additional diversion structures below the Murdock Diversion.

Minimum instream flows on the Provo River below Jordanelle and Deer Creek Dams are legislatively established in Section 303(c) of CUCPA at 125 and 100 cfs, respectively. CUPCA does not require a minimum instream flow for the Provo River below the Olmsted Diversion. However, CUPCA Section 302 does authorize the District, with funding from the Mitigation Commission, to acquire water rights, with the goal of establishing a year-round minimum flow of 75 cfs on the lower Provo River. To date, few water rights have been available for purchase from willing sellers.

Efforts authorized under CUPCA Section 207 have been successful at securing instream flows for the lower Provo River. Water conserved under CUPCA Section 207 projects (e.g., canal linings and improved irrigation systems) can be turned over to the Secretary of the Interior to be used for instream flows, which the Secretary has accepted and committed to help recover the June sucker. Currently, between both the Section 302 and the Section 207 waters, a total of 21,172 acre-feet of water is available annually for June sucker and instream flow purposes. However, 7,070 acre-feet of this total is temporary water acquired through water conservation efforts under Section 207 of the CUPCA legislation. Based on current agreements, the use of this 7,070 acre-feet of temporary water will gradually expire by 2025. Efforts remain ongoing to secure additional permanent and temporary water supplies to support June sucker recovery and provide ecologically beneficial instream flows. One such recent effort has involved a multi-party agreement to cover the cost of providing additional flows in the section of Provo River between the Murdock Diversion and the Olmsted Hydroelectric Power Plant tailrace. This section of river has commonly had very low summertime flows. Additional efforts to improve instream flows in this river section, and along the entire lower Provo River, continue to be actively explored.

Recommendations about how and when to deliver instream flow water on the lower Provo River are guided by the JSRIP. Each year the JSRIP meets in early spring to review available reservoir storage and anticipated runoff volumes. The appropriate flow regime for that year is discussed by the JSRIP, and any necessary adjustments are made in target flows as the runoff period progresses. JSRIP-guided target runoff releases have been implemented annually since 1999. In May 2015, the JSRIP Administration Committee passed a resolution that formally adopted guidelines (Figure 3.4-5 and Figure 3.4-6) described in the 2008 *Lower Provo River Ecosystem Flow Recommendations Final Report* (Stamp et al. 2008) and established the following priorities for the use of acquired water supplies:

1. Provide base flows during the spring and/or early summer to support June sucker spawning activity.
2. Provide supplemental flows in the low water periods of late summer when irrigation and other uses may reduce stream flows to levels that may be detrimental to the health of the stream ecosystem and have negative impacts on June sucker rearing habitat.
3. Provide a spring runoff peak. This peak can serve as a cue to adult June sucker to initiate spawning migrations into Utah Lake tributaries. The peak also provides the necessary channel maintenance and transport of sediment needed for preparing substrates for June sucker spawning.
4. Provide flows following the peak to facilitate the movement of spawning adults back into Utah Lake and also transport larval suckers to Utah Lake or other suitable rearing habitat, where available.

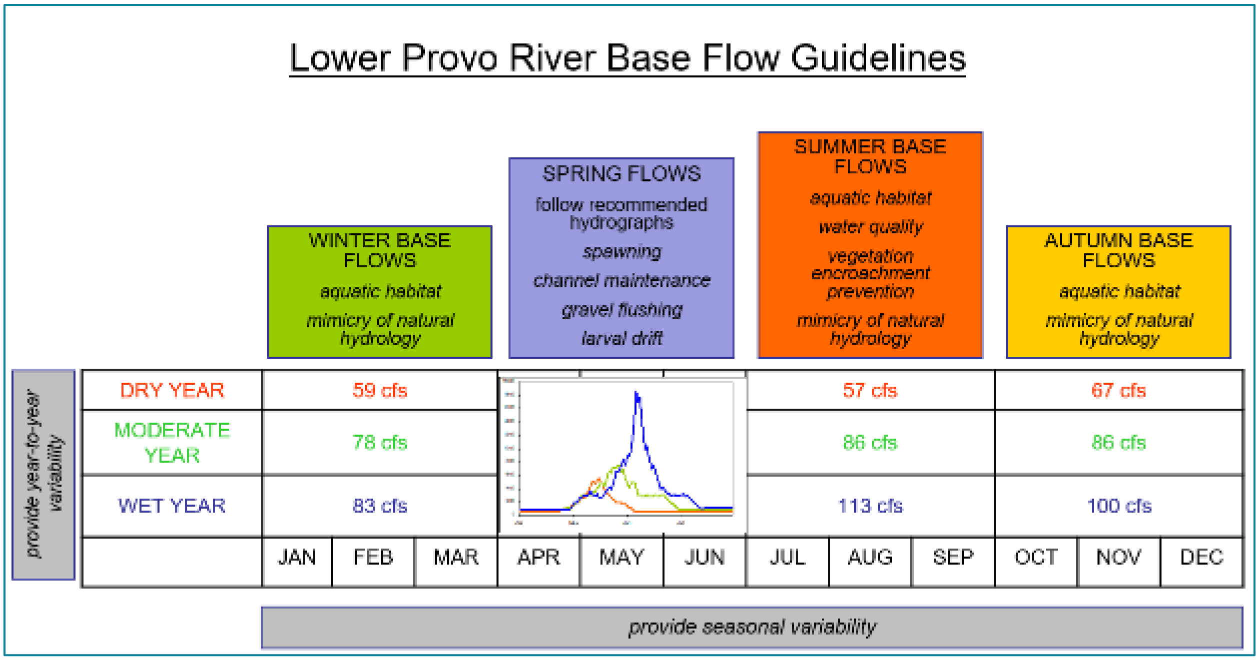

Figure 3.4-5. Base flow guidelines for lower Provo River (Stamp et al. 2008).

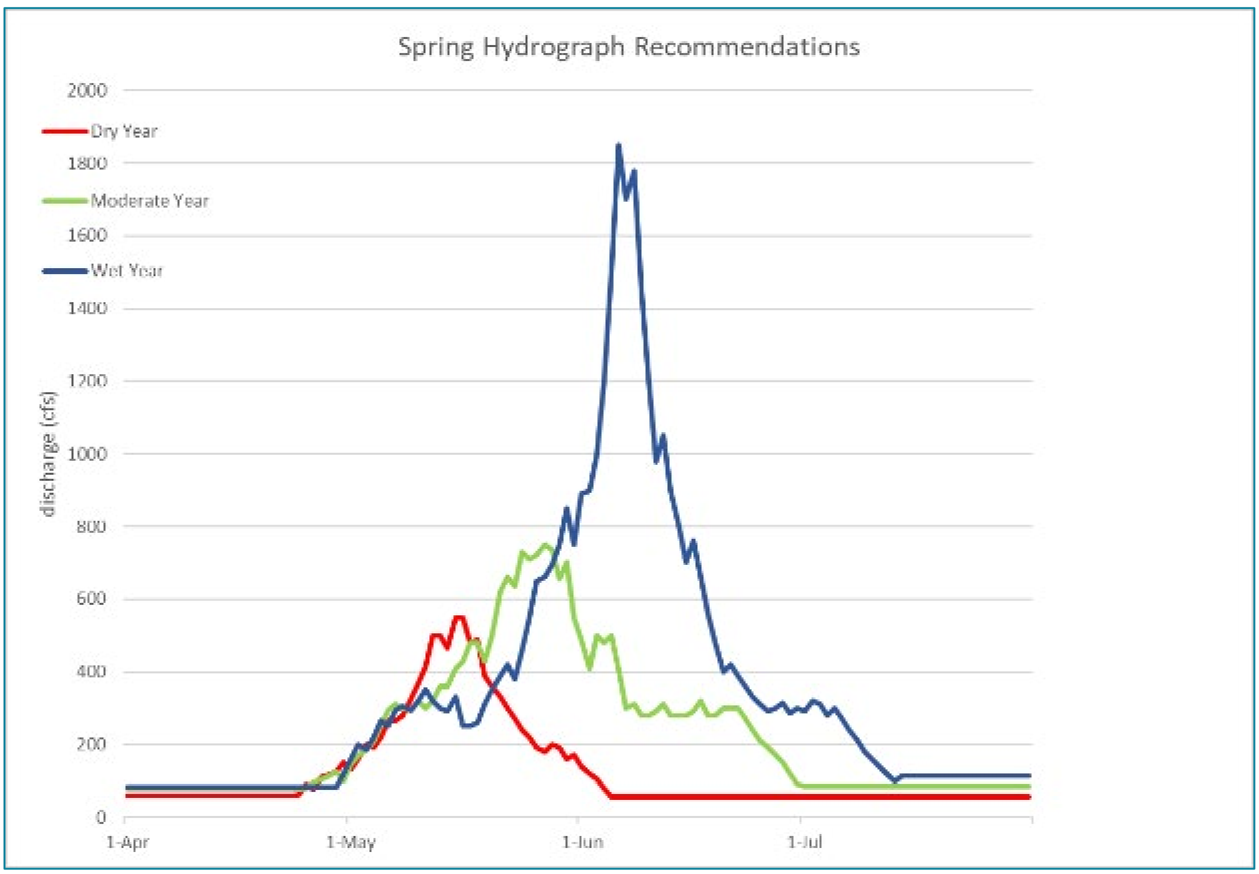

Figure 3.4-6. Spring hydrograph recommendations for the lower Provo River (Stamp et al. 2008).

To date, the JSRIP has been successful at improving instream flow conditions on the lower Provo River and supporting June sucker spawning. The current volume of acquired instream flow water has been adequate to support spawning activity and to maintain summer flows in the range of 40 to 50 cfs during dry years (just shy of the dry year guideline of 57 cfs). However, to date, acquired instream flow water has been insufficient to fully meet priorities #3 and #4, except in wet water years, when snowmelt runoff volumes exceed reservoir storage capacity and water must be released downstream to mitigate flooding risk. To fully meet the dry year instream flow guidelines between April 1 and September 15 would require a total of 35,609 acre-feet of water, and meeting the moderate year guidelines for that time period would require more than 63,000 acre-feet of water. Acquiring additional instream flow water beyond the current total of 21,172 acre-feet would increase the ability of the JSRIP to more completely and more frequently meet ecosystem flow recommendations for the lower Provo River. By 2025, 7,070 acre-feet of temporary June sucker water will gradually expire. This will reduce the total volume available from 21,172 acre-feet to 14,102 acre-feet, reducing the ability of the JSRIP to meet ecosystem flow recommendations for the lower Provo River.

3.4.2.5 Jordanelle Reservoir

Construction of the Jordanelle Dam was completed in the spring of 1993, impounding the Provo River and creating Jordanelle Reservoir. The dam and reservoir are principal features of the Municipal and Industrial System of the Bonneville Unit. Jordanelle Reservoir is owned by Reclamation and is operated and maintained by the District, which administers the delivery of water stored in the reservoir to its users, which are composed of irrigation companies and municipal water districts. These deliveries are critical to the water supply for much of the Wasatch Front. Jordanelle Reservoir has capacity of 314,006 acre-feet with a surface area of 3,024 acres at the top of active storage at an elevation of 6,166.40 feet above mean sea level. The reservoir has an additional 49,348 acre-feet of space for flood storage.

3.4.2.6 Deer Creek Reservoir

Deer Creek Dam is located on the Provo River between Jordanelle Reservoir and Utah Lake and was constructed as part of the Provo River Project by Reclamation. It is a zoned earthfill structure 235 feet high with a reservoir capacity of 152,570 acre-feet (Reclamation 2021). Construction was completed in 1941. The operations of Deer Creek Reservoir and Jordanelle Reservoir are coordinated under a 1994 operating agreement that acknowledges the water rights and water right priorities of both projects and specifies when each project can store water. The parties to the operating agreement are the United States, the State of Utah, the Provo River Water Users Association, and the District.

3.4.2.7 Utah Lake

Utah Lake is a large, shallow freshwater lake located in Utah County. Its major surface tributaries are the Spanish Fork River, Hobble Creek, Provo River, and the American Fork River. The Jordan River is the lake's only natural outlet, which flows northward through Salt Lake County to the Great Salt Lake. Utah Lake's volume and surface water elevation fluctuate depending on the amount of moisture received in the Utah Lake drainage basin and water diversion and management activities. Utah Lake's watershed is approximately 3,846 square miles and its surface area is approximately 148 square miles. Utah Lake has a volume capacity of approximately 870,000 acre-feet.

Utah Lake provides an important role in Bonneville Unit water deliveries. The Bonneville Unit requires an exchange of water between Strawberry and Jordanelle Reservoirs with Utah Lake as the centerpiece of that exchange. Jordanelle Reservoir stores Provo River water that historically flowed into Utah Lake. Utah Lake water originating from the Provo River is replaced by Bonneville Unit return flows to the lake, water rights previously acquired by the District in Utah Lake, direct releases of water from Strawberry Reservoir to Utah Lake, and flows that are surplus to Utah Lake rights. The exchange water is stored in Jordanelle Reservoir for municipal and industrial delivery to Salt Lake County and northern Utah County under existing contracts.

3.4.3 Environmental Consequences

3.4.3.1 No Action Alternative

Under the No Action Alternative, the Diamond Fork System would continue to operate under the CUPCA-mandated minimum instream flows. During the summer irrigation season, flows would be delivered through the Strawberry Tunnel for Sixth Water Creek and at the Sixth Water Flow Control Structure and Monks Hollow Overflow Structure for Diamond Fork Creek. These releases, in addition to the natural stream flows, meet minimum flows for each reach. The winter (non-irrigation season) mandated minimum flows are delivered through the Strawberry Tunnel and the Sixth Water Flow Control Structure to meet Sixth Water and Diamond Fork Creek minimum flow requirements.

As noted in Section 3.4.1, for this analysis, flows for the No Action Alternative (and the instream flow alternatives) were simulated for the period of 2005 through 2017. Figures 3.4-7 through 3.4-10 show the flow duration curves for the No Action Alternative in Sixth Water and Diamond Fork Creeks (compared to the instream flow alternatives) based on the modeled period (2005–2017) for both summer and winter. For each alternative and season (summer and winter), these curves depict the percentage of days (x-axis) where stream flow is less than the corresponding flow value on the y-axis. Under the No Action Alternative, minimum flows would conform to the CUPCA-mandated minimum flows and would remain substantially higher than natural flows in Sixth Water and Diamond Fork Creeks. Flows would also exhibit relatively low variability, particularly in Diamond Fork Creek, compared to natural flow conditions.

Under the No Action Alternative, no redistributed instream flow water would be delivered to the Provo River. The 7,070 acre-feet of temporary June sucker water would gradually expire by 2025 unless alternate instream flow water supplies are secured. The total volume of instream flow water available would drop from 21,172 acre-feet to 14,102 acre-feet, reducing the ability of the JSRIP to meet ecosystem flow recommendations for the lower Provo River. The No Action Alternative would not affect the hydrology of Strawberry Reservoir, the Spanish Fork River, Jordanelle Reservoir, Deer Creek Reservoir, or Utah Lake.

No H_2S spring collection around the UDFFCS would occur under the No Action Alternative. Springs would continue to contribute a small amount of flow (approximately 1.76 cfs based on measurements by the District in 2019 and 2020) to Diamond Fork Creek.

Under the No Action Alternative, the District would inspect and maintain the Strawberry Tunnel in accordance with the parameters from the 1999 FS-FEIS, which would involve dewatering the tunnel for up to 2 days once every 5 to 7 years. There would be no flow from the Strawberry Tunnel into Sixth Water Creek for 2 days during inspection and maintenance. This would result in a reduction in flow in Sixth Water and Diamond Fork Creeks during the 2 days of the inspection and maintenance activities. Flow would be restored immediately following inspection and maintenance, and the interruption would not result in a long-term disruption of hydrology in the system.

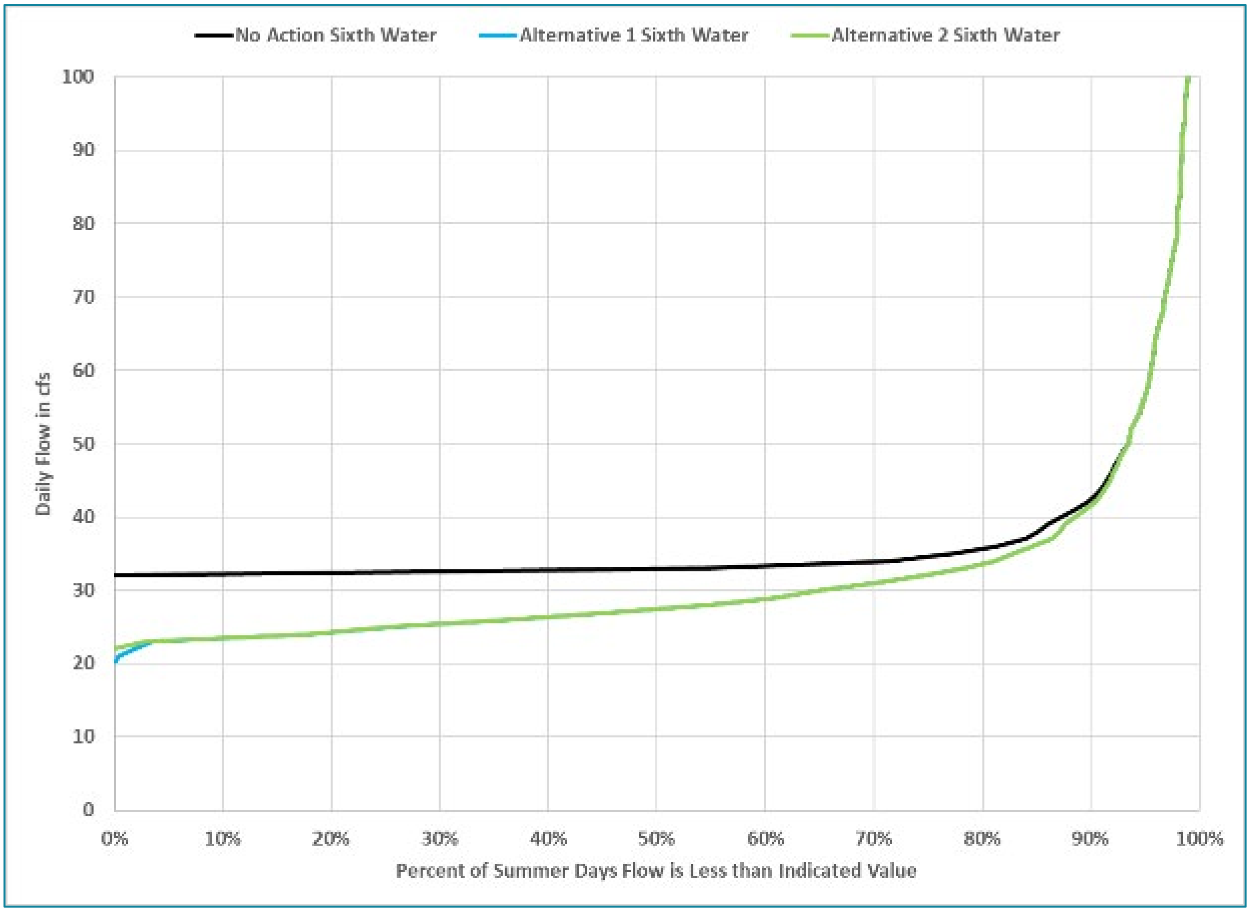

Figure 3.4-7. Flow duration curve for simulated flows during the summer (2005–2017) at Sixth Water Gage, No Action and Proposed Action Alternatives.

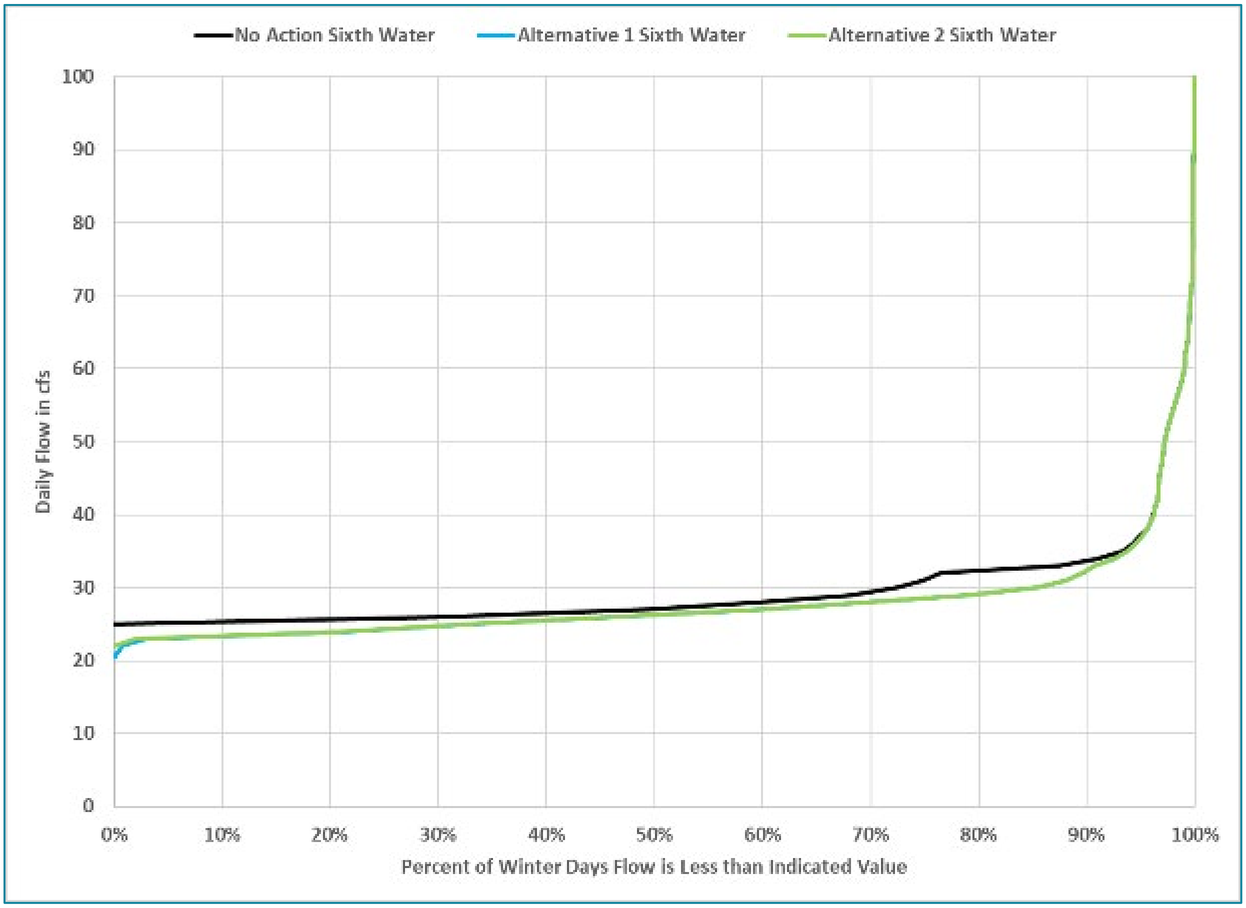

Figure 3.4-8. Flow duration curve for simulated flows during the winter (2005–2017) at Sixth Water Gage, No Action and Proposed Action Alternatives.

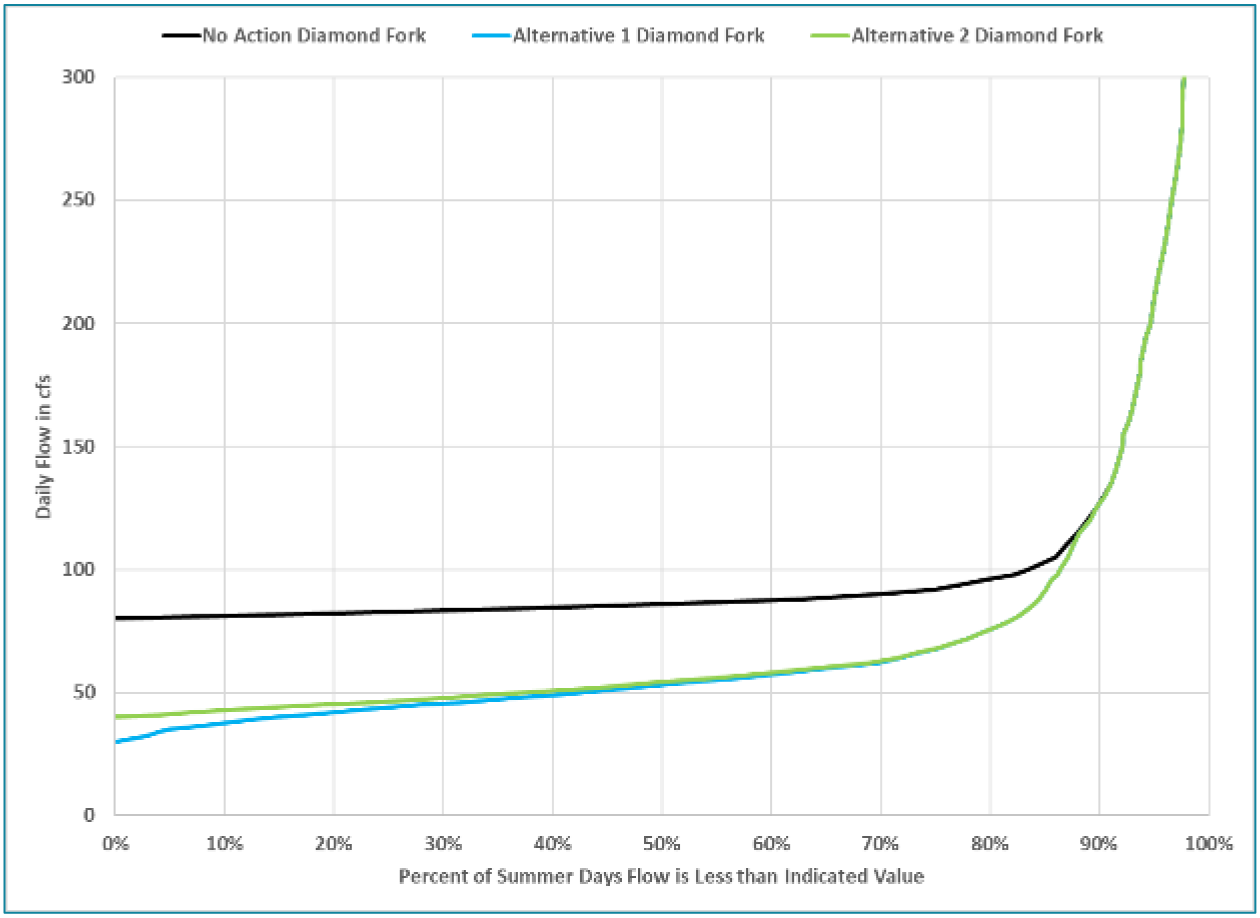

Figure 3.4-9. Flow duration curve for simulated flows during the summer (2005–2017) at Diamond Fork Gage, No Action and Proposed Action Alternatives.

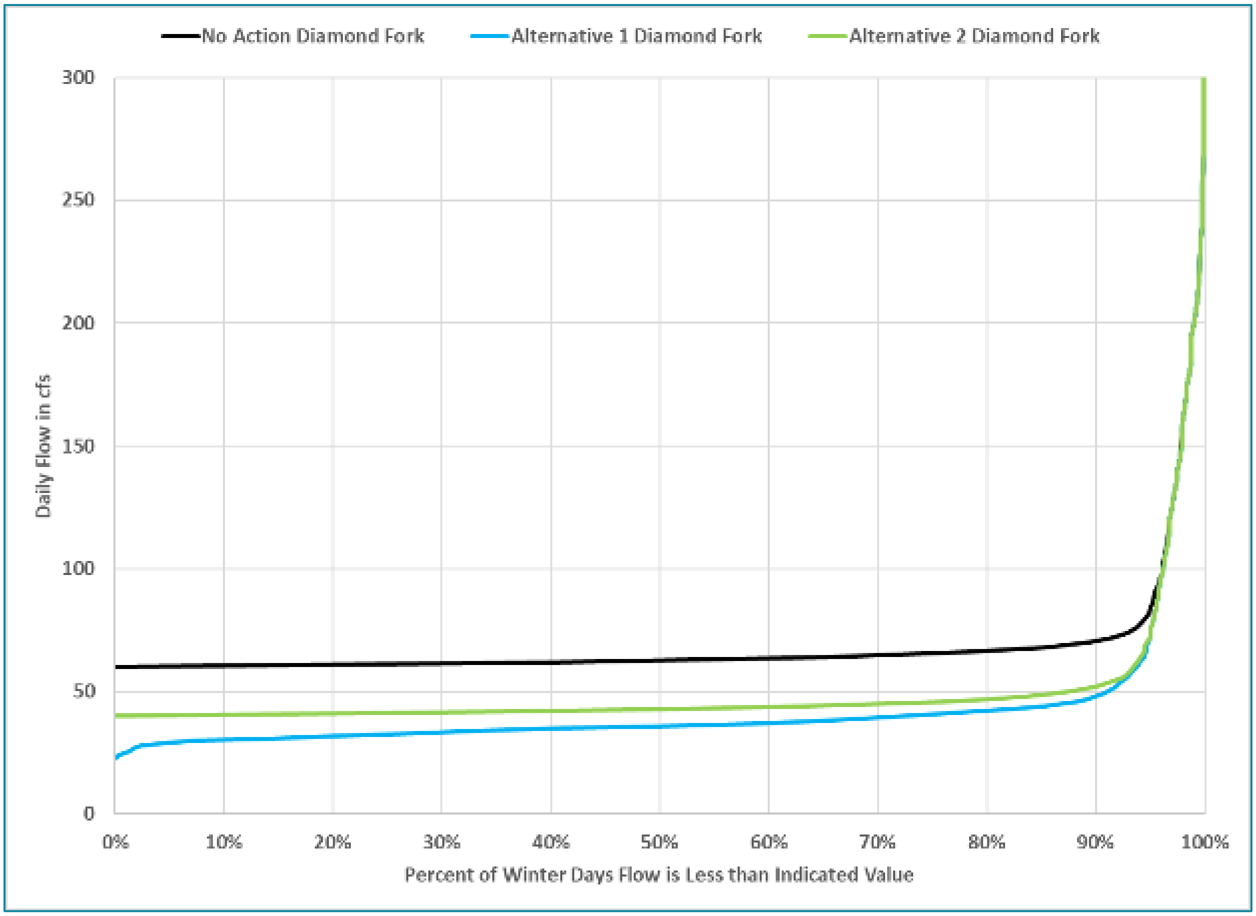

Figure 3.4-10. Flow duration curve for simulated flows during the winter (2005–2017) at Diamond Fork Gage, No Action and Proposed Action Alternatives.

3.4.3.2 Proposed Action Alternative

3.4.3.2.1 INSTREAM FLOW ALTERNATIVES

Strawberry Reservoir

The Proposed Action, including the instream flow alternatives, would not change the timing or amount of water diverted into the Strawberry Aqueduct and Collection System to meet project purposes, including storage in Strawberry Reservoir. Water retained in Strawberry Reservoir due to the reduced instream flows in Sixth Water and Diamond Fork Creeks would be less than 1% of its storage capacity and would be negligible compared to the overall storage capacity of Strawberry Reservoir (1,106,500 acre-feet capacity with a surface area of 6,770 acres). There would be no adverse effect to Strawberry Reservoir hydrology as a result of the instream flow alternatives. Since there would be no change to Strawberry Reservoir hydrology from the instream flow alternatives, effects to other resources in Strawberry Reservoir were not analyzed in detail for this EA.

The Proposed Action would have no effect on federal reserved water rights.

Sixth Water and Diamond Fork Creeks

The instream flow alternatives would result in less water released from the Strawberry Reservoir to Sixth Water and Diamond Fork Creeks, which ultimately flow into the Spanish Fork River and Utah Lake depending on the time of year. Figures 3.4-7 through 3.4-10 show the flow duration curves comparing the instream flow alternatives with the No Action Alternative, and Table 3.4-1 presents the simulated minimum, average, and maximum daily flows for the No Action Alternative compared with the instream flow alternatives. Key modeling parameters and assumptions are listed in Section 3.4.1. Both instream flow alternatives would provide lower base flows and more flow variability than the No Action Alternative. Lower base flows are beneficial to the health of Sixth Water and Diamond Fork Creeks. Instream Flow Alternative 1 provides the greatest variability in flow and the hydrograph that most closely mimics natural conditions when compared to the No Action Alternative and to Instream Flow Alternative 2. Instream Flow Alternative 2 would result in lower base flows and more flow variability in Sixth Water Creek when compared to the No Action Alternative and would provide higher base flows in Diamond Fork Creek to meet the desired medium fishery when compared to Instream Flow Alternative 1 (see Figures 3.4-7 and 3.4-10). During summer months under the instream flow alternatives, the base flows would be significantly lower than the No Action Alternative in Sixth Water and Diamond Fork Creeks, and there would be minimal differences between Instream Flow Alternatives 1 and 2 (see Figures 3.4-7 and 3.4-9). During winter months, the No Action Alternative and both instream flow alternatives would result in very similar hydrographs in Sixth Water Creek (see Figure 3.4-8). Winter flows under the instream flow alternatives in Diamond Fork Creek would be significantly lower than under the No Action Alternative, and flows under Instream Flow Alternative 1 would be substantially lower than under Instream Flow Alternative 2 (see Figure 3.4-10). In general, Proposed Action Alternatives 1 and 2 are very similar but are most distinct from each other in Diamond Fork Creek during winter months when flows may drop below 40 cfs roughly 50% of the time under Instream Flow Alternative 1 (see Figure 3.4-10).

Peak flows in both Sixth Water and Diamond Fork Creeks would be expected to be similar during high runoff years for the instream flow alternatives and the No Action Alternative (see Figures 3.4-7 through 3.4-10; see Table 3.4-2).

Table 3.4-2. Simulated Minimum, Average, and Maximum Daily Flow Statistics for the Evaluated Flow Alternatives

	No Action		Alternative 1		Alternative 2	
	Sixth Water Creek	Diamond Fork Creek	Sixth Water Creek	Diamond Fork Creek	Sixth Water Creek	Diamond Fork Creek
Minimum	25	60	20	22.1	22	40
Average	30.5	76.9	23.7	45.9	27.2	53.2
Maximum	77	260.8	77	260.8	77	260.8

Spanish Fork River

None of the proposed instream flow alternatives would change the amount of water being delivered to the Spanish Fork River during irrigation season. During non-irrigation season, instream flow from Diamond Fork Creek to the Spanish Fork River would be reduced by up to 27 cfs under Instream Flow Alternative 1 and up to 19 cfs under Instream Flow Alternative 2 (see Table 2.3-2). This would represent a reduction of up to 26% of Spanish Fork River flow downstream of Diamond Fork for Instream Flow Alternative 1 and up to an 18% reduction for Instream Flow Alternative 2. Once the river water reaches the Spanish Fork River Diversion (a power plant diversion approximately 2.5 miles downstream of the Diamond Fork confluence with the Spanish Fork River), 100% of the water in the river can be diverted for hydropower generation use, which is non-consumptive; the water is returned to the river upstream of the Mill Race Canal Diversion, approximately 4.25 miles downstream of the power plant diversion.

Provo River, Jordanelle Reservoir, Deer Creek Reservoir, and Utah Lake

Under both instream flow alternatives, redistributed instream flow water would be delivered to the Provo River. Relative to the No Action Alternative, this would increase the total volume of water available for instream flow purposes on the lower Provo River. However, net hydrologic conditions on the Provo River would not substantially change relative to current conditions because the anticipated amount of redistributed instream flow water (5,300 to 6,500 acre-feet annually) is similar to the 7,070 acre-feet of temporary instream flow water that will gradually expire by 2025. Therefore, the total volume of instream flow water available each year would continue to be about 20,000 acre-feet, and the ability of the JSRIP to meet ecosystem flow recommendations would not substantially change from existing conditions.

The imported flows delivered to Sixth Water and Diamond Fork Creeks during the non-irrigation season (winter months as defined in Table 2.3-1) are counted toward CUP import storage and are used for the Utah Lake/Jordanelle Reservoir exchange. Water stored in the Jordanelle and Deer Creek Reservoirs for municipal and industrial supply is released down the Provo River and conveyed though existing pipelines and tunnels to northern Utah County and Salt Lake County to meet municipal and industrial water needs. The reduction of the instream flows (from the instream flow alternatives) that contribute to the import storage in Utah Lake would not result in an impairment to the Utah Lake/Jordanelle Reservoir exchange and would be less than 1% of Utah Lake’s storage capacity; these reductions would not affect the overall hydrology of Utah Lake, Jordanelle Reservoir, or Deer Creek Reservoir.

3.4.3.2.2 HYDROGEN SULFIDE SPRINGS

The collection of hydrogen sulfide spring flow would remove the dispersed contribution of approximately 1.76 cfs of flow into Diamond Fork Creek to a single discharge channel approximately 0.5 mile downstream. This flow diversion represents approximately 15 to 20% of the flow of Diamond Fork Creek, and it would be discharged back into the stream approximately 0.5 mile downstream. The diversion of spring flows would occur at multiple distinct points over a distance of approximately 1,700 feet; therefore, effects to hydrology would be gradual and minor, and only 0.5 mile of stream would experience the full 15 to 20% reduction.

3.4.3.2.3 INSPECTION AND MAINTENANCE

Strawberry Tunnel

The proposed change to the inspection and maintenance schedule of the Strawberry Tunnel would interrupt the flow in Sixth Water Creek more frequently but for a shorter duration than the No Action Alternative. The short duration—up to 12 hours—of interrupted flows from the Strawberry Tunnel on an annual basis would decrease flow in Sixth Water Creek from the Strawberry Tunnel to the Sixth Water Flow Control Structure (upper Sixth Water Creek) by about 20 cfs. Flows entering upper Sixth Water Creek below the Strawberry Tunnel during the interruption would solely be from tunnel make and natural gains, 5 cfs on average (see Figure 2.3-6). Flows on Sixth Water Creek below the Sixth Water Flow Control Structure and on Diamond Fork below Three Forks would also briefly be reduced by about 20 cfs during the shutdown. Because the reduction in flows would be for a short duration (12 hours or less) and flows would be immediately restored following inspection, the annual Strawberry Tunnel inspection would have only a short-term, minor effect on the hydrology of upper Sixth Water and Diamond Fork Creeks.

In years when Strawberry Tunnel maintenance is needed, estimated to be every 3 years based on past maintenance needs, the delivery of instream flows through the Strawberry Tunnel would be interrupted for up to 5 days to allow for tunnel dewatering during maintenance activities. Shutdowns would take place in late September or early October after irrigation season has ended for the year, when air temperatures are mild and the Strawberry Tunnel is accessible. Maintenance shutdowns would reduce the flow in upper Sixth Water Creek to tunnel make and natural gains (5 cfs on average, as discussed above) for up to 5 days. Flows would be restored into the Strawberry Tunnel upon completion of maintenance activities. Depending on coordination with stakeholders conducted in advance of each maintenance shutdown, supplemental instream flows may be delivered at the Sixth Water Flow Control Structure to replace some or all of the approximately 20 cfs that would normally be delivered at the Strawberry Tunnel. If supplemental flows were delivered via the Sixth Water Flow Control Structure, flows on lower Sixth Water and Diamond Fork Creeks would remain in the ranges predicted (see Figures 3.4-8 and 3.4-10). If not, during the maintenance shutdown, flows on Diamond Fork Creek would drop by about 20 cfs to a predicted median value of 16 cfs under Instream Flow Alternative 1 and 23 cfs under Instream Flow Alternative 2.

Sixth Water Flow Control Structure

Annual inspection and maintenance activities for the Sixth Water Flow Control Structure would take place during the non-irrigation season. Regular inspection and maintenance are anticipated to take approximately 1 to 3 weeks. During that time, no instream flow would be released from the Sixth Water Flow Control Structure but would continue to be released from the Strawberry Tunnel. The 1- to 3-week shutdown would have no impact on Sixth Water or Diamond Fork Creeks under Instream Flow Alternative 1 because it does not entail non-irrigation season instream flow releases at the Sixth Water Flow Control Structure. Under Instream Flow Alternative 2, during the Sixth Water Flow Control Structure inspection and maintenance shutdown, flows would be expected to be similar to Instream Flow Alternative 1 and may not meet the 40 cfs minimum flow in Diamond Fork Creek during the shutdown period.

It is anticipated that approximately every 5 years extensive maintenance would be required on components of the Sixth Water Flow Control Structure, requiring it to be shut down for the entire non-irrigation season. Under Instream Flow Alternative 1, there would be no change because minimum flows would be delivered from the Strawberry Tunnel. Under Instream Flow Alternative 2, Diamond Fork Creek minimum flows could not be supplemented by releases from the Sixth Water Flow Control Structure. The JLAs will coordinate with agencies and interested parties on the desired flow regime to be delivered from the Strawberry Tunnel. Depending on coordination with stakeholders conducted in advance of maintenance shutdowns, supplemental flows may be made at the Strawberry Tunnel to more closely match the anticipated range of flows in Diamond Fork Creek and maintain the 40 cfs minimum. If these supplemental flows are made at the Strawberry Tunnel, flows in Sixth Water Creek would increase by about 7 cfs during the duration of the shutdown.

3.5 STREAM MORPHOLOGY

3.5.1 Issues, Impact Indicators, and Analysis Area

As part of the project's internal and external scoping, the following stream morphology issues were identified:

- How would minimum instream flow modifications impact steam morphological functions such as base flow channel geometry, channel variability/heterogeneity, and sediment transport competency in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River?
- How would the proposed hydrogen sulfide spring collection affect downstream stream morphology?
- How would proposed inspection and maintenance schedule changes impact the stream morphology in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River?

The impact indicators used to assess this issue are as follows:

- Observed quantitative changes in channel width over time are used to predict expected changes to the channel geometry.
- The predicted change in channel geometry is used to assess the stream channel's ability to mobilize sediment during both base flow and high flow conditions.

The analysis area is the Sixth Water Creek and Diamond Fork Creek channels and adjacent floodplain areas from the Strawberry Tunnel outlet to the confluence with the Spanish Fork River (see Figure 1.2-1) and the Spanish Fork River channel from Diamond Fork Creek downstream to the Spanish Fork River Diversion (see Figure 1.2-2). As noted in Section 3.4.3.2, the Proposed Action would not affect the hydrology of Strawberry Reservoir, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, or Utah Lake and therefore would not affect stream morphology associated with those waterbodies.

3.5.2 Affected Environment

3.5.2.1 Sixth Water and Diamond Fork Creeks

The morphology of a stream system is the result of the surrounding landscape and the balance between water and sediment that moves through the system. Stream morphology and the associated physical processes are what create and maintain the unique characteristics of instream and floodplain habitats. The morphology of a stream is typically characterized by the flow regime; substrate materials; and the channel slope, geometry, and planform (such as sinuosity or braiding). For this analysis, morphology of individual stream segments (identified during the USU study) was characterized to understand the dominant processes and sensitivities to a change in flow as well as the riverine habitats that are potentially supported by these physical characteristics (Figure 3.5-1).

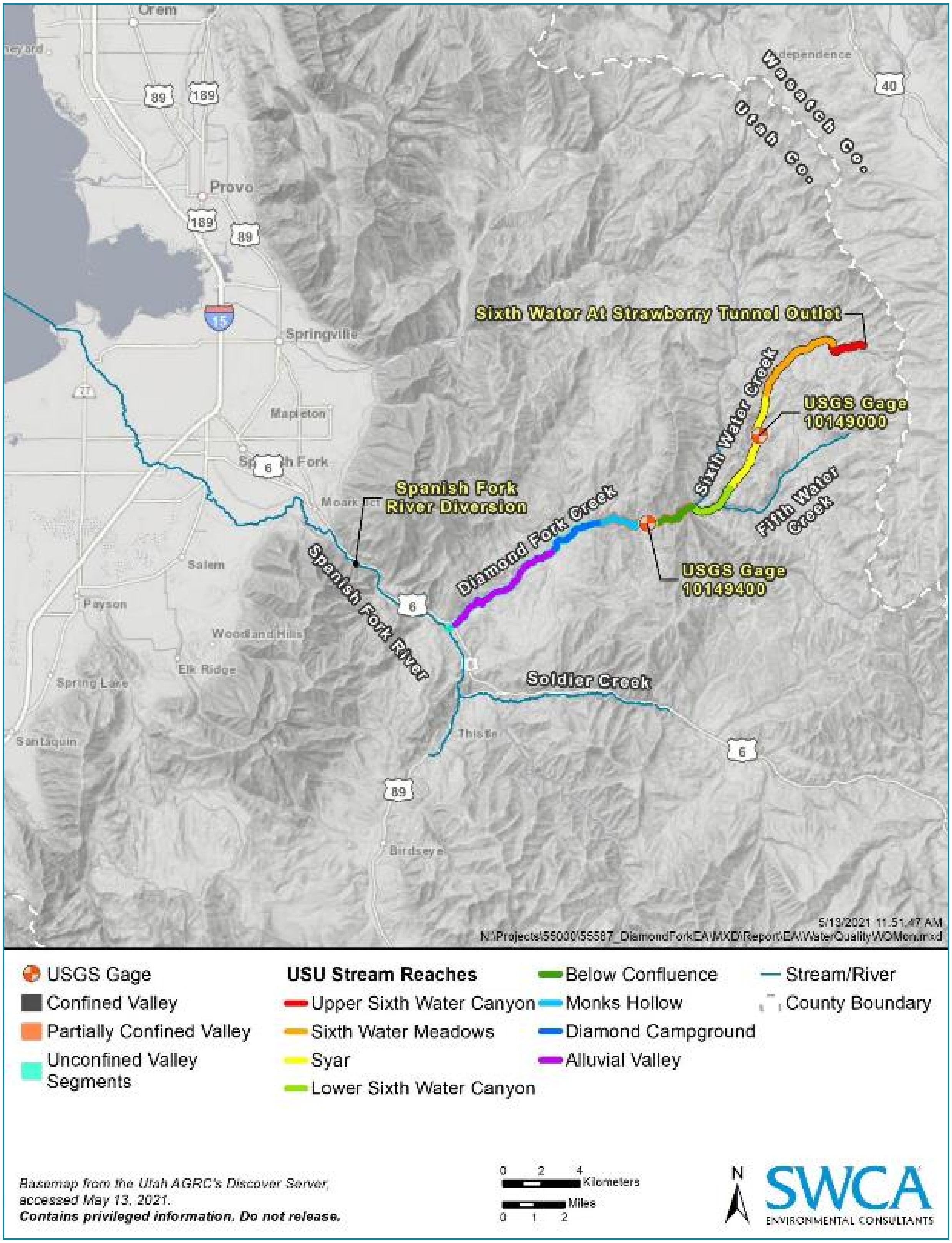

Figure 3.5-1. Reaches of Sixth Water Creek, Diamond Fork Creek, and U.S. Geological Survey flow monitoring gages.

A stream channel's morphological function is defined by the stream's ability to transport the sediment delivered to it and to provide flow access to the associated floodplain. The formation and maintenance of stream channels are generally considered to be a function of the higher flood flows in the channel that occur during spring snowmelt and summer thunderstorms, because these flows are able to transport the supplied sediment and access the river's floodplain.

The very large historical flow releases that were delivered for decades following development of the SVP and prior to operation of the Diamond Fork System substantially changed the morphology of the Sixth Water Creek and Diamond Fork Creek channels. Sixth Water Creek widened and incised by an average depth of 12–15 feet (BIO-WEST 2009a). The partially confined reaches of Diamond Fork Creek also incised but only by about 2–4 feet, and the lower unconfined reaches of Diamond Fork Creek became braided in response to the high SVP irrigation flows and the very high sediment loads delivered from the upstream erosion and incision (BIO-WEST 2009a).

The channel width of Sixth Water Creek has remained quite static since 1996, when imported SVP irrigation water began to be delivered via the Syar Tunnel instead of the Strawberry Tunnel. The bed and bank material consists of coarse cobbles and boulders that remain largely immobile during common 2 to 5–year floods. Very few finer grained bars or channel margin deposits are present (Wilcock et al. 2019).

Diamond Fork Creek, in contrast, is less confined and has more mobile bed material. Since completion of the Syar Tunnel and the Diamond Fork System, the channel has adjusted from a braided to a single-thread channel planform and has narrowed by about 45%. The extent of narrowing has been greatest in the most-downstream, least-confined reaches of the creek that were initially the widest under SVP hydrology conditions (Wilcock et al. 2019). Gravel bedload is mobilized by common 2 to 5–year floods, and transport rates are adequate to cause some scour and bar deposition; however, observed transport rates during common flood events do not appear large enough to generate large-scale channel shifts. Many channel reaches are straight with fairly uniform bed topography, and pools only occupy about 14% of the total channel area (Wilcock et al. 2019).

The CUPCA-mandated minimum flows on Diamond Fork Creek exceed the estimated bedload transport threshold of 40–50 cfs, meaning that fine sediment is in transport year-round at those flows, which is thought to contribute to unnaturally turbid conditions and gravel embeddedness (BIO-WEST 2012). The summertime mandated minimum flow of 80 cfs also limits encroachment of vegetation along channel margins, limiting further channel narrowing.

Diamond Fork Creek between the UDFFCS and the Sixth Water Creek confluence is a small stream that flows in a narrow, confined valley setting. The stream and its floodplain are further confined by Diamond Fork Road. The hydrology of this part of Diamond Fork Creek has never been affected by imported flows.

3.5.2.2 Spanish Fork River

The Spanish Fork River has received augmented flow deliveries via Diamond Fork Creek since the development of the SVP. Available information on the current stream morphology and sediment transport characteristics of the Spanish Fork River is limited. Diamond Fork Creek enters the Spanish Fork River in Spanish Fork Canyon, a naturally confined reach of the Spanish Fork River that is further confined by the presence of railroad and highway corridors. The Spanish Fork River becomes less confined below the canyon mouth, but the shape and alignment of the river have been modified by agricultural and urban development. Sediment transport is interrupted by numerous irrigation diversion structures and the large Spanish Fork River Diversion that dewaters a section of the river for power generation. Much of the lower Spanish Fork River has been channelized and has limited floodplain width and a relatively narrow corridor of streamside riparian habitat.

3.5.3 Environmental Consequences

3.5.3.1 No Action Alternative

Under the No Action Alternative, the stream processes and morphology of Sixth Water and Diamond Fork Creeks, and the Spanish Fork River, would not change from their current condition. On Diamond Fork Creek, CUPCA-mandated minimum flow requirements would continue to limit vegetation encroachment and cause year-round fine sediment transport, and associated turbidity and embeddedness concerns would persist. Diamond Fork Creek bedload sediment transport during common flood events would be expected to continue to generate small-scale bar deposition but not large-scale channel dynamics.

The periodic inspection and maintenance of the Strawberry Tunnel would continue to occur every 5 to 7 years, during which no flows would be delivered to Sixth Water Creek via the Strawberry Tunnel, and flows in Sixth Water and Diamond Fork Creeks would be reduced for up to 2 days. These shutdowns would be brief, occur outside the growing season, and do not affect snowmelt or rainfall-driven flood events; therefore, they are not thought to influence stream morphology.

3.5.3.2 Proposed Action Alternative

3.5.3.2.1 INSTREAM FLOW ALTERNATIVES

On Sixth Water Creek, both instream flow alternatives would reduce summer base flows relative to the No Action Alternative. Although this reduction would occur during the growing season, the coarse-bedded, immobile nature of Sixth Water Creek limits potential for vegetation encroachment and associated stream morphology change. Overall, neither instream flow alternative would be expected to change stream morphology on Sixth Water Creek.

On Diamond Fork Creek, both instream flow alternatives would reduce summer base flows relative to the No Action Alternative (see Figure 3.4-9). This change would re-establish a more natural ratio between base flow and flood flow magnitudes on Diamond Fork Creek. It would reduce the loading of fines caused by year-round fine sediment transport and address associated turbidity and embeddedness concerns (BIO-WEST 2012). Neither instream flow alternative would alter the higher magnitude flood flows associated with snowmelt runoff and thunderstorms that are the main drivers of morphological change. However, the reduction in base flows during the summer growing season would be expected to lead to vegetation encroachment and narrowing of the active channel width by up to 1 meter (Wilcock 2019). This narrowing would increase instream shear stress, resulting in increased rates of sediment transport and mobilization of coarser bed material during snowmelt and rainfall-driven flood events. This increase in sediment mobility would be expected to increase channel dynamics and potentially lead to more diverse in-channel topography and associated aquatic habitat relative to the No Action Alternative. These minor effects are expected to be most pronounced in the downstream reaches of Diamond Fork Creek that are the least confined and have the most mobile bed material (Wilcock et al. 2019).

On the Spanish Fork River, both instream flow alternatives would reduce base flows during the non-irrigation season. However, neither alternative would affect base flows on the Spanish Fork River during the irrigation season and therefore no vegetation encroachment or channel narrowing would be expected to occur. Neither alternative would affect snowmelt or rainfall-associated flood flows that drive morphological processes. Therefore, neither alternative is expected to alter the stream morphology of the Spanish Fork River.

3.5.3.2.2 HYDROGEN SULFIDE SPRINGS

The collection of hydrogen sulfide springs, approximately 1.76 cfs, would remove the dispersed contribution of a relatively small portion of upper Diamond Fork Creek flow from multiple hydrogen sulfide springs to a single discharge point downstream. The small narrow channel of upper Diamond Fork Creek is confined within Diamond Fork Canyon and not very mobile; thus, it would not be very susceptible to the influence of the discharge channel. The reduction in flow from the springs in the short reach downstream of the UDFFCS would be minimal, and the discharge of the flow from the springs would occur only a short distance (3,500 feet) downstream. The discharge channel for the piped spring flows would not substantially modify the morphology of the stream in the immediate area of the discharge channel and would not be expected to affect the stream morphology downstream.

3.5.3.2.3 INSPECTION AND MAINTENANCE

The proposed changes to the inspection and maintenance schedules for Strawberry Tunnel and the Sixth Water Flow Control Structure would alter the frequency and duration of shutdowns to these features relative to the No Action Alternative. As discussed in Hydrology Section 3.4, these shutdowns would reduce flows on Sixth Water and Diamond Fork Creeks and the Spanish Fork River by up to about 20 cfs at times. However, all planned shutdowns would occur during the non-irrigation season, when flow reductions would not lead to vegetation encroachment or channel narrowing even in the case of a prolonged shutdown. In addition, the shutdowns would not be expected to occur during high flood flows associated with springtime snowmelt runoff or summer thunderstorms and would not impact these high magnitude flows that drive morphological processes. Therefore, the proposed inspection and maintenance changes would not be expected to alter the stream morphology of Sixth Water Creek, Diamond Fork Creek, or the Spanish Fork River.

3.6 WATER QUALITY

3.6.1 Issues, Impact Indicators, and Analysis Area

As part of the project's internal and external scoping, the following water quality issues were identified:

- How would the instream flow alternatives impact critical water quality parameters such as dissolved oxygen, temperature, and selenium in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River?
- How would the collection and discharge of hydrogen sulfide spring water near the UDFFCS impact critical water quality parameters (e.g., sulfide) in Diamond Fork Creek?
- How would proposed inspection and maintenance schedule changes impact the water quality in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River?

The impact indicators used to assess these issues are as follows:

- Concentrations of water quality parameters compared to numeric criteria in UAC R317
- Acres of ground disturbance for the hydrogen sulfide spring collection, including acres of high gradient slopes

The water quality analysis area for the instream flow alternatives consists of Sixth Water Creek from the Strawberry Tunnel outlet to Three Forks, Diamond Fork Creek from Three Forks to the confluence with the Spanish Fork River, and the Spanish Fork River downstream of Diamond Fork Creek to Utah Lake. As noted in Section 3.4.3.2, the Proposed Action would not affect the hydrology of Strawberry Reservoir, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, or Utah Lake and therefore would not affect water quality associated with those waterbodies. The water quality analysis area for the hydrogen springs collection issue consists of Diamond Fork Creek from just upstream of the UDFFCS down to Three Forks. The water quality analysis area for the proposed changes to the inspection and maintenance schedule consists of Sixth Water Creek, Diamond Fork Creek from Three Forks to the confluence with the Spanish Fork River, and the Spanish Fork River from Diamond Fork River downstream to Utah Lake.

3.6.2 Affected Environment

Diamond Fork Creek is a mid-elevation mountain stream that feeds into the Spanish Fork River approximately 8.5 miles upstream of the City of Spanish Fork. The approximately 156-square-mile watershed includes the tributary Sixth Water Creek watershed, which has received supplemental trans-basin flow inputs from the Strawberry Reservoir since the early 1900s. Other than the installation of the water conveyance infrastructure (including access roads) that makes up the Diamond Fork System, very little development has occurred within the Diamond Fork watershed, and water quality has historically been good, except for a short reach of Diamond Fork Creek which is impacted by inflows from a series of sulfur-rich springs. An additional water quality concern is related to selenium in groundwater seepage into the Strawberry Tunnel that enters Sixth Water Creek. Selenium concentrations are generally diluted below numeric criteria thresholds by flow deliveries from the Strawberry Tunnel. The sources of the sulfur and selenium are associated with the natural geology of the watershed. Water quality monitoring has been completed by the District, and the data are stored for public use in the DWQ Ambient Water Quality Data Management System database. Diamond Fork Creek is broken up into three assessment units (Diamond Fork-1, -2, and -3), Sixth Water Creek into a single assessment unit, and the Spanish Fork River into two assessment units (Spanish Fork River-1 and -2) (Figure 3.6-1). All six assessment units are designated by DWQ for the following beneficial uses per the CWA in UAC R317-2:

- **Class 2B:** Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water.
- **Class 3A:** Protected for cold-water species of game fish and other cold-water aquatic life, including the necessary aquatic organisms in their food chain.
- **Class 4:** Protected for agricultural uses including irrigation of crops and stock watering.

Assessment unit Spanish Fork River-1 is also designated by DWQ for the following beneficial uses per the CWA in UAC R317-2:

- **Class 3B**: Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.
- **Class 3D**: Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.

Water quality data from monitoring locations within each assessment unit are compared to numeric criteria associated with each of the beneficial uses in UAC R317-2 (Table 3.6-1) to identify exceedances. If repeated exceedances are documented for a given assessment unit, it may be listed as impaired on the 303(d) (of the CWA) list of impaired waterbodies, which triggers the need for a total maximum daily load analysis for these assessment units. A total maximum daily load establishes the maximum amount of a pollutant allowed in a waterbody and serves as the starting point or planning tool for restoring water quality.

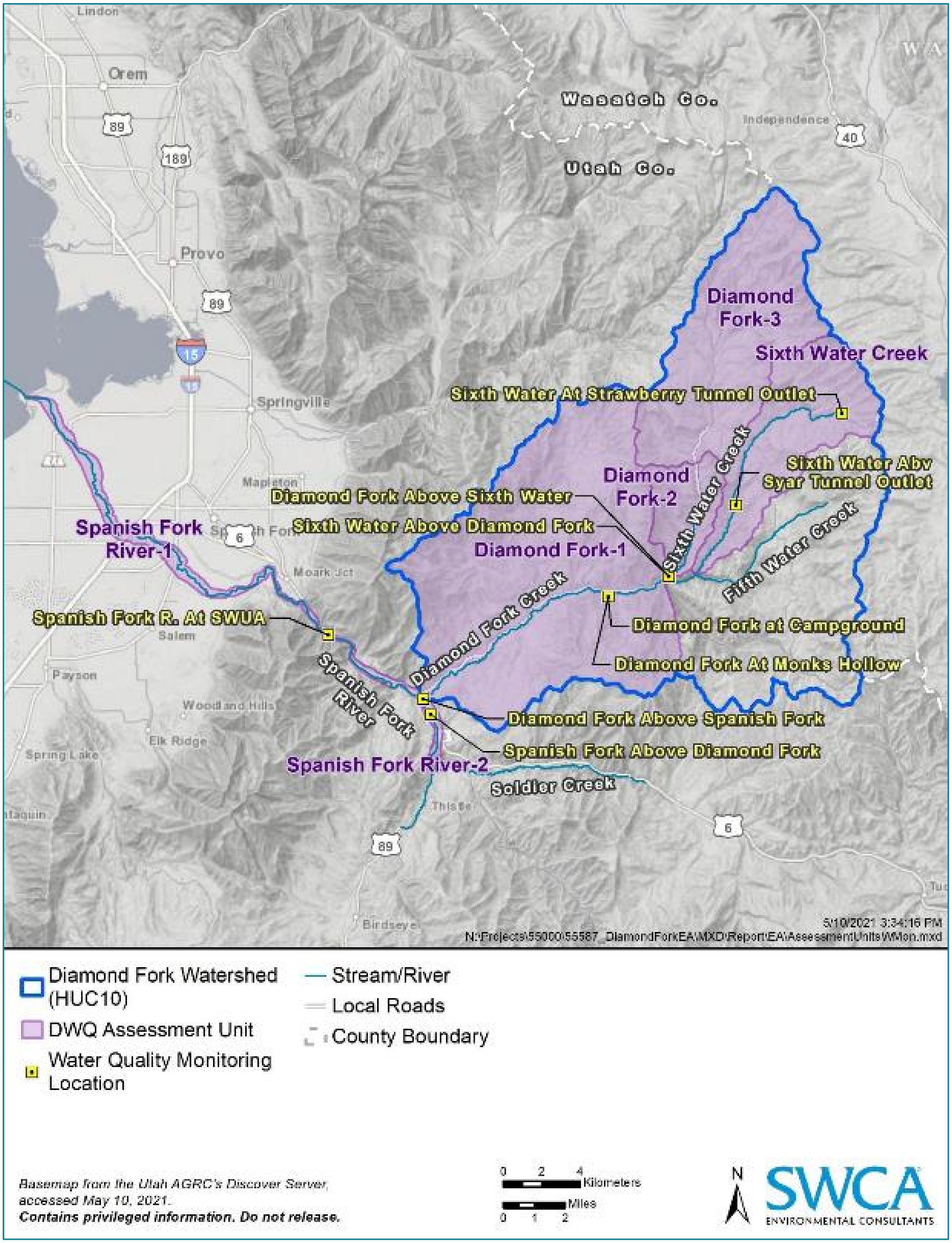

Figure 3.6-1.The project area broken up into the Utah Division of Water Quality Assessment Units. Yellow squares represent Utah Division of Water Quality water quality monitoring locations.

CENTRAL UTAH WATER CONSERVANCY DISTRICT

UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION

Although there are no impairments currently listed in any of the assessment units in the instream flow alternatives water quality analysis area, the 2016 assessment was for Category 3 No Assessment for Sixth Water Creek, Diamond Fork-1, Diamond Fork-2, Diamond Fork-3, and Spanish Fork-1, meaning that more data are required to fully evaluate the impairment status of the stream units. Monitoring by the District indicates that concentrations of undissociated H_2S may be in exceedance of the numeric criteria for the Class 3A beneficial use in a portion of Diamond Fork Creek near the hydrogen sulfide springs. Additionally, naturally occurring selenium presents a water quality concern in upper Sixth Water Creek where concentrated groundwater inputs (tunnel make) enter Strawberry Tunnel and discharge into Sixth Water Creek. Monitoring by the District indicates that concentrations in the discharge from the Strawberry Tunnel during tunnel closures are commonly above the acute 1-hour average aquatic life numeric criteria; however, dilution from inputs of Strawberry Reservoir water generally result in concentrations below the chronic (4-day average) numeric criteria and exceedances of the numeric criteria during releases from the Strawberry Tunnel greater than 20 cfs are rare. Exceedances for *Escherichia coli* (in 2011) and mercury (in 2012) have been observed in Diamond Fork-2, for *Escherichia coli* in Diamond Fork-1 (in 2011), and for selenium (4-day average) in Sixth Water Creek (at Strawberry Tunnel Outlet) in 2016 and 2017 during experimental low releases from Strawberry Tunnel, and in 2019, but no others have been documented subsequently. No exceedances have been documented in the Ambient Water Quality Data Management System database for dissolved oxygen or temperature, although monitoring data from the District, Mitigation Commission, and Wilcock et al. (2019) indicate that exceedances occasionally occur at some monitoring locations (Figure 3.6-2), and the periodic measurements collected by District staff may not accurately characterize diel (24-hour period) temperature dynamics in the streams. Periodic high-frequency data collection efforts show that during the hottest days of the summer, temperatures may exceed the numeric criteria for cold-water aquatic life for several hours during the day. However, these exceedances are likely caused by high air temperatures and do not appear to be correlated with or caused by low flows (see Figure 3.6-2) (SWCA Environmental Consultants [SWCA] 2021). No data are available in Ambient Water Quality Data Management System for sulfides or undissociated hydrogen sulfide.

Table 3.6-1. Numeric Criteria for Key Water Quality Parameters from Utah Administrative Code R317-2

Parameter	Class 2B	Class 3A	Class 3B	Class 3D	Class 4
Dissolved oxygen (minimum)	Not applicable (N/A)	8.0/4.0 mg/L	5.0/3.0 mg/L	3.0 mg/L	N/A
Temperature (maximum)	N/A	20°C	27°C	27°C	N/A
Selenium	N/A	4.6 µg/L (4-day average) 18.4 µg/L (1-hour average)	4.6 µg/L (4-day average) 18.4 µg/L (1-hour average)	4.6 µg/L (4-day average) 18.4 µg/L (1-hour average)	0.05 mg/L
Undissociated hydrogen sulfide (maximum)	N/A	2.0 µg/L	2.0 µg/L	2.0 µg /L	N/A

Note: °C = degrees Celsius; µg/L = micrograms per liter; mg/L = milligrams per liter.

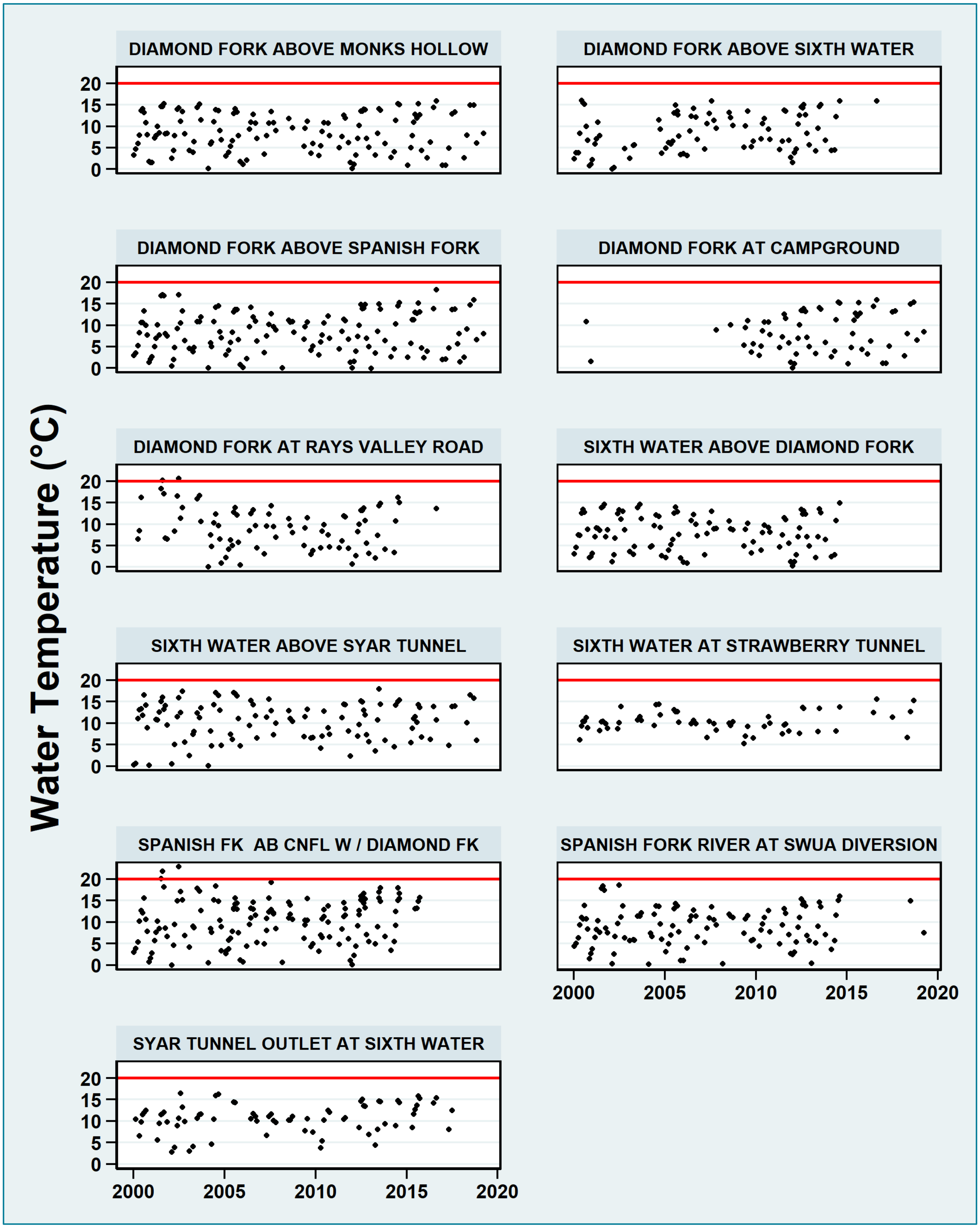

Figure 3.6-2. Temperature measurements collected by the District at monitoring locations in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River from 2000 to 2019 compared to the numeric criteria for Class 3A cold-water aquatic life (20°C).

The presence of sulfur-rich springs in portions of the Diamond Fork Creek watershed influences the water quality of the stream in certain reaches. Near the UDFFCS, approximately 12 springs enter Diamond Fork Creek, contributing an estimated 1.76 cfs to the flow of the creek. Some of these springs are highly concentrated in hydrogen sulfide, and their flow into Diamond Fork Creek causes high concentrations of sulfides in a stretch of the creek. However, oxidation appears to rapidly remove the hydrogen sulfide as the water moves downstream. The approximately 1.25-mile reach of Diamond Fork Creek from just upstream of the UDFFCS down to the area just upstream of the fish barrier is largely considered to be uninhabitable for numerous aquatic taxa because of high concentrations of undissociated hydrogen sulfide. No fish were sampled in this reach during a May 2020 sampling event; however, fish were sampled with greater frequency with increasing distance downstream. Degraded water quality is reflected in the low richness of the benthic macroinvertebrate community and in the extremely low abundance of fish within this reach.

Limited water quality data are available because DWQ does not have a regular monitoring location where water quality measurements of undissociated hydrogen sulfide are made. The District has monitored water quality in upper Diamond Fork Creek since January 2020 to document existing conditions and the changes that occur in the downstream reach. Monitoring data indicate that concentrations of total sulfides average roughly 80 µg/L in Diamond Fork Creek just downstream of the sulfur springs. When converted to undissociated hydrogen sulfide, this average concentration is roughly 4.8 µg/L which is more than double the numeric criteria value for the aquatic wildlife beneficial use (see Table 3.6-1). As the creek travels downstream, concentrations of undissociated hydrogen sulfide appear to decrease rapidly to 1.6 µg/L (66% decrease) within 0.2 mile downstream and to 1.05 µg/L (78% decrease) within 0.4 mile downstream. While these numbers are estimates, they provide an indication that the sulfides are oxidized rapidly within the creek and that water quality in Diamond Fork Creek returns to upstream (of the sulfur springs) conditions rapidly.

3.6.3 Environmental Consequences

3.6.3.1 No Action Alternative

Under the No Action Alternative, the Diamond Fork System would operate under the CUPCA-mandated minimum instream flow requirements. The anticipated flow regime of Sixth Water and Diamond Fork Creeks to meet these minimums is described in Section 3.4 Hydrology and is similar to actual flows documented in the creeks in recent years. As described in Section 3.6.2, water quality in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River is high, with very few documented exceedances of water quality numeric criteria. Given that water quality data have included very few documented exceedances of numeric criteria for dissolved oxygen, temperature, or selenium, the No Action Alternative would not be expected to negatively affect water quality in the creeks.

There is a known water quality concern with elevated selenium concentrations naturally occurring in the tunnel make (groundwater that seeps out of the Strawberry Tunnel high up in Sixth Water Creek). The observed exceedances of the numeric criteria for selenium were collected during periods when the Strawberry Tunnel was shut down and therefore were not representative of normal conditions in Sixth Water Creek. Wilcock et al. (2019) modeled the relationship between flow and selenium concentrations at the Strawberry Tunnel outflow to determine the flow threshold (20 cfs) that maintains selenium concentrations below the numeric criteria (Figure 3.6-3). The CUPCA-mandated minimum flows that would be released by the No Action Alternative would exceed 20 cfs and successfully dilute selenium concentrations below numeric criteria values. Even though there is no specified minimum flow requirement from the Strawberry Tunnel, flow simulations for the No Action Alternative (see Figures 3.4-7 and 3.4-10) indicate that releases from the Strawberry Tunnel would always remain above 20 cfs and therefore high enough to keep selenium concentrations in Sixth Water Creek diluted to below numeric criteria values (Wilcock et al. 2019). The No Action Alternative would not be expected to cause exceedances of dissolved oxygen or temperature in Diamond Fork or Sixth Water Creeks. As shown in Figure 3.6-2, very few exceedances have been documented by DWQ, and exceedances during the heat of the summer that only last for a few hours do not pose a significant threat to aquatic wildlife. Data from the USGS stream gages in Sixth Water and Diamond Fork Creeks indicate that actual flow releases matched the simulated hydrograph for the No Action Alternative very closely from 2013 through 2014. Dissolved oxygen concentrations and temperature measurements collected from 2000 to 2019 (and accepted by DWQ into the Ambient Water Quality Data Management System) are summarized in Table 3.6-2. These water quality measurements and samples were taken at flows within the range of what is expected for the No Action Alternative and all measurements were below numeric criteria detailed in UAC R317-2. The No Action Alternative for flow releases would not be anticipated to affect water quality negatively within Sixth Water or Diamond Fork Creeks.

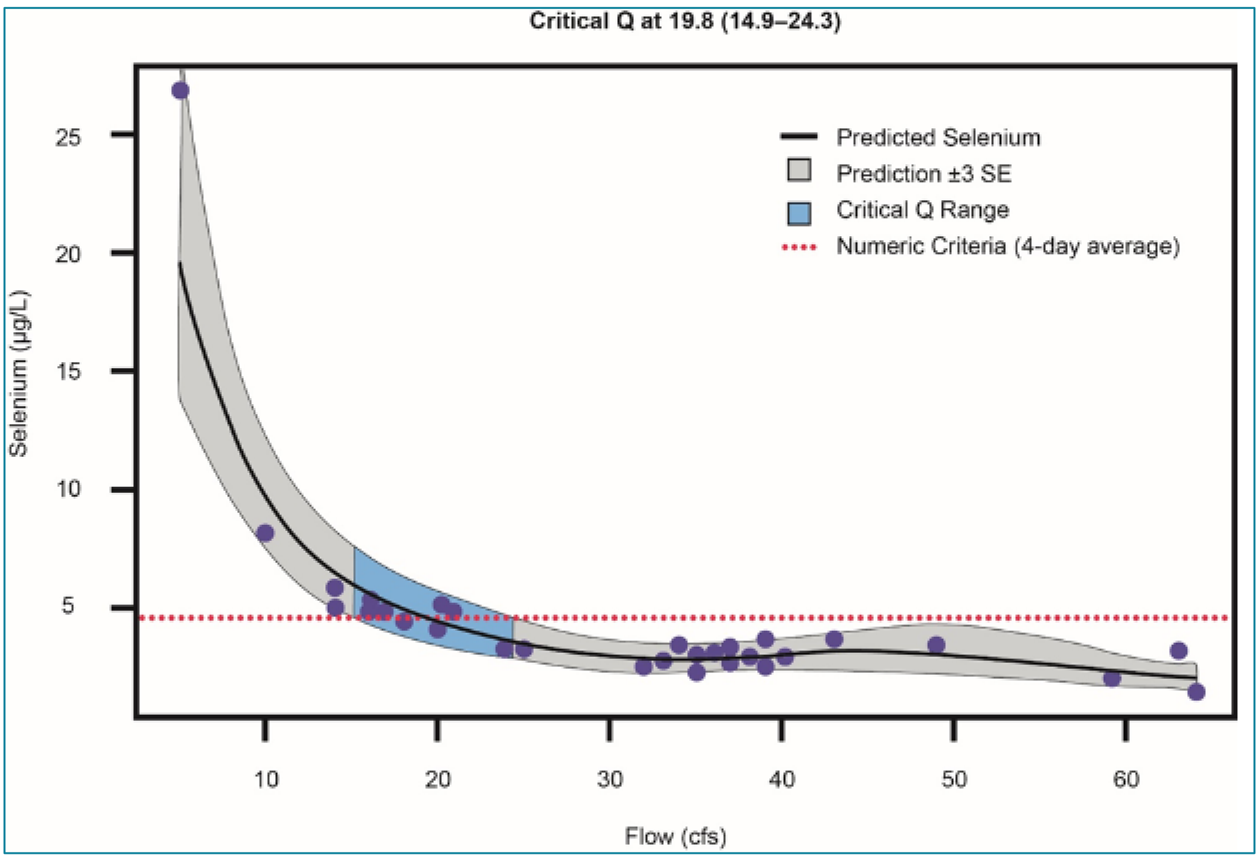

Figure 3.6-3. The observed (purple dots) and modeled (black line) relationship between flow and selenium concentrations in Sixth Water Creek. The analysis concluded that a flow in excess of 20 cfs is required to maintain selenium concentrations below the Utah chronic (4-day average) numeric criteria for aquatic life.

Table 3.6-2. Range in Measured Water Quality Measurements from 2000 to 2019 at Utah Division of Water Quality Regular Monitoring Locations in Sixth Water Creek (monitoring locations 4995720, 4995730, and 4995780), Diamond Fork Creek (monitoring locations 4995640, 4995670, 4995690, 4995710, and 4995760), and the Spanish Fork River (monitoring locations 4995645, 4995790, and 4995600) for 2000 through 2019

Parameter	Sixth Water Creek	Diamond Fork Creek	Spanish Fork River
Dissolved oxygen	5.84–12.1 mg/L	6.43–12.78 mg/L	6.31-12.7 mg/L
Temperature (maximum)	0.04°C–17.97°C	-0.03°C–20.65°C	0-22.91°C
Selenium	1.3–8.3 µg/L	0.5–2.9 µg/L	0.5-2.1 µg/L
Undissociated hydrogen sulfide (maximum)*	Not applicable	Not applicable	Not applicable

* Samples were not collected for analysis of undissociated hydrogen sulfide.

Note: mg/L = milligrams per liter; °C = degrees Celsius; µg/L = micrograms per liter.

Under the No Action Alternative, no modifications to the hydrogen sulfide springs upstream and downstream of the UDFFCS would be made, and therefore the water quality of Diamond Fork Creek would not be altered. The inputs of hydrogen sulfide–rich springs into Diamond Fork Creek would continue to cause elevated concentrations of undissociated hydrogen sulfide in the reach downstream of the UDFFCS. Water quality monitoring completed by the District in 2020 indicates that concentrations of undissociated hydrogen sulfide are likely reduced below the numeric criteria for aquatic wildlife (2.0 µg/L) within 0.2 to 0.4 mile downstream because of oxidation in the creek.

Under the No Action Alternative, the District would inspect and maintain the Strawberry Tunnel in accordance with the parameters from the 1999 FS-FEIS, which would involve dewatering the tunnel for up to 2 days once every 5 to 7 years. While the Strawberry Tunnel is dewatered, the only flow into Sixth Water Creek would be 5 to 7 cfs of tunnel make. During these 2 days, there would be a reduction in water quality—specifically, elevated concentrations of selenium. While selenium concentrations would be expected to surpass numeric criteria, concentrations would be diluted as soon as flows from the Strawberry Tunnel are resumed following the 2-day shutdown. In addition, without more frequent inspections and maintenance of the Strawberry Tunnel, conditions would likely continue to degrade and, at some point, use of the Strawberry Tunnel for instream flow deliveries may not be possible. This could have an impact on selenium levels in Sixth Water Creek.

3.6.3.2 Proposed Action Alternative

3.6.3.2.1 INSTREAM FLOW ALTERNATIVES

The anticipated changes in flows from the instream flow alternatives are described in Section 3.4.3.2.1. The instream flow alternatives have minor differences in their simulated flow regimes (mainly base flows) but are not anticipated to result in different water quality conditions—from each other or from the No Action Alternative. Based on a review of existing water quality data and concerns raised during scoping, the main water quality parameters of concern identified were temperature and dissolved oxygen. The assessment of potential changes in water quality conditions was made by analyzing the drivers of stream temperature (which is negatively correlated with dissolved oxygen) and comparing water quality conditions in recent years (from 2000 to 2019) to DWQ numeric criteria. Water quality measurements collected during a wide range of flow conditions that encompass the range of flows simulated in the instream flow alternatives largely fell within the numeric criteria of UAC R317-2 (see Table 3.6-2).

The few exceedances were for dissolved oxygen, temperature, and selenium. The concentration of selenium samples (from October 2016; see Figure 3.6-2) collected in Sixth Water Creek at the Strawberry Tunnel outlet were higher than the chronic 4-day average numeric criteria of 4.6 milligrams per liter (mg/L). These samples were collected at flows less than 20 cfs during a monitoring effort to evaluate the selenium exceedance threshold, which is less than the minimum release prescribed in the instream flow alternatives. Both instream flow alternatives include a minimum release of 20 cfs through Strawberry Tunnel and were developed in part to mitigate potential water quality concerns associated with selenium-rich groundwater inputs into the Strawberry Tunnel. Therefore, no exceedances of numeric criteria for selenium would be anticipated under either of the instream flow alternatives. As described in Wilcock et al. (2019), flows larger than 22 cfs at the Sixth Water Creek USGS gage result in relatively constant selenium concentrations that are below the Utah chronic limit of 4.6 mg/L. The range of flows anticipated from the instream flow alternatives are similar to flows that have been recorded at times in the past.

Exceedances for dissolved oxygen and temperature in Diamond Fork are generally understood to occur during the hottest summer months. While the instream flow alternatives would lower baseflows in Sixth Water and Diamond Fork Creeks, additional exceedances of dissolved oxygen and temperature numeric criteria during summer months would not be anticipated. Using high-frequency temperature data collected by USU during low-flow summer conditions during 2016, 2017, and 2018 (Figure 3.6-4), a statistical analysis was completed to evaluate the potential relationship between flow and stream temperature during summer base flow in Diamond Fork Creek (SWCA 2021a). Base flow conditions were defined as flows with an exceedance probability > 40% (< 60 cfs) from a flow duration curve (2016–2018) for Diamond Fork Creek. This analysis was undertaken to evaluate whether a reduction in stream flow would be expected to result in higher stream temperatures (and theoretically lower dissolved oxygen concentrations). The results of the analysis indicated that there was not a statistically significant correlation between stream temperature and stream flow (p-value 0.39) based on the Kendall Rank Correlation test with a 95% confidence interval (Figure 3.6-5). The Kendall Rank Correlation test (non-parametric) was used because the summer flow data (and residuals) did not come from a normal distribution.

Multiple regression analyses were completed to explore correlation with other variables, and they concluded that stream flow was not a driver of stream temperature and that using stream flow as a variable along with air temperature and day of the year did not significantly improve model performance compared to only using air temperature and day of the year. This indicated that flow could be removed from the model and that there is not a significant relationship between flow and stream temperature across the range of flows modeled. In Diamond Fork Creek summer water temperature appears to be driven by a combination of day of the year and air temperature. Given that the solubility of oxygen in water is temperature dependent, it can be assumed that there is similarly no relationship between stream flow and dissolved oxygen concentrations in Diamond Fork Creek. This result likely applies to the Spanish Fork River given its close proximity to Diamond Fork Creek. Although average base flows in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River are anticipated to be reduced under both instream flow alternatives when compared to the No Action Alternative, this is not expected to result in impacts to water quality.

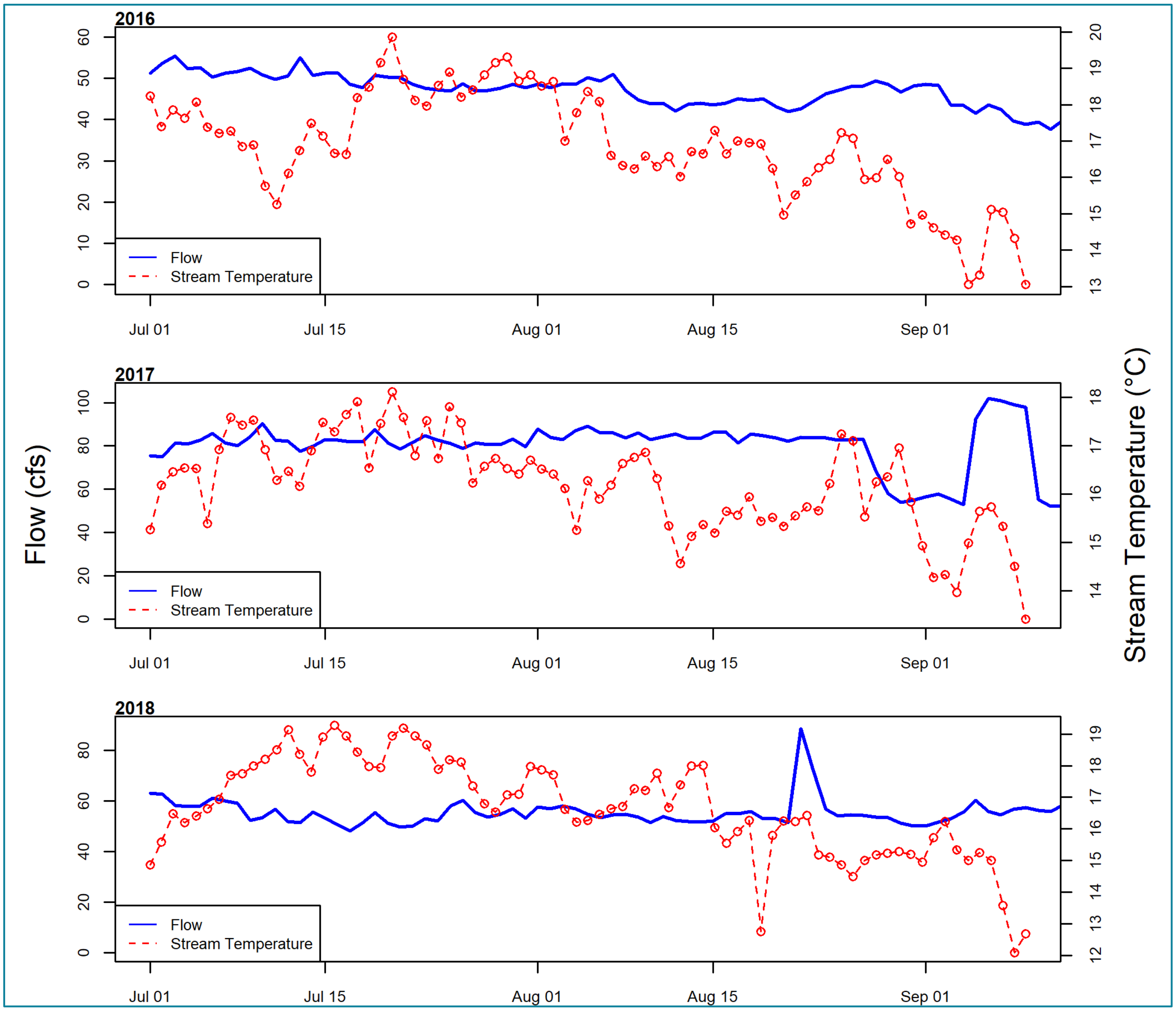

Figure 3.6-4. Daily mean temperature (from the Mother Lode site) and flow measurements (from USGS Gage #10149400) for Diamond Fork Creek during the summer base flow periods (July 1 to September 15) of 2016, 2017, and 2018.

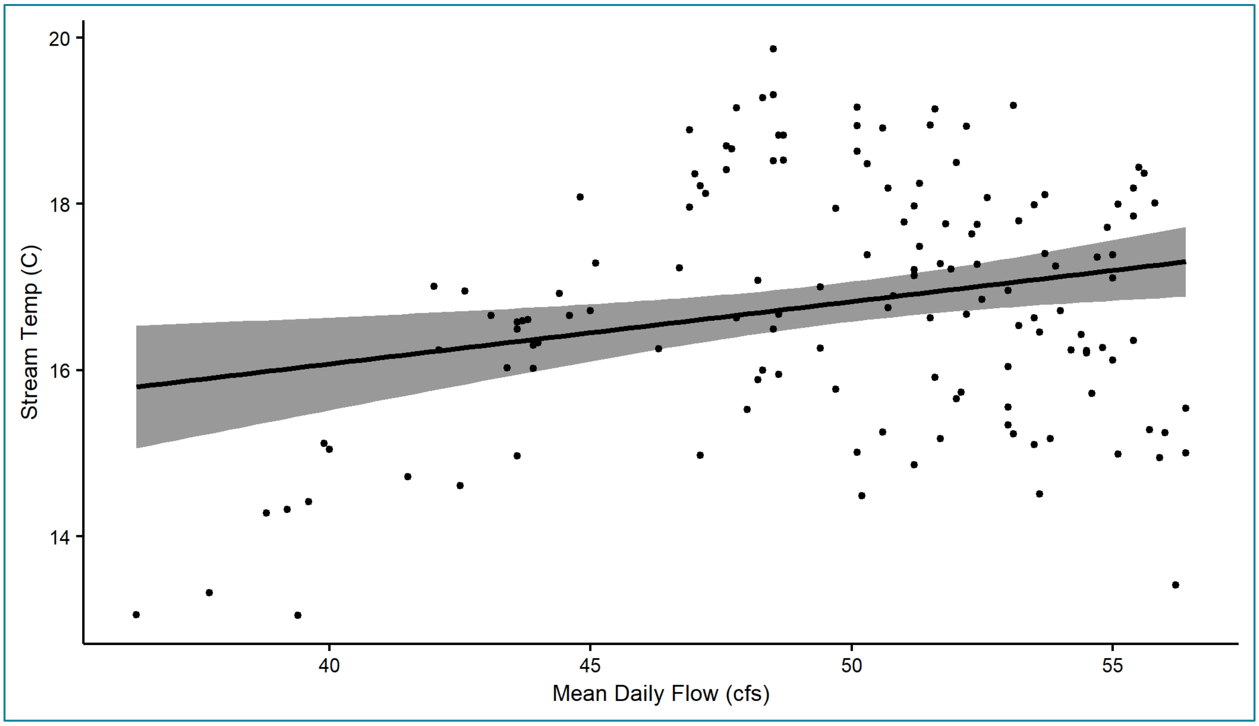

Figure 3.6-5. Daily flow measurements (from USGS Gage #10149400) for Diamond Fork Creek and daily mean temperature (from the Mother Lode site) during the summer base flow periods (July 1 to September 15) of 2016, 2017, and 2018 and the Kendall Rank Correlation.

3.6.3.2.2 HYDROGEN SULFIDE SPRINGS

During construction there is potential for temporary impacts to water quality due to construction-related inputs such as loose sediment entering Diamond Fork Creek. However, BMPs would be implemented during construction to prevent hazardous chemicals and loose sediments from entering Diamond Fork Creek. Measures to protect surface water quality from construction activities, including ground disturbance, would be outlined in a stormwater pollution prevention plan to be developed by the construction contractor. Nonetheless short-term impacts to water quality would be expected from ground-disturbing activities associated with the development of hydrogen sulfide springs and installation of the collection pipeline, including the development of pipeline crossings under Diamond Fork Creek.

The collection of hydrogen sulfide springs would modify water quality conditions in specific segments of the reach of Diamond Fork downstream of the UDFFCS. Under the Proposed Action, the discharge of collected hydrogen sulfide spring water into Diamond Fork Creek would occur further downstream than the current diffuse discharge of numerous springs and would occur at a single point. This would improve water quality in Diamond Fork Creek between the location of the springs and the proposed discharge location but would increase concentrations of undissociated hydrogen sulfide in the reach downstream of where the conveyance pipe would discharge (see Figure 2.3-5). However, design features to encourage oxidation/aeration during discharge of the spring flows would limit the potential for increases in undissociated hydrogen sulfide in the stream segment downstream of the discharge point. Additionally, this hydrogen sulfide–rich spring water is natural and, because of rapid oxidation, it is not anticipated that concentrations of undissociated hydrogen sulfide would reach the numeric criteria for cold-water aquatic wildlife (2.0 µg/L) for more than 0.2 to 0.4 river mile downstream of the discharge location (which is similar to the current condition in the creek). However, the total length of Diamond Fork Creek impacted by elevated hydrogen sulfide would likely be shorter than it is currently because the diffuse discharge of hydrogen sulfide springs over approximately 0.25 mile near the UDFFCS would be modified to a single discharge point. The Proposed Action would not be expected to impact water quality downstream of the fish barrier (see Figure 2.3-5) because the rate of oxidation would cause water quality conditions to return toward baseline upstream of the fish barrier.

3.6.3.2.3 INSPECTION AND MAINTENANCE

Strawberry Tunnel

The proposed change to the inspection and maintenance schedule of the Strawberry Tunnel would interrupt the flow in Sixth Water Creek more frequently but for a shorter duration than the No Action Alternative. The short duration—up to 12 hours—of interrupted flows from the Strawberry Tunnel on an annual basis would decrease flow in Sixth Water Creek from the Strawberry Tunnel to the Sixth Water Flow Control Structure (upper Sixth Water Creek) by about 20 cfs. Flows on Sixth Water Creek below the Sixth Water Flow Control Structure and on Diamond Fork Creek below Three Forks would also briefly be reduced by about 20 cfs during the shutdown. This reduction in flow would result in increased selenium concentrations that may exceed the acute numeric criteria, as the flow would be comprised of tunnel make. Additional water quality parameters such as temperature and dissolved oxygen would not be anticipated to exceed numeric criteria because inspections would be planned in winter months. While selenium concentrations would likely exceed numeric criteria, water quality in Sixth Water and Diamond Fork Creeks would only be affected in the short term because of the brief duration (12 hours or less) of the flow reductions and the immediate restoration of flows following inspection.

In years when Strawberry Tunnel maintenance is needed, estimated to be every 3 years based on past maintenance needs, the delivery of instream flows through the Strawberry Tunnel would be interrupted for up to 5 days to allow for tunnel dewatering during maintenance activities. Shutdowns would take place in late September or early October after irrigation season has ended for the year, when air temperatures are mild and the Strawberry Tunnel is accessible. Maintenance shutdowns would reduce the flow in upper Sixth Water Creek to tunnel make and natural gains (5 cfs on average, as discussed above) for up to 5 days. Flows would be restored into the Strawberry Tunnel upon completion of maintenance activities. Depending on coordination with stakeholders conducted in advance of each maintenance shutdown, supplemental instream flows may be delivered at the Sixth Water Flow Control Structure to replace some or all of the approximately 20 cfs that would normally be delivered at the Strawberry Tunnel. During these shutdowns for Strawberry Tunnel maintenance, water quality conditions in Sixth Water Creek would be affected, as concentrations of selenium would be anticipated to exceed both acute and chronic numeric criteria. Five days of elevated selenium concentrations would impact the water quality of Sixth Water Creek; however, the source of the selenium is natural (from groundwater inputs), and similar shutdowns have occurred in the past. Elevated selenium concentrations would be relatively short term and would be diluted below numeric criteria as soon as flows are restored through the Strawberry Tunnel. Impacts to additional water quality parameters such as temperature and dissolved oxygen would be minimized by the timing of the shutdowns in fall months when air temperatures are moderate.

Sixth Water Flow Control Structure

Annual inspection and maintenance activities for the Sixth Water Flow Control Structure would take place during non-irrigation season. Regular inspection and maintenance are anticipated to take approximately 1 to 3 weeks. During that time, no instream flow would be released from the Sixth Water Flow Control Structure but would continue to be released from the Strawberry Tunnel. The 1- to 3-week shutdown would have no impact on Sixth Water or Diamond Fork Creeks under Instream Flow Alternative 1 because it does not entail non-irrigation season instream flow releases at the Sixth Water Flow Control Structure. Under Instream Flow Alternative 2 during the Sixth Water Flow Control Structure inspection and maintenance shutdown, flows would be expected to be similar to Alternative 1 and may not meet the 40 cfs minimum flow in Diamond Fork Creek during the shutdown period. This would not be anticipated to result in any impacts to water quality in Sixth Water and Diamond Fork Creeks.

It is anticipated that approximately every 5 years extensive maintenance would be required on components of the Sixth Water Flow Control Structure, requiring it to be shut down for the entire non-irrigation season. Under Instream Flow Alternative 1, there would be no change because minimum flows would be delivered from the Strawberry Tunnel. Under Instream Flow Alternative 2, Diamond Fork Creek minimum flows could not be supplemented by releases from the Sixth Water Flow Control Structure. The JLAs will coordinate with agencies and interested parties on the desired flow regime to be delivered from the Strawberry Tunnel. Depending on coordination with stakeholders conducted in advance of maintenance shutdowns, supplemental flows may be made at the Strawberry Tunnel to more closely match the anticipated range of flows in Diamond Fork Creek and maintain the 40 cfs minimum. If these supplemental flows are made at the Strawberry Tunnel, flows in Sixth Water Creek would increase by about 7 cfs during the duration of the shutdown. This would not be anticipated to result in impacts to water quality in Sixth Water and Diamond Fork Creeks.

3.7 WETLANDS AND WATERS OF THE U.S.

3.7.1 Issues, Impact Indicators, and Analysis Area

Based on the project's internal and external scoping, the following wetlands and Waters of the United States (WOTUS) issues were identified:

- How would minimum instream flow modifications in Sixth Water and Diamond Fork Creeks impact wetland hydrology for wetlands associated with the two creeks and the Spanish Fork River?
- Would minimum instream flow modifications in Sixth Water and Diamond Fork Creeks impact the existing wetlands associated with the creeks and the Spanish Fork River?
- How would the collection of hydrogen sulfide spring water or groundwater near the UDFFCS impact wetland habitat and wetland hydrology for wetlands associated with the hydrogen sulfide spring?
- How would proposed inspection and maintenance schedule changes impact the wetlands in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River?

The wetlands impact indicators used to assess wetlands related to minimum flow modification are as follows:

- Area of wetlands currently adjacent to Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River
- Changes in flood flows and high-water tables within Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River

The wetlands impact indicator used to assess wetlands related to the collection of springs is as follows:

- Area of wetlands subject to temporary impacts, permanent fill, and permanent impacts due to changes in hydrology associated with construction of the hydrogen sulfide spring collection boxes.

The wetlands and WOTUS analysis area for minimum instream flow modifications is the 100-year floodplains of Diamond Fork Creek and Sixth Water Creek from the Strawberry Tunnel to the Diamond Fork Creek confluence with the Spanish Fork River. In addition, the wetlands and WOTUS analysis area included the Spanish Fork River from the confluence with Diamond Fork Creek to Utah Lake. Federal Emergency Management Agency 100-year floodplain data are not available for these streams; therefore, a 0.25-mile buffer around Diamond Fork Creek, Sixth Water Creek, and the Spanish Fork River was used to represent floodplain areas. Wetlands within the 100-year floodplains of Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River may be affected by a modification of minimum instream flows. As noted in Section 3.4.3.2, the Proposed Action would not affect the hydrology of Strawberry Reservoir, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, or Utah Lake and therefore would not affect wetlands associated with those waterbodies.

The wetlands and WOTUS analysis area for issues related to the hydrogen sulfide springs is the Diamond Fork Creek 100-year floodplain from the confluence of Diamond Fork Creek and Sixth Water Creek upstream to the start of Diamond Fork Creek. Federal Emergency Management Agency 100-year floodplain data are not available for this stream; therefore, a 0.25-mile buffer around Diamond Fork Creek was used to represent wetlands in the floodplain. Additionally, wetlands and WOTUS subject to construction impacts based on the preliminary design concept for the spring collection system were investigated for impact analysis (upper Diamond Fork Creek area) (Hansen, Allen & Luce, Inc. 2020).

Affected Environment

Wetlands are "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (Environmental Laboratory 1987:9). Wetlands are defined by three characteristics: hydrophytic vegetation, wetland hydrology, and hydric soils.

The Navigable Waters Protection Rule (30 CFR 328) defines the scope of waters subject to federal regulation under the CWA and interprets these waters as "Waters of the U.S." (WOTUS). Under this final rule, WOTUS include territorial seas and navigable waters; perennial and intermittent tributaries that contribute flow to such waters; certain lakes, ponds, and impoundments of jurisdictional waters; and wetlands adjacent to other jurisdictional waters.

Sixth Water Creek and Diamond Fork Creek are perennial streams that flow into navigable waters; for this reason, these streams and adjacent wetlands are WOTUS. According to National Wetlands Inventory data, 40.26 acres of freshwater emergent wetlands, 51.84 acres of freshwater forested/shrub wetlands, 3.85 acres of freshwater pond, and 176.45 acres of riverine systems are mapped adjacent to Sixth Water and Diamond Fork Creeks (USFWS 2019a). Of the mapped wetland environments, 89% of them have seasonally or temporarily flooded water regimes and are associated with overbank flooding from Diamond Fork Creek and Sixth Water Creek. Figure 3.7-1 through Figure 3.7-3 illustrates National Wetlands Inventory wetlands in the analysis area. These wetlands experience seasonal disturbances from flooding and may have some groundwater inputs from a high-water table associated with their respective riverine systems.

The Spanish Fork River and its adjacent wetlands are also considered WOTUS, as the Spanish Fork River eventually flows into Utah Lake approximately 13 miles northwest of the Diamond Fork Creek confluence. National Wetlands Inventory data were reviewed for the area around the Spanish Fork River from the confluence of Diamond Fork Creek to the Spanish Fork River Diversion, since up to 100% of the flow may be diverted at the diversion and much of the lower Spanish Fork River has been channelized and has limited floodplain width and a relatively narrow corridor of streamside riparian habitat. National Wetlands Inventory data show 15.08 acres of freshwater emergent wetlands, 24.92 acres of freshwater forested/shrub wetlands, and 7.78 acres of freshwater ponds mapped directly adjacent to the Spanish Fork River. The majority of these wetland environments are mapped as having seasonally or temporarily flooded water regimes and are associated with overbank flooding from the Spanish Fork River. These wetlands experience seasonal disturbances from flooding and may have some groundwater inputs from a high water table associated with the Spanish Fork River.

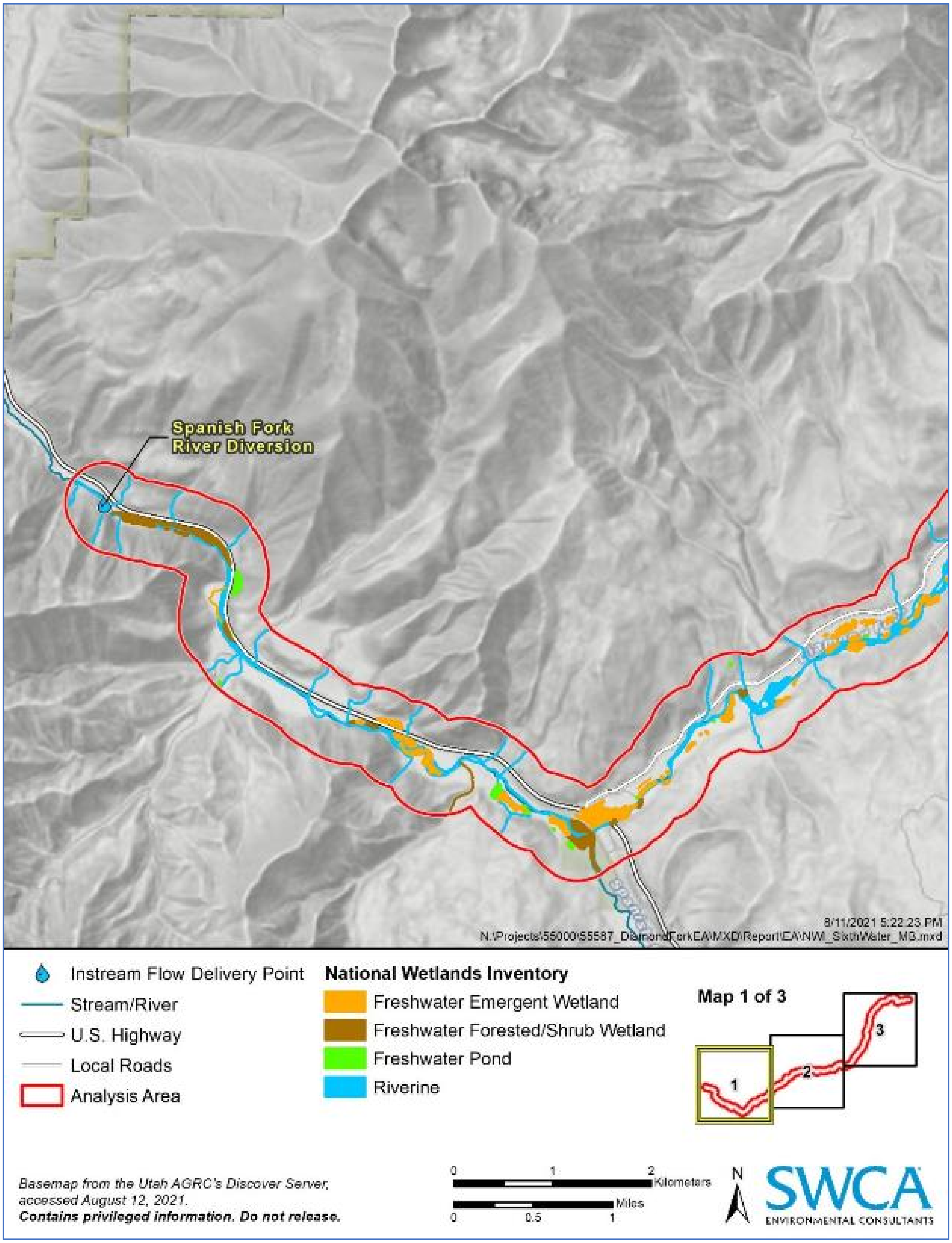

Figure 3.7-1. National Wetlands Inventory mapped wetlands within the instream flow analysis area (map 1 of 3).

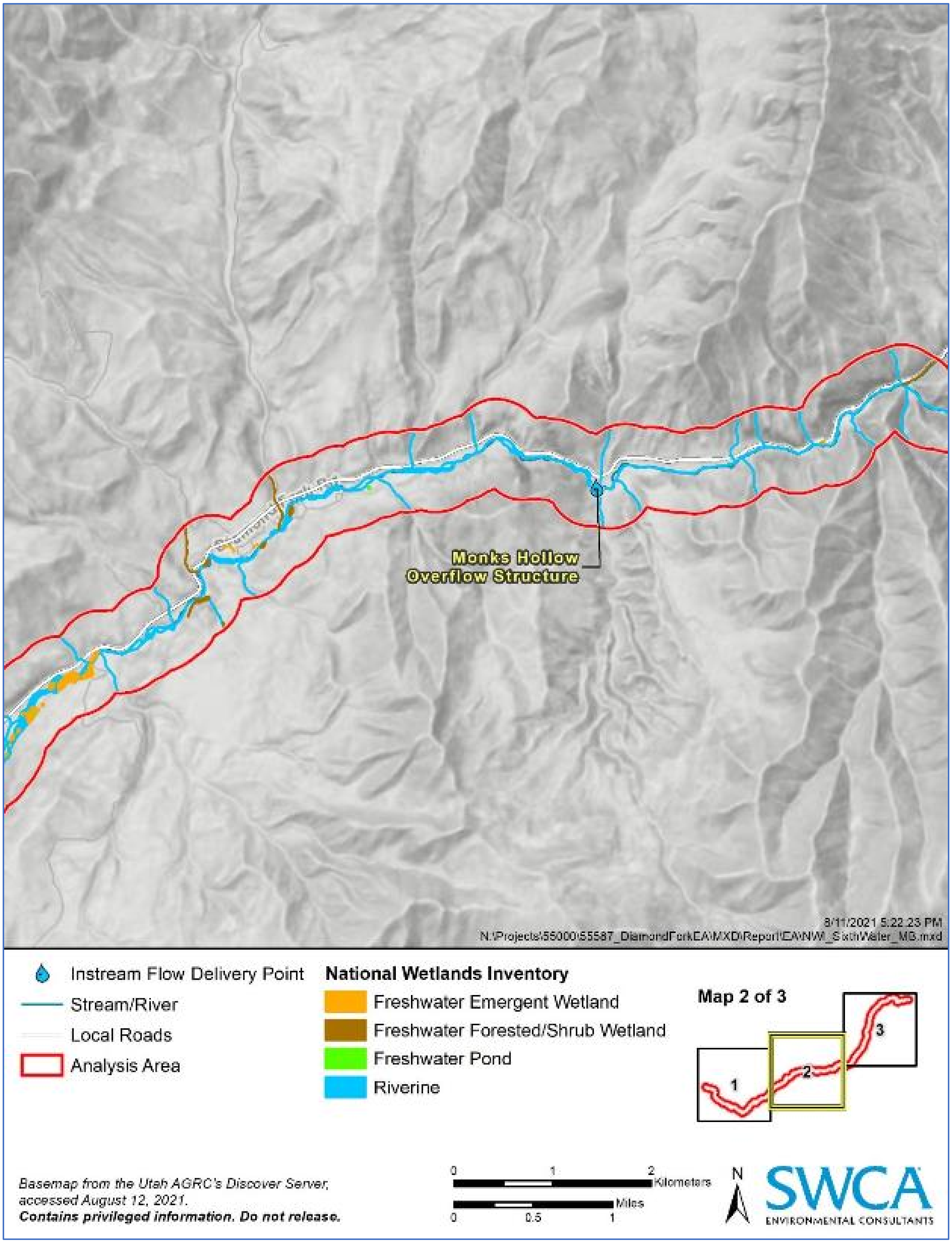

Figure 3.7-2. National Wetlands Inventory mapped wetlands within the instream flow analysis area (map 2 of 3).

CENTRAL UTAH WATER CONSERVANCY DISTRICT

UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION

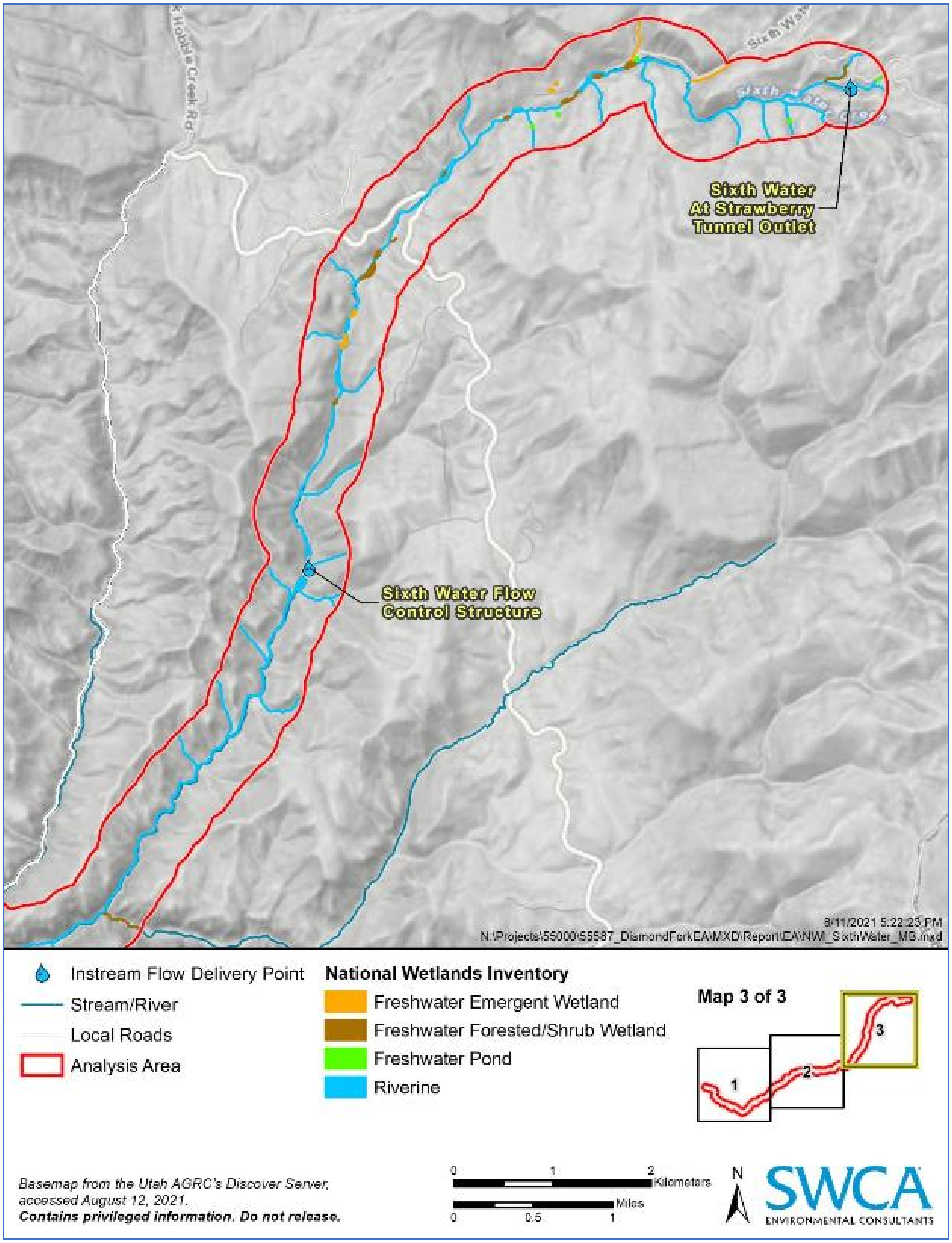

Figure 3.7-3. National Wetlands Inventory mapped wetlands within the instream flow analysis area (map 3 of 3).

CENTRAL UTAH WATER CONSERVANCY DISTRICT

UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION

3.7.2 Environmental Consequences

As mentioned in Section 3.7.1, the wetlands and WOTUS analysis area for issues related to the hydrogen sulfide spring collection system is the Diamond Fork Creek 100-year floodplain from the confluence of Diamond Fork Creek and Sixth Water Creek upstream to the start of Diamond Fork Creek. According to National Wetlands Inventory data, 5.15 acres of emergent wetlands, 69.28 acres of scrub/shrub wetlands, and 30.69 acres of riverine habitat is mapped in this analysis area (USFWS 2019a). Additionally, a formal wetland delineation was conducted where the area of construction impacts may occur based on the preliminary design concept for the system (Figure 3.7-4 through Figure 3.7-8). The wetland delineation conducted in September 2020 identified 0.45 acre of palustrine emergent wetlands, 0.02 acre of palustrine forested wetlands, 0.19 acre of palustrine scrub shrub wetlands, 0.01 acre of ephemeral streams, and 1.26 acres of perennial streams. Several of the palustrine emergent wetlands are associated with the hydrogen sulfide springs and receive wetland hydrology from these springs (SWCA 2021b).

3.7.2.1 No Action Alternative

Under the No Action Alternative, the Diamond Fork System would continue to operate under the CUPCA-mandated minimum instream flows. Existing wetlands in the Diamond Fork and Sixth Water Creeks System would not change because overbank flooding and/or a seasonally high water table would still be expected to occur during spring runoff. Under the No Action Alternative, the hydrogen sulfide spring collection system would not be installed, and there would be no changes to wetlands and WOTUS in the area around the UDFFCS.

The periodic inspection and maintenance of the Strawberry Tunnel would continue to occur every 5 to 7 years, during which no flows would be delivered to Sixth Water Creek via the Strawberry Tunnel, and flows in Sixth Water and Diamond Fork Creeks would be reduced for up to 2 days. These shutdowns would be brief, occur outside the growing season, and do not affect snowmelt or rainfall-driven flood events; therefore, they are not thought to influence wetlands or WOTUS.

3.7.2.2 Proposed Action Alternative

3.7.2.2.1 INSTREAM FLOW ALTERNATIVES

High flows during spring runoff and subsequent overbank flooding or a seasonally high water table would not change for Sixth Water Creek and Diamond Fork Creek. There would be no difference in the frequency of high flows between the No Action Alternative and the two instream flow alternatives (see Figures 3.4-7 through 3.4-10). As described in Section 3.7.2, the National Wetlands Inventory–mapped wetlands within the analysis area for instream flow modification are mapped as having seasonal or temporary flooding hydrologic regimes, and natural flooding would still occur within these systems. Because wetland hydrology is still expected from flooding, a reduction in minimum instream flows under the instream flow alternatives would have little to no effect on the total acreage of wetlands in the analysis area. Additionally, wetland hydrology is generally required at a minimum frequency of 5 years in 10 years (USACE 2010). If flood flows do not occur in a given year because of drought or other stochastic events, wetland hydrology may be provided through a high groundwater table or flooding in subsequent years.

The Diamond Fork system has the potential to build gravel bars during common floods (Wilcock et al. 2019). The lower base flows of the instream flow alternatives (in comparison to the No Action Alternative) would expose these areas and provide the potential for vegetation to colonize the gravel bars, which would cause the channel to narrow (Wilcock et al. 2019). These vegetated areas would likely be colonized by hydrophytic vegetation and would meet wetland criteria, thus increasing the total wetland habitat within the Diamond Fork Creek system. As described in Section 3.5, gravel bars in lower reaches of Diamond Fork Creek are estimated to increase by up to 1 meter under the Proposed Action. If these exposed gravel bars are colonized by hydrophytic vegetation, up to 2.9 acres of new wetland area could be created in the analysis area.

For the Spanish Fork River, the majority of mapped wetlands and WOTUS directly adjacent to the Spanish Fork River have seasonal or temporary flooding hydrologic regimes. Flooding events on the Spanish Fork River typically occur during high flows of spring runoff from snowmelt and precipitation events within the watershed. As identified in Section 3.4.3.2.1, none of the proposed instream flow alternatives would change the amount of water being delivered to the Spanish Fork River during the irrigation season, which typically coincides with high flows during spring runoff. As high flows are expected to remain the same during spring runoff, seasonal and temporary flooding would still occur within wetlands adjacent to the Spanish Fork River. There would be no effect to wetland hydrology for wetlands adjacent to the Spanish Fork River.

3.7.2.2.2 HYDROGEN SULFIDE SPRINGS

Construction of the hydrogen sulfide spring collection system would have temporary and minor, permanent impacts some wetland areas and WOTUS within the analysis area. The impacts would include the placement of spring collection boxes within wetland habitat. As identified in the *Diamond Fork Creek Wetland Delineation* (SWCA 2021b), wetland hydrology is provided by the hydrogen sulfide springs for wetlands W01, W03, W05 (Figure 3.7-4 through Figure 3.7-8). As the spring water is collected and conveyed, wetland hydrology may be removed from these wetlands and they would likely see a drying trend and transition to upland habitat, resulting in a minor impact to these wetlands. Temporary impacts may include vegetation removal, soil compaction, sedimentation, erosion, and crossing of Diamond Fork Creek with the collection pipe. Based on the preliminary design concept, approximately 0.36 acre of wetlands and 0.06 acre of streams would be impacted from construction activities, representing 0.5% of wetlands and 0.2% of streams within the hydrogen sulfide spring analysis area. This is a minor impact acreage of wetland area and streams. Approximately 0.02 acre of wetlands and 0.13 acre of streams would be temporarily impacted from construction activities, representing 0.03% of wetlands and 0.4% of streams within the hydrogen sulfide springs analysis area (see Figure 3.7-4 through Figure 3.7-8). These impacts to wetlands and upper Diamond Fork Creek are considered very small and minor and result in a very minimal loss of wetlands and WOTUS.

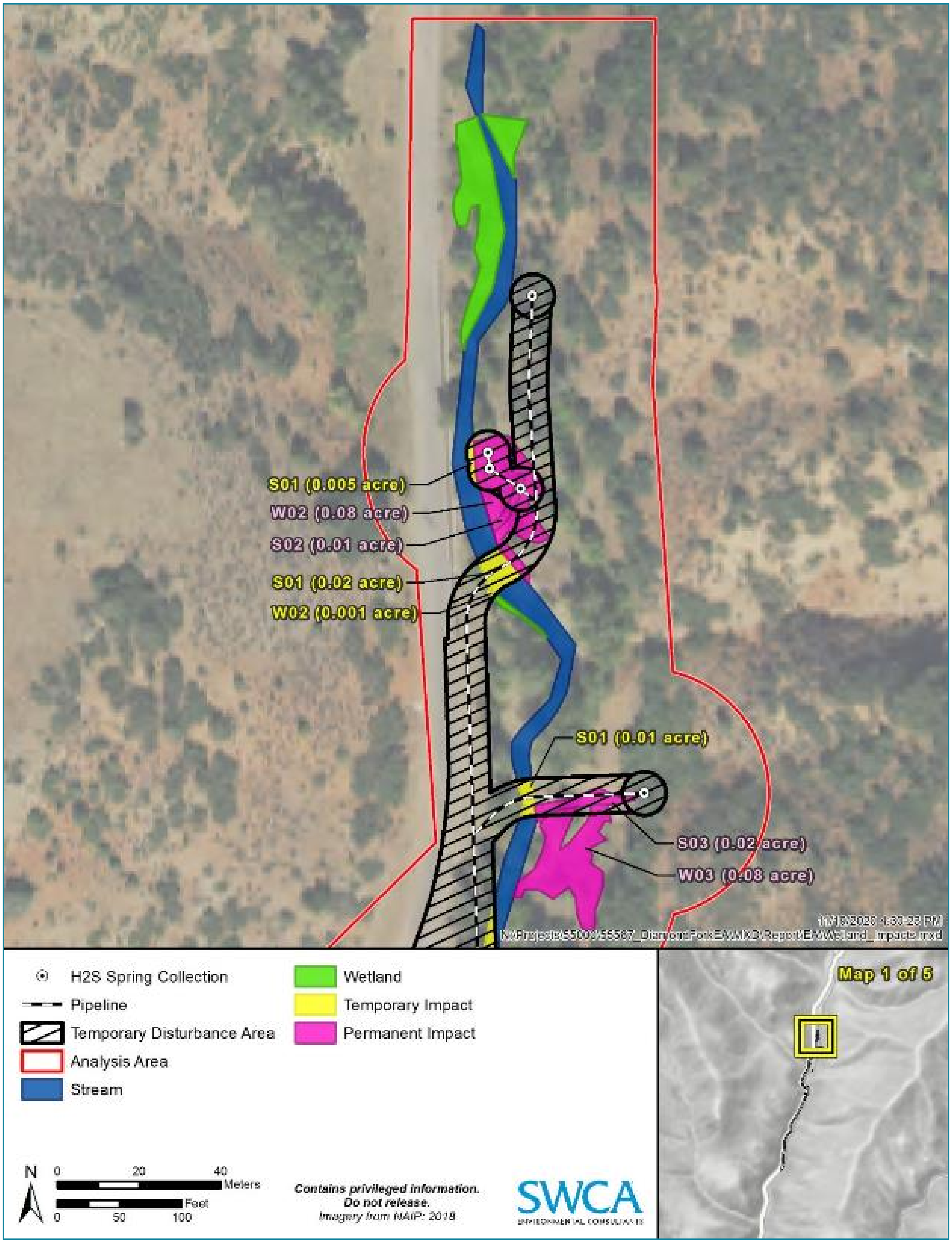

Figure 3.7-4. Permanent and temporary impacts to wetlands and waters of the U.S. in the analysis area (map 1 of 5).

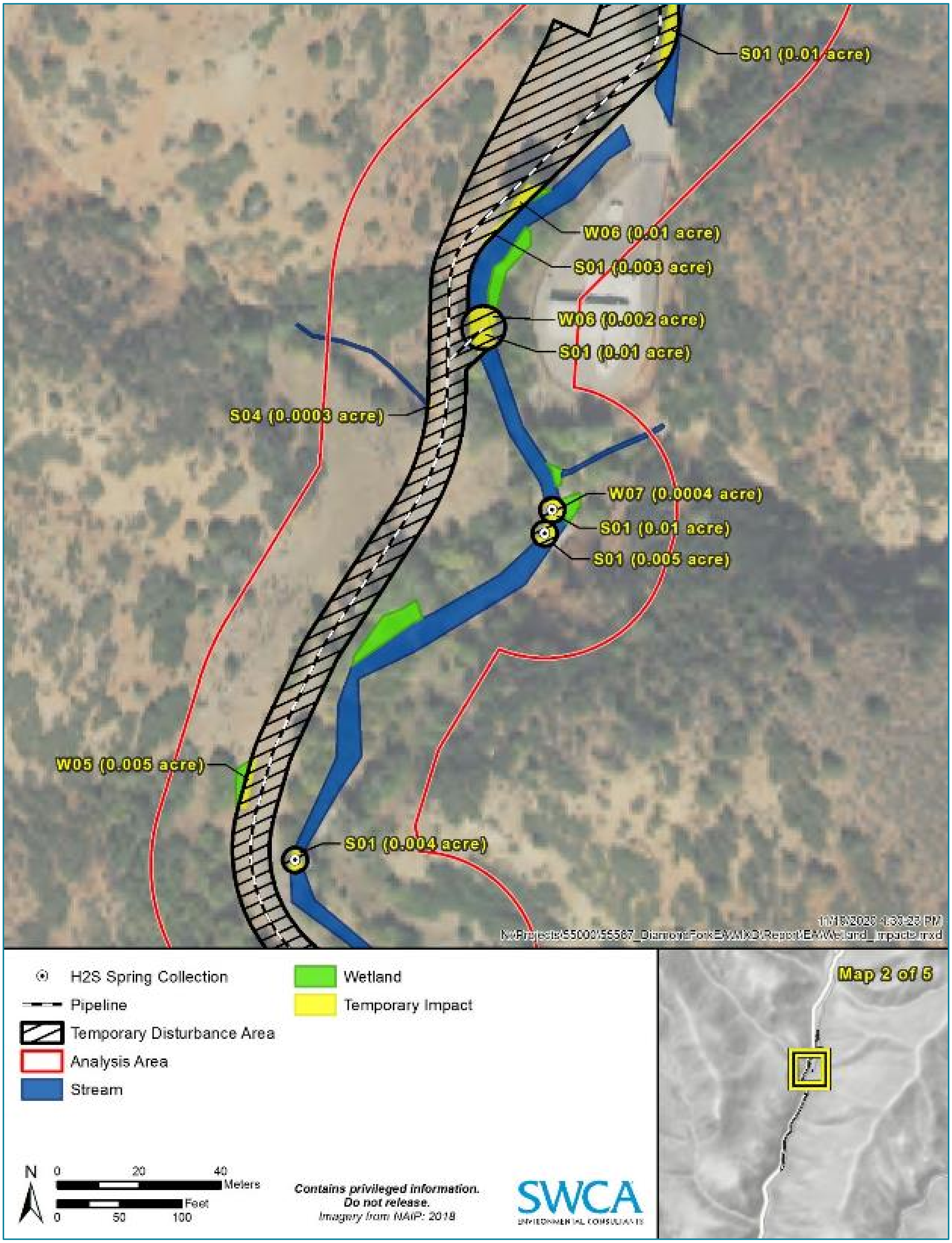

Figure 3.7-5. Permanent and temporary impacts to wetlands and waters of the U.S. in the analysis area (map 2 of 5).

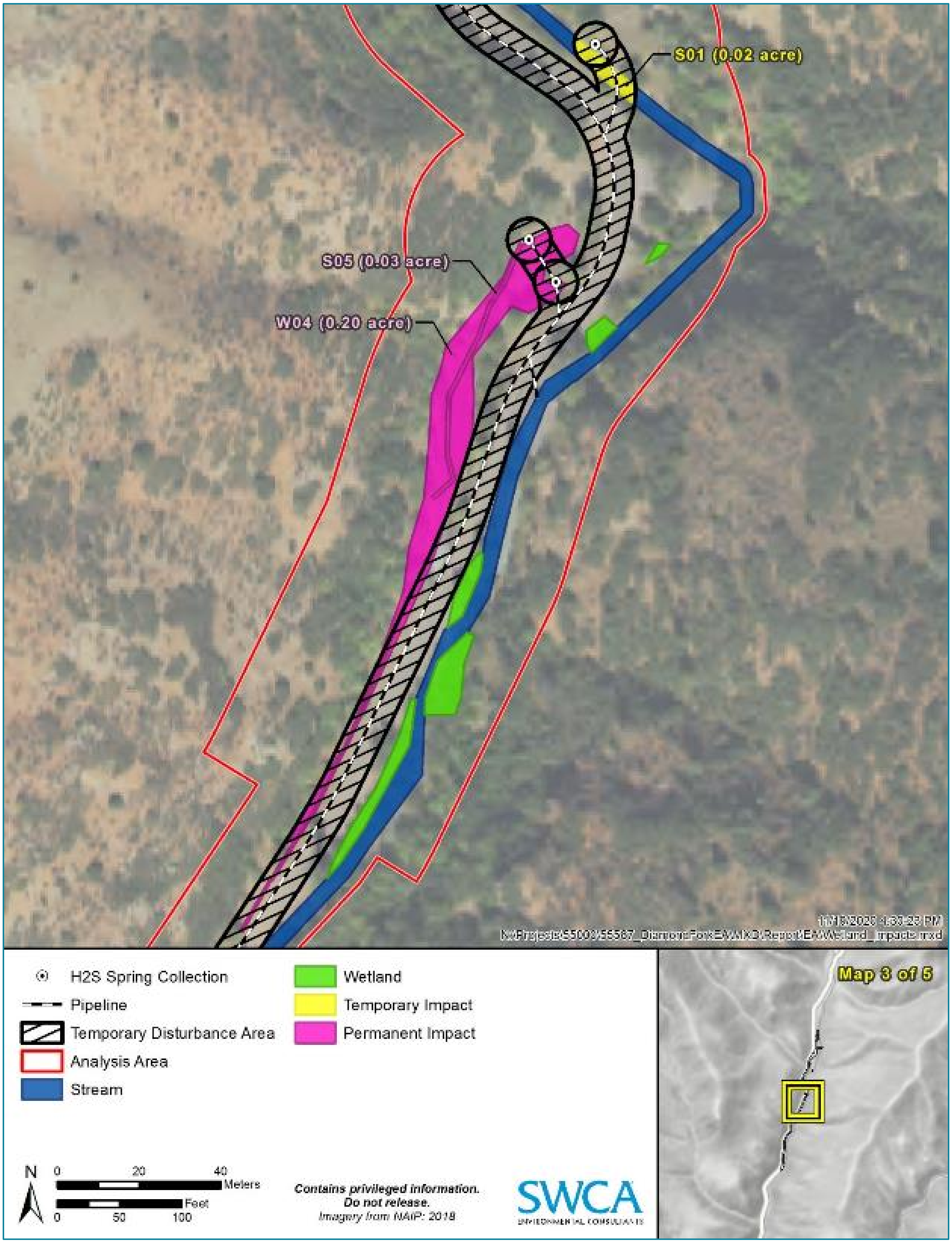

Figure 3.7-6. Permanent and temporary impacts to wetlands and waters of the U.S. in the analysis area (map 3 of 5).

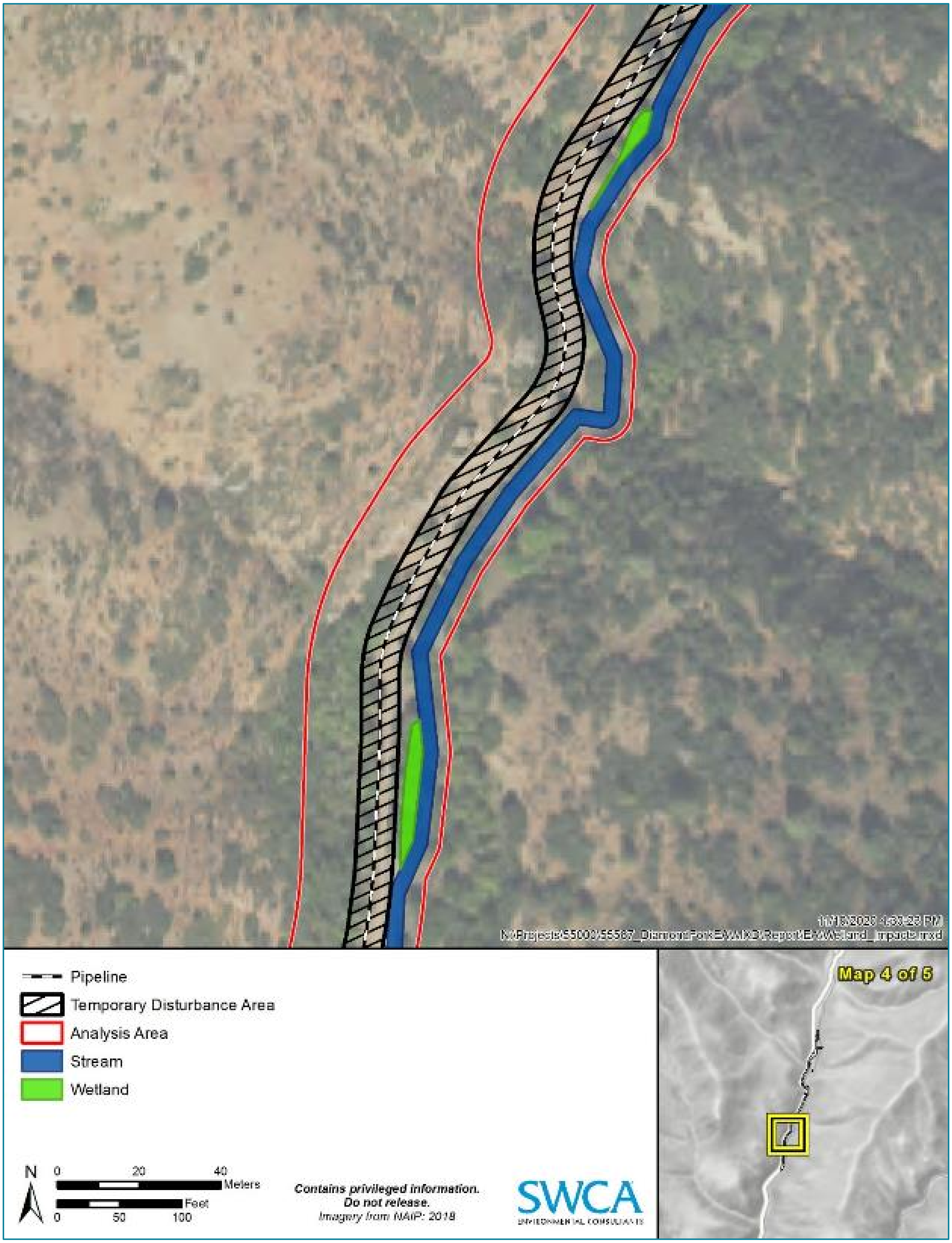

Figure 3.7-7. Permanent and temporary impacts to wetlands and waters of the U.S. in the analysis area (map 4 of 5).

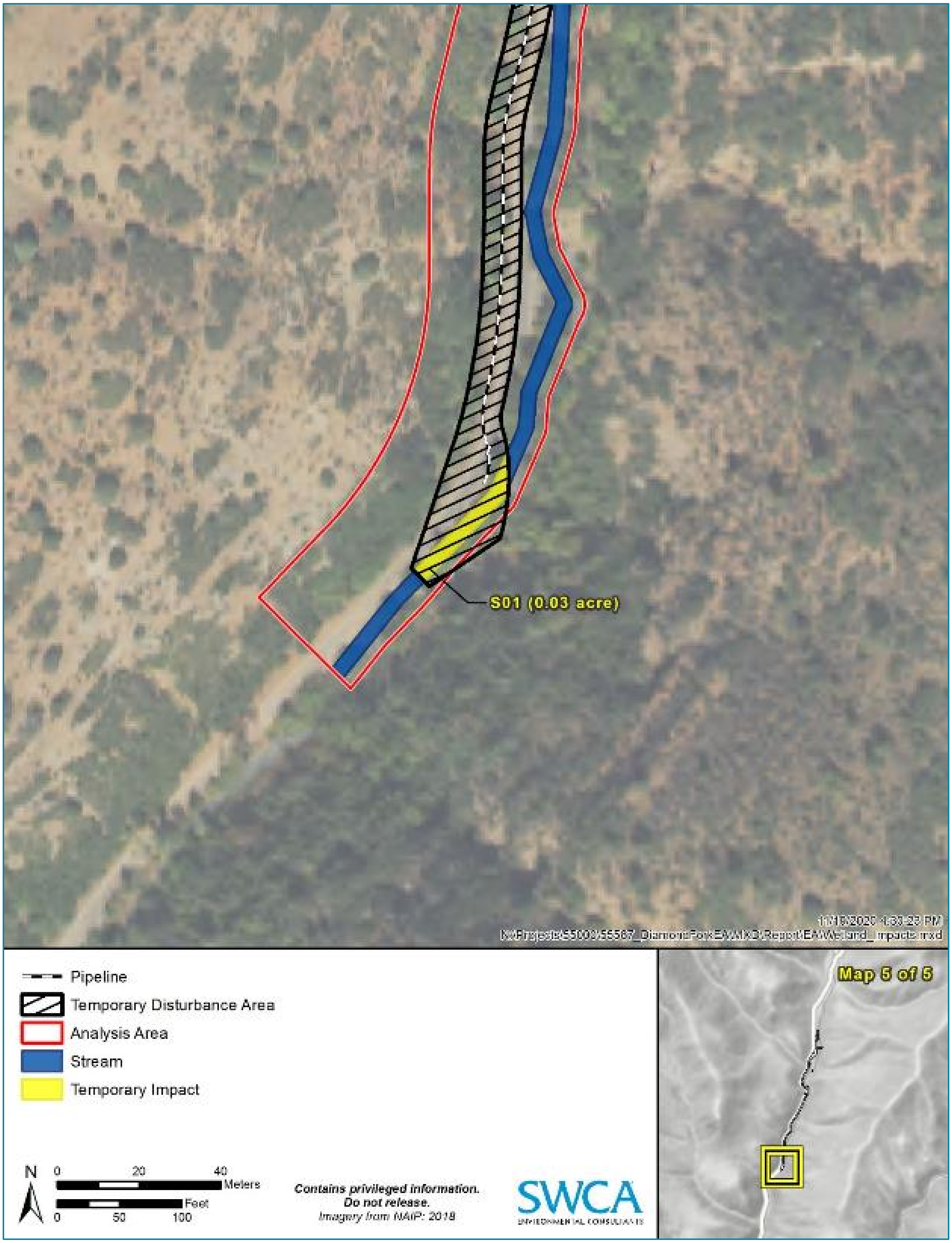

Figure 3.7-8. Permanent and temporary impacts to wetlands and waters of the U.S. in the analysis area (map 5 of 5).

3.7.2.2.3 INSPECTION AND MAINTENANCE

The proposed changes to the inspection and maintenance schedules for the Strawberry Tunnel and the Sixth Water Flow Control Structure would alter the frequency and duration of shutdowns to these features relative to the No Action Alternative. As discussed in Hydrology Section 3.4, these shutdowns would reduce flows on Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River by up to about 20 cfs at times. However, all planned shutdowns would be temporary and would occur during the non-irrigation season, when flow reductions would not affect riparian vegetation or the hydrology that influences wetland areas, even in the case of a prolonged shutdown. In addition, the shutdowns would not be expected to occur during high flood flows associated with springtime snowmelt runoff or summer thunderstorms and would not impact these high magnitude flows that contribute to wetland hydrology. Therefore, the proposed inspection and maintenance changes would not be expected to impact wetlands that are within the riparian areas of Sixth Water Creek, Diamond Fork Creek, or the Spanish Fork River.

3.8 WILDLIFE (FISH AND AQUATIC RESOURCES)

3.8.1 Issues, Impact Indicators, and Analysis Area

Based on the project's internal and external scoping, the following wildlife issues were identified:

- How would minimum instream flow modifications in Sixth Water and Diamond Fork Creeks impact fisheries, particularly brown trout (*Salmo trutta*) and Bonneville cutthroat trout (*Oncorhynchus clarkii utah*) (BCT), and aquatic life?
- How would the collection and discharge of spring water or groundwater near the UDFFCS impact fisheries and aquatic life in Diamond Fork Creek?
- How would proposed inspection and maintenance schedule changes impact fisheries and aquatic life in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River?

The impact indicators used to assess these issues are as follows:

- Changes in water quality parameters (temperature, dissolved oxygen, selenium, or hydrogen sulfide) that may exceed parameters for cold-water aquatic wildlife
- Changes in benthic macroinvertebrate abundance and diversity
- Frequency of flows identified as favorable for fish and aquatic life in Wilcock et al. 2019

The analysis area for fish and aquatic wildlife is Sixth Water Creek between the Strawberry Tunnel outlet and the confluence with Diamond Fork Creek, and Diamond Fork Creek from approximately 0.2 mile upstream of the UDFFCS downstream to the Spanish Fork River. The analysis area also includes the Spanish Fork River from Diamond Fork Creek downstream to the Spanish Fork River Diversion. As noted in Section 3.4.3.2, the Proposed Action would not affect the hydrology of Strawberry Reservoir, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, or Utah Lake and therefore would not affect aquatic life associated with those waterbodies.

3.8.2 Affected Environment

The historic manipulation of flows in Diamond Fork and Sixth Water Creeks as part of the SVP and, more recently, the Diamond Fork System and CUPCA-mandated minimum flows have resulted in habitat and fisheries in the streams that are highly altered from their predevelopment (or more natural) conditions (Crockett and Slater 2019; DWR 2019). Flow regimes that deviate from a river's historical norm may affect both carrying capacity and the compositional integrity of benthic macroinvertebrate communities (Poff and Ward 1989). When the benthic community is changed, the amount and type of drift organisms that are subsequently available as food for fish are also changed. The size of aquatic organisms is often decreased as flows are increased, impacting the quality and quantity of the diet of the fish community (Turner and Williams 2000; Kennedy et al. 2014). Fires and sediment plumes are additional factors that affect aquatic habitat in the Diamond Fork and Sixth Water Creeks (Crockett and Slater 2019).

Historically, Diamond Fork Creek and its tributaries have been regarded as a brown trout fishery with limited opportunities for BCT and rainbow trout (*Oncorhynchus mykiss gairdneri*) (Nielson and Wiley 2013). Fish surveys of Diamond Fork Creek conducted in 2002, 2003, 2010, 2011, 2012, 2016, and 2017 (Crockett and Slater 2019) found the following species in addition to brown trout and BCT: mottled sculpin (*Cottus bairdii*) and mountain sucker (*Catostomus platyrhynchus*). Brown trout densities in 2011 ranged from 692 ± 54 per mile near Diamond Fork Creek's confluence with the Spanish Fork River to 591 ± 17 per mile near Three Forks (the most upstream reach sampled). Brown trout densities were reduced in 2012 surveys of Diamond Fork Creek (Nielson and Wiley 2013). Additional surveys in 2016 and 2017 showed no clear trend in brown trout abundance or size between 2002 and 2016, though there were significantly fewer fish in 2017 compared to 2016 (Crockett and Slater 2019), likely due to fish kills as a result of post-fire debris flows. Recent population estimates for sport fish in Sixth Water Creek are 900 ± 122 BCT per mile and 456 ± 58 brown trout per mile (Verde and Slater 2020). Total trout densities by species in Sixth Water Creek were higher in the 2020 survey than those observed in 2012 (Verde and Slater 2020).

In 2006, the USFS installed a fish barrier upstream of Three Forks (see Figure 2.3-4) with the purpose of preventing brown trout from moving up into upper Diamond Fork Creek. Following construction of the fish barrier, the DWR conducted a chemical treatment of Upper Diamond Fork Creek (above the fish barrier) and its tributaries to remove non-native species and facilitate the reintroduction of BCT. Excluding brown trout from upper Diamond Fork Creek is meant to preserve the upper portion of the creek as a conservation population of BCT (Figure 3.8-1). The springs around the UDFFCS (approximately 1 mile upstream of the fish barrier) contribute hydrogen sulfide to Diamond Fork Creek (see Section 3.6 for additional details), further discouraging brown trout movement upstream. Diamond Fork Creek and its tributaries have been stocked with BCT by DWR (Crockett and Slater 2019).

Figure 3.8-1. Fish Barrier on Diamond Fork Creek upstream of Three Forks.

A recent study (Wilcock et. al 2019) of Sixth Water and Diamond Fork Creeks, comparing conditions based on CUPCA-mandated minimum flows against experimental lower flows (like the proposed instream flow modification alternatives), found that the CUPCA-mandated minimum flows affected macroinvertebrate population in the following ways when compared to experimental lower flows:

- Macroinvertebrate density is negatively correlated with flow metrics in Diamond Fork Creek; that is, macroinvertebrate density is reduced as flow increases. The same effect was not observed in Sixth Water Creek.
- In Diamond Fork Creek, proportions of sensitive macroinvertebrate taxa (groups) in the benthos (stream substrate) decreased as flows increase.
- Abundance and density of certain benthic macroinvertebrates (scraper and gatherer functional feeding groups) were reduced by higher flows.
- Fish diet composition suggested both brown trout and BCT may be selectively consuming environmentally sensitive taxa (Plecoptera) and avoiding environmentally tolerant taxa (Chironomid midges).

Impacts to the trout fishery that can result from the higher-than-natural base flows include the following: higher flows can reduce reproduction by pulling eggs and sac-fry from the substrate, inhibit young-of-year from maintaining position in low-velocity rearing habitats and pushing them into areas where more predators are present, and cause all life stages to expend more energy to maintain body position within the river. Wilcock et al. (2019) observed that higher base flows appear to suppress BCT recruitment, as they did not observe any recruitment at flows above 50 cfs in Sixth Water Creek. Additionally, they found that lower summer base flows (near 40 cfs) provide for better reproductive and somatic growth potential than higher flows (near 80 cfs) in Diamond Fork Creek. Wilcock et al. also found that brown trout and BCT have a large amount of dietary overlap (80% in Sixth Water and 55% in Diamond Fork Creek) and that enhanced summer base flows represent a stressor to BCT populations in Sixth Water Creek by limiting fall recruitment and spawning habitat.

The Spanish Fork River supports a fishery comprised of several native species (mountain whitefish, sculpin, and mountain sucker) in addition to introduced sport fish (brown trout) (Slater 2021a). While these species are likely present within the Spanish Fork River in the analysis area, the recent sampling conducted by DWR took place downstream of the analysis area near the city of Spanish Fork. Fish collected during this sampling were mainly brown trout ranging from 60 to 390 mm in length. The diversion of flow from the Spanish Fork River at the Spanish Fork River Diversion (see Figure 1.2-2) for hydropower generation and further downstream for irrigation may limit fish habitat.

3.8.3 Environmental Consequences

3.8.3.1 No Action Alternative

Under the No Action Alternative, the Diamond Fork System would continue to operate under the current CUPCA-mandated minimum instream flows, and conditions described in the Affected Environment section would generally continue for fish and aquatic life. This flow regime would limit recruitment and spawning success of BCT. The fish barrier on Diamond Fork Creek near Three Forks would not change, and springs would continue to create high concentrations of hydrogen sulfide in Diamond Fork Creek upstream of the fish barrier. The interruption of flow from the Strawberry Tunnel for inspection and maintenance (for up to 2 days every 5 to 7 years) would reduce flows in Sixth Water and Diamond Fork Creeks for the duration of the inspection and maintenance but would not have measurable effects on fish and aquatic life.

Periodic shutdowns of the Strawberry Tunnel for inspection and maintenance would reduce flows in Sixth Water Creek to the tunnel make from the Strawberry Tunnel in addition to natural gains (generally about 5–7 cfs). Reduced flows during Strawberry Tunnel shutdowns would affect fish and aquatic life, causing fish to temporarily seek refuge in pools and other areas with sufficient water and water quality conditions. Additionally, water quality would be expected to decrease with elevated concentrations of selenium. However, shutdowns are short in duration and would not have long-term effects on fish or aquatic life. In addition, without more frequent inspections and maintenance of the Strawberry Tunnel, conditions would likely continue to degrade and, at some point, use of the Strawberry Tunnel for instream flow deliveries may not be possible. This could have an impact on selenium levels in Sixth Water Creek.

3.8.3.2 Proposed Action Alternative

3.8.3.2.1 INSTREAM FLOW ALTERNATIVES

As described in Sections 3.4 and 3.6, the instream flow alternatives are not significantly different from each other in their effects during the summer months. Under Instream Flow Alternative 1, flows in Diamond Fork Creek would be substantially lower in the winter than the flows under Instream Alternative 2. In general, the flow regimes of the instream flow alternatives would more closely mimic a natural flow regime for this system when compared to the No Action Alternative. Lower base flows would result in more favorable conditions for macroinvertebrates (scrapers and gatherers), as well as BCT and brown trout, and would result in more diverse and appropriate habitats for fish. The lower summer base flow of the instream flow alternatives would promote greater benthic and drift density and more favorable community composition (Wilcock et al. 2019). Additionally, flow velocities and substrates would be more tolerable and appropriate for BCT spawning and rearing. Based on these findings, the instream flow alternatives would all provide flow conditions favorable to BCT, both in terms of population abundance and individual fish size. Lower base flows would benefit the overall health of Sixth Water and Diamond Fork Creeks.

Both instream flow alternatives would maintain a minimum flow release of 20 cfs through Strawberry Tunnel, which provides sufficient dilution of naturally occurring selenium concentrations from the Strawberry Tunnel accretion flow to below the Utah numeric criteria for aquatic life. Under both instream flow alternatives, minimum flows would be closer to the ranges that would maximize BCT capacity in Sixth Water Creek and brown trout capacity in Diamond Fork Creek than under the No Action Alternative. Additionally, all instream flow alternatives would provide minimum flows that are closer to flows that would maximize BCT recruitment. Flows would also be within the range of flows that maximize BCT and brown trout reproductive and somatic growth potential. Overall, both instream flow alternatives would have beneficial effects for fish and aquatic life.

3.8.3.2.2 HYDROGEN SULFIDE SPRINGS

The discharge of the hydrogen sulfide springs near the UDFFCS naturally creates a high concentration of undissociated hydrogen sulfide in upper Diamond Fork Creek that at times may be above the numeric criteria for aquatic wildlife (2.0 µg/L). This currently results in a macroinvertebrate community with reduced richness and limited-to-no presence of fish in a short reach of Diamond Fork Creek between the UDFFCS and the fish barrier. Monitoring by DWR indicates that fish abundance is limited in this reach but increases with distance downstream (Slater 2020).

The Proposed Action would move the hydrogen sulfide discharge approximately 0.5 mile downstream of the UDFFCS and would combine the discharge from the springs into one discharge location. However, the proposed discharge channel would be designed and constructed to help reduce the concentration (via oxidation) of hydrogen sulfide prior to discharge (see Section 2.3.2.2). Additionally, the JLAs believe that some aeration of the collected hydrogen sulfide water would occur in the collection pipe as it moves downhill. Water quality monitoring of Diamond Fork Creek by the District in 2020 indicates that the oxidation of hydrogen sulfide occurs quickly in the creek, and concentrations of undissociated hydrogen sulfide move from as high as 7 to 28 µg/L to below the numeric criteria over approximately 0.2 to 0.4 mile downstream. Assuming this holds true with the designed discharge system, this correlates to moving the hydrogen sulfide impacted area downstream to within 0.4 mile of the fish barrier near Three Forks. Therefore, the portion of Diamond Fork Creek impacted by hydrogen sulfide spring water would be shifted downstream to between the discharge point and the existing fish barrier (see Figure 2.3-4). With the collection of spring water, the reach downstream of the UDFFCS that is currently impacted by the hydrogen sulfide springs (and does not support BCT; see Section 3.6.2) would not be affected by the high hydrogen sulfide concentrations and would become more habitable for aquatic wildlife. The discharge of the hydrogen sulfide spring water farther downstream would be expected to increase the efficacy of the fish barrier by creating inhabitable water quality conditions just upstream of the barrier, yet would not be expected to impact water quality conditions for aquatic life downstream of the fish barrier. This is a minor effect to the water quality conditions at the proposed discharge location.

The three proposed pipeline crossings of Diamond Fork Creek would be installed with conventional open cut excavations, using a trench box or similar approach to stabilize and minimize disruption to the stream bed. Two crossings would be placed upstream of the UDFFCS and one crossing would be placed downstream of the UDFFCS. The construction of the collection boxes and pipe delivery system would have short-term impacts on aquatic wildlife from vibration and sedimentation from construction activities. However, the reach of Diamond Fork Creek that would be affected by construction activities is largely currently devoid of aquatic wildlife due to the high concentration of hydrogen sulfides. Sedimentation would be mitigated through BMPs such as dust abatement and sediment fencing. Any impacts would be temporary, lasting only during construction.

3.8.3.2.3 INSPECTION AND MAINTENANCE

Strawberry Tunnel

The proposed change to the inspection and maintenance schedule of the Strawberry Tunnel would interrupt the flow in Sixth Water Creek more frequently but for a shorter duration than the No Action Alternative. The short duration—up to 12 hours—of interrupted flows from the Strawberry Tunnel on an annual basis would decrease flow in Sixth Water Creek from Strawberry Tunnel to the Sixth Water Flow Control Structure (upper Sixth Water Creek) by about 20 cfs. Flows on Sixth Water Creek below the Sixth Water Flow Control Structure and on Diamond Fork below Three Forks would also briefly be reduced by about 20 cfs during the shutdown. This reduction in flow would result in increased selenium concentrations, as the flow would be comprised of tunnel make. Additional water quality parameters such as temperature and dissolved oxygen would not be anticipated to exceed numeric criteria because the inspections would be planned in the winter months. While selenium concentrations would likely exceed numeric criteria, water quality in Sixth Water and Diamond Fork Creeks would only be affected in the short term because of the brief duration (12 hours or less) of the flow reductions and the immediate restoration of flows following inspection. Annual Strawberry Tunnel inspection would have only a short-term, minor effect on water quality in Sixth Water and Diamond Fork Creeks. The flow reductions would reduce habitat availability to aquatic resources, and fish would be forced to seek refugia in pools and other remnant habitat. The timing of the shutdowns (in fall or winter months) and the short duration would minimize impacts to fish and aquatic resources in Sixth Water and Diamond Fork Creeks.

In years when Strawberry Tunnel maintenance is needed, estimated to be every 3 years based on past maintenance needs, the delivery of instream flows through the Strawberry Tunnel would be interrupted for up to 5 days to allow for tunnel dewatering during maintenance activities. Shutdowns would take place in late September or early October after irrigation season has ended for the year, when air temperatures are mild and the Strawberry Tunnel is accessible. During these shutdowns for Strawberry Tunnel maintenance, water quality conditions and aquatic habitat availability in Sixth Water Creek would be affected, and concentrations of selenium would be anticipated to exceed numeric criteria. Five days of elevated selenium concentrations would impact the water quality of Sixth Water Creek, which could have the potential to affect aquatic resources. However, similar shutdowns have occurred in the past, and it is believed that aquatic resources in Sixth Water Creek are able to find refuge habitat in pools and tolerate the elevated selenium concentrations. Additional impacts to aquatic resources from potential degradation of stream temperature and dissolved oxygen would be minimized by the timing of the shutdowns in fall months when air temperatures are moderate.

Sixth Water Flow Control Structure

Annual inspection and maintenance activities for the Sixth Water Flow Control Structure would take place during non-irrigation season. Regular inspection and maintenance are anticipated to take approximately 1 to 3 weeks. During that time, no instream flow would be released from the Sixth Water Flow Control Structure, but it would continue to be released from the Strawberry Tunnel. The 1- to 3-week shutdown would have no impact on Sixth Water or Diamond Fork Creeks under Instream Flow Alternative 1 because it does not entail non-irrigation season instream flow releases at the Sixth Water Flow Control Structure. Under Instream Flow Alternative 2, flows would be expected to be similar to Instream Flow Alternative 1 and may not meet the 40 cfs minimum flow in Diamond Fork Creek during the shutdown period. This would not be anticipated to result in any impacts to aquatic resources in Sixth Water and Diamond Fork Creeks.

It is anticipated that approximately every 5 years extensive maintenance would be required on components of the Sixth Water Flow Control Structure, requiring it to be shut down for the entire non-irrigation season. Under Instream Flow Alternative 1, there would be no change because minimum flows would be delivered from the Strawberry Tunnel. Under Instream Flow Alternative 2, Diamond Fork Creek minimum flows could not be supplemented by releases from the Sixth Water Flow Control Structure. The JLAs will coordinate with agencies and interested parties on the desired flow regime to be delivered from the Strawberry Tunnel. Depending on coordination with stakeholders conducted in advance of maintenance shutdowns, supplemental flows may be made at the Strawberry Tunnel to more closely match the anticipated range of flows in Diamond Fork Creek and maintain the 40 cfs minimum. If these supplemental flows are made at the Strawberry Tunnel, flows in Sixth Water Creek would increase by about 7 cfs during the duration of the shutdown. This would not be anticipated to result in any impacts to aquatic resources in Sixth Water and Diamond Fork Creeks due to the minimal change in water quality and habitat availability in addition to the timing of the work.

3.9 VEGETATION

3.9.1 Issues, Impact Indicators, and Analysis Area

Based on the project’s internal and external scoping, the following vegetation issues were identified:

- How would vegetation communities change in response to minimum instream flow modifications?
- What are the potential impacts to vegetation associated with hydrogen sulfide spring collection at the UDFFCS?
- How would proposed inspection and maintenance schedule changes impact vegetation communities?

The impact indicators used to assess these issues are as follows:

- Composition of the vegetation community within the riparian area
- Area of vegetation affected by surface disturbance

The analysis area for vegetation consists of a 0.1-mile buffer surrounding Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River down to the Spanish Fork River Diversion because it is representative of the riparian corridor for the creeks in which vegetation may be affected by the Proposed Action. As noted in Section 3.4.3.2, the Proposed Action would not affect the hydrology of Strawberry River, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, or Utah Lake and therefore would not affect riparian vegetation associated with those waterbodies.

3.9.2 Affected Environment

Vegetation composition within the area was identified using Southwest Regional Gap Analysis Project (SWReGAP) land cover data (Lowry 2005) and field verified by observations made on September 23, 2020. The habitat in the analysis area is dominated by the Rocky Mountain Gambel Oak-Mixed Montane Shrubland land cover type, which makes up approximately 41% of the vegetation community within the analysis area. The second-most common land cover type is Rocky Mountain Lower Montane Riparian Woodland and Shrubland (12%) (Figure 3.9-1 through Figure 3.9-3).

Field observations indicate that the riparian areas in the upper reaches of Diamond Fork Canyon are dominated by well-established tree species such as narrow-leaf cottonwood (*Populus angustifolia*), narrow-leaf willow (*Salix exigua*), ash-leaf maple (*Acer negundo*), water birch (*Betula occidentalis*), and speckled alder (*Alnus incana*). Grass and forb species in the analysis area have been impacted by grazing activity. The tree species listed above were also observed in the middle reaches of the canyon, but recent fire disturbance has provided an opportunity for new undergrowth species to colonize this area, including the following small trees and shrubs: black hawthorn (*Crataegus douglasii*), golden currant (*Ribes aureum*), red osier (*Cornus alba*), and musk thistle (*Carduus nutans*). Riparian areas in the lower reaches of Diamond Fork Canyon are dominated by higher concentrations of sedges, rushes, and grasses including spreading bent (*Agrostis stolonifera*), Nebraska sedge (*Carex nebrascensis*), common spike-rush (*Eleocharis palustris*), Baltic rush (*Juncus balticus*), Torrey's rush (*Juncus torreyi*), and white clover (*Trifolium repens*).

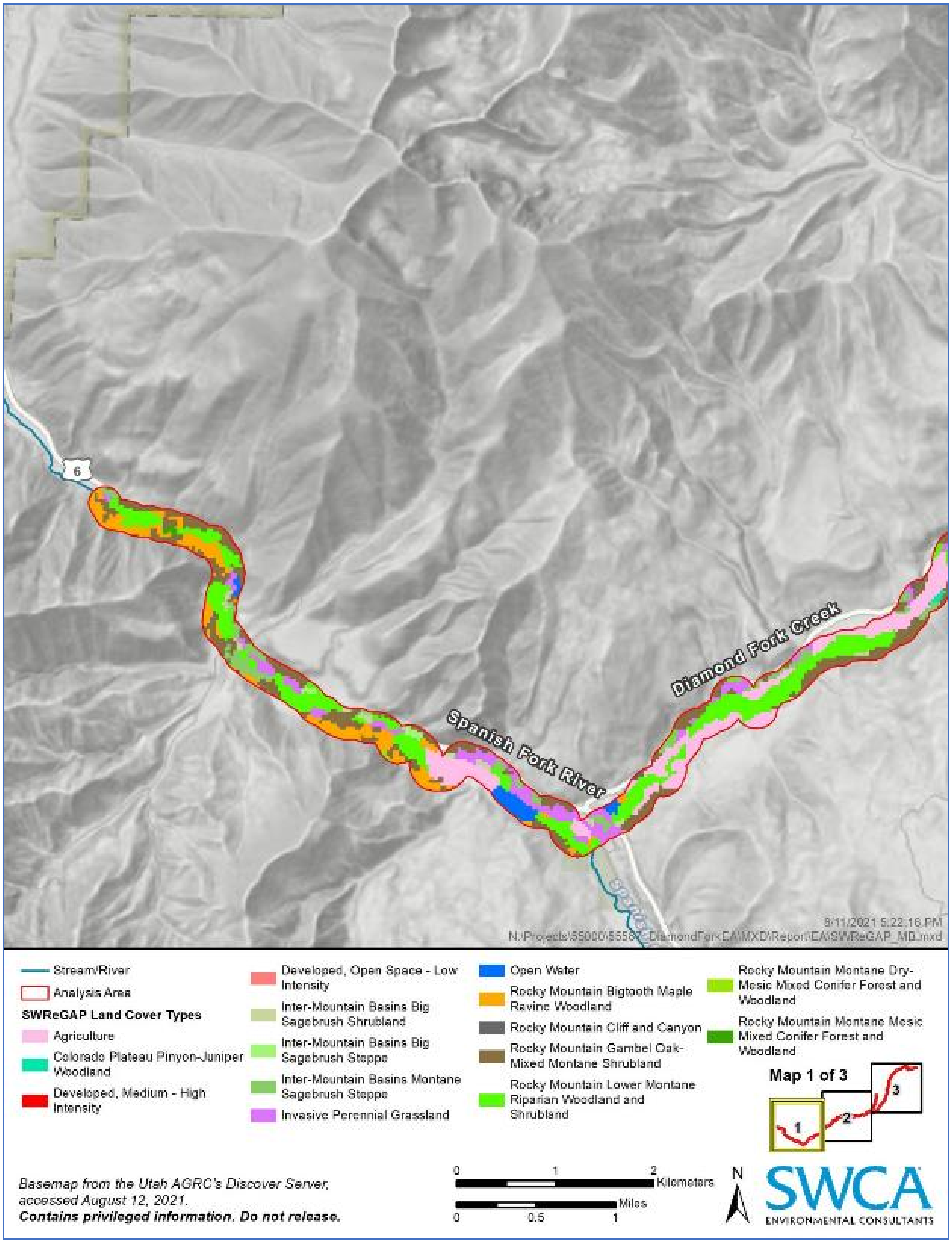

Figure 3.9-1. Southwest Regional Gap Analysis Project vegetation communities within the analysis area (map 1 of 3).

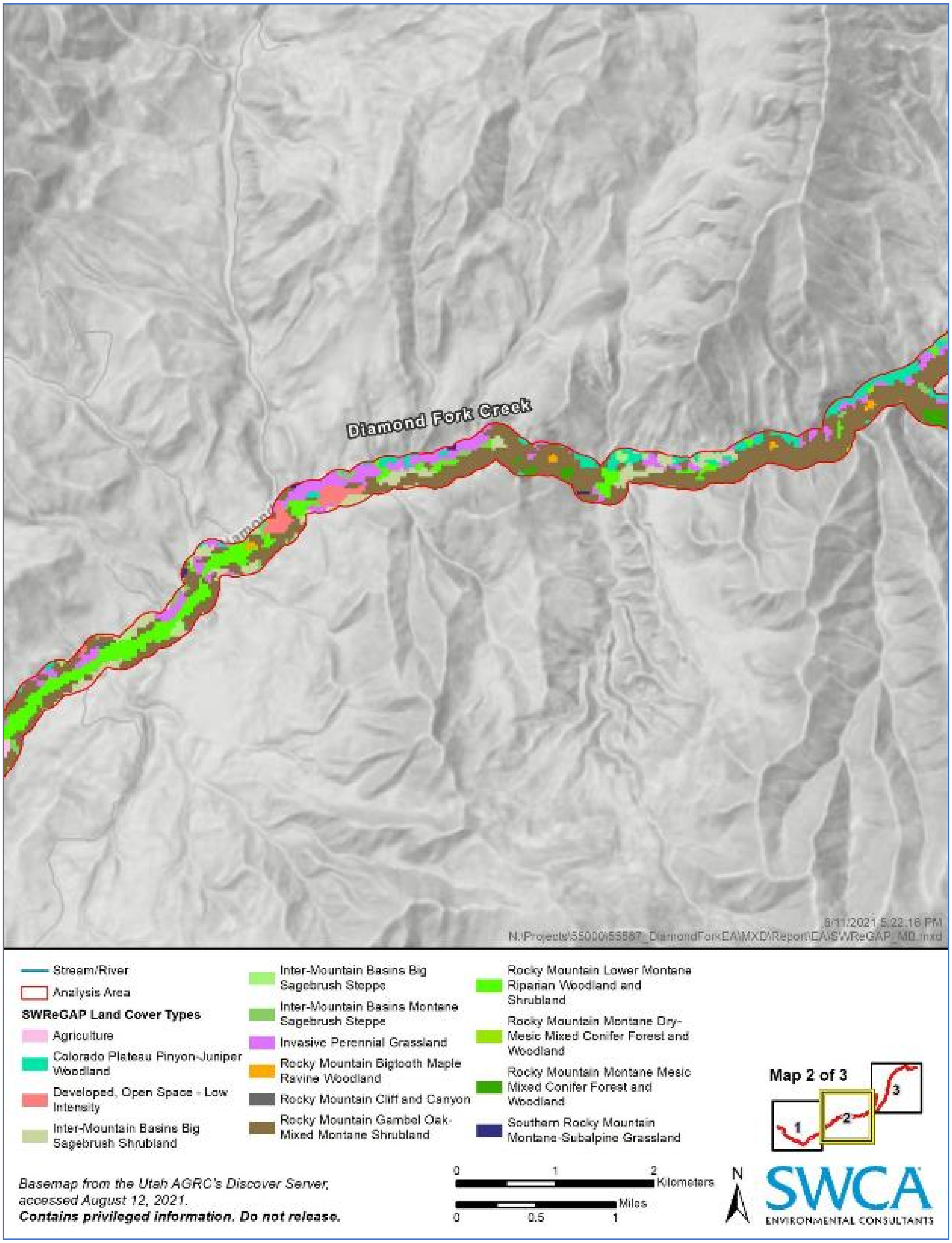

Figure 3.9-2. Southwest Regional Gap Analysis Project vegetation communities within the analysis area (map 2 of 3).

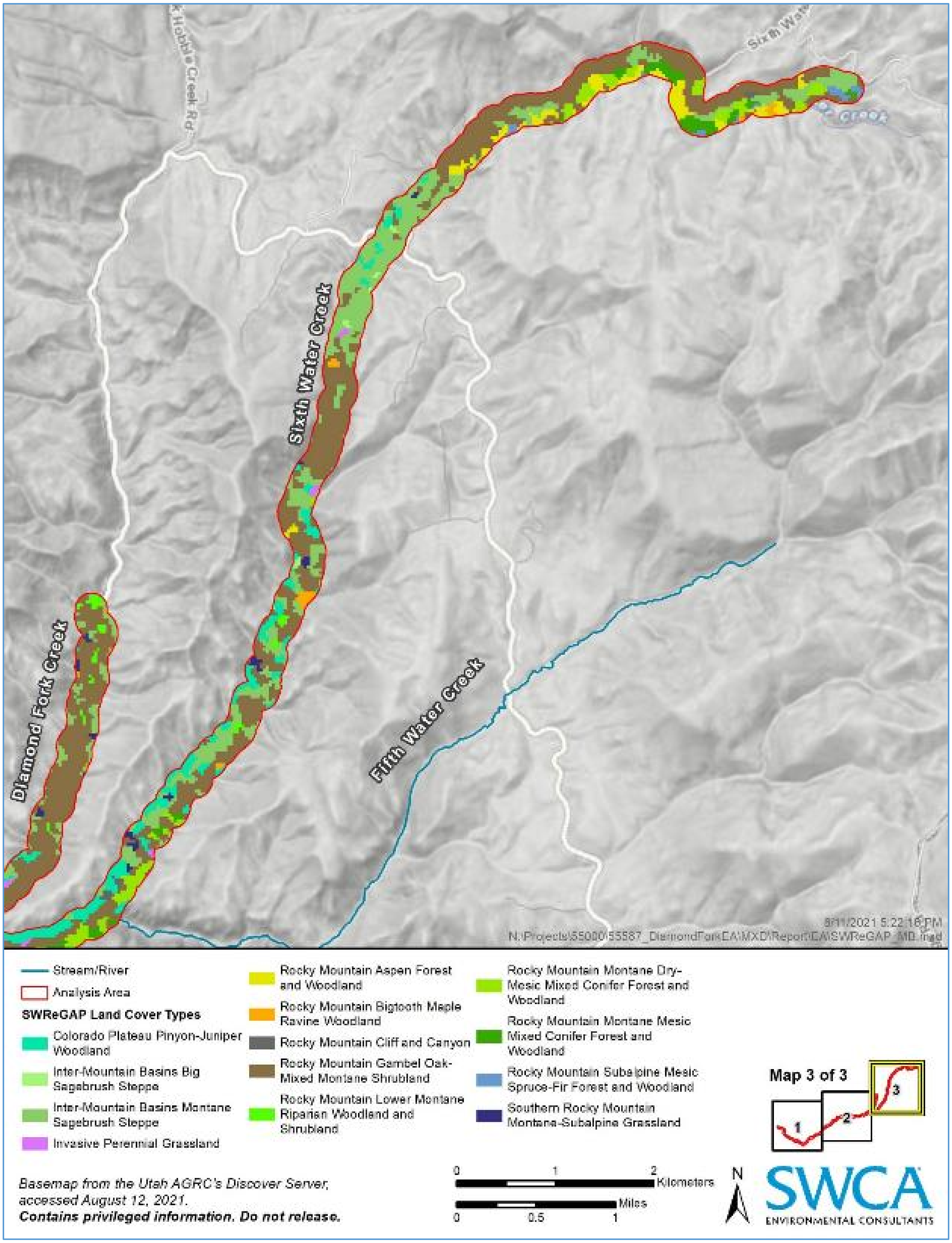

Figure 3.9-3. Southwest Regional Gap Analysis Project vegetation communities in the analysis area (map 3 of 3).

Species within vegetation communities in the analysis area have adapted to semi-arid climates; however, the species composition is susceptible to changes caused by prolonged drought or fire. Evidence of altered species composition due to fire was observed within the analysis area.

3.9.3 Environmental Consequences

3.9.3.1 No Action Alternative

The No Action Alternative would have no effect on the vegetation communities in the analysis area because the dominant species types would remain stable under the current conditions.

3.9.3.2 Proposed Action Alternative

The two instream flow alternatives would affect some vegetation communities within the analysis area; however, there would be no expected difference between the alternatives. Existing vegetation communities would generally remain stable. However, reduced instream flows could result in a narrower stream channel and increase available area in the riparian corridor for new species to establish and occupy.

3.9.3.2.1 INSTREAM FLOW ALTERNATIVES

Both instream flow alternatives would have the same effect on vegetation. Under the two instream flow alternatives, vegetation communities within the analysis area would adapt to the lower minimum flows, and the composition of the vegetation communities in the analysis area would not change. The instream flow alternatives may result in channel narrowing over time, which would affect vegetation immediately adjacent to each stream. The instream flow alternatives would not change high flows, but channel narrowing would create conditions where bankfull or overbank flows connect the streams with their floodplains more frequently than under the No Action Alternative. New riparian areas may be exposed as a result of the lower instream flows and are likely to be colonized by grasses, forbs, and sedges such as spreading bent, Nebraska sedge, common spike-rush, Baltic rush, Torrey's rush, and white clover. The overall structure of vegetation communities would not be expected to change under the instream flow alternatives because the dominant species are drought tolerant species with pervasive root systems (USFS 2016).

3.9.3.2.2 HYDROGEN SULFIDE SPRINGS

Construction of the spring collection system would have temporary and permanent impacts to the surrounding vegetation. Based on the preliminary design concept for the spring collection system (Hansen, Allen & Luce, Inc. 2020), approximately 0.05 acre of streamside vegetation would be permanently impacted, and approximately 0.12 acre of streamside vegetation would be temporarily impacted. Temporary impacts that could affect vegetation would include ground disturbance, vegetation trampling or removal, and soil compaction. Areas disturbed during construction would be regraded and restored where possible, and BMPs would minimize potential impacts to vegetation. Permanent vegetation loss would be primarily associated with spring development and loss of wetland vegetation, which are described in Section 3.7.3. The impacts to vegetation are very minor.

3.9.3.2.3 INSPECTION AND MAINTENANCE

The proposed changes to the inspection and maintenance schedules for the Strawberry Tunnel and the Sixth Water Flow Control Structure would alter the frequency and duration of shutdowns to these features relative to the No Action Alternative. As discussed in Hydrology Section 3.4, these shutdowns would reduce flows on Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River by up to about 20 cfs at times. However, all planned shutdowns would be temporary and would occur during the non-irrigation season, when vegetation is generally dormant and flow reductions would not affect riparian vegetation, even in the case of a prolonged shutdown. In addition, the shutdowns would not be expected to occur during high flood flows associated with springtime snowmelt runoff or summer thunderstorms and would not impact these high magnitude flows that contribute water and soil moisture to riparian vegetation during the growing season. Therefore, the proposed inspection and maintenance changes would not be expected to impact vegetation in the riparian areas of Sixth Water Creek, Diamond Fork Creek, or the Spanish Fork River.

3.10 THREATENED AND ENDANGERED SPECIES

3.10.1 Issues, Impact Indicators, and Analysis Area

According to the USFWS Information for Planning and Consultation (IPaC) system, four federally listed threatened species could occur in the project area. The threatened species are Canada lynx (*Lynx canadensis*), western yellow-billed cuckoo (*Coccyzus americanus*) (WYBC), Ute ladies'-tresses (*Spiranthes diluvialis*) (ULT), and June sucker (*Chasmistes liorus*).

As part of the project's internal and external scoping, the following threatened and/or endangered species issues were identified:

- How would minimum instream flow modifications impact threatened species populations and suitable habitat?
- How would the collection and discharge of spring water near the UDFFCS impact threatened and/or endangered species populations and suitable habitat in Diamond Fork Creek?
- How would proposed inspection and maintenance schedule changes impact threatened and/or endangered species populations and suitable habitat in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River?

The impact indicators used to assess these issues are as follows:

- For all species: Area of suitable habitat along the riparian corridor that could be altered by flow reduction in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River
- For all species: Area of suitable habitat within the disturbance area that could be temporarily or permanently altered by surface disturbance
- For ULT: Predicted changes to suitable ULT habitat due to lower base flows in Diamond Fork Creek
- For ULT: Distance from the wetted width (or edge) of modeled flow levels to suitable ULT habitat and ULT occurrences mapped in 2020

The analysis areas are specific to each species. The analysis area for WYBC focuses on Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River down to the Spanish Fork River Diversion plus a 0.5-mile buffer surrounding the creeks because the WYBC primarily occupies and nests in riparian vegetation. The analysis area for WYBC also includes the Spanish Fork River downstream of Diamond Fork Creek because instream flow alternatives would affect flows in the Spanish Fork River. The analysis area for the Canada lynx comprises the entire Diamond Fork watershed (HUC level 10) to account for roaming territories at different elevations. The analysis area for the June sucker is the lower Provo River and the lowest 1.6 miles of Spanish Fork River from Utah Lake upstream to the Huff Dam diversion. ULT suitable habitat was previously delineated during 2008 (BIO-WEST 2009b) and 2020 surveys (Gibbons and Wheeler 2021). Therefore, the ULT analysis area coincides with known ULT populations and suitable habitat data.

As noted in Section 3.4.3.2, the Proposed Action would not affect the hydrology of Strawberry River, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, or Utah Lake and therefore would not affect threatened and/or endangered species associated with these waterbodies.

3.10.2 Affected Environment

Special-status species are species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species that are protected under the Endangered Species Act. Suitable habitat and the species' potential to occur within its analysis area were evaluated for each of the four identified species mentioned above. The suitable habitat analysis was based on mapped critical habitat, as determined by the IpaC resources list, aerial landcover data provided by SWReGAP, and habitat descriptions from the USFWS Environmental Conservation Online System. A brief description of each species, suitable habitat requirements, and potential to occur within its analysis area are described below. No critical habitat for federally threatened species was identified within the analysis areas.

3.10.2.1 Western Yellow-Billed Cuckoo

The WYBC is a large migratory bird that depends on riparian forests that are dominated by cottonwood species and have a complex understory structure. The WYBC nests at lower elevations (2,500 to 6,000 feet) in riparian woodlands and prefers large contiguous patches of forest (25 to 50 acres) (USFWS 2019b). In all, 16,639 acres of riparian habitat in the analysis area were analyzed as potentially suitable for WYBC. Of this 16,639 acres, 517.3 acres (approximately 3.1% of the analysis area) is Rocky Mountain Lower Montane Riparian Woodland and Shrubland habitat that could support WYBC (Lowry 2005). However, this habitat does not meet the criteria for suitable WYBC habitat outlined in *Guidelines for the identification and evaluation of suitable habitat for western yellow-billed cuckoo in Utah* (USFWS 2017) due to the lack of multilayered riparian vegetation, a habitat patch size of less than 12 acres, a lack of multilayered riparian vegetation large enough to be 100 meters long × 100 meters wide, or a combination of these criteria. For this reason, there is no potential for WYBC to occur within the analysis area.

3.10.2.2 Canada Lynx

The Canada lynx is a medium-sized cat averaging 19 to 22 pounds. Its distribution in North America is closely associated with boreal forest communities. Its range may extend into subalpine forest in the western United States. Forests with boreal features extend south into the Rocky Mountains. The lynx is most likely to persist in areas that receive deep snow and have high-density populations of snowshoe hare (*Lepus americanus*) (USFWS 2019b). In all, 2.3 acres of Rocky Mountain Subalpine Forest exists within the analysis area; however, there is no boreal forest habitat, the preferred species' habitat, in the analysis area (Lowry 2005). Although snowshoe hares are commonly found in the Wasatch Range at elevations above 8,000 feet (Murray 1999), the subalpine forests within the analysis area are too low in elevation to support consistent snowshoe hare populations. For this reason, there is little potential for Canada lynx to occur within the analysis area.

3.10.2.3 June Sucker

June sucker is a threatened fish species associated with Utah Lake and its tributaries. June sucker spends most of its life cycle in Utah Lake and spawns in the montane rivers and tributaries associated with the lake (USFWS 2020). When the species was listed as endangered in 1986, spawning had been documented in the lower reaches of the Provo and Spanish Fork Rivers (*Federal Register* 51:10851), but little is known about the extent of historical June sucker spawning migrations. While similar sucker species do migrate long distances (greater than 10 miles) for spawning (Cooperman and Markle 2003), such long-distance spawning migrations have not been observed in June sucker. A series of water control structures prevents fish in Utah Lake from reaching the Diamond Fork System for spawning. Currently the only known significant spawning habitats are within the Provo River and Hobble Creek, both tributaries to Utah Lake. Adult June sucker do access the lower Spanish Fork River for spawning, but upstream migration is impeded by the Huff Dam diversion located 1.6 miles upstream of Utah Lake. Spawning habitat in the lower 2.7 miles of the Spanish Fork River is of poor quality (*Federal Register* 86: 192), but improves upstream as river channel conditions are more favorable (M. Stamp et al. 2002). As discussed in Section 3.4.3.2.1, the net hydrologic conditions on the Provo River or Hobble Creek under both instream flow alternatives would not substantially change relative to current conditions nor affect flows in the Spanish Fork River during spawning season. The adjustment in stream flows outlined in the alternatives would aid in replacement of water acquired on a temporary basis to support flows in the Provo River that have benefited the June sucker. As this would be a replacement of water currently used in the Provo River, the instream flow alternatives are not anticipated to affect June sucker compared to current conditions.

3.10.2.4 Ute Ladies'-Tresses

3.10.2.4.1 BACKGROUND

The ULT is a small perennial orchid with white or ivory spiraling flowers. Individuals often go dormant and bloom once every 3 years; dormancy is influenced by environmental stressors, particularly drought (Heidel 2001). ULT individuals typically bloom from late July through August (USFWS 2019c). Habitat for ULT includes alluvial banks, moist soils, sandy edges, point bars, floodplains, sandbars, and oxbows associated with perennial streams, wetland meadows, springs, or lakes. Habitat is often associated with perennial graminoid (grass-like plants) and forb-dominated riparian areas located at elevations between 5,185 and 7,200 feet in Utah (Fertig 2005; Goodrich and Huber 2016; USFWS 2019c).

The analysis area is a historic location of ULT habitat along portions of Diamond Fork Creek and the Spanish Fork River from Diamond Fork Creek to the Castilla Gage (District 2004a). The Diamond Fork watershed provides areas of ULT preferred habitat of open vegetative communities, moist soils, and sandy edges with oxbows and other desired conditions (BIO-WEST 2009b). Conditions affecting ULT habitat in the analysis area include remnant features associated with historic SVP high flow releases, changes to the Diamond Fork Creek flow regime starting in 2004, erosion and flooding events following the 2018 Pole Creek Fire, the invasion of non-native plants, and drought (Gibbons and Wheeler 2021). No critical habitat has been designated for this species (USFWS 2019d).

3.10.2.4.2 MONITORING AND SURVEYS

The District monitored flowering ULT plants in 11 of the 13 years between 1992 and 2004 in the Diamond Fork area. The Mitigation Commission took over the monitoring responsibility in 2005 and completed ULT surveys from 2005 to 2008 and in 2019 and 2020. Groundwater monitoring was conducted as part of the 2005–2007 ULT monitoring efforts and found that there are two water sources that affect near-surface groundwater elevations and occupied ULT habitat during the growing season: 1) side-hill water sources that are independent of Diamond Fork Creek flows, and 2) high flows, generally occurring during spring snowmelt runoff and after storm events that exceed 100 cfs and overtop the stream bank (BIO-WEST 2009b). The groundwater monitoring results showed that near-surface groundwater elevations on surfaces occupied by ULT were not impacted by stream flow changes in the 60 to 80 cfs range (BIO-WEST 2009b).

The number of ULT individuals identified in surveys has varied widely. Surveys conducted between 2005 and 2008 detected an average total of 5,088 ULT individual plants in the analysis area; however, in the 2019 surveys, 872 individuals were detected, and in 2020, only 53 ULT individuals were documented. The second-lowest number of individuals counted was 616 ULTs in 2004 (Gibbons and Wheeler 2021). Overall, monitoring results were highly variable but do suggest a general trend toward fewer flowering plants compared to pre-2005 data. ULT individuals can be difficult to count because of their size, blooming window, and other factors such as dense vegetation surrounding the plants. ULTs do not necessarily flower every year, and annual variation in climate and hydrology may influence the number of flowering plants observed. Therefore, the USFWS recommends that surveys be conducted annually during the blooming season for three consecutive years to account for dormancy and get an approximate range of actual numbers. For these reasons, ULT suitable habitat is a more reliable indicator to use for this analysis. Areas of suitable habitat for this analysis are defined as polygons of potentially suitable habitat mapped in the 2008 survey and revisited in the 2019 and 2020 surveys (Gibbons and Wheeler 2021). When the polygons from the 2008 survey were revisited in 2019 and 2020, some polygons determined to no longer contain suitable habitat were removed, and new areas that were determined to be suitable in 2019 and 2020 were added to the maps of suitable habitat.

3.10.2.4.3 SUITABLE HABITAT

Following development of the SVP through the time the Diamond Fork System began operating (1916 to 2004), average irrigation season flows released directly into Sixth Water Creek from the Strawberry Tunnel were approximately 320 cfs with intermittent peak flows of 400–500 cfs (Gibbons and Wheeler 2021). These high flows from the influx of SVP irrigation water changed the Diamond Fork Creek ecosystem, causing regular disturbance and channel scouring events that kept vegetation along the channel at an early to mid-seral stage and creating ideal habitat for ULT (Gibbons and Wheeler 2021). In 2004, CUPCA completed the Diamond Fork System, a series of aqueducts, pipelines, and tunnels that largely bypassed Sixth Water and Diamond Fork Creeks and reduced typical summer flows on Diamond Fork Creek to approximately 80 cfs. The modification of flows and reduction in channel scouring events and early seral habitats preferred by ULT have been suggested to be a contributing factor to the decline of ULT in Diamond Fork Creek (Bio West 2009b).

In the Diamond Fork watershed, ULT suitable habitat and ULT individuals are typically found in two different types of riparian locations: 1) relatively wide, large relict floodplain surfaces associated with pre–Diamond Fork System hydrology (portions of these surfaces are located over 100 feet from the current active stream channel), and 2) narrower channel margin floodplain surfaces located adjacent to the current active channel. Channel margin surfaces are more susceptible to erosion, scour, and sediment deposition under the post–Diamond Fork System flow regime.

Suitable habitat for ULT totaling 59.73 acres was identified in a 2008 survey (Table 3.10-1) (BIO-WEST 2009b). A subsequent survey 12 years later, in 2020, by USU and the Utah Department of Natural Resources (DNR) identified 53.23 acres of suitable ULT habitat in the analysis area (BIO-WEST 2009b; Gibbons and Wheeler 2021). The 2020 survey identified 8.34 acres of previously suitable habitat that was no longer considered suitable and 0.12 acre of new suitable habitat and confirmed the 1.73 acres of new habitat mapped in 2019 (see Table 3.10-1). Unsuitable habitat was often either too dry and/or too densely vegetated (Gibbons and Wheeler 2021).

Table 3.10-1. 2008 and 2020 Suitable Habitat in the Upper and Lower Reaches of Diamond Fork Creek

Reach	2008 Acres of Suitable Habitat	2019 Acres of Suitable Habitat
Upper Reach	7.20	5.24
Lower Reach	52.53	47.99
Total	**59.73**	**53.23**

Note: The upper reach is defined as Diamond Fork Creek upstream from USGS Gage 10149400, and the lower reach is defined as Diamond Fork Creek downstream from the gage.

The habitat polygons used for ULT surveys were originally mapped in 2005 and correspond to the river location in 2005. Since then, the channel location and shape has shifted in some areas, rendering some polygons as needing to be redrawn or reshaped (identified as “reshape” in the 2020 survey results) because they now contain a mix of suitable and unsuitable habitats. The reshaping exercise has not yet been completed, and the 8.34-acre value consists only of entire habitat polygons that are no longer suitable (identified as “remove” in the 2020 survey results). It does not include any acreage associated with now partially unsuitable polygons. Therefore, it likely underestimates the total acreage no longer providing suitable habitat relative to the 2008 data set. In general, the areas identified as no longer providing suitable habitat for ULT are typically located in relict floodplains and/or areas where changes in vegetation and drying conditions related to the 2004 change in flows have eliminated portions of the once suitable ULT habitat. Changes in the instream flow in Diamond Fork and Sixth Water Creeks, along with years of drought and changes in vegetation may have contributed to the historic decline in the number of ULT individuals and habitat conditions.

Ongoing changes in habitat may be due to several factors or a combination of factors, including periodic high flow events from spring runoff, drought, grazing, and the 2018 Pole Creek Fire and subsequent floods. High flow events have resulted in changes to the stream channel width, and the deposition of sediment has created new sediment bars. Following the Pole Creek Fire, the introduction of aggressive, non-native weedy species into ULT habitat has created dense vegetation in some areas and a loss of suitable habitat. These changes may result in both the loss and gain of suitable ULT habitat in the analysis area (Wheeler et. Al 2020).

At the time the analysis for the Utah Lake Drainage Basin Water Delivery System EIS was conducted, there were seven known ULT occurrences along the Spanish Fork River between the confluence with Diamond Fork Creek downstream to the Castilla gage, and five of the known occurrences were located on gravel bars and low floodplains adjacent to the main channel and were believed to be supported by river flows (District 2004a). Areas where there were known occurrences of ULTs along the Spanish Fork River between the confluence with Diamond Fork Creek and the Castilla gage were not surveyed as part of more recent District, DWR, or USU surveys, and current data on Spanish Fork ULT occurrences are not available.

3.10.3 Environmental Consequences

3.10.3.1 No Action Alternative

The No Action Alternative would have no effect on WYBC or Canada lynx because there is no suitable habitat or known occurrences for these species within the analysis areas. Under the No Action Alternative, the Diamond Fork System would continue to operate at CUPCA-mandated minimum instream flows, and construction activities related to the UDFFCS would not occur. Therefore, the No Action Alternative would have no effect on ULT suitable habitat in the analysis area because water sources that affect near-surface groundwater elevations and occupied ULT habitat would not be impacted, and there would be no construction disturbance to ULT suitable habitat. The general trend in lower ULT numbers and habitat would be expected to continue as floodplains continue to stabilize during the post–Diamond Fork System hydrologic regime and riparian vegetation continues to grow. Impacts from invasive weeds, fires, and grazing would also continue to affect ULT suitable habitat and population numbers. Under the No Action Alternative, no instream flow water would be redistributed to the Provo River. The temporary June sucker water would gradually expire by 2025 unless new water supplies are found as a replacement. The ability of the JSRIP to meet ecosystem flow recommendations for the lower Provo River would be reduced.

3.10.3.2 Proposed Action Alternative

3.10.3.2.1 INSTREAM FLOW ALTERNATIVES

The instream flow alternatives would have no effect on WYBC or Canada lynx because there is no suitable habitat or known occurrences of these species within their analysis areas. Instream flow alternatives would not change hydrologic conditions in the Provo River or Hobble Creek, or change flow in the lower Spanish Fork River during spawning seasons and therefore would not affect June sucker.

Under the instream flow alternatives, the distribution of suitable ULT habitat within its analysis area would change slightly because of the lower minimum flows. The instream flow alternatives would result in channel narrowing over time and an increase in streambed mobility and sediment transport (Wilcock et al. 2019), which would create new areas of suitable ULT habitat, particularly in Diamond Fork Creek. The instream flow alternatives would not change high flows, but channel narrowing would create conditions where bankfull or overbank flows connect the streams with their floodplains more frequently than under the No Action Alternative. The lower base flows are beneficial to the overall health of Sixth Water and Diamond Fork Creeks.

Data Sources

The tabular and spatial data provided by DNR and USU from the 2008 and 2020 ULT suitable habitat surveys provided a naming convention for delineated polygons (i.e., the discrete areas of suitable habitat identified) and corresponding acreage of each polygon. All ULT polygons in the analysis area have used this standard naming convention throughout the years of surveys, and these polygons were used to calculate how many acres of habitat were determined suitable or unsuitable in 2020 for comparison to the 2008 survey. Using 2017 LiDAR spatial data from the Mitigation Commission, the slope, distance from the stream channel, and the absolute elevation of suitable habitat identified in the 2008 and 2020 surveys were calculated and compared. These calculations indicated that the areas of previously suitable habitat that were identified as unsuitable in the 2020 survey were typically on steeper slopes, farther away from the channel, and higher in the stream reach. Newly identified areas of suitable habitat in the 2019 and 2020 surveys were generally located in the downstream reaches of the Diamond Fork Creek and were created from sediment deposition.

Hydraulic Modeling and Spatial Analysis

To evaluate the effects of the proposed flow reductions on the extent of suitable habitat for ULT, a hydraulic model of four representative reaches of Diamond Fork Creek was developed to illustrate the differences in channel wetted width at 82 cfs base flows (representative of summer growing season base flows under the No Action Alternative) and the 50 cfs reduced flow (representative of summer growing season base flows under both proposed instream flow alternatives), using terrain data derived from ground-based survey methods and LiDAR, which were both collected in 2017 (SWCA 2021c). The two-dimensional hydraulic model was developed using U.S. Army Corps of Engineers software HEC-RAS v. 6.0.0 Beta 2 at four locations on Diamond Fork Creek: Diamond Fork Campground (DFC), Motherlode (MO), Oxbow (OX), and Childs (CH) (SWCA 2021c). Site selection was based on the presence of both suitable habitat and known ULT populations, existing stream cross section transect data for DFC, MO, and OX, and newly mapped suitable habitat and ULT individuals at CH. Modeled reaches are illustrative of areas of ULT suitable habitat in the lower portion of Diamond Fork Creek. The model simulated flow conditions during 82 cfs and 50 cfs flow events. Wetted areas for each scenario are summarized in Table 3.10-2. The wetted area values represent the surface area of the water at each flow based on channel topography; they are not a prediction of soil moisture and do not account for subsurface flows or possible side hill moisture sources. Based on the modeled locations, the overall wetted area of Diamond Fork River is predicted to decrease by 17% when flows are reduced from 82 cfs to 50 cfs.

Table 3.10-2. Summary of Wetted Areas Predicted by the Hydraulic Model for Sites on Diamond Fork Creek

Site Name	Flow (cfs)	Wetted Area (acre)	Percentage Change
DFC	82	1.13	-14%
	50	0.97	
MO	82	1.19	-19%
	50	0.96	
OX	82	1.82	-21%
	50	1.43	
CH	82	0.85	-14%
	50	0.73	

An overview map and individual maps showing the modeling results at each location is provided below (Figures 3.10-1 to 3.10-5).

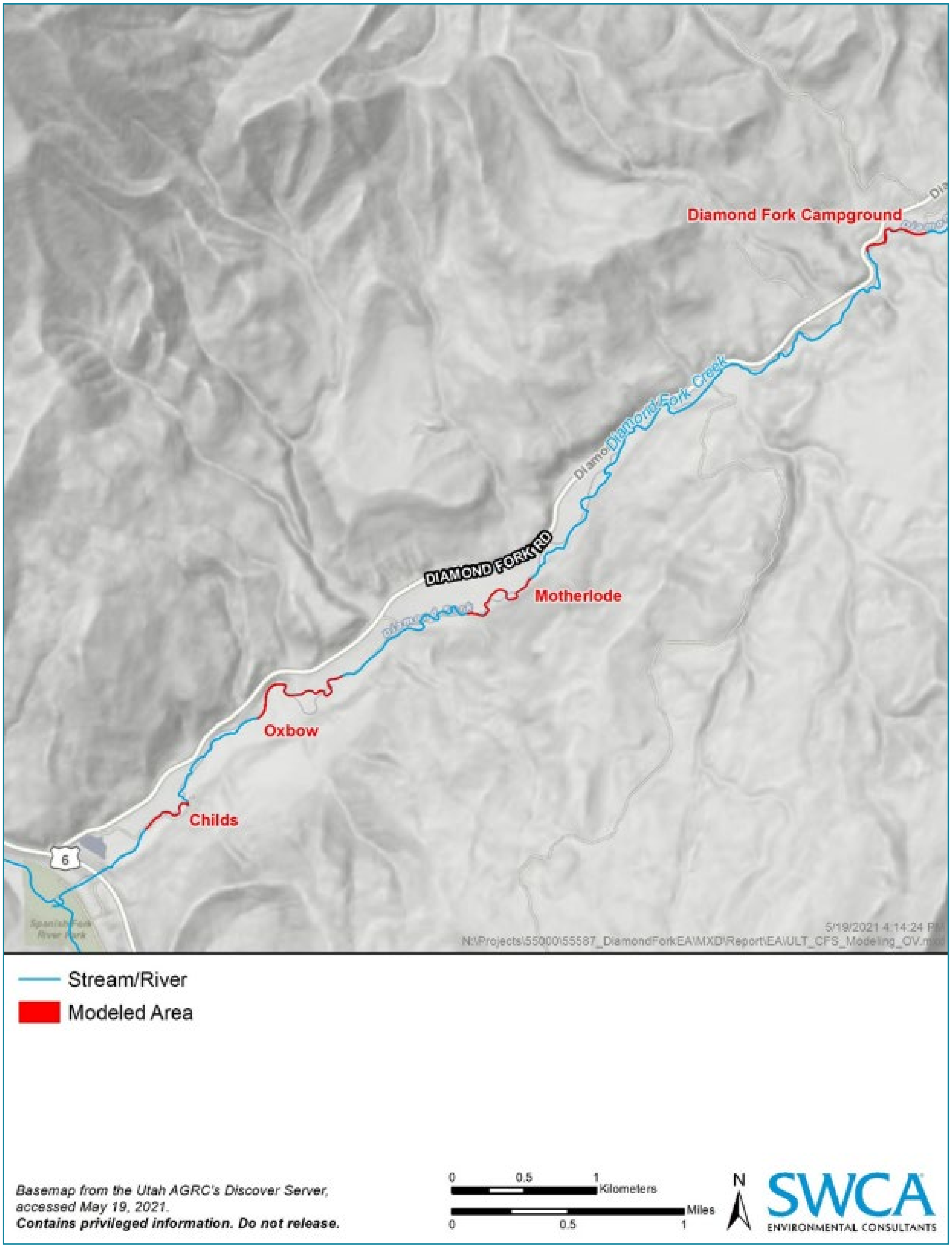

Figure 3.10-1.Overview map of areas where hydraulic modeling was conducted.

Figure 3.10-2.Hydraulic modeling results for the Diamond Fork Campground site.

Figure 3.10-3.Hydraulic modeling results for the Motherlode site.

CENTRAL UTAH WATER CONSERVANCY DISTRICT

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Figure 3.10-4.Hydraulic modeling results for the Oxbow site.

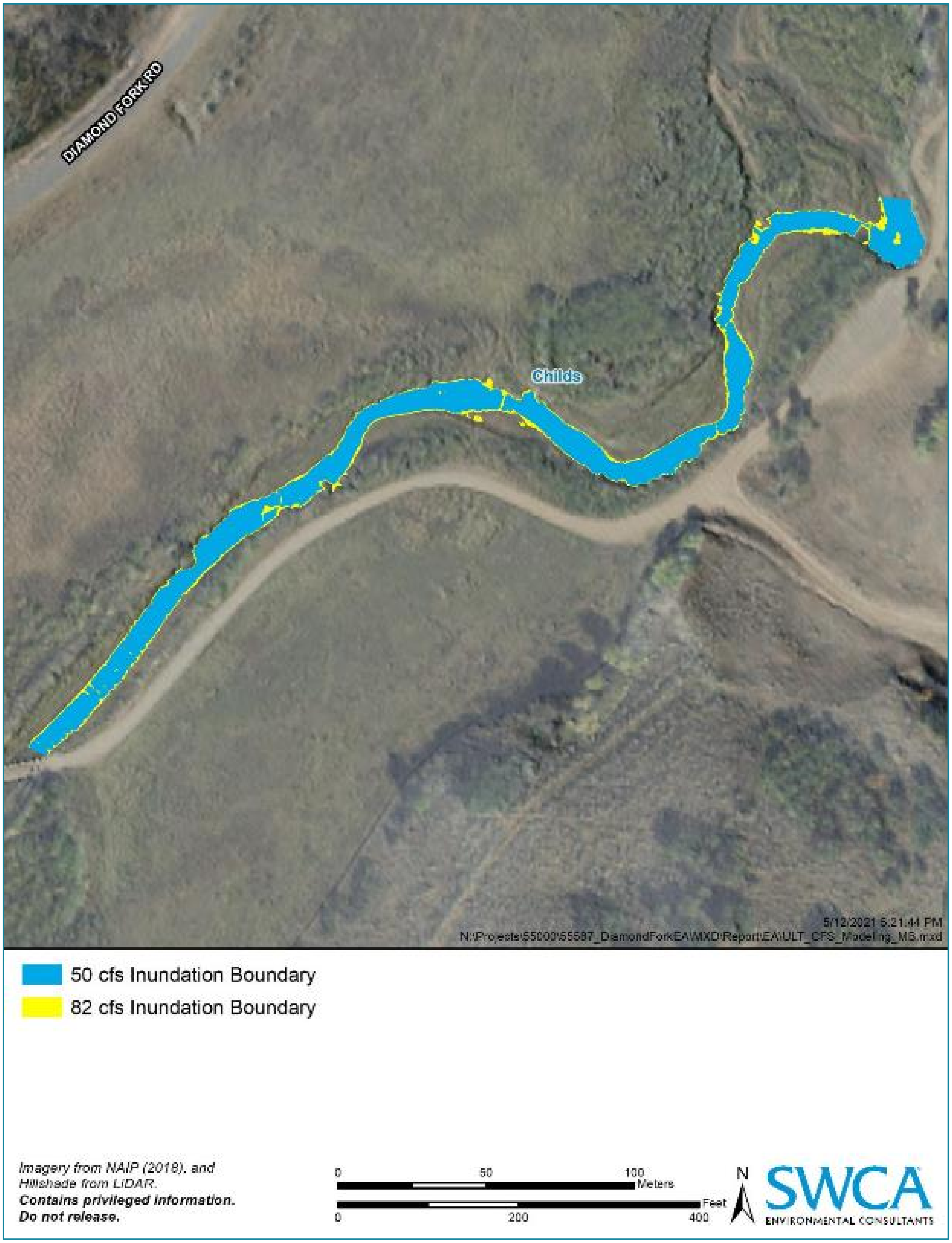

Figure 3.10-5.Hydraulic modeling results for the Childs site.

For each modeled site, the average distance from the edge of the water to known ULT locations and to suitable habitat polygons (2019 and 2020 DNR/USU data) from the 82 cfs and 50 cfs hydraulic model results was calculated (Table 3.10-3). Based on these calculations, the overall distance from the edge of the water to known ULT individuals varies widely, and the reduction in wetted width is very small in comparison to the distance from wetted width to ULT individuals and suitable habitat (see Table 3.10-3). ULTs are located closest to the stream channel at the CH site and farthest from the stream channel at the OX site. This analysis demonstrates that recently observed ULTs are located far enough away from the wetted channel that they are most likely supported by subsurface or side hill soil moisture sources rather than being directly dependent upon surface flows in the wetted channel.

Table 3.10-3. Summary of Average Distance to Ute Ladies'-Tresses Individuals and Suitable Habitat for the Hydraulic Model Sites on Diamond Fork Creek

Site Name	Flow (cfs)	Average Distance to Mapped ULTs (feet)	Change in Distance to Mapped ULTs (feet)	Average Distance to Suitable Habitat (feet)	Change in Distance to Suitable Habitat (feet)
DFC	82	25.6	1.1	20.2	1.6
	50	26.7		21.8	
MO	82	120.4	2.2	31.3	1.6
	50	122.6		32.9	
OX	82	152.4	1.6	109.7	1.2
	50	154.0		110.9	
CH	82	17.4	1.3	0.0	2.5
	50	18.7		2.5	

Representative cross sections were created to show the distance to mapped ULT individuals from the 82 cfs base flow (No Action Alternative) and the 50 cfs reduced flow (proposed instream flow alternatives) for each site (see Figures 3.10-6 to 3.10-9). (Note: Scale varies on each cross section to illustrate the relative location of ULT individuals).

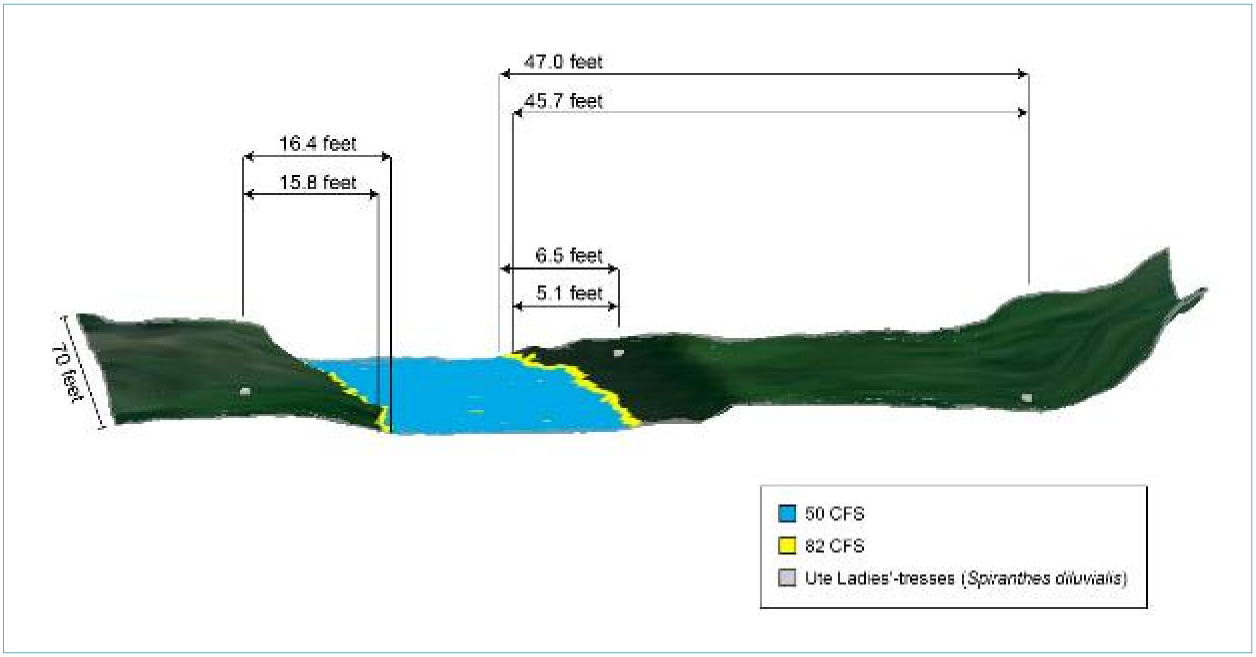

Figure 3.10-6.Representative cross section from the Diamond Fork Campground modeling site showing the distance to Ute ladies'-tresses individuals (shown as white dots) at 82 cfs and 50 cfs.

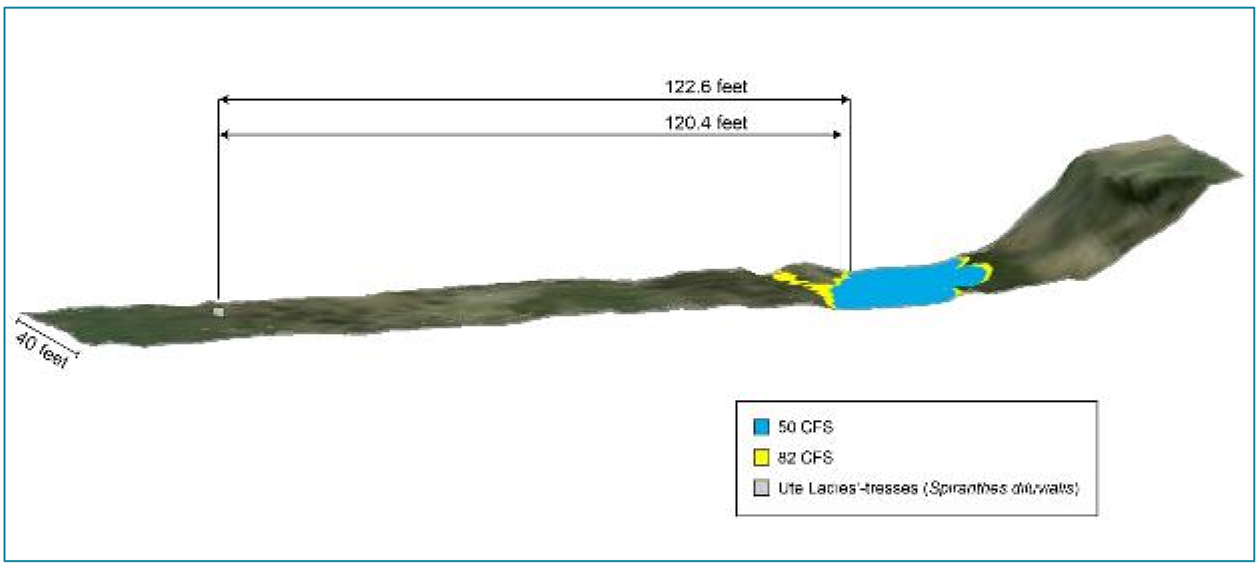

Figure 3.10-7. Representative cross section from the Motherlode modeling site showing the distance to Ute ladies'-tresses individuals at 82 cfs and 50 cfs.

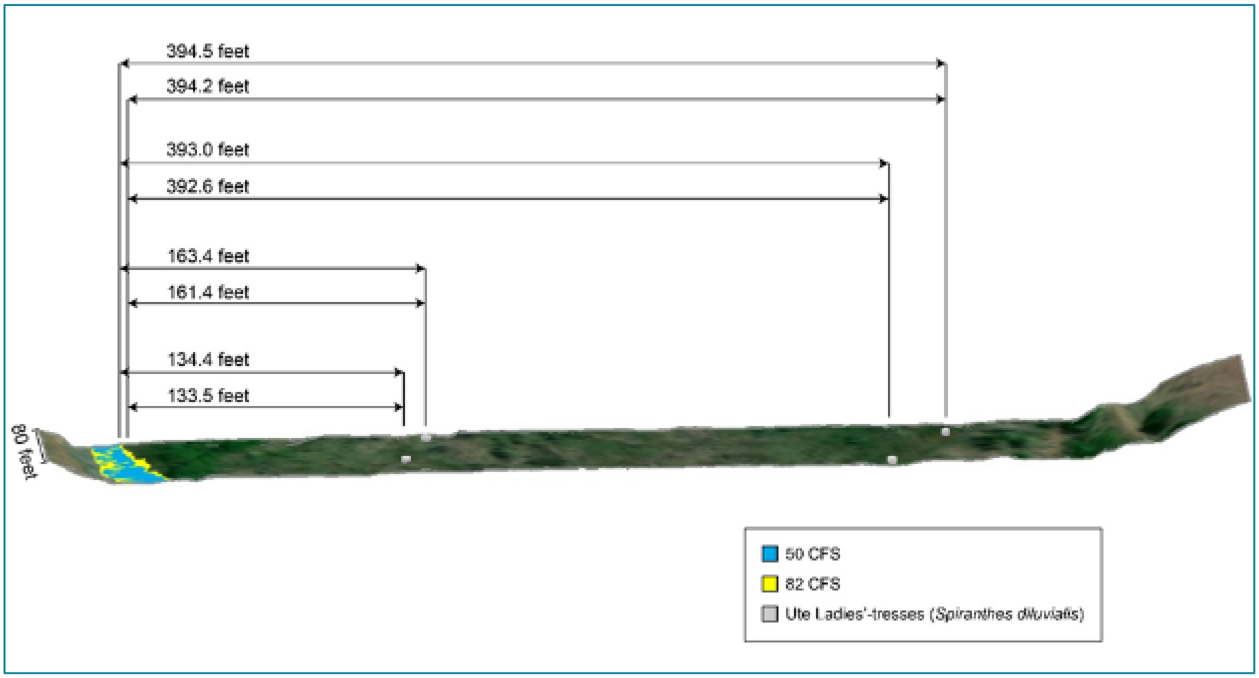

Figure 3.10-8. Representative cross section from the Oxbow modeling site showing the distance to Ute ladies'-tresses individuals at 82 cfs and 50 cfs.

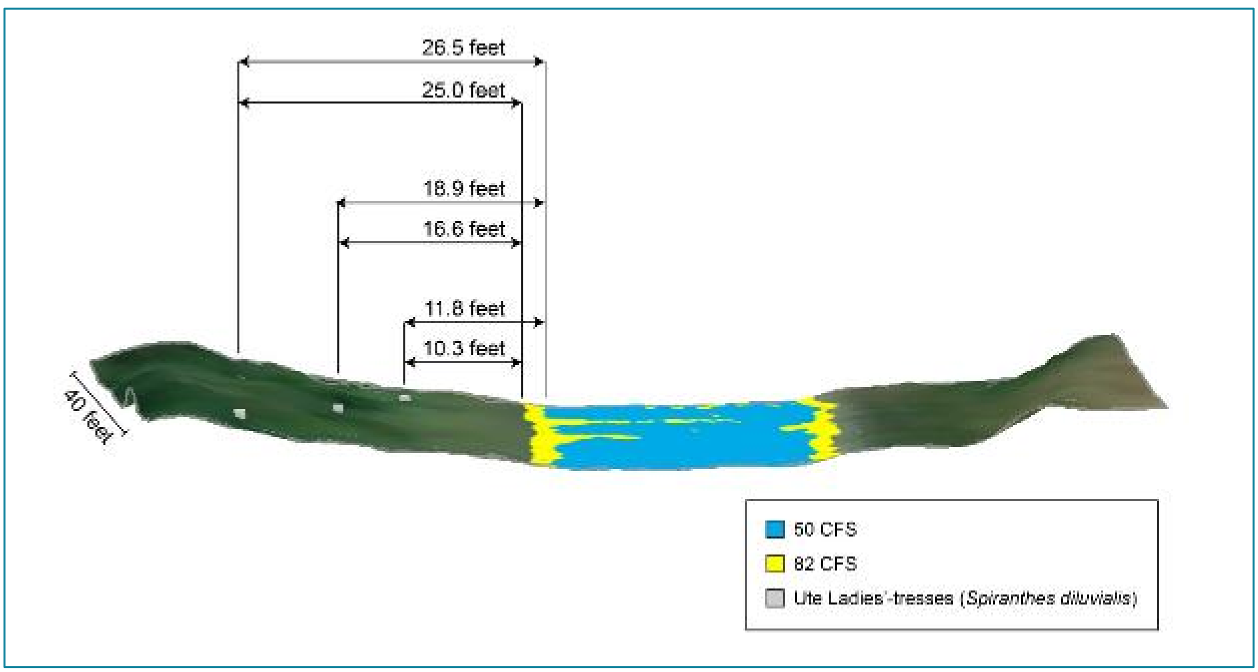

Figure 3.10-9. Representative cross section from the Childs modeling site showing the distance to Ute ladies'-tresses individuals at 82 cfs and 50 cfs.

Findings of Effects Analysis

High flows that are important in maintaining adequate hyporheic zone recharge and providing sediments onto the lower level flood terraces and overbank floodplain habitats (e.g., oxbows, depressions) that promote ULT suitable habitat would not change under the instream flow alternatives. If the channel of Diamond Fork Creek narrows as a result of lower base flows, overbank flooding may become more common, as less flow would be required to overtop the stream banks. Channel narrowing and sediment deposition in the lower reaches of Diamond Fork Creek may result in an increase in suitable ULT habitat in those reaches. The results of the hydraulic modeling indicate that the overall wetted width of the channel could be reduced by 17% because of the instream flow alternatives, and this change in wetted width could create new habitat for ULTs through the formation of gravel bars exposed at lower flows. The results of the spatial analysis indicate that the distance ULTs and suitable habitat are located from the wetted channel would not change significantly because of the instream flow alternatives compared to the No Action Alternative base flow of 82 cfs.

As with the No Action Alternative, the general trend toward lower numbers of ULTs would be expected to continue as floodplains continue to stabilize during the post–Diamond Fork System hydrologic regime and riparian vegetation continues to grow. The trend of small losses and gains of suitable habitat would also likely continue as the proposed reductions in base flows are expected to promote channel narrowing and increased sediment transport, with most of the habitat losses occurring in the mid- to upper stream reaches, and suitable habitat being created in areas where sediments are deposited or where gravel bars have formed. The proposed reduction in base flows is also expected to narrow the wetted water level in the channel during the summer growing season, reducing the horizontal extent of streamflow-associated moisture; however, the magnitude of this change is predicted to be small.

On the Spanish Fork River, the instream flow alternatives would reduce base flows during the non-irrigation season but would not affect base flows during the irrigation season, and therefore changes to the Spanish Fork River channel and ULT habitat would not be expected to occur. Based on the continuation of spring runoff events that would cause overbank flows (which are a key factor in supporting ULT habitat), the small magnitude of change in wetted width of the Diamond Fork Creek channel, anticipated channel narrowing resulting from the instream flow alternatives, and the anticipated removal of existing and creation of new ULT habitat due to altered scouring and sedimentation regimes, the proposed modification of minimum instream flows is expected to have minimal effect on suitable ULT habitat and individuals. Therefore, the minimum instream flow alternatives may affect, but are not likely to adversely affect, suitable ULT habitat or ULT individuals in the analysis area.

3.10.3.2.2 HYDROGEN SULFIDE SPRINGS

No suitable habitat for June sucker or ULT is present in the area where the hydrogen sulfide spring collection system is proposed; therefore, impacts to June sucker or ULT are not anticipated. The Proposed Action would have no effect on WYBC or Canada lynx because there is no suitable habitat or known occurrences of these species within the analysis areas.

3.10.3.2.3 INSPECTION AND MAINTENANCE

The proposed changes to inspection and maintenance activities would have no effect on WYBC or Canada lynx because there is no suitable habitat or known occurrences of these species within the analysis areas.

The proposed changes to the inspection and maintenance schedules for the Strawberry Tunnel and the Sixth Water Flow Control Structure would alter the frequency and duration of shutdowns to these features relative to the No Action Alternative. As discussed in Hydrology Section 3.4, these shutdowns would reduce flows on Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River by up to about 20 cfs at times. However, all planned shutdowns would be temporary and would occur during the non-irrigation season, outside of June sucker spawning season and when vegetation is generally dormant and flow reductions would not affect riparian vegetation, even in the case of a prolonged shutdown. In addition, the shutdowns would not be expected to occur during high flood flows associated with springtime snowmelt runoff or summer thunderstorms and would not impact these high magnitude flows that contribute water and soil moisture in riparian areas during the growing season. Therefore, the proposed inspection and maintenance changes would not be expected to change conditions that contribute to ULT suitable habitat in the riparian areas and would have no effect on ULT suitable habitat or individuals.

3.11 CULTURAL RESOURCES

3.11.1 Issues, Impact Indicators, and Analysis Area

Based on the project's internal and external scoping, the following cultural resources issues were identified:

- How would proposed ground-disturbing activity affect properties listed in or eligible for listing in the National Register of Historic Places (NRHP)?
- How would proposed inspection and maintenance schedule changes impact cultural resources?

The impact indicators used to assess this issue are as follows:

- Presence or absence of historic properties
- If present, the application of the criteria of adverse effect for historic properties as provided in the implementing regulations for the NRHP at 36 CFR 800.5(a)(1)

The analysis area for proposed ground-disturbing activity that could affect cultural resources consists of the area of surface disturbance for the hydrogen sulfide spring collection system plus a 0.5-mile buffer. This captures the area where ground-disturbing activity could have adverse effects to historic properties. The analysis area for inspection and maintenance comprises Strawberry Reservoir, Sixth Water Creek, and Diamond Fork Creek from the Strawberry Tunnel downstream to the confluence with the Spanish Fork River. This analysis area encompasses the Diamond Fork System components that would require inspection and maintenance.

The Proposed Action does not include ground-disturbing activities or inspection and maintenance activities in Strawberry Reservoir, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, or Utah Lake; therefore, the Proposed Action would not affect cultural resources associated with those waterbodies.

3.11.2 Affected Environment

Cultural resources are any prehistoric or historic district, site, building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes. Archaeological resources are areas where prehistoric or historic activity altered the earth or where deposits of physical remains are discovered. Prehistoric cultural resources are those materials deposited or left behind prior to the entry of non–American Indians into an area. Historic cultural resources are those materials deposited or left behind after presence of non–American Indians was established. Architectural resources include standing structures of historic value. Traditional resources can include archaeological resources, structures, topographic features, habitats, plants, wildlife, and minerals that American Indians or other groups consider essential for the preservation of traditional culture and traditional values. Traditional values can be manifested at locations called traditional cultural properties, American Indian sacred sites, or cultural landscapes. For the purposes of describing the affected environment and analysis of environmental consequences, cultural resources are defined as historic properties as described in 36 CFR 800.16.

To determine the presence or absence of known historic properties within the analysis area, a review of existing literature and available records was conducted using records maintained by the Utah Division of State History, the database of NRHP-listed properties, and available historic maps. No known historic properties, including archaeological, historical, architectural, or places of traditional values, were identified in these records.

To determine the presence or absence of previously undocumented historic properties, an intensive-level pedestrian archaeological survey was conducted for the project's area of surface disturbance. This area was subject to an intensive-level survey because it is the portion of the project where heretofore unknown historic properties could be subject to direct impacts from the project. This archaeological survey identified nine isolated historic features comprising seven water control features within the Diamond Fork Creek streambed, one galvanized steel culvert, and a segment of the Diamond Fork Road (Forest Road 29) that appears on historic maps of the area. None of these isolated historic features meet the criteria for significance for inclusion on the NRHP and are accordingly not defined as historic properties.

3.11.3 Environmental Consequences

Environmental consequences to cultural resources were analyzed using the assessment of adverse effect for historic properties as provided by the National Historic Preservation Act's implementing regulations in 36 CFR 800.5. An adverse effect is found when an action "may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association" 36 CFR 800.5(a)(1).

3.11.3.1 No Action Alternative

Under the No Action Alternative, no ground disturbance would occur for the hydrogen sulfide springs collection system; therefore, no cultural resources would be impacted. Current inspection and maintenance activities would continue under the No Action Alternative and are not anticipated to have the potential to affect cultural resources.

3.11.3.2 Proposed Action Alternative

3.11.3.2.1 INSTREAM FLOW ALTERNATIVES

The instream flow alternatives do not have the potential to impact cultural resources and were not analyzed in detail for this resource.

3.11.3.2.2 HYDROGEN SULFIDE SPRINGS

Construction of the hydrogen sulfide springs collection system would require ground disturbance within the project's area of surface disturbance. An intensive pedestrian survey of the area of surface disturbance found that no historic properties are present. The Utah State Historic Preservation Office concurred with this determination (Agardy 2020). Accordingly, the proposed collection of hydrogen sulfide springs would have no impacts to cultural resources.

3.11.3.2.3 INSPECTION AND MAINTENANCE

The proposed changes to the inspection and maintenance schedule would not modify the inspection and maintenance activities or locations of the activities (at existing developed areas of the Diamond Fork System infrastructure) and would not have the potential to impact cultural resources.

3.12 INDIAN TRUST ASSETS

3.12.1 Issues, Impact Indicators, and Analysis Area

Based on the project's internal and external scoping, the following Indian Trust Assets (ITAs) issues were identified:

- How would proposed ground-disturbing activity affect ITAs?
- How would minimum instream flow modifications and proposed inspection and maintenance schedule changes impact ITAs?

The impact indicator used to assess this issue is as follows:

- Presence or absence of ITAs

The analysis area for proposed ground-disturbing activity that could affect ITAs consists of the area of surface disturbance for the hydrogen sulfide spring collection system plus a 0.5-mile buffer. This captures the area where ground-disturbing activity could have adverse effects to ITAs. The analysis area for instream flow modifications and inspection and maintenance comprises Strawberry Reservoir, Sixth Water Creek, and Diamond Fork Creek from the Strawberry Tunnel downstream to the confluence with the Spanish Fork River. This analysis area encompasses the Diamond Fork System components that would require inspection and maintenance.

The Proposed Action does not include ground-disturbing activities or inspection and maintenance activities in Strawberry Reservoir, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, or Utah Lake; therefore, the Proposed Action would not affect ITAs associated with those waterbodies.

3.12.2 Affected Environment

ITAs are legal interests in property held in trust by the United States for federally recognized Indian tribes or individuals. Assets can be real property, physical assets, or intangible property rights, such as lands, minerals, hunting and fishing rights, and water rights. Interior's policy is to recognize and fulfill its legal obligations to identify, protect, and conserve the trust resources of federally recognized Indian tribes and tribal members and to consult with tribes on a government-to-government basis whenever plans or actions affect tribal trust resources, trust assets, or tribal safety. Under this policy, the federal government is committed to carrying out its activities in a manner that avoids adverse impacts to ITAs when possible and to mitigate or compensate for such impacts when it cannot. All impacts to ITAs, even those considered insignificant, must be discussed in the trust analyses in NEPA compliance documents, and appropriate compensation or mitigation must be implemented.

In Winters v. United States, the Supreme Court held that the establishment of an Indian reservation implicitly reserved the amount of water necessary to fulfill the purposes of the reservation (207 U.S. 564 (1908)) (Winters Doctrine). Federal reserved water rights are quantified based on what is needed to accomplish the reservation's purposes both for present and future needs, and Indian tribes with reserved water rights under the Winters Doctrine enjoy a priority date no later than the date of their reservation's establishment.

Water rights associated with the Uintah and Ouray Reservation for the Ute Indian Tribe and its members have been addressed in part in two federal court decrees and a 1965 deferral agreement between the Ute Indian Tribe, the United States, and the District (1965 deferral agreement). At the request of the Ute Indian Tribe and the State of Utah, Congress enacted the Ute Indian Rights Settlement in 1992, Title V of CUPCA, to approve and ratify The Revised Ute Indian Compact of 1990, subject to re-ratification by the State of Utah and the Ute Indian Tribe, which would quantify the Ute Indian Tribe's water rights and allow increased beneficial use of waters. Title V of CUPCA also and provided economic benefits to the Ute Indian Tribe in lieu of the storage projects envisioned in the 1965 deferral agreement. The Ute Indian Tribe's Winters Doctrine–reserved water rights have priority dates no later than 1861 and 1882, corresponding to two executive orders dated October 3, 1861, and January 5, 1882, establishing the Uintah Valley Reservation and the Uncompahgre Reservation, respectively.

Interior sent letters to all Indian tribes with a potential interest in the Diamond Fork System Environmental Update Project requesting information regarding ITAs within the analysis areas during the scoping process. Responses were received from the Hopi Tribe, Northern Arapaho Tribe, and the Navajo Nation. The Hopi Tribe requested copies of the EA and cultural resources identified (see Section 3.11 for additional information on cultural resources). The Ute Indian Tribe responded via a letter commenting on the Draft EA. The JLA's response is found in Table 4.2-1 in Chapter 4 and a copy of the letter is in Appendix B.

A cultural resources inventory was only needed for the Proposed Action hydrogen sulfide springs element; the other two Proposed Action elements do not require ground-disturbing actions, and no cultural resources inventory was conducted for them. The analysis area for proposed ground-disturbing activity that could affect cultural resources consists of the area of surface disturbance for the hydrogen sulfide spring collection system plus a 0.5-mile buffer. No eligible cultural resources were identified within this analysis area.

3.12.3 Environmental Consequences

3.12.3.1 No Action Alternative

The No Action Alternative would have no effect on ITAs.

3.12.3.2 Proposed Action Alternative

The implementation of the Proposed Action Alternative would have no foreseeable impacts on ITAs.

The Proposed Action would have no effect on federal reserved water rights.

3.13 RECREATION

3.13.1 Issues, Impact Indicators, and Analysis Area

Based on the project's internal and external scoping, the following recreation issues were identified:

- How would minimum instream flow modifications affect the recreational fishery in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River?
- How would the presence and use of vehicles, equipment, and crews during construction of the hydrogen sulfide spring collection system change access to and experiences in recreation areas?
- How would proposed inspection and maintenance schedule changes impact the recreational fishery in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River?

The impact indicators used to assess these issues are as follows:

- Changes to fisheries in Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River
- Construction-related changes to recreational access and activities
- Changes in (loss and/or creation of) areas available for fishing and other recreational uses

The analysis area for the recreational fishery is Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River because minimum instream flow modifications could affect fish and aquatic conditions in these waters. The analysis area for construction-related recreation impacts consists of the spring collection system area plus a 5-mile buffer. This area captures the variety of recreation settings and opportunities that may be affected by construction activities.

As noted in Section 3.4.3.2, the Proposed Action would not affect the hydrology of Strawberry Reservoir, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, or Utah Lake and therefore would not affect recreation or recreational fisheries in these waterbodies.

3.13.2 Affected Environment

3.13.2.1 Recreational Fisheries

The current sport fishery in Diamond Fork Creek is composed primarily of brown trout and native BCT, with rare sterile rainbow trout moving in from Sixth Water Creek. The Diamond Fork Creek fishery has faced multiple challenges over the past decades, including unnaturally high flows, high intensity rain events, and fish-killing sediment plumes caused by wildfires (Crockett and Slater 2019). Brown trout populations were evaluated by DWR and Utah State University between 2002 and 2017. No clear trend in the size and abundance of brown trout was identified from 2002 to 2016, although there were significantly fewer fish in 2017 when compared to 2016 (Crockett and Slater 2019). However, anglers are likely to experience variations in catch rates based on fluctuations in fish abundance. Additional sampling performed after the 2018 Pole Creek and Bald Mountain fires detected noticeably reduced densities of sportfish at all sites sampled below areas impacted by recent fires. Recent sediment plumes have severely reduced sportfish populations downstream of Three Forks in Diamond Fork Creek (Crockett and Slater 2019).

DWR conducted a programmed creel survey on Diamond Fork Creek from its confluence with the Spanish Fork River to Three Forks from April 1 through October 31, 2005 (Hepworth and Wiley 2006). The survey showed that brown trout were most often caught (97% of the total catch), and the anglers surveyed fished Diamond Fork Creek approximately 10 times per year on average (Hepworth and Wiley 2006). Total catch and catch rates were lower and harvest rates were higher on Diamond Fork Creek than on other local streams. Although harvest rates were higher on Diamond Fork Creek, the total fish harvested during the survey was still relatively low. Low catch rates on Diamond Fork Creek may be attributed to unstable flows and unfavorable fishing conditions during the survey (Hepworth and Wiley 2006).

Because of the high hydrogen sulfide concentrations, there is a lack of fish between the UDFFCS and the fish barrier on upper Diamond Fork Creek. For this reason, anglers do not fish in this area.

No angler surveys have been conducted for Sixth Water Creek. Fish population monitoring conducted in August 2020 in Sixth Water Creek captured a total of 53 BCT and 28 brown trout. Further information about fish populations in Sixth Water Creek and the analysis area is presented in Section 3.8.2.

The Spanish Fork River is an overlooked fishing area in Utah County that contains brown trout and rainbow trout in its higher reaches and fish from Utah Lake such as walleye (*Sander vitrius*), white bass (*Morone chrysops*), and channel catfish (*Ictalurus punctatus*) in its lower reaches (Utah Fishing Information n.d. [2021]). Fish sampling of the Spanish Fork River was conducted in August 2018 by DWR at the Spanish Fork Sports Park (in Spanish Fork City) and a site near 1100 East on River Bottoms Road (just south of Spanish Fork City) (Slater 2021a). Most of the fish population consisted of brown trout but mountain whitefish (*Prosopium williamsoni*), mottled sculpin (*Cottus bairdii*), and mountain sucker (*Catostomus platyrhynchus*) were also present. A total of 411 brown trout were collected from the Sports Park site and a total of 766 brown trout were collected from the River Bottoms Road site (Slater 2021a). Young-of-the-year fish dominated the fish samples at both sites. Water flows were very low during the 2018 sampling, and fish appeared to be concentrated in areas with suitable habitat, which may have resulted in elevated fish counts (Slater 2021a).

The September 2018 Pole Creek and Bald Mountain Fires decimated most of the fish populations in the Spanish Fork River (Slater 2021a). DWR estimates that fishing pressure on the Spanish Fork River is moderate and on the rise. The development of a trail along a portion of the river in Spanish Fork City has attracted more use, and DWR has begun stocking brown trout (with some rainbow trout supplementation) more regularly, both to meet fishing pressure and to reestablish decimated populations (Slater 2021a).

3.13.2.2 Recreational Amenities

With the exception of the Spanish Fork River (from the Diamond Fork Creek confluence downstream to Utah Lake), the analysis areas are located in Diamond Fork Canyon within the Uinta-Wasatch-Cache National Forest. Recreational opportunities in Diamond Fork Canyon include developed and dispersed camping, hiking, mountain biking, fishing, heli-skiing, horseback riding, off-highway vehicle use, rock climbing and rappelling, wildlife watching, and driving for pleasure (USFS 2003).

Diamond Campground (66 campsites, interpretive nature trail), Dry Canyon Campground (15 walk-in only sites; semi-dispersed), Three Forks Trailhead (16-mile loop mountain bike trail and a 4.5-mile out-and-back hike to Fifth Water Hot Springs), Monks Hollow Trailhead (14-mile point-to-point off-highway vehicle and mountain bike trail), and Red Ledges picnic area are recreational amenities located in Diamond Fork Canyon. Three Forks Trailhead is the closest amenity to proposed construction activities (located approximately 1.03 miles south of the discharge location for the proposed hydrogen sulfide spring collection system). Table 3.13-1 lists visitor use at the amenities for which data are available. In general, visitor use in the analysis area is high. Odors from the sulfur springs on Diamond Fork Creek may be noticeable in the Three Forks area but are variable and depend on wind direction.

In 1998, the Diamond Fork watershed was selected as the pilot location for initiation of the Diamond Fork Youth Forest. The youth forest program provides areas for youth to investigate, study, interact with natural resource managers, and engage in natural resource management. Diamond Campground and Red Ledges picnic area are used for outdoor classroom teaching in this program.

Table 3.13-1. Visitor Data at Recreation Amenities in the Analysis Area

Amenity	Season of Use	Visitation
Diamond Campground	Open April through October (Lower Loop B open in winter)	16,216 visitors in 2020
Dry Canyon Campground	Open June through November	All 15 sites typically full from June to August, at an average of 4 nights a week
Three Forks Trailhead	Open May through September	Typically averages 1,500 people per day (holiday weekends average 2,500 people per day)
Monks Hollow Trailhead	Open June through September	Typically averages 5,000 visitors during the season of use
Red Ledges picnic area	Open year-round	Annual visitation more than 100,000 people per year

Source: Flinders (2020).

3.13.3 Environmental Consequences

The project would result in no changes to the USFS recreation opportunity spectrum classes described for the Diamond Fork Management Area in the USFS 2003 *Land and Resource Management Plan* for the Uinta National Forest (USFS 2003).

3.13.3.1 No Action Alternative

Under the No Action Alternative, the Diamond Fork System would continue to operate under the CUPCA-mandated minimum instream flows and current inspection and maintenance schedules, and construction activities related to the UDFFCS would not occur. Recreational uses and access to recreation in the analysis area would not be affected. The minimum instream flows would limit recruitment and spawning success of BCT. The fish barrier on Diamond Fork Creek near Three Forks would not change, and sulfur springs would continue to create high concentrations of hydrogen sulfide in Diamond Fork Creek upstream of the fish barrier.

Periodic shutdowns of the Strawberry Tunnel for inspection and maintenance would reduce flows in Sixth Water Creek to the tunnel make from the Strawberry Tunnel in addition to natural gains (generally about 5–7 cfs). Reduced flows during Strawberry Tunnel shutdowns would affect aquatic life and fish, causing fish to temporarily seek refuge in pools and other areas with sufficient water and water quality conditions. Water quality would also be expected to decrease from elevated concentrations of selenium. However, shutdowns would be short in duration and would not have long-term effects on fisheries in the analysis area, nor would they affect access to recreation or recreation activities.

3.13.3.2 Proposed Action Alternative

3.13.3.2.1 INSTREAM FLOW ALTERNATIVES

As discussed in Section 3.8, both instream flow alternatives would more closely mimic a natural flow regime for the system when compared to the No Action Alternative. Under the instream flow alternatives, the lower base flow condition would result in more diverse and appropriate habitats for fish. The lower summer base flow of the instream flow alternatives would promote greater benthic and drift density and more favorable community composition (Wilcock et al. 2019). Additionally, flow velocities and substrates would be more tolerable and appropriate for BCT spawning and rearing. Both instream flow alternatives would provide minimum flows that are closer to flows that maximize BCT recruitment. Flows would also be within a range that maximizes BCT and brown trout reproductive and somatic growth potential.

Both instream flow alternatives would maintain the effectiveness of the fish barrier, which prevents upstream brown trout movement and maintains BCT populations above the barrier. In addition, both instream flow alternatives would maintain a minimum flow release of 20 cfs from Strawberry Reservoir, which provides sufficient dilution of naturally occurring selenium concentrations from Strawberry Tunnel accretion (to levels below the Utah numeric criteria for aquatic life).

Under the instream flow alternatives, minimum flows would be closer to the ranges that would maximize BCT capacity in Sixth Water Creek and brown trout capacity in Diamond Fork Creek when compared to the No Action Alternative. Overall, both instream flow alternatives would have beneficial effects for the recreational and native trout fisheries in the analysis area, which would improve fishing opportunities. Improved fishery health and fish population dynamics over the long term would support more anglers, better catch rates, and better harvest rates in the analysis area. Instream Flow Alternative 2 best supports a “mid-size” fishing experience, which is rare along the Wasatch Front.

A winter drop of 18 to 26% of flow in the Spanish Fork River would reduce angling to some degree, although anglers should still find suitable fishing opportunities (Slater 2021b). It would not cause permanent impacts to overall fish survival in the Spanish Fork River (Slater 2021b). This decrease in winter flows would be a minor impact.

3.13.3.2.2 HYDROGEN SULFIDE SPRINGS

During construction, Diamond Fork Road would be closed for approximately 4 months while the main pipeline is built. All of the recreational amenities in Diamond Fork Canyon (see Table 3.13-1) are approximately 1 mile or more down canyon from where construction would occur; access to these amenities would not be affected. Those seeking to recreate above the road closure in Diamond Fork Canyon could use Sheep Creek Road or Hobble Creek Canyon for access. Use of these alternate access roads would increase travel time and be an inconvenience for recreational users; this impact would be temporary and would end at the completion of pipeline construction. Prior to construction, a traffic control plan would be developed to minimize traffic issues from the road closure. The JLAs would coordinate the construction and road closure with the USFS.

In general, the presence of construction personnel, noise from construction equipment and vehicles, and dust from ground disturbance could negatively impact nearby recreation users. Dust impacts would be limited with BMPs such as watering. Those using the campgrounds and trails in Diamond Fork Canyon may hear construction noise and see construction personnel. However, because of the distance of the proposed construction activities from the recreation amenities, construction noise would likely be attenuated by the topography and would not interfere with recreational activities. The source of odors associated with the springs (i.e., the spring water) would be located closer to the Three Forks Trailhead; however, the discharge location would be over 1 mile away from the area, and noticeable odor would be variable based on wind and would not interfere with recreational activities.

Anglers using Diamond Fork Creek outside of the reach between the UDFFCS and the fish barrier could experience similar impacts (e.g., construction noise, traffic delays) as other recreational users and would have to use alternate routes to access fishing locations above the road closure. Construction impacts would be temporary, ending after the 4-month construction period and the completion of site restoration.

3.13.3.2.3 INSPECTION AND MAINTENANCE

Strawberry Tunnel

The proposed change to the inspection and maintenance schedule of the Strawberry Tunnel would interrupt the flow in Sixth Water Creek more frequently but for a shorter duration than the No Action Alternative. As discussed in Section 3.8.3.2.3., these flow reductions of about 20 cfs would temporarily reduce habitat availability, and fish would be forced to seek refuge in pools and other remnant habitat. However, the short duration and timing of the shutdowns (in the winter season) would minimize impacts to the recreational fishery in the analysis area.

In years when Strawberry Tunnel maintenance is needed, flows in upper Sixth Water Creek would be reduced to tunnel make and natural gains (generally 5–7 cfs) for up to 5 days. During these maintenance shutdowns, which would take place in late September or early October, water quality and fish habitat in Sixth Water Creek would be negatively affected (as discussed in Section 3.8.3.2.3). However, based on past system shutdowns, fish in Sixth Water Creek would likely be able to find refuge habitat in pools and tolerate the elevated selenium concentrations. The timing of the shutdowns for the fall months, when air temperatures are moderate, would help reduce impacts to the recreational fishery. In addition, if supplemental instream flows are delivered at the Sixth Water Flow Control Structure as a result of advance coordination with stakeholders for the maintenance shutdown, impacts to the recreational fisheries in lower Sixth Water Creek, Diamond Fork Creek, and the Spanish Fork River would be minimized. If supplemental instream flows are not delivered during the maintenance shutdown, flows on Diamond Fork Creek would drop by about 20 cfs to a predicted median value of 16 cfs under Instream Flow Alternative 1 and 23 cfs under Instream Flow Alternative 2; these flow reductions may reduce the availability of some fish habitat but are not expected to negatively impact the overall health of the recreational fishery in the analysis area.

A winter drop of 20 cfs on the Spanish Fork River equates to about a 25% flow reduction and would reduce angling to some degree, although anglers should still find suitable fishing opportunities (Slater 2021b). It would not cause permanent impacts to overall fish survival in the Spanish Fork River (Slater 2021b).

Sixth Water Flow Control Structure

Annual inspection and maintenance activities for the Sixth Water Flow Control Structure would take place in the fall, during non-irrigation season. For 1 to 3 weeks, instream flow would not be released from the Sixth Water Flow Control Structure but would continue to be released from the Strawberry Tunnel. This shutdown would have no impact on the recreational fisheries in Sixth Water Creek, Diamond Fork Creek, or the Spanish Fork River under Instream Flow Alternative 1 because it does not entail non-irrigation season instream flow releases at the Sixth Water Flow Control Structure. Under Instream Flow Alternative 2 during the shutdown, flows would be similar to Instream Flow Alternative 1 and may not meet the 40 cfs minimum flow in Diamond Fork Creek during the shutdown period. However, this is not expected to negatively impact the overall health of the recreational fishery in the analysis area.

Extensive maintenance may be required on components of the Sixth Water Flow Control Structure approximately every 5 years, requiring it to be shut down for the entire non-irrigation season. Under Instream Flow Alternative 1, there would be no impact to the recreational fishery because minimum flows would be delivered from the Strawberry Tunnel. Under Instream Flow Alternative 2, Diamond Fork Creek minimum flows could not be supplemented by releases from the Sixth Water Flow Control Structure. The JLAs would coordinate with agencies and interested parties on the desired flow regime to be delivered from the Strawberry Tunnel. Based on this coordination, supplemental flows may be made at the Strawberry Tunnel to maintain the 40 cfs minimum. If these supplemental flows occur, flows in Sixth Water Creek would increase by about 7 cfs during the duration of the shutdown. This would not impact the health of the recreational fishery in the analysis area because of the relatively small changes in water quality and habitat availability and the timing of the maintenance.

3.14 TEMPORARY CONSTRUCTION IMPACTS SUMMARY

Construction activities based on the preliminary design concept for the hydrogen sulfide spring collection system (Hansen, Allen & Luce, Inc. 2020) are described in Section 2.3.2.2.1. Construction impacts are discussed in detail in each resource area section under the hydrogen sulfide springs analysis and are summarized below.

Hydrology; Stream Morphology; Threatened, Endangered, and Sensitive Species; Cultural Resources and ITAs

- No temporary construction impacts would occur to these resources.

Water Quality

- Temporary water quality impacts from sedimentation and hazardous chemicals could occur during construction activities.
- Measures to limit impacts to water quality would be implemented, such as a stormwater pollution prevention plan and sediment control.

Wetlands and WOTUS

- Temporary construction impacts would include vegetation removal, soil compaction, sedimentation, and erosion.
- Approximately 0.02 acre of wetlands and 0.13 acre of streams would be temporarily impacted from construction activities.

Wildlife (Fish and Aquatic Resources)

- Construction activities (e.g., construction of the spring collection boxes and pipeline delivery system) would have short-term impacts on aquatic wildlife from vibration and sedimentation. However, part of the stream reach where construction would occur is currently lacking aquatic wildlife because of high hydrogen sulfide concentrations.

Vegetation

- Approximately 0.12 acre of streamside vegetation would be temporarily impacted by construction. Temporary impacts that could affect vegetation include ground disturbance, vegetation trampling or removal, and soil compaction.
- Areas temporarily disturbed during construction would be regraded and restored where possible, and construction BMPs would minimize potential impacts to vegetation.

Recreation

- A segment of Diamond Fork Road would be closed temporarily while the main pipeline is built. All of the recreational amenities in Diamond Fork Canyon are approximately 1 mile or more downcanyon from where construction would occur; access to these amenities would not be affected. Those seeking to recreate above the road closure in Diamond Fork Canyon could use Sheep Creek Road or Hobble Creek Canyon for access. Use of these alternate access roads would increase travel time and be an inconvenience for recreational users; this impact would be temporary and would end at the completion of pipeline construction.
- Prior to construction, a traffic control plan would be developed to minimize traffic issues from the Diamond Fork Road closure.
- The JLAs would coordinate with the USFS prior to construction.
- The presence of construction personnel, noise from construction equipment and vehicles, and dust from ground disturbance could negatively impact recreation users in the analysis area. However, these impacts would likely be minimized by topography and the distance of recreational amenities from the construction area.

3.15 CUMULATIVE IMPACTS

A *cumulative impact* results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. The cumulative impacts of past and present actions are represented in the description of the affected environment section for each resource area. Reasonably foreseeable future actions are decisions, funding, or formal proposals that are either existing or are highly probable based on known opportunities or trends. They include projects that are proposed or part of ongoing management plans. They do not include speculative actions (not proposed or developed at a level to allow analysis) or pending management plans that have not progressed enough to develop proposed management. The analysis areas for cumulative impacts are the same as those used for each issue.

The USFS Schedule of Proposed Actions lists no reasonably foreseeable future actions for Spanish Fork Ranger District that would overlap with the Proposed Action. The District, Mitigation Commission, and DWR did not identify any reasonably foreseeable future actions that may affect resources in the analysis areas.

The Proposed Action would have both beneficial and some minor effects that would contribute incrementally to the cumulative impacts of past and present actions on the resources analyzed. The two instream flow alternatives would have beneficial impacts on hydrology, stream morphology, wetlands, fish and aquatic resources, and recreation. The Proposed Action's hydrogen sulfide spring collection system would have a beneficial impact on water quality in one reach of upper Diamond Fork Creek and an adverse impact on wetlands and streamside vegetation. Overall, the Proposed Action's impacts would contribute to an improvement to the existing conditions created by past and present actions.

Both instream flow alternatives would result in a smaller volume of water being delivered from Strawberry Reservoir during the non-irrigation season in comparison to the No Action Alternative. The JLAs would redistribute the volume difference between the higher winter CUPCA-mandated flow rate in Diamond Fork Creek and the lower Proposed Action instream flow alternatives flow rates for instream flow and environmental uses in the Provo River. The redistributed instream flow water would be in addition to other permanent and temporary water supplies acquired for June sucker and instream flow purposes on the Provo River, as described in Section 3.4.2.4 and therefore would be a beneficial contribution when considered along with other reasonably foreseeable future actions.

The proposed changes to the inspection and maintenance of the Sixth Water Flow Control Structure and the Strawberry Tunnel would not contribute to incremental cumulative impacts because of the short duration of most of the activities and the ability to manage instream flows from other areas of the Diamond Fork System.

3.16 SUMMARY OF ENVIRONMENTAL COMMITMENTS

Environmental commitments identified in this EA are summarized below:

Air Quality

- Implementation of dust control measures (e.g., watering, use of dust palliatives) during construction of the hydrogen sulfide spring collection system to avoid and minimize particulate emissions.

Hydrology, Water Quality, and Wetlands

- Implementation of a SWPPP that would include applicable sediment and erosion control BMPs such as minimizing the disturbed area, preserving topsoil, controlling stormwater runoff with berms, the use of silt fencing or fiber rolls, good housekeeping practices during construction, and revegetation.
- If the District determines that Sixth Water Flow Control Structure shutdown should be for the entire non-irrigation season for major maintenance work, the JLAs will coordinate with stakeholders to determine their preference for increased flows from the Strawberry Tunnel over the non-irrigation season or maintaining flows at the lower flow rate.
- If one of the instream flow action alternatives is selected, the approximately 5,300 to 6,500 acre-feet annually of redistributed instream flow water would be provided for use in the Provo River to support June sucker recovery and provide ecologically beneficial instream flows.
- The District will continue to monitor water quality on the Spanish Fork River near the Spanish Fork Diversion Dam. An additional site as determined by the District and DWR will be selected for water quality analysis below the discharge point of the power plant and will be sampled

twice during the winter months for 3 years. All collected water quality data will be shared with DWR.

Vegetation and Wildlife

- Vegetation that does not need to be removed as part of the construction of the hydrogen sulfide spring collection system will be protected.
- Compliance with the District's Integrated Pest Management Program, which requires ongoing monitoring for invasive species and noxious weeds, as well as treatment on lands administered by the District. In addition, the construction contractor would implement BMPs to limit the introduction or spread of invasive species from equipment, vehicles, and fill (e.g., use of weed-free fill, cleaning of vehicles and equipment).
- See Table 4.2-1 for the JLA's commitment to coordinate with DWR for issues outside the scope of this project.

Recreation, Transportation, and Human Health and Safety

- Implementation of a traffic control plan by the construction contractor to protect public health and safety and minimize traffic issues during construction of the hydrogen sulfide spring collection system.
- Limitation of noise and vibration to the extent possible during construction of the hydrogen sulfide spring collection system and during maintenance activities. Construction equipment would be properly muffled according to industry standards and would be in good working condition. Electric air compressors and similar power tools would be used rather than diesel equipment where feasible. Construction equipment, including motor vehicles, would be turned off when not in use for more than 5 minutes. Construction materials would be handled and transported in a manner that does not create any unnecessary noise or vibration.
- Open cut excavations would be signed, flagged, or fenced to protect public health and safety.

CHAPTER 4. CONSULTATION AND COORDINATION

This chapter describes JLA efforts to comply with legal requirements to involve the public in the NEPA process and as part of the CUPCA legislation, and consult and coordinate with various government agencies. These efforts include public scoping; identifying, designating, and working with cooperating agencies; and consulting with applicable federal agencies and state, local, and tribal governments.

4.1 PERSONS, GROUPS, AND AGENCIES CONSULTED

4.1.1 Agency Consultation

CEQ regulations implementing NEPA allow the lead agency or agencies to invite tribal, state, and local governments, as well as federal agencies, to serve as cooperating agencies during the NEPA process. To serve as a cooperating agency, the potential agency or government must have either jurisdiction by law or special expertise relevant to the environmental analysis. In addition, the District's *Handbook for the National Environmental Policy Act* specifies that the District must request any federal agency with jurisdiction by law or special expertise concerning the proposed action to be a cooperating agency (District 2016). The cooperating agencies for this project are described in Section 1.1.2.

The JLAs coordinated with USFWS through scoping and met via conference call with USFWS staff in April and September 2020 regarding the project and the Endangered Species Act.

4.1.2 Public and Agency Scoping Process

Prior to beginning the NEPA process for the Project, the JLAs had already developed a contact list of interested parties and stakeholders and had been meeting periodically with these stakeholders since 2011. The interested parties and stakeholders were engaged to participate in public scoping for the EA.

The District mailed a scoping information packet, consisting of a letter and a scoping document explaining the Proposed Action and alternatives, to agencies and the public on Thursday, March 19, 2020. The District posted the scoping document on the project website on March 20, 2020 (https://cuwcd.com/diamondfork.htm). Interested parties were able to access other project information and technical documents on the website.

The formal public scoping process for the project began on Sunday, March 22, 2020. Newspaper advertisements were placed in the *Daily Herald*, *Salt Lake Tribune*, and *Deseret News* on Sunday, March 22, 2020, and Wednesday, March 25, 2020. The public scoping comment period concluded on Tuesday, April 24, 2020.

Interested parties could submit comments via the project website, email, or postal mail during the public scoping comment period.

A stakeholder engagement meeting in the form of a webinar was held on Thursday, April 2, 2020. Although the meeting was originally planned to be held in person, it was conducted as a webinar because of Coronavirus Disease (COVID-19) health concerns.

Input received during the scoping period is summarized in the July 2020 Public Scoping Summary report in Appendix A.

4.1.3 Tribal Consultation

Letters to initiate Native American tribal consultation were sent to the following tribes with a potential interest in the proposed project:

- Ute Indian Tribe
- Ute Mountain Ute Tribe
- Paiute Indian Tribe
- Kaibab Band of Paiute Indians of the Kaibab Indian Reservation
- Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada
- Moapa Band of Paiute Indians of the Moapa River Indian Reservation, Nevada
- Skull Valley Band of Goshute Indians
- Confederated Tribes of the Goshute Reservation
- Northwestern Band of Shoshone Nation of Utah
- Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho
- Shoshone Tribe of the Wind River Reservation of Wyoming
- Hopi Tribe of Arizona
- Northern Arapahoe Tribe of the Wind River Reservation, Wyoming
- Navajo Nation, Arizona, New Mexico, and Utah
- Zuni Tribe of the Zuni Reservation, New Mexico

The letters notified the tribes of the proposed project and included scoping information. The letters also requested tribal notification and participation as a consulting party if the tribes felt that tribal interests might be affected by the proposed project. They were mailed by Interior on April 7, 2020. Responses were received from the Hopi Tribe, the Northern Arapaho Tribe, and the Navajo Nation. The Hopi Tribe requested copies of the EA and cultural resources reports.

4.2 DRAFT ENVIRONMENTAL ASSESSMENT REVIEW

The JLAs released the Draft EA for public and agency review and comment on Monday, September 13, 2021. The public and agency review and comment period ended on Friday, November 5, 2021. Notification methods included legal notices in statewide and local newspapers, postcards, and tribal consultation. The postcards were sent to local, state, and federal agencies, as well as interested parties. Native American tribal consultation letters were mailed by Interior. In addition, updates to the project website were made that included a copy of the Draft EA along with a means to submit comments.

A total of three comment letters were received. Responses to comments are shown in Table 4.2-1. The comment letters are included in Appendix B.

Table 4.2-1. Comments on Draft Environmental Assessment and Joint Lead Agency Responses

Submission Number	Commenter	Page	Paragraph	Comment	Response to Comment
1	Chris Crockett, DWR	1	2	DWR recommends utilizing a significant portion of redistributed instream flow savings within the Diamond Fork watershed to support existing off-channel wetland habitat that benefits a variety of aquatic species, specifically Columbia spotted frog and southern leatherside chub. Ideally, timing of flows should reflect the ecological needs of the system, which means a portion of water delivery, should occur outside the irrigation period to support key species during crucial life stages. DWR supports the use of flow savings in the Provo River, but it is important to maintain a portion of the flow in the Diamond Fork River watershed.	We appreciate DWR's interest in securing additional water to support the off-channel wetland ponds in lower Diamond Fork Canyon. Water can only reach these ponds by opening the headgate at the diversion structure on the mainstem of Diamond Fork River and delivering water to the ponds via the Hayes ditch system. Therefore, the amount of water available for the ponds is dependent upon the water rights legally allowed to be diverted and its timing under state water law, not upon how much water is in the river. As DWR is aware, the water rights currently available for use in the ponds are not sufficient to fully meet the ecological needs of Columbia spotted frog or southern leatherside chub. The EA Proposed Action does not alter any water rights; therefore, the same water right constraints on diversion amounts still apply regardless of redistributed instream flow savings. The redistribution of the instream flows still allows this water to be delivered to Utah Lake and be available for exchange to keep the water rights whole for Jordanelle Reservoir. If this water were to be delivered and conveyed through the Diamond Fork Ponds, it would create an additional demand and deplete the water that is allocated for the CUP M&I supply. Although the issue of water rights for the wetland ponds is not within the scope of this EA, the JLAs commit to re-engage with DWR to better define the water needs of the species of concern and to re-visit strategies to pursue a water rights change application. However, the ability to change anything about the amount or timing of water diversions to the ponds will depend on the State Engineer and Division of Water Rights.
1	Chris Crockett, DWR	2	1	It is imperative to note that flow reduction may have unintended consequences downstream in the Spanish Fork River. For example, a reduced flow may fall below minimum biological thresholds for aquatic species like southern leatherside chub and brown trout. To address this, DWR recommends creating and implementing a monitoring protocol in the Spanish Fork River. Mitigation measures may be needed if monitoring identifies negative impacts.	The JLAs included the Spanish Fork River as part of the evaluation in the EA (see section 3.2). The first bullet in section 3.4.1 states "How would minimum instream flow modifications impact the hydrology in Sixth Water Creek, Diamond Fork Creek, the Spanish Fork River, the Provo River, Jordanelle Reservoir, Deer Creek Reservoir, and Utah Lake?" The EA discusses throughout how the proposed instream flow alternatives would affect the Spanish Fork River. The Proposed Action would have no effect on the Spanish Fork River during the irrigation season because there would be no change to the amount of water being delivered from the mouth of Diamond Fork Canyon to the Spanish Fork River. During the non-irrigation season, all of the supplemental water and natural flows in Sixth Water and Diamond Fork creeks, a minimum of 40 cfs as measured at the Monks Hollow gage, would remain in the Spanish Fork River to Utah Lake. Water quality monitoring is occurring on the Spanish Fork River with samples taken at the Spanish Fork diversion dam (headgate for the Highline Canal). The water quality monitoring has been taking place consistently since 1994, with a small gap between 2014 and 2018. The water quality monitoring includes dissolved oxygen, pH levels, temperature, turbidity, phosphates, iron, and other water quality parameters. The District plans to continue monitoring the Spanish Fork River into the future. The JLAs commit to engage with DWR regarding water quality monitoring on the Spanish Fork River.

Submission Number	Commenter	Page	Paragraph	Comment	Response to Comment
2	Ute Indian Tribe	1	1	We require additional information and *an accounting of the water* to be used in order to assess and discuss potential or real adverse impacts on the availability and development of the Tribe's reserved water rights and to ensure the protection and preservation of its Indian reserved water rights.	Section 2.3.2. provides a description of the Proposed Action Alternative and, sub-section 2.3.2.1.1 outlines the proposed distribution of instream flow water. Approximately 5,300 to 6,500 acre-feet would be annually redistributed for use in the Provo River. This in no way changes the amount of water diverted from the Duchesne Drainage or the amount of water released from Strawberry Reservoir (see sections 2.3.2.1 and 3.4.2.1). The Proposed Action will not create any saved water to increase the storage of Strawberry Reservoir. Impacts from the transmountain diversion of water from the Duchesne River Basin to the Wasatch Front were analyzed in the 1973 Bonneville Unit Final Environmental Statement, and the 2004 Utah Lake Drainage Basin Water Delivery System Environmental Impact Statement. A significant amount of analysis was completed during the development of the 1965 Deferral Agreement which provided for the development of the Bonneville Unit transmountain diversion and use along the Wasatch Front. The information the Tribe seems to seek has previously been provided and is not related to this discrete action.
2	Ute Indian Tribe	5	4	Although it is recommended that more thorough additional studies of the Diamond Fork System Environmental Assessment be conducted in an effort to determine the impacts of the modified instream flows of the Creeks on our Tribe's water rights interests, it appears that in general the lower the water released from Strawberry reservoir to satisfy the instream flow requirement of the Sixth Water and Diamond Fork Creeks, the less water is expected to be diverted from the Duchesne River and its tributaries to augment the storage of Strawberry Reservoir.	See response to comment #1. The Proposed Action will not create any saved water to increase the storage of Strawberry Reservoir. The amount of water diverted from the Duchesne Basin to the Wasatch Front will remain the same. Therefore, the Proposed Action would not affect the Ute Tribe's reserved water rights. All diverted water will be used for Central Utah Project purposes.
2	Ute Indian Tribe	6	1	More in-depth analysis and scrutiny of the Diamond Fork System Environmental Assessment is recommended in order to prepare comments that would represent the Tribal concerns regarding the CUP continued diversions from Duchesne River and its tributaries to the Strawberry Reservoir and from the Strawberry Reservoir to the Wasatch Basin.	See response to comment #s 1 and 2. The amount of water diverted from the Duchesne Basin to the Wasatch Front will remain the same. Therefore, the Proposed Action would not affect the Ute Tribe's reserved water rights. All diverted water will be used for Central Utah Project purposes. Previous NEPA analysis (as identified in comment # 1) has considered the effects from the maximum trans-basin diversion on both deferred and non-deferred Ute Tribe reserved water rights.

CHAPTER 5. LIST OF PREPARERS

5.1 LIST OF PREPARERS

Table 5.1-1 identifies District and JLA staff and consultants used in the preparation of the EA.

Table 5.1-1. List of Preparers

Name	Agency or Entity	Role/Responsibility
Chris Elison	District	NEPA/Engineering Manager I
Chris Hansen	District	CUPCA Program/Construction Manager
Daryl Devey	District	CUP Manager
David Imlay	District	Senior Instrument/Maintenance Technician
Devin McKrola	District	Bonneville Operations and Maintenance Manager
Mike Rau	District	Water Quality Manager
Rachel Musil	District	Water Rights Manager
Rich Tullis	District	Assistant General Manager
Robert Aitken	District	Diamond Fork Area Manager
Sarah Sutherland	District	Environmental Programs Manager
Melissa Stamp	Mitigation Commission	Project Coordinator
Mike Mills	Mitigation Commission	Project Coordinator
W. Russ Findlay	Central Utah Completion Act Office	CUPCA Program Coordinator
David Hansen	Hansen, Allen & Luce	Managing Principal
William Bigelow	Hansen, Allen & Luce	Principal
Alyson Eddie	SWCA	Biology Lead
Crystal Young	SWCA	Water Resources
Dave Epstein	SWCA	Assistant Project Manager/Water Quality
Debbi Smith	SWCA	Formatting and Section 508 Accessibility
Elliott Casper	SWCA	Wetlands and WOTUS
Gretchen Semerad	SWCA	NEPA Specialist/Recreation
James Gregory	SWCA	Project Manager
Jason Kline	SWCA	Fisheries
Katelyn Cary	SWCA	Vegetation
Kelly Beck	SWCA	Cultural Resources
Lacey Wilder	SWCA	Threatened, Endangered, and Sensitive Species
Melissa Phillips	HDR	Public Involvement Lead
Molly Reeves	HDR	Hydrogeologist
Steve Thurin	HDR	Flow Simulation Technical Lead

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