ALPINE AQUEDUCT REACH 1

REPLACEMENT &
RESILIENCY PROJECT

DRAFT ENVIRONMENTAL
ASSESSMENT

CENTRAL UTAH WATER
CONSERVANCY DISTRICT

Alpine Aqueduct Reach 1
Replacement & Resiliency Project

DRAFT ENVIRONMENTAL ASSESSMENT

August 2022

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1 Introduction

The Central Utah Water Conservancy District (District) and the U.S. Department of the Interior, Central Utah Project Completion Act Office (Interior) are evaluating alternatives to increase the resiliency and reliability of the Alpine Aqueduct Reach 1 (AA-1). The District and Interior, as Joint Lead Agencies (JLAs), have initiated an Environmental Assessment (EA) to analyze and disclose the potential impacts of the proposed Alpine Aqueduct Reach 1 Replacement and Resiliency Project (Project) located in northeast Orem west of Provo Canyon.

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 Central Utah Project (CUP) and its network of water facilities, in addition to District-owned water facilities. Under the terms of the Central Utah Project Completion Act (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 Interior CUPCA office reports directly to the Secretary through the Assistant Secretary for Water and Science.

1.1 National Environmental Policy Act

This Draft EA evaluates the potential effects of the Proposed Action to determine whether it would cause significant impacts to the human or natural environment as defined by the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ), and Department of the Interior Regulations Implementing NEPA (40 Code of Federal Regulations [CFR] §1500-1508 and 43 CFR §46.300, respectively). If the EA shows no significant impacts associated with implementation of the proposed Project, then a Finding of No Significant Impact (FONSI) will be issued by the JLAs. During the EA process, if it is determined that there may be significant impacts, preparation of an Environmental Impact Statement (EIS) would be necessary prior to implementation of the Proposed Action. The JLAs will use this EA to satisfy disclosure requirements and as a means for public participation as part of NEPA, Section 106 of the National Historic Preservation Act (NHPA), Section 7 of the Endangered Species Act (ESA), and Public Involvement as required by the CUPCA (Public Law 102-575 CUPCA).

1.2 Cooperating Agencies

The JLAs invited the U.S. Bureau of Reclamation (Reclamation) and the Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission) to serve as Cooperating Agencies, and they are participating in the preparation and review of the NEPA process.

As defined by the CEQ 40 CFR §1501.8, 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 project's interdisciplinary team.

1.3 Proposed Action

The Proposed Action would make the following improvements to the AA-1 pipeline:

- Realign the AA-1 pipeline to avoid an existing landslide complex.
- Perform design and construction across the Wasatch Fault Zone (WFZ) to ensure the AA-1 pipeline can withstand a 975-year seismic event.

For this proposed Project, the Proposed Action is also the Preferred Alternative.

1.3.1 Detailed Description of the Preferred Alternative

The realignment of the AA-1 pipeline would cross the WFZ, which is unavoidable but would completely avoid the landslide complex that it currently traverses. A summary is provided below. Further details and a map of the Preferred Alternative are provided in Chapter 2.

Preferred Alternative

The Preferred Alternative refers to the alternative that would best accomplish the Project's purpose and need (43 CFR §46.420(d)). The Preferred Alternative would include utilizing the existing Alpine Tunnel and constructing a new 1,100-foot-long tunnel running southward from the Alpine Tunnel outlet at the west end. From the end of the new tunnel there would be 750 feet of open cut construction for the pipeline to the intersection near 1060 North/1560 East in Orem. The realigned AA-1 pipeline would run west under 1060 North, turn north onto 1360 East, and continue through the former Cascade Golf Course toward Orem City's storage tanks before terminating at the Don A. Christiansen Regional Water Treatment Plant (DACRWTP).

The following are alternate variations on how to reach the Preferred Alternative's alignment northeast of 1060 North.

Variation A

Variation A would construct the new AA-1 pipeline beginning at the Alpine Tunnel outlet portal to an area east of 1060 North using open cut construction. The new AA-1 pipeline would be constructed along a steep slope which would require it to be rock bolted to the hillside to anchor the new pipe in place. The pipe would also be encased in reinforced concrete to protect and secure it.

Variation B

Variation B would include boring a new tunnel that would intersect the existing Alpine Tunnel near its midpoint and terminate at an area east of 1060 North. The pipeline would be installed within the tunnel. The lower portion of the Alpine Tunnel would be abandoned.

Variation C

Variation C would include boring a new tunnel beginning near the inlet to the Alpine Tunnel directly west of the 10 million-gallon (MG) Olmsted Reservoir to an area east of 1060 North. The existing Alpine Tunnel would be abandoned.

1.3.2 Fault Crossings

Design and construction across faults would include heavy or thicker wall welded steel pipe which is considered a flexible pipe and welded steel pipe joints which allows the pipe to deflect and bend thereby providing the elongation necessary during a seismic event. Additionally, the trench zone around the pipe would be backfilled with movable or crushable materials to help accommodate movement during a seismic event. Also, the pipe would be constructed in a zig-zag pattern across the fault which allows the pipe to bend and yield during a seismic event. During preliminary and final design, geotechnical subsurface investigations may be needed for the final design details.

1.4 Background

1.4.1 Central Utah Project

The CUP is the largest and most complex water resource development project in the state of Utah. 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 Statute 105). Constructed by Reclamation and the District. The CUP is located in the central, east central, and northeast parts of Utah. 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.

The Bonneville Unit is the largest unit of the CUP. The Bonneville Unit collects and diverts water within the Uinta Basin (part of the Colorado River Basin) to the Bonneville and Uinta basins, providing water for Salt Lake, Utah, Wasatch, Juab, and Duchesne Counties and portions of Summit County, Utah. The Bonneville Unit contains a vast network of reservoirs, aqueducts, tunnels, canals, pipelines, pumping plants, and other conveyance facilities that develop water

for irrigation, municipal, and industrial use; instream flows; and hydropower production. The Bonneville Unit is comprised of six systems: Starvation Collection System, Strawberry Aqueduct & Collection System, Municipal and Industrial System (M&I System), Diamond Fork System, Utah Lake Drainage Basin Water Delivery System (ULS), and Wasatch County Water Efficiency/Daniel Replacement Project (WCWEP/DRP) (Figure 1-1). Much of the Bonneville Unit is completed, and the remaining features of the ULS are currently under construction.

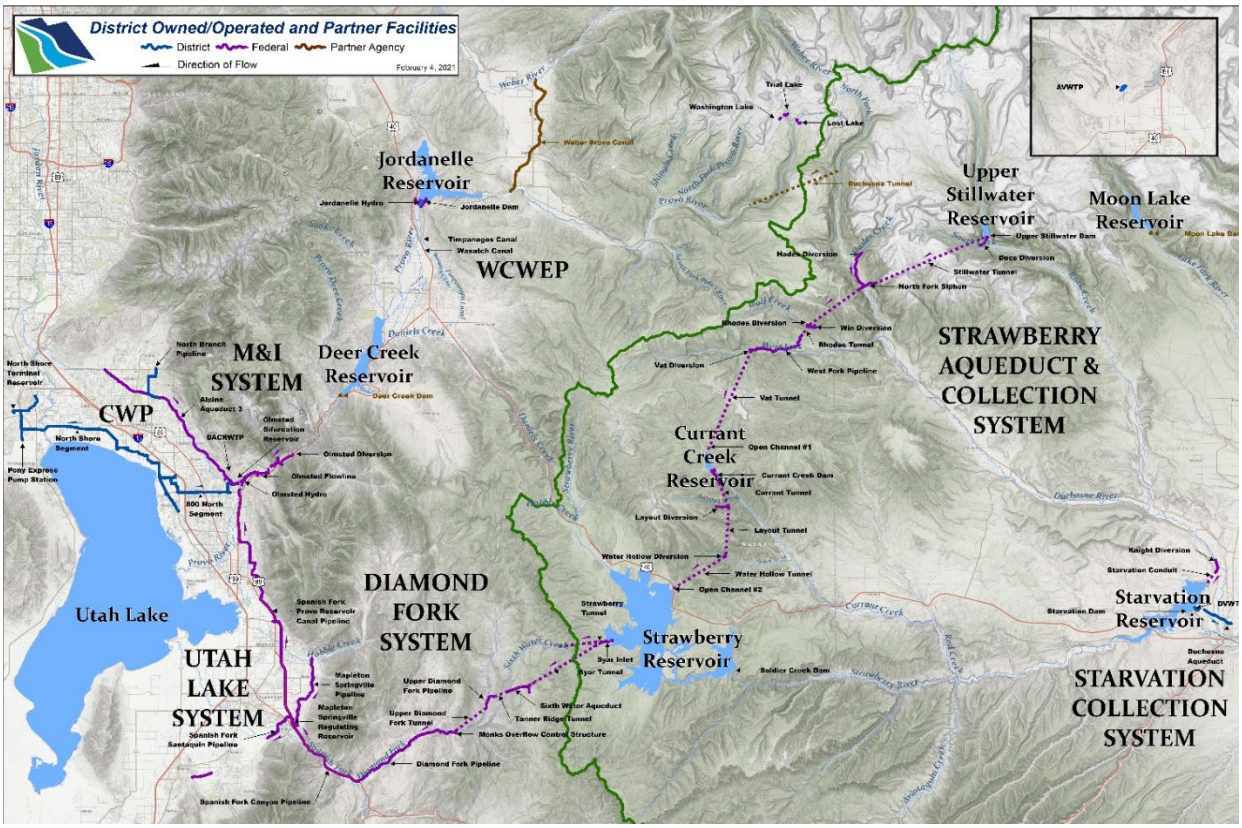

Figure 1-1. Bonneville Unit Map of the CUP and District-Owned Facilities.

The M&I System conveys water through the Jordanelle Reservoir and delivers over 90,000 acre-feet of water to northern Utah and Salt Lake Counties. The M&I System transmission network consists of the Olmsted Diversion and Flowline, the Alpine Aqueduct, and Jordan Aqueduct systems. District and non-District facilities are listed in Tables 1-1 and 1-2 and shown in Figure 1-2.

Table 1-1. District Regional Water Delivery Facilities.

Facility	Description
Alpine Aqueduct	The federally owned and District operated Alpine Aqueduct conveys water from the 10 MG Olmsted Reservoir to approximately half of Utah's population along the Wasatch Front through its three reaches: Reach 1, which connects to the DACRWTP and into the Jordan Aqueduct near the DACRWTP; Reach 2, which delivers treated water from the DACRWTP to Orem and Provo; and Reach 3, which delivers untreated water to water treatment plants in Salt Lake County and to cities for use in their secondary pressurized irrigation systems in northern Utah County.
Central Water Project – 800 North Aqueduct (CWP)	The District owns and operates the non-federal Central Water Project (CWP) that develops and delivers Municipal & Industrial (M&I) water to northwest Utah County and to Jordan Valley Water Conservancy District. The 800 North Aqueduct is part of the CWP that delivers treated water from the DACRWTP.
Don A. Christiansen Regional Water Treatment Plant	The non-federal and District owned and operated DACRWTP is a 100-million-gallons-per-day (MGD) water treatment plant located above the Orem cemetery in the foothills of Mount Timpanogos. It delivers treated water to Orem, Provo, and other District customers. It is owned and operated by the District.
Olmsted Diversion and Flowline	The federal Olmsted Flowline carries water from the Provo River Olmsted Diversion to the 10 MG Olmsted Reservoir. Water for the Olmsted Hydroelectric Plant flows from the 10 MG reservoir through an 84-inch pipeline and is then returned to the Provo River through the historic tailrace. The Olmsted Flowline also supplies water to the Alpine Aqueduct at the 10 MG reservoir.
ULS, Spanish Fork Canyon and Provo Reservoir Canal Pipeline	The federal Spanish Fork Provo Reservoir Canal Pipeline (SFPRCP) is a 60-inch, 19-mile-long welded steel pipe that conveys water from Spanish Fork Canyon pipeline to Utah and Salt Lake Counties. The SFPRCP connects to AA-1 (through the Olmsted hydroelectric powerplant and the 10 MG Olmsted Reservoir) and to the Provo River Aqueduct (PRA).

Table 1-2. Non-District Regional Water Facilities.

Facility	Description
Alta Springs Pipeline	The non-federal Alta Springs Pipeline delivers Orem City M&I water from springs located about 3 miles up Provo Canyon to storage tanks near the DACRWTP. It is a steel pipeline that ranges from 16 to 30 inches in diameter. It is owned and operated by Orem City.
Jordan Aqueduct	The federal Jordan Aqueduct is a 38-mile-long pipeline beginning near the DACRWTP and terminating near 2100 South/Bangerter Highway in West Valley City. It is a major conveyance facility to the western and southern Salt Lake Valley areas delivering water from the Provo River to the 180 MGD Jordan Valley Water Treatment Plant (JVWTP) and the 70 MGD Point of the Mountain Water Treatment Plant (POMWTP). It was constructed as part of the M&I System of the CUP and is operated by Jordan Valley Water Conservancy District (JVWCD).
Provo River Aqueduct (PRA)	The non-federal PRA, previously known as the Murdock Canal or the Provo Reservoir Canal, is a 21-mile-long pipeline that originates from the Murdock Diversion at the mouth of Provo Canyon to the Point of the Mountain. The open portion of the PRA was enclosed in 2012 with a 126-inch welded steel pipe and delivers water from the Provo River to Utah and Salt Lake Counties and to the Jordan Valley and Point of the Mountain Water Treatment Plants. In 2012, the Provo River Water Users Association (PRWUA) and Reclamation constructed a parallel pipe to the existing PRA Olmsted Siphon Pipeline located at the mouth of Provo Canyon that is 4,200 feet of 84-inch welded steel pipe (known as the Parallel Pipe). The existing Olmsted Siphon is a 96-inch diameter reinforced concrete pipeline constructed in the late 1940's and includes non-seismic designed gasketed pipe joints. The Parallel Pipe is approximately 1-mile long and constructed parallel to the Olmsted Siphon at the mouth of Provo Canyon to the crest of the hill on 800 North in Orem. The Parallel Pipe provides the PRA additional capacity and some system reliability and resiliency.
Salt Lake Aqueduct (SLA)	The non-federal SLA is a 69-inch diameter, 42-mile-long pipeline beginning at the base of Deer Creek Dam. It is a major conveyance facility for eastern Salt Lake Valley delivering water from Deer Creek Reservoir to the 113 MGD Little Cottonwood Water Treatment Plant. The SLA can also supply water to the DACRWTP on a space-available basis, and it can be supplied with water through the AA-1 pipeline (requires pumping). It is operated by Metropolitan Water District of Salt Lake and Sandy (MWDSLS).

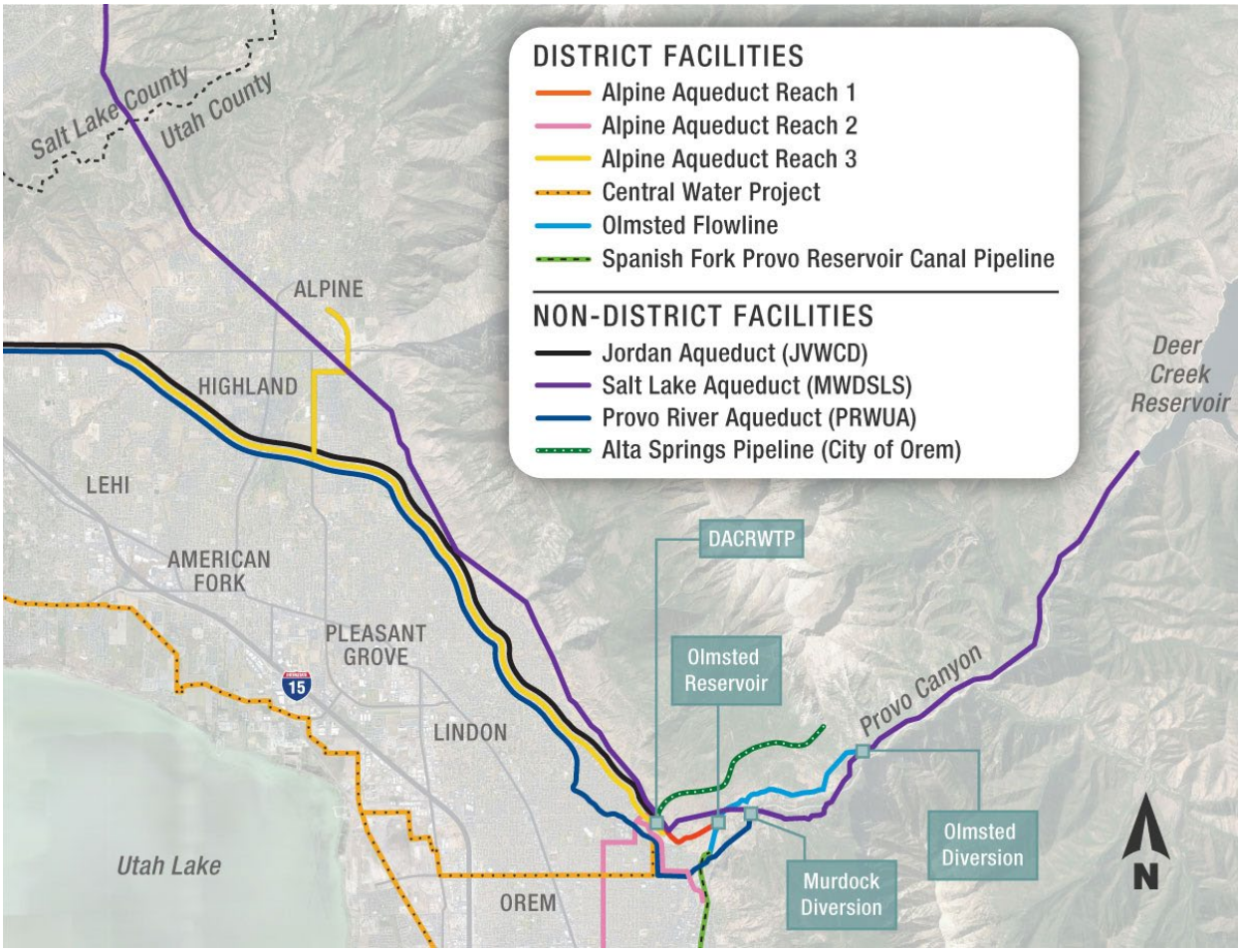

Figure 1-2. Map of Regional Water Delivery Facilities along the Wasatch Front.

1.4.2 Alpine Aqueduct

Constructed by Reclamation in 1978-80 and put into operation in 1982, the Alpine Aqueduct is part of the M&I System's regional water delivery system. The 13.2-mile-long pipeline begins at the 10 MG Olmsted Reservoir in Provo Canyon, traverses the foothills of Orem City, and terminates in northern Utah County. The aqueduct consists of three reaches: Reach 1 (proposed Project reach); Reach 2, which delivers treated water from the DACRWTP to Orem and Provo; and Reach 3, which delivers untreated water to water treatment plants in Salt Lake County and to cities in northern Utah County for use in their secondary pressurized irrigation systems. In addition, AA-1 provides water to the Jordan Aqueducts which are a primary water supply for the JVWTP and POMWTP located in south Salt Lake County. The Alpine Aqueduct supplies a major portion of the water for Utah and Salt Lake Counties along the Wasatch Front, as it delivers M&I water to approximately half of Utah's population (Figure 1-3).

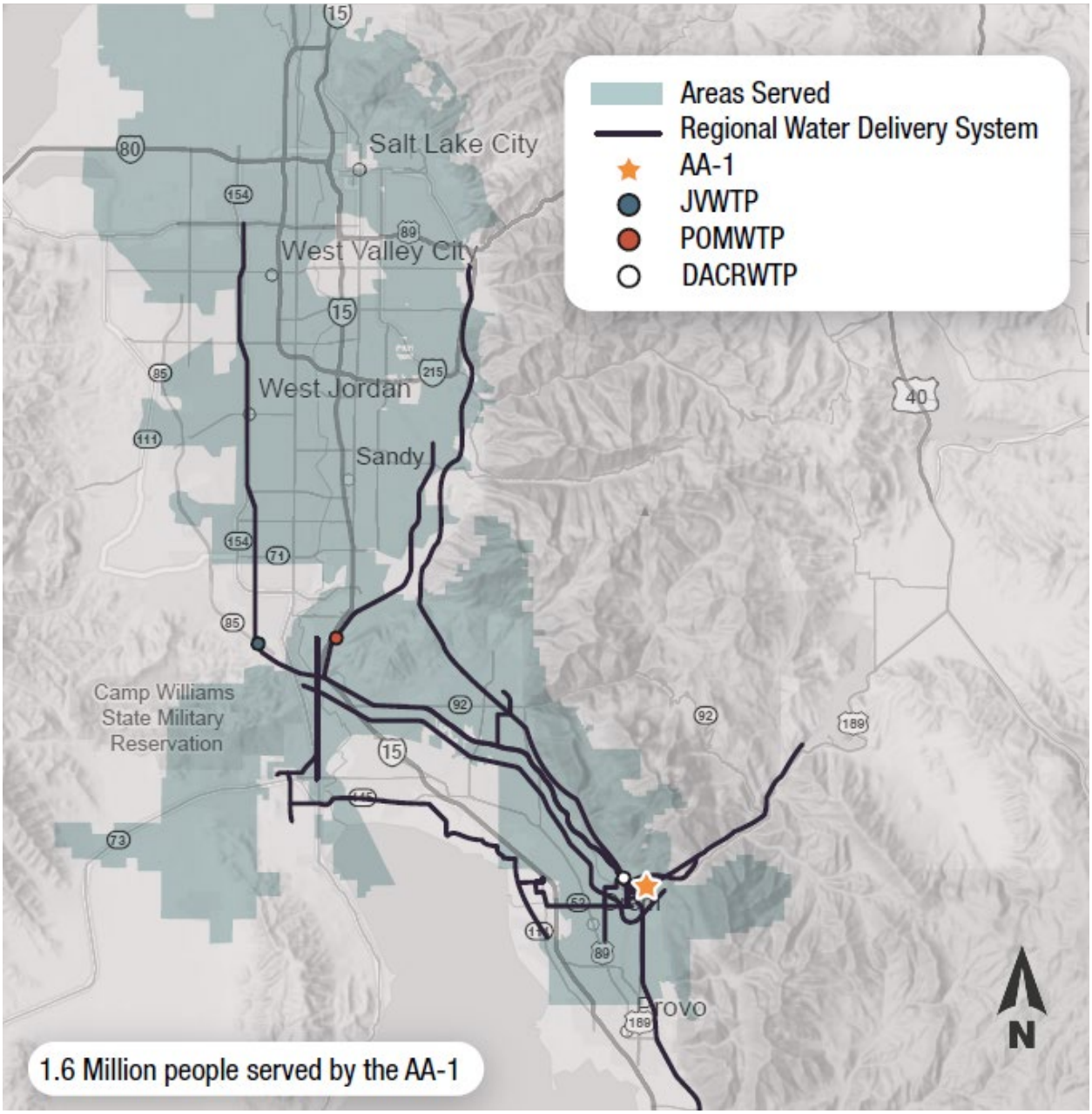

Figure 1-3. Alpine Aqueduct Service Area.

1.4.3 Alpine Aqueduct Reach 1

The AA-1 pipeline is a welded steel pipeline, measuring 90 inches in diameter, approximately 1.1 miles in length and can deliver up to 450 cubic feet per second (cfs) of water. It is comprised of an 1,830-foot-long tunnel called the Alpine Tunnel and a 400-foot above-ground section. The remainder of the AA-1 pipeline is buried and connects to the DACRWTP and downstream of the Jordan and Alpine Aqueduct systems. The existing AA-1 pipeline alignment and the Project's study area is shown in Figure 1-4.

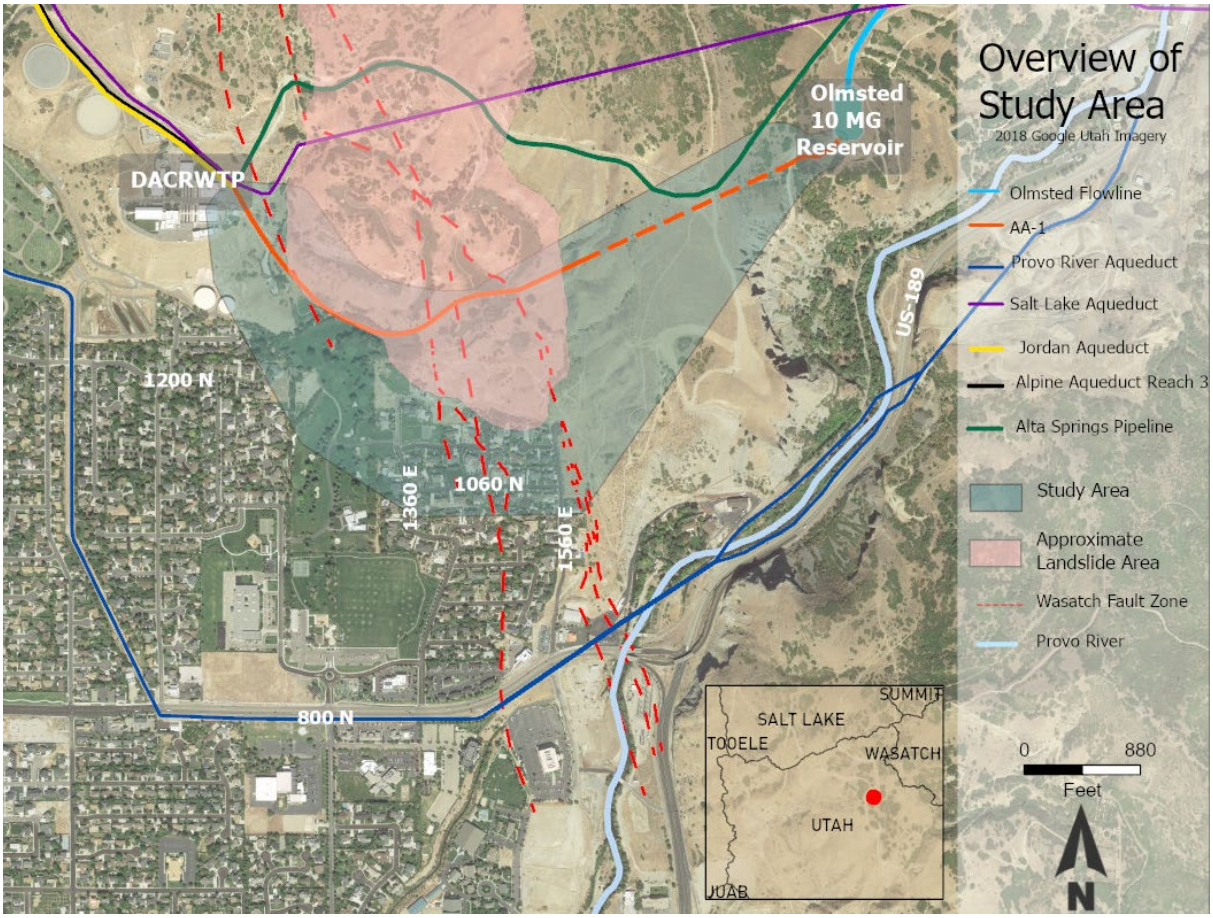

Figure 1-4. AA-1 Alignment and Project Study Area.

1.5 Geologic Hazards

The regional water delivery pipelines discussed above in Tables 1-1 and 1-2 cross the WFZ and an active landslide (Figure 1-4). Given their location within a highly geologically active area, they are subject to a variety of geologic hazards such as fault displacements, landslide movements, steeply incised canyons, and unstable bedrock conditions. The AA-1 pipeline's location in relation to historical landslides and potential seismic events place it at high risk of catastrophic failure due to the unpredictable ground movement and displacement that will cause the pipeline to rupture.

1.5.1 Wasatch Fault

The 230-mile-long WFZ is the largest seismic fault in northern Utah. It is the most likely fault in the area to produce a moderate- to large-magnitude earthquake. Research from the Utah Chapter of the Earthquake Engineering Institute indicates that the Wasatch Fault has a 43% chance of experiencing a magnitude 6.75 or greater earthquake in the next 50 years. Often referred to as "The Big One," experts predict that an earthquake of this magnitude would be one of the deadliest disasters in U.S. history with a projected death toll of 2,500 individuals.

Additionally, hundreds of thousands of Utahns would be left without shelter and critical services such as water, sewer, electricity, and natural gas, and transportation could be disrupted for a huge portion of the population. Current estimates predict that 330,000 homes would be left without water for a minimum of three months following a major seismic event. The Utah Seismic Safety Commission (USSC) recently ranked improvements to major aqueducts along the Wasatch Front as the number one priority in preparing for "The Big One" (USSC 2021).

The Provo Segment of the WFZ has produced five surface rupturing events over the last 7,000 years, causing substantial vertical displacements along the fault. Vertical displacement estimates for a future design seismic event range from 8 to 17 feet along the Provo Segment. Displacement of this magnitude would damage pipelines, tunnels, and aqueducts that cross the fault (Figure 1-5).

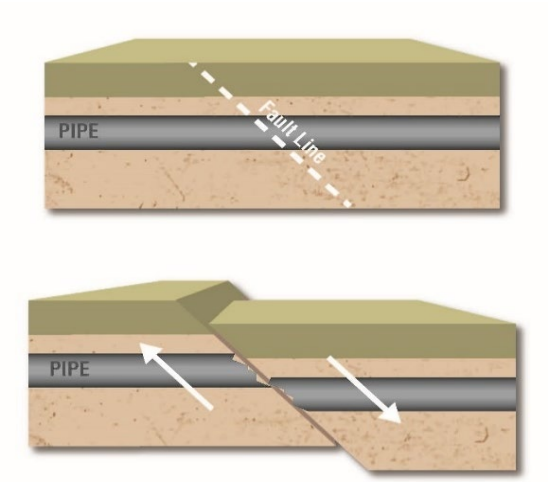

Figure 1-5. Illustration of Vertical Displacement.

1.5.2 Landslide Complex

The foothills above Orem at the mouth of Provo Canyon are made up of ancient deposits including a large landslide complex (see Figure 1-4 above). Geologic mapping shows that the AA-1 pipeline crosses through a large landslide, which consists of unstable fractured limestone and shale, and multiple smaller slides within Lake Bonneville deposits. As part of the Alpine Aqueduct Reach 1 Resiliency Assessment Project (*Resiliency Assessment*, Jacobs 2020), mapping by several different organizations including the Utah Geological Survey (UGS) and Lettis Consultants International (LCI) shows the large landslide to be approximately 5,000 feet long and 1,800 feet wide. Due to the presence of weak bedding planes and sheer surfaces, the landslide can be activated by a variety of triggers, including high moisture content and seismic activity. In the last 40 years, the AA-1 pipeline has ruptured five times due to landslide movement and hillside slumping (Figure 1-6 and Figure 1-7). A 900-foot section of the pipeline that had experienced previous ruptures was replaced during the winter of 2001-2002. In the spring of 2017, a 300-foot-wide segment of the slide's southwestern toe upgradient of the AA-1

pipeline became active and pushed up and over the pipeline, causing deformation and strain to the steel pipeline. Emergency mitigation measures required the construction of a large earthen berm to buttress the landslide and reduce further deformation of the pipe. Inclinometers (instruments used to detect if a landslide is moving) installed in 2017 indicate that the landslide continues to move and puts stress on the existing AA-1 pipeline, resulting in damage, deformity, and corrosion of the pipe in several locations.

Figure 1-6. Pipeline Failures in the Last 40 Years.

Figure 1-7. 2000 Landslide that Caused AA-1 Failure.

1.6 Reliability and Resiliency

In 2018, the District initiated the *Resiliency Assessment* (Jacobs 2020) to evaluate the AA-1 pipeline's vulnerability, risk, and consequences of failure; determine its existing resiliency; and develop reasonable options to decrease consequences of failure and to identify potential steps to increase reliability of the pipeline for District customers.

Though the AA-1 pipeline continues to provide District customers with water, the *Resiliency Assessment* (Jacobs 2020) found that the existing pipeline does not meet current industry standard performance objectives and has a high risk of failure. In accordance with ALA[1] *Seismic Guidelines for Water Pipelines* (ALA 2005), major transmission pipelines such as the AA-1 should have a minimum performance reliability objective following an earthquake due to the critical water supply they provide to the community. The JLAs determined that the AA-1 pipeline is a Class III critical water supply pipeline in accordance with the ALA criteria, based on the population it serves, and its importance to the area's economy. After a seismic event, the AA-1 pipeline would be temporarily shut down for inspection and repair but should have a minimum performance reliability of remaining in service following a 975-year seismic event.

[1] The American Lifelines Alliance is a public-private partnership project that is funded by the Federal Emergency Management Agency (FEMA). The ALA is managed by the National Institute of Building Sciences, and its goal is to reduce the risks to essential utility and transportation systems (lifelines) from hazards including seismic damage.

Failure would result in significant economic impact to the community and a substantial hazard to human life and property.

The *Resiliency Assessment* (Jacobs 2020) developed replacement options based on weighted non-cost evaluation criteria deemed to be most critical to provide safe, reliable operations of the AA-1 pipeline (Table 1-3). Replacement and rehabilitation options were ranked according to these criteria and are discussed more fully in the *Resiliency Assessment* (Jacobs 2020).

Table 1-3. Criteria Considered in Resiliency Assessment.

Criteria	Items Considered	Weight
Reliability	• Non-Seismic Events. • Seismic Events. • Consequences of Failure/Flooding Risk. • Potential for Interconnection.	40%
Repairability	• Accessibility. • Repair Materials and Methods. • Time to Repair.	20%
Operations and Maintenance	• Access. • Maintenance. • Security.	20%
Environmental	• Wetlands/Rivers/Groundwater. • Species/Land Disruption. • Community Impacts. • Visual/Safety.	10%
Implementation/Constructability	• Construction Risk. • Property/Right-of-Way. • Schedule.	10%

All replacement and rehabilitation alignments and options considered would cross the WFZ. They were carefully planned to minimize the number of required crossings traversing identified fault strands and to orient the crossings as close to perpendicular as possible to the faults to allow the application of seismic design principles. Furthermore, some options cross over the fault strands in addition to being located within the landslide complex.

The preliminary analyses yielded four potential pipeline alignments that scored notably higher than the other alignment options evaluated as part of the *Resiliency Assessment* (Jacobs 2020). These four alignments were carried forward for further development. Based on evaluation criteria, the final analyses determined the highest-ranking alignment as Option 3B and is a subset of Option 3 that was identified during the preliminary analyses. Option 3B was used to develop the Preferred Alternative alignment. The Draft EA evaluates the Preferred Alternative, Variations A, B, and C, and the No Action Alternative.

1.7 Purpose and Need

The need for the Project is to increase the physical integrity, functionality, and long-term viability of the AA-1 pipeline, which is the transmission line for a critical water supply. The purposes of the Project are:

1. Continue to provide Bonneville Unit's M&I System water to Orem, Provo, and northern Utah and Salt Lake Counties along the Wasatch Front by maintaining continual service during seismic and non-seismic events.
2. Prevent catastrophic damage to adjacent residential areas and the environment due to pipe failure.
3. Increase the reliability and resiliency of the AA-1 pipeline.
4. Increase seismic design performance to provide for continued operation of the DACRWTP. In addition, the AA-1 pipeline provides a critical water supply to the JVWTP and POMWTP located in the Salt Lake Valley.
5. Reduce operation, maintenance, and repair (OM&R) costs associated with AA-1 pipeline.

1.7.1 Description of Purposes

The following provide more detailed descriptions of each purpose.

1. *Continue to provide Bonneville Unit's M&I System water to Orem, Provo, and northern Utah and Salt Lake Counties along the Wasatch Front by maintaining continual service during seismic and non-seismic events.*

The M&I System of the Bonneville Unit delivers water to more than half of Utah's population. If a geohazard were to cause damage to the AA-1 pipeline that required a shutdown of the facility, the impacts would be significant and widely felt. In addition, two other significant water transmission facilities cross this same landslide complex: the SLA, originally constructed by Reclamation and operated by Metropolitan Water District of Salt Lake and Sandy, and the Alta Springs Pipeline, constructed and owned by Orem City.

The AA-1 pipeline's construction and alignment through an active landslide do not meet current industry design standards which have become more stringent since its construction. Continuous landslide movement is weakening the pipe structure, increasing non-seismic damage, and decreasing its structural integrity. The Project would design the AA-1 pipeline to remain operable following a 975-year seismic event, according to American Lifelines Alliance (ALA) guidelines for a Class III pipeline. See Section 1.6 for detailed discussion on reliability and resiliency.

Because of the landslide's proximity to the fault and the potential for significant ground deformation through the landslide complex during a seismic or non-seismic event, the pipeline located within the landslide has a high likelihood of failure, which diminishes its ability to provide reliable and continual service. Relocating, designing, and constructing the AA-1

pipeline to current seismic standards increases the overall resiliency of the pipeline allowing it to continue to provide water to the people of Utah, even in the wake of a geologic event.

2. *Prevent catastrophic damage to adjacent residential areas and the environment due to pipe failure.*

A portion of the AA-1 pipeline is situated directly above a residential neighborhood. Pipeline failure due to a geologic event may result in substantial flooding of downhill properties and place the lives of those below in significant danger. Additionally, flooding from the pipeline would exacerbate landslide conditions. Flows from the broken pipeline would notably increase saturation and weight of the soils, further loosening the sediments and increasing downhill debris flows. Relocating the AA-1 pipeline away from the existing landslide and constructing it to the 975-year seismic event reduces the potential for catastrophic damage to the residential area and the environment.

3. *Increase the reliability and resiliency of the AA-1 pipeline.*

There have been five ruptures of AA-1, all caused by movement of the landslide complex, over the last 40 years that have necessitated significant repairs. As a key artery for the M&I System, the AA-1 pipeline supplies raw water to treatment facilities that, combined, deliver water to over 1.6 million people. During a moderate earthquake, the AA-1 pipeline in its current location is anticipated to fail and would be unable to provide critical water supply; damage could take six months or more to repair as materials would need to be custom manufactured (USSC 2021).

4. *Increase seismic design performance to provide for continued operation of the DACRWTP.*

The District recently upgraded DACRWTP, which provides drinking water to Orem, Provo, and CWP customers in northwest Utah County, to increase its resiliency and continuous operation following a 975-year seismic event and avoid catastrophic failure following a 2,475-year seismic event. The AA-1 also supplies water to the Jordan Aqueduct which supplies water to JVWTP and POMWTP for service to their customers in Salt Lake County. The Project would upgrade the AA-1 pipeline to industry seismic standards to maintain operability of the DACRWTP following a seismic event.

5. *Reduce OM&R costs associated with the AA-1 pipeline.*

In its current location, the AA-1 pipeline is relatively accessible for OM&R activities. However, due to the continual danger of damage due to the landslide, the pipeline currently requires weekly exterior inspections; more frequent in-depth inspections that require the pipeline to be taken offline, drained, and walked through; and, as well as routine monitoring of inclinometers and piezometers. The District maintains a small stockpile of various diameter welded steel pipe and repair materials for minor repairs. However, in the event of a moderate seismic event, the AA-1 pipeline would likely require extensive repairs and necessitate the procurement and installation of new pipe materials. The pipeline would likely be inoperable for months.

1.8 Permits, Contracts, and Authorizations

Prior to ground disturbance for construction, the contractor would be required to obtain a Utah Pollution Discharge Elimination System Permit and follow a stormwater pollution prevention plan.

The Project would require federal easements from private landowners and Orem City for the proposed pipeline alignment, access points, and construction right-of-way not located in the public road right-of-way or existing easement. Construction time could be shortened in residential neighborhoods if temporary easements are granted for construction in landowner's park strips mainly along 1060 North and 1360 East (see Figures 3-1 and 3-2 in Chapter 3 for more information). Other permits for the project would include Orem City road cut and construction permits; and other county, state, and jurisdictional agency permits typical of this type of construction.

1.9 Statutes, Regulations, and Other Related Documents

1.9.1 Statutes and Regulations

The Project would comply with all federal, state, and local regulations.

1.9.2 Related Environmental Documents

The Preferred Alternative has taken into consideration related environmental documents, including:

- Environmental Statement, Municipal and Industrial System, Bonneville Unit, Central Utah Project (1979).
- Supplement to the Final Environmental Study, Municipal and Industrial System, Bonneville Unit, Central Utah Project (1987).
- Provo Reservoir Canal Enclosure Environmental Assessment and Finding of No Significant Impact (2003).
- 2004 Supplement to the 1988 Definite Plan Report for the Bonneville Unit (supplement to the Bonneville Unit 1964 Definite Plan Report).
- Utah Lake Drainage Basin Water Delivery System Final Environmental Impact Statement (2004) and Record of Decision (2005).
- Realignment of a Portion of the Utah Lake Drainage Basin Water Delivery System Final Environmental Assessment (2010).
- Parallel Pipeline Project Final Environmental Assessment and Finding of No Significant Impact (2011).

2 Alternatives

2.1 Introduction

The National Environmental Policy Act (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 project 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 were developed and evaluated to address issues or concerns raised during internal and public scoping, as described in this Chapter. If an alternative is suggested that does not meet the project need, 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.

2.2 Screening Criteria

Project Screening Criteria were developed by the JLAs to evaluate alternatives for replacing the Alpine Aqueduct Reach 1 (AA-1) pipeline (Table 2-1). Screening Criteria were developed based on the Project's need: to provide physical integrity, functionality, and long-term viability of the AA-1 pipeline. Preliminary alternatives that would not meet the Screening Criteria or would incur unacceptable impacts to environmental resources were removed from further consideration or evaluation. The Preferred Alternative and Variations A, B, and C meet the Project Screening Criteria and were developed and evaluated in detail.

Table 2-1. Project Screening Criteria.

Project Screening Criteria	Description
Physical Integrity	Does not require additional maintenance beyond routine maintenance. Does not pose a risk to human life and property in the event of a landslide.
Functionality	Provides continual service to Central Utah Water Conservancy District (District) customers during a 975-year seismic event and non-seismic geologic events.
Long-Term Viability	Provides reliable pipeline to meet long term water commitments. Long design life of the pipeline.

2.3 Alternatives Considered but Eliminated From Further Discussion

As requested during the public scoping, the JLAs developed two alternatives including the Existing Alpine Aqueduct Reach 1 Alignment Alternative and the 800 North Alternative. These alternatives were evaluated, and it was determined that they did not meet the Project's need identified in Section 1.7.

2.3.1 Existing Alpine Aqueduct Reach 1 Alignment Alternative

Several comments received during scoping requested that an alternative be evaluated along the existing AA-1 alignment and right-of-way using stronger and more flexible pipe material that could potentially withstand landslide movement. As part of the Alpine Aqueduct Reach 1 Resiliency Assessment Project (*Resiliency Assessment)*, the JLAs developed and evaluated options that would utilize all or a portion of the existing AA-1 right-of-way. These options generally ranked low for reliability as the pipeline is expected to experience continued ruptures and failures if it remains in its existing alignment crossing the landslide complex. This is primarily due to the number of failures the pipeline has already experienced during its relatively short lifespan, the up to 10 feet of ground displacement the landslide is expected to experience during the 975-year seismic event, and the statistical certainty that the landslide will continue to move during non-seismic events. Further, it should be recognized that landslide movement is expected to continue along the existing pipeline alignment compared to fault displacement that occurs at localized areas where mitigation measures can be implemented.

The JLAs have concluded that the AA-1 pipeline is at high risk of failure due to previously experienced and ongoing landslide movement. Regardless of the pipe material from which it may be constructed, excessive sudden movement of the landslide or slow and steady incremental movement would eventually overstress and rupture the AA-1 pipeline, potentially resulting in downhill flooding. Additionally, this potential rupture would require the AA-1 pipeline to be taken out of service for repair over an extended period and would inhibit the delivery of water.

Movement of the landslide since the construction of the AA-1 pipeline is primarily due to creep and soil moisture conditions that increase the instability of the landslide. The landslide is also anticipated to move due to seismic shaking resulting from a low- to moderate-sized earthquake (less than the 475-year seismic event). During the 975-year seismic event, the landslide is projected to move up to 10 feet. Any alternative through the landslide would require frequent and above-normal maintenance because of this landslide's documented continual gradual movement. This landslide complex contains many other smaller landslides nested within the larger slide that have historically caused ruptures and continue to stress the existing pipe.

In addition to the landslide concern, danger to the existing AA-1 alignment and any variation of the alignment through the landslide is compounded by having to cross the Wasatch Fault.

During the 975-year seismic event, fault displacement is anticipated to range from 8 to 17 vertical feet coupled with 3 to 6 feet of horizontal displacement. Experts anticipate a fault displacement of this magnitude would trigger movement of the landslide resulting in the shearing or rupture of the pipeline, rendering it unusable until it could be repaired. This could result in flooding downhill of the AA-1 pipeline, depending on the location and severity of the rupture. The AA-1 pipeline would most likely be out of service for an extended period while enough length of pipe could be acquired, and the pipeline reconstructed. Constructing a replacement pipeline through the landslide to withstand a 475-year to 975-year seismic event is not feasible.

For these reasons, any alignment that would utilize the existing AA-1 right-of-way or other alignment variations through the landslide complex was removed from consideration as it would not provide a long-term, reliable, and resilient solution as identified as part of the Project need.

2.3.2 800 North Alternative

Several comments received during the scoping period recommended that the JLAs evaluate an alternative on 800 North as part of the alignment for the proposed pipeline. The 800 North Alternative recommended during scoping would extend southward from the Alpine Tunnel outlet and would be constructed within the 1560 East roadway to 800 North and then loop back up to the Don A. Christiansen Regional Water Treatment Plant (DACRWTP).

This alternative would avoid the landslide complex but would still cross the eastern and central strands of the Wasatch Fault. In addition, this alternative would parallel the eastern strand of the Wasatch Fault along 1560 East on the hanging wall side of the “normal” fault (Figure 2-1) that is expected to drop during a seismic event. If the rock mass above a fault moves down, the fault is termed normal. Having a significant amount of the pipeline parallel to the fault greatly increases the chances of rupture during a seismic event and its anticipated fault displacement.

As discussed in the *Resiliency Assessment* (Jacobs 2020), a 975-year seismic event is anticipated to have a vertical displacement of 8 to 17 feet and a horizontal displacement of 3 to 6 feet. This displacement is anticipated to occur across the eastern and central strands of the Wasatch Fault. The more stable footwall of the Wasatch Fault is represented by the exposed limestone and weather shale layers located on the east side of the eastern strand of the fault. The location of the eastern strand of the fault is well documented by fault trenches excavated during geological investigations for the Utah Lake Drainage Basin Water Delivery System (ULS) pipeline.

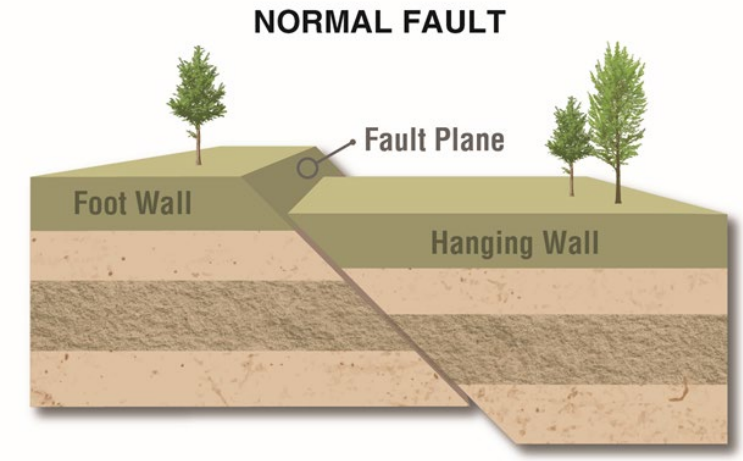

Figure 2-1. Hanging Wall and Foot Wall of a Normal Fault.

Constructing the AA-1 pipeline within 800 North would place three large regional water delivery pipelines parallel to each other: the 84-inch welded steel pipe and 96-inch reinforced concrete pipe segments of the Provo River Aqueduct (PRA) and the proposed realigned AA-1 pipeline. In this location, the original PRA, 96-inch Olmsted Siphon, was constructed in the 1940s with non-seismic resistant concrete pipe and gasketed joints. In 2010-2012 the concrete segment was paralleled with a more seismic-resilient, 84-inch-diameter welded steel pipeline to increase the PRA's capacity. However, the reduced seismic resilience of the 1940s concrete pipe presents a potential risk to any utilities constructed parallel and in the same corridor as this section of pipe. A 975-year earthquake is anticipated to have a vertical displacement of 8 to 17 feet and a horizontal displacement of 3 to 6 feet. Displacements of this magnitude would most likely pull apart and rupture the concrete, gasketed PRA pipeline, which could wash out any other pipelines and utilities in this corridor. In this event, water deliveries from three regional pipelines (both PRA pipelines and the AA-1) would be out of service for an extended period.

For these reasons, the 800 North Alternative was removed from consideration as it would not satisfy the Project Screening Criteria and therefore would not meet the Project need.

2.4 No Action Alternative

2.4.1 Alternative Description

The No Action Alternative has been developed in accordance with CEQ guidelines to provide a comparison with the Preferred Alternative. Under the No Action Alternative, the AA-1 pipeline would remain in place. The pipeline would continue to require extensive ongoing maintenance and repair to remain operational and its location poses a high failure hazard because of landslide movement and the potential for a seismic event.

2.4.2 Screening Criteria Compliance

The No Action Alternative does not satisfy the need-based Project Screening Criteria as described in Table 2-1.

- *Physical Integrity* – The current pipeline alignment crosses through a known landslide and has ruptured by the slide five times since its construction. Additionally, the AA-1 pipeline poses a risk to human life and property located downhill, as landslide movement or a moderate seismic event could cause pipeline failure.
- *Functionality* – The AA-1 pipeline does not meet the ALA industry standard performance objectives for high-priority pipelines (see Chapter 1). According to the ALA, the AA-1 pipeline should have a minimum performance reliability objective of remaining in service following a 975-year seismic event. The AA-1 pipeline is at risk of failure due to even a moderate seismic event. The extensive repairs needed in the case of pipeline failure after a seismic event would likely take months.
- *Long-term Viability* – The AA-1 pipeline has limited long-term viability due to the constant strain and pressure from the landslide which will most likely result in future failures to the pipeline.

The No Action Alternative fails to meet the Project need. It has been studied in detail in accordance with CEQ guidelines throughout this EA.

2.5 Preferred Alternative

The Preferred Alternative would realign the AA-1 pipeline to completely avoid the landslide complex it currently traverses and be designed and constructed to withstand and remain operational following a 975-year seismic event. It has the lowest flooding risk due to fewer potential break points and is the most reliable alignment evaluated as stated in the *Resiliency Assessment* (Jacobs 2020).

Proposed improvements include a tunneled section, buried pipeline (located within undeveloped land, within residential streets, and through a section of the former Cascade Golf Course), and across two unavoidable fault lines. The Preferred Alternative includes a preferred alignment and three alignment variations, which are optional alignments between the Olmsted 10 MG Reservoir and east of the landslide complex to the 1060 North/1560 East intersection as shown in Figure 2-2. The Preferred Alternative and the alignment variations would use the Alpine Tunnel or a new tunnel alignment that would meet up with the Preferred Alternative.

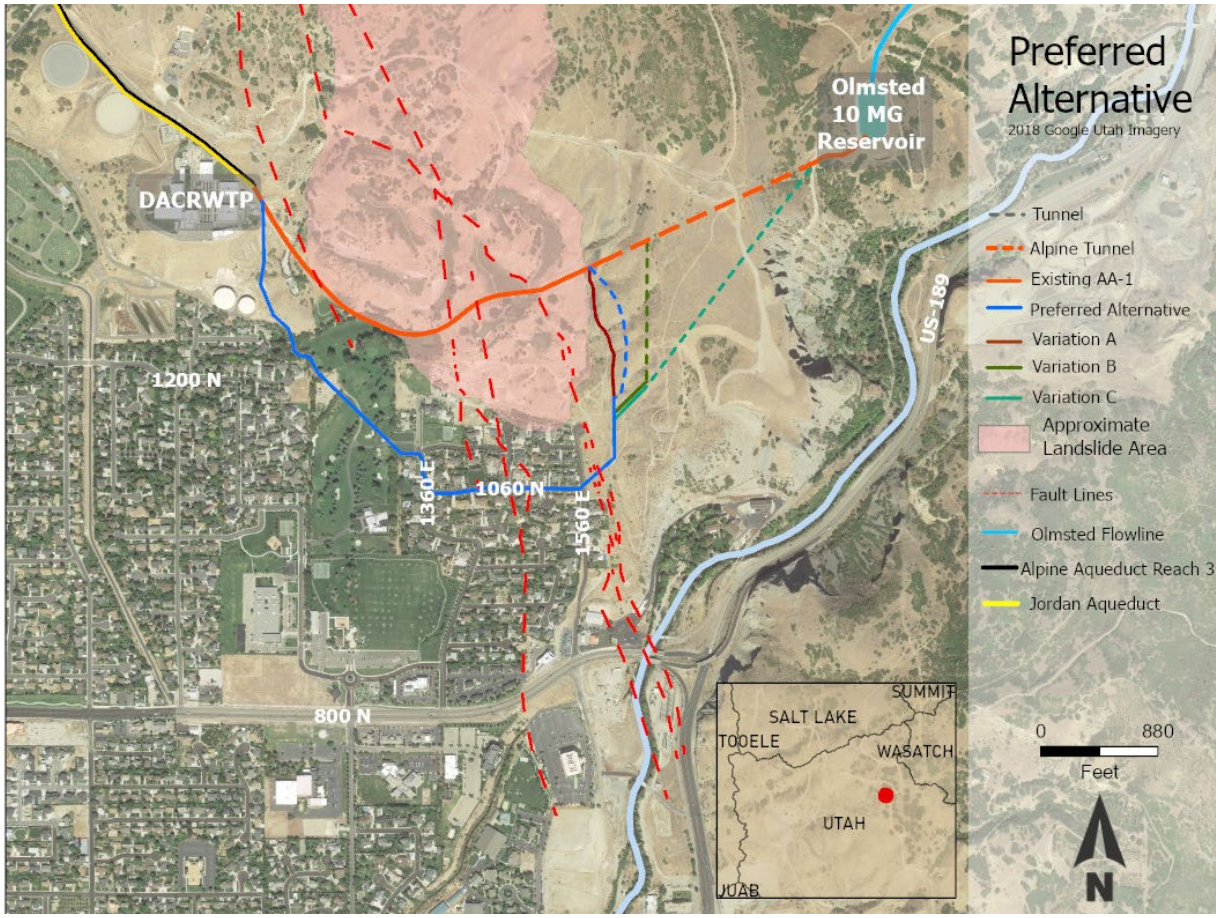

Figure 2-2. Preferred Alternative and Other Alignment Variations.

2.5.1 Design Considerations

One of the primary risks of failure is at the fault crossings during a major seismic event. The pipeline design and construction would incorporate the expected fault displacements to avoid failure. During construction and prior to operations, the new AA-1 pipeline would be hydro tested to make sure that there are no leaks.

The design would address any constructability risks associated with tunneling, including additional bore holes and geotechnical investigations along the tunnel alignment to develop a geotechnical baseline to help establish ground conditions. To reduce the tunneling risks, all proposed tunnel alignments would be sited east of the steeply interbedded weak shale layers to reduce risk of damage and tunneling risks, thereby reducing the likelihood of repair.

Fault Crossings

The alignment would include several unavoidable crossings of fault lines, which is true for any possible alignment. Design and construction efforts include heavy wall, welded steel pipe with movable pipe joints providing flexibility. Where the pipeline crosses the fault lines, it would be designed to cross at approximate perpendicular angles to minimize the length of the pipe at

risk. Additionally, the pipe would be constructed at horizontal offsets to create a "stacked" or zig-zag pattern across the fault that would allow the pipe to expand, contract, and accommodate fault displacement during a seismic event. Figure 2-3 shows how this would be done. The trench zone around the pipe would be backfilled with movable or crushable material to help accommodate ground movement and would be no more than 3 feet of fill on top of the pipe allowing it to move vertically without failing during a seismic event. Strain gauge sensors would be installed on the outside of the pipeline at the fault lines to monitor for any changes to the pipe's alignment indicating movement. During design, geotechnical subsurface investigations may be needed for the final design details.

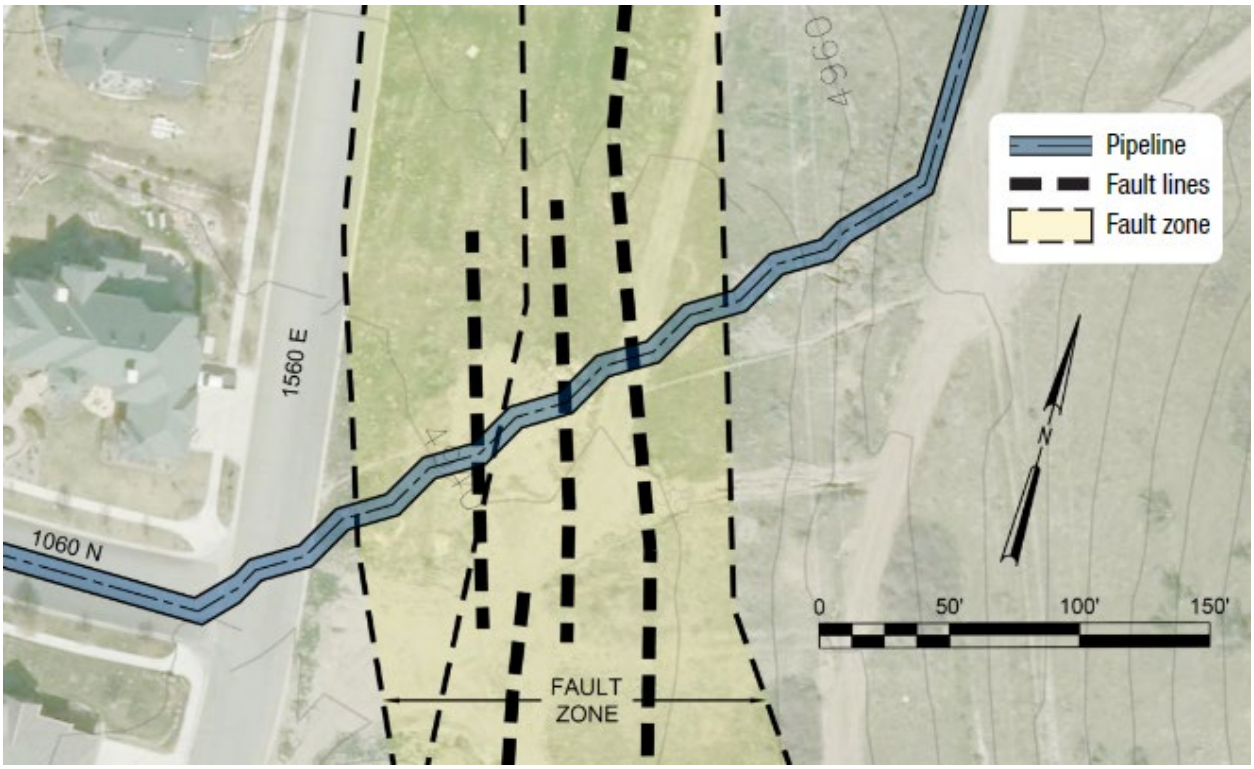

Figure 2-3. Stacked Pipe Design for Fault Crossings.

Constructability within Residential Neighborhoods

The pipeline would be constructed within the roadway's easement which is from curb to curb owned by Orem City. Construction equipment would be at both ends of the open trench for access and pipe installation. Access to home's driveways could be restricted for several weeks during construction. Although vehicle access to driveways would be restricted, walk-in and emergency access would be provided. In an effort to minimize disruption times, a schedule would be followed by the contractor to maintain construction progress. Coordination and cooperation between the contractor, construction workers, and the public would be necessary to ensure a smooth construction process for all involved parties.

An option for speeding up construction is to obtain temporary construction easements from homeowners on one side of 1060 North and 1360 East for construction access in their park strips which would widen the construction zone thereby allowing construction equipment to be on the sides of the trench. Park strips would be reconstructed as near as possible to preconstruction conditions.

2.5.2 Preferred Alternative Alignment

The Preferred Alternative's alignment would utilize the existing Alpine Tunnel and bore a new 156-inch diameter tunnel, approximately 1,100-foot-long, southward from the Alpine Tunnel outlet. A 108-inch welded steel pipeline would be installed in the new tunnel and would continue southward from the new tunnel's outlet to a location east of the 1060 North/1560 East intersection. From there, the pipeline would go west under 1060 North, turn north onto 1360 East, and continue through the former Cascade Golf Course toward Orem City's storage tanks before terminating at the DACRWTP. The Preferred Alternative would be buried. Visible elements would include blowoff structures connected to the Orem City storm drain system, access manways, air vents, inlet and outlet portals for the new tunnel, and access to the strain gauge sensors.

2.5.3 Preferred Alternative Variation Alignments

As part of the *Resiliency Assessment* (Jacobs 2020), other alignments were evaluated of where to construct the pipeline between the 10 MG Olmsted Reservoir to a location southeast of the landslide complex. There are three alignment variations that could be used instead of the Preferred Alternative's alignment for connection to the Preferred Alternative at a location east of the 1060 North/1560 East intersection as shown in Figure 2-4.

Variation A

Variation A's alignment would begin at the existing Alpine Tunnel outlet portal (where the above-ground section of AA-1 begins). This variation would utilize the entire Alpine Tunnel. Connecting at the Alpine Tunnel's outlet, an approximately 1,750 foot 108-inch diameter welded steel pipeline would be constructed along the foothills northeast of the Canyon Cove Estates neighborhood to a location east of the 1060 North/1560 East intersection. Segments of this reach would be along steep hillsides and would include considerable earthwork consisting of open cut construction to reach stable soils suitable for construction. Rock bolts and reinforced concrete encasement would be used to anchor the pipeline into the hillside and texturized to blend in with the existing landscape. Variation A would intersect with the alignment of the Preferred Alternative as shown in Figure 2-4.

Variation B

Variation B's alignment would include boring a new tunnel, approximately 1,450 feet long, that would intersect the existing Alpine Tunnel and terminate at an area east of the1060 North/1560 East intersection. The new tunnel would be 156 inches in diameter with a 108-inch diameter

welded steel pipeline constructed within it. A 200-foot vertical shaft would be required above where the tunnel intersects the existing Alpine Tunnel to remove the boring equipment and to provide a connection to the existing tunnel. From the outlet of the new tunnel, the 108-inch pipeline would continue along the Preferred Alternative's alignment. The segment of the existing Alpine Tunnel downstream of the intersection with the new tunnel would be abandoned.

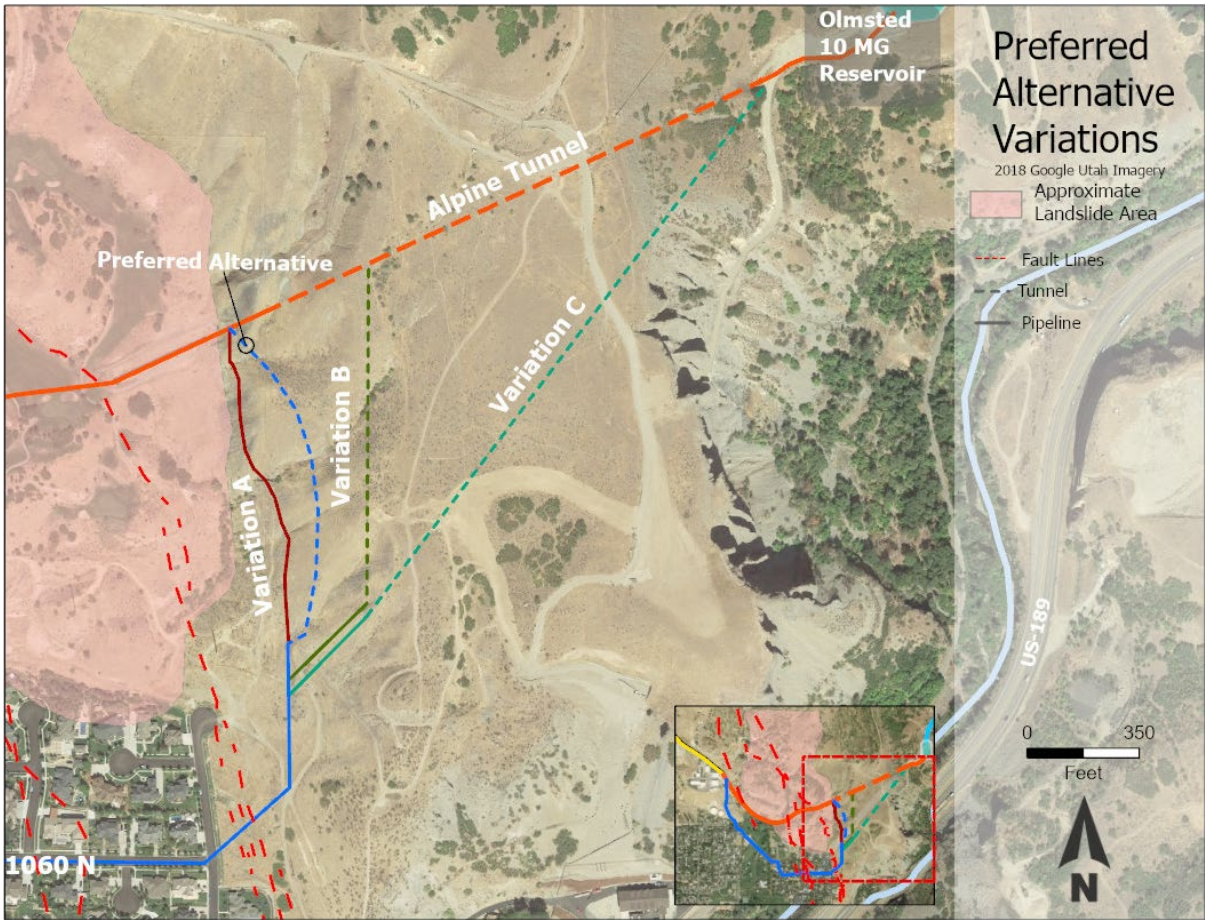

Figure 2-4. Detail View of Alignment Variations.

Variation C

Variation C's alignment would include boring a new tunnel beginning near the inlet to the Alpine Tunnel directly west of the 10 MG Olmsted Reservoir to an area east of the 1060 North/1560 East intersection. The new 2,450-foot-long tunnel would be 156 inches in diameter with a 108-inch diameter welded steel pipeline constructed within it. From the outlet of the new tunnel, the 108-inch pipeline would continue along the Preferred Alternative. The existing Alpine Tunnel would be abandoned.

2.5.4 Screening Criteria Compliance

The Preferred Alternative satisfies the need-based Project Screening Criteria as described in Table 2-1.

- *Physical Integrity* - The Preferred Alternative would provide the physical integrity of the AA-1 pipeline by moving the pipeline to an alignment that completely avoids the known landslide complex and minimizes crossings of the Wasatch Fault Zone (WFZ). Additionally, the pipeline would be designed and constructed to increase its ability to withstand seismic movement.
- *Functionality* - The Preferred Alternative would increase the functionality of the AA-1 pipeline by making improvements that would enable the pipeline to stay in service following the 975-year seismic event.
- *Long-term Viability* - The Preferred Alternative would improve the long-term viability of the pipeline by moving it away from the constant landslide hazard and building the pipeline to current seismic design standards with improved resilient materials.

2.6 Summary and Comparison of Alternatives

Table 2-2 is a summary and comparison of the resources of concern and associated impacts of the Preferred and No Action Alternatives addressed in Chapter 3.

Table 2-2. Summary and Comparison of Alternatives.

Resource of Concern	Preferred Alternative	No Action Alternative
Air Quality	• Temporary and localized impacts to air quality during construction that would be minimized through implementation of Best Management Practices (BMPs). • No long-term effects.	• Temporary and localized impacts to air quality during repair work that would be minimized through implementation of BMPs.
Climate Change	• Would cause a temporary increase in emissions during construction but overall would result in a decrease of emissions corresponding to a decreased need for a high frequency of pipeline inspection and maintenance.	• Would require a high frequency of maintenance and inspection that would continually release greenhouse gas emissions.
Cultural Resources	• No effect.	• Same as Preferred Alternative.
Geological Hazards	• Would result in decreased crossing of geologic hazards.	• Risks from known soil and geologic hazards.
Groundwater	• No effect. No change in the amount of water that infiltrates into the ground. No change in the flow of groundwater.	• Same as Preferred Alternative.
Indian Trust Assets	• No effect.	• Same as Preferred Alternative.

Resource of Concern	Preferred Alternative	No Action Alternative
Public Health and Safety	• Reduced risk to public safety from existing pipeline failure. • Temporary noise impacts during construction to adjacent residents and businesses. • Potential vibration impacts to nearby homes.	• Temporary noise impacts during maintenance activities to nearby residents and businesses.
Socioeconomics	• No permanent effect. • During the construction period there would be temporary benefits to the local economy (employment, spending on goods, services, and materials).	• No permanent effect.
Soils	• Would result in soil disturbance, but to a lesser degree than the No Action Alternative.	• Would result in soil disturbance caused by potential pipeline rupture in the event of a geologic hazard and/or pipeline repair.
Threatened and Endangered Species	• No effect to yellow-billed cuckoo, greater sage-grouse, least chub, June sucker, Deseret milk-vetch, Clay phacelia, Ute ladies'-tresses, and Canada lynx.	• Same as Preferred Alternative.
Transportation and Utilities	• Temporary impacts to businesses and local residents as a result of construction traffic. • No long-term effects.	• Temporary impacts during maintenance activities to adjacent residents and businesses. • Temporary impacts if failure causes soil erosion that enters neighborhood streets. • No long-term effects.
Vegetation and Invasive Species	• Construction activities could allow for the establishment or spread of invasive species and noxious weeds; however, BMPs would be utilized during construction and the District's Integrated Pest Management Plan would be implemented after construction for ongoing monitoring and treatment of invasive species. • Vegetation removal.	• Construction activities during maintenance and repair of the current alignment could allow for the establishment or spread of invasive species and noxious weeds; however, BMPs would be utilized during construction and the District's Integrated Pest Management Plan would be implemented after construction for ongoing monitoring and treatment of invasive species. • Vegetation removal.

Resource of Concern	Preferred Alternative	No Action Alternative
Visual Resources	• Temporary to permanent impacts to visual resources during construction depending on alignment. • Removal of 400-foot visible pipeline section.	• No change or effect.
Wildlife	• No effect to state sensitive species. • Would not permanently impact suitable habitat for mule deer and elk. • Minimal to non-existent permanent impacts to nesting, feeding, roosting, and hiding cover habitat for migratory birds, including raptors. • No impacts to aquatic habitat in the Olmsted Hydroelectric Plant tailrace, Provo Bench Canal, or Provo River. • Temporary impacts to wildlife and their habitats because of higher than usual noise levels, proximity of construction equipment, and other construction-related activities during construction. • Lower impacts to habitat due to reduced ground disturbance.	• No effect to state sensitive species. • Would not permanently impact suitable habitat for mule deer and elk. • Minimal to non-existent permanent impacts to nesting, feeding, roosting, and hiding cover habitat for migratory birds, including raptors. • No permanent impacts to aquatic habitat in the Olmsted Hydroelectric Plant tailrace, Provo Bench Canal, or Provo River. • Temporary impacts to wildlife and their habitats as a result of higher than usual noise levels, proximity of construction equipment, and other construction-related activities during pipeline maintenance and repair.

3 Affected Environment and Environmental Consequences

3.1 Introduction

The purpose of this chapter is to describe the existing conditions of the human and natural environments within the Alpine Aqueduct Reach 1 Replacement and Resiliency Project's (Project) study area and evaluate the potential beneficial or adverse effects of implementing the Preferred Alternative, including alignment variations (Variations A, B, and C), or the No Action Alternative. Identified resources of concern are presented in this chapter. Each resource section presents the issues for analysis and characterizes both the affected environment and environmental effects. The environmental consequences are discussed including the impact (effect) indicators used that 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 Code of Federal Regulations [CFR] §1508.1(g)). Finally, construction impacts and mitigation measures are described.

3.1.1 Affected Environment

The affected environment or the existing conditions were identified and described based on field investigations; scientific studies; previous related reports; coordination with federal, state, and local agencies; and literature and data file searches.

3.1.2 Resource Concerns

Resources of concern, identified by agency and public scoping and Joint Lead Agencies' (JLAs) staff with specific knowledge of resources considered in this Draft Environmental Assessment (EA) are shown in Table 3-1.

Table 3-1. Resources of Concern.

Resources of Concern	Resources of Concern
Air Quality	Socioeconomics
Climate Change	Soils
Cultural Resources	Threatened and Endangered Species
Geological Hazards	Transportation and Utilities
Groundwater	Vegetation and Invasive Species
Indian Trust Assets	Visual Resources
Public Health and Safety	Wildlife

Resources Not Addressed in the Draft EA

Resources not addressed in this Draft EA include those that are not present in the study area or the Preferred Alternative would have no effect or impact on these resources. The resources considered for inclusion but eliminated from further analysis are listed in Table 3-2.

Table 3-2. Resources Eliminated from Consideration.

Resource	Reason for Exclusion
Agricultural Resources	There would be no agricultural resources effected by the Project.
Energy	There would be no effect on the energy production of the nearby Olmsted Hydroelectric Plant or any other facilities.
Environmental Justice	The Project would not result in disproportionately high and adverse human health or environmental effects on minority or low-income populations.
Floodplains	There would be no change to the base flood elevations of the Provo River and would not impact the Provo River floodplain. Additionally, there are no Federal Emergency Management Agency (FEMA)-mapped floodplains within the study area.
Hazardous Waste	Construction of the Preferred Alternative is not expected to create hazardous materials, result in any hazardous waste impacts, or add contaminated soils within the study area.
Land Use Plans and Policies	There would be no change to existing or proposed land use plans. The Preferred Alternative would require easements from private landowners and Orem City for the pipeline alignment, access points, and construction right-of-way not located in the public road right-of-way or existing easement. Construction time could be shortened in residential neighborhoods if easements are granted for construction in landowner's park strips, which would be restored after construction.
Prime, Unique, and Statewide Important Farmland	The Farmland Protection Policy Act (FPPA) defines prime farmland as farmland that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for other uses. A Unique Farmland is land other than Prime Farmland that is used for production of specific high-value food and fiber crops; it has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops. Farmland already in urban development includes lands identified as "urbanized area" on the Census Bureau Map. There are no Prime, Unique, or Statewide Important Farmland within the Project study area.
Recreation	There would be no impacts to recreational resources. Access points in the construction area may be limited during construction, but the trails used by outdoor enthusiasts would still be available.
Water Resources	The Project would not involve new or a change in use of water resources.
Water Quality	The Project would not impact water quality in receiving waters.
Waters of the U.S. (WOTUS)	The Project would not impact any Waters of the U.S.
Wetlands	No wetland areas were delineated in the study area and therefore none would be impacted by the Project.

Resource	Reason for Exclusion
Wild and Scenic Rivers	The Provo River, within the study area, is not protected under the Wild and Scenic Rivers Act of 1968, as amended, and there is no known proposal to protect this portion of the Provo River under the act. The river would not be impacted by the Project.
Wilderness	The Project would not disturb lands that are protected now or proposed for protection under the Wilderness Act of 1964, nor would the project introduce any additional lands for consideration as wilderness.

3.1.3 Environmental Consequences

The National Environmental Policy Act (NEPA) requires consideration of the potential direct, indirect, and cumulative impacts that each alternative would have on the affected environment and provide measures to avoid, minimize, or mitigate these potential impacts. The terminology used to describe impacts is included in Table 3-3.

Table 3-3. Environmental Consequences.

Effect Type	Description
Direct	Impacts caused by an action and occurring at the same time and place (40 CFR §1508.8).
Indirect	Impacts caused by an action that are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR §1508.8). Indirect effects are generally less quantifiable but can be reasonably predicted to occur.
Cumulative	Impacts on the environmental that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person is undertaking such other action (40 CFR §1508.7).

These environmental consequences can have either a temporary or permanent impact and short- or long-term impact, as described in Table 3-4.

Table 3-4. Project Impact Descriptions.

Impacts	Description
Temporary	Not lasting, and the affected resource would return or be restored to its pre-project state.
Permanent	Lasting, and the affected resource would not return to its previous state within one's lifetime.
Short-Term	Impacts that last during the duration of construction and shortly after (duration of impact is approximately 2 years).
Long-Term	Impacts that last for an extended duration of time (beyond year 2 up to the evaluated life of the Project (75-100 years).

Resources benefitting from mitigation measures and Best Management Practices (BMPs) are defined in Section 3.17 and not identified in each resource section. The Preferred Alternative contains a preferred alignment and three alignment variations - Variations A, B, and C. The environmental consequences' sections evaluate the Preferred Alternative and Variation A, B,

and C. The No Action Alternative discussions assume that there would be no construction activities. If the Alpine Aqueduct Reach 1 (AA-1) pipeline ruptures due to landslide or fault movement, Operations, Maintenance and Replacement (OM&R) activities would be needed, in which case the impacts would be similar to those of the Preferred Alternative related construction activities.

3.2 Air Quality

The Clean Air Act Amendments (CAAA) of 1990 established the National Ambient Air Quality Standards (NAAQS) for airborne pollutants. The six criteria pollutants addressed in the NAAQS are carbon monoxide (CO), particulate matter (PM), ozone (O_3), nitrogen dioxide (NO_2), lead (Pb), and sulfur dioxide (SO_2). Particulate matter is broken into two categories: particulate matter with a diameter of 10 micrometers or less (PM_{10}) and particulate matter with a diameter of 2.5 micrometers or less ($PM_{2.5}$). The CAAA requires that air quality conditions within all areas of a state be designated with respect to the NAAQS as attainment, maintenance, nonattainment, or unclassifiable. Areas that do not exceed the NAAQS are designated as attainment, while areas that exceed the standards are designated as nonattainment. A maintenance area is an area previously designated as a nonattainment area where a state or local government has developed a plan to reduce the criteria pollutant concentrations to levels below NAAQS standards.

3.2.1 Affected Environment

According to the Utah Division of Air Quality (UDAQ), the study area falls within an area that has been designated as nonattainment for PM_{10} and $PM_{2.5}$. Additionally, a small portion of the study area is located in an area of Utah County that has been designated a maintenance area for CO.

3.2.2 Environmental Consequences

Preferred Alternative and Variations A, B, or C

PM_{10} and $PM_{2.5}$

Temporary and localized impacts to air quality as a result of fugitive dust emissions and other construction-related pollutants could occur during implementation of the Preferred Alternative and Variations A, B, or C. Fugitive dust can be released and become airborne during construction activities including land clearing, ground excavation, cut-and-fill, road cutting, construction trucks carrying uncovered loads, mud tracked onto paved roads in the construction zone, and by winds blowing through the construction site. All other pollutants, $PM_{2.5}$ and greenhouse gases are generated from heavy-duty diesel construction equipment. Earthwork phases emit the greatest amount of dust and emissions. Implementation of BMPs, including periodic watering of borrow and spoil material, and access roads, would prevent large amounts of dust from being emitted. There would be no long-term adverse impacts to air quality from operation of the pipeline.

CO

Emissions of CO would be generated from construction equipment and vehicle exhaust during construction activities. The Preferred Alternative or Variations A, B, or C would have no long-term adverse impacts on air quality.

No Action Alternative

Under the No Action Alternative, the Central Utah Water Conservancy District (District) would continue to provide OM&R to the existing AA-1 pipeline, as it regularly receives damage from movement of the landslide complex, resulting in temporary and localized impacts to air quality.

3.3 Climate Change

The earth's climate is changing, as evidenced by rising temperatures, shifting snow and rainfall patterns, and more extreme climate events like heavy rainstorms and record high temperatures. Climate change is in part caused by greenhouse gases which trap heat in the atmosphere. Burning fossil fuels (coal, natural gas, and oil), solid waste, trees, and other biological materials release carbon dioxide (CO_2) into the atmosphere. Emissions of CO_2 make up the largest component, 79%, of greenhouse gas emissions.

Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance established an integrated strategy towards sustainability in the federal government and made the reduction of greenhouse gas emissions a priority for agencies.

3.3.1 Affected Environment

Weather patterns are changing over time, including warmer temperatures, more severe storms, and increased drought. The study area and the areas supplied by the regional water delivery system are being affected by these changes.

3.3.2 Environmental Consequences

Preferred Alternative and Variations A, B, or C

Additional CO_2 emissions would be emitted during the construction of the Preferred Alternative or Variations A, B, or C. These would be temporary and localized impacts. Implementation of BMPs may be required for construction equipment. Emissions from construction activities are usually local and temporary and last only for the duration of the construction period. There would be no long-term, indirect impacts from the implementation of the Preferred Alternative and Variations A, B, or C.

No Action Alternative

Under the No Action Alternative, the District would continue to provide OM&R to the AA-1 pipeline, which regularly sustains damage from the movement of the landslide, resulting in temporary and localized emissions. There would be no long-term impacts to climate change.

3.4 Cultural Resources

Historic properties include archaeological resources (both prehistoric and historic), architectural resources (buildings and structures), and traditional cultural properties. The Advisory Council on Historic Preservation (ACHP) defines a historic property as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP)."

The National Historic Preservation Act (NHPA) of 1966, as amended, and its implementing regulations (36 CFR §800) establish the national policy and procedures regarding historic properties. Section 106 of the NHPA requires consideration of the effects of federal projects and policies on historic properties. Utah Administrative Code (UAC) §9-8-401 et seq. was passed to provide protection of "all antiquities, historic and prehistoric ruins, and historic sites, buildings, and objects which, when neglected, desecrated, destroyed or diminished in aesthetic value, result in an irreplaceable loss to the people of this state."

The Section 106 review process requires historic properties to be evaluated for eligibility and listing on the NRHP based upon whether "the quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association," and meet one or more of the following criteria:

A. Associated with events that have made a significant contribution to the broad patterns of our history.
B. Associated with the lives of persons significant in our past.
C. Embody distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction.
D. Yielded, or may likely yield, information important in prehistory or history.

3.4.1 Affected Environment

A Class I literature review and a Class III cultural resource inventory were completed within the Area of Potential Effects (APE) in April 2022. The inventory resulted in no newly recorded sites and documentation of two previously recorded sites within the APE, indicated in Table 3-5. In accordance with 36 CFR §800.4, any sites identified within the APE were evaluated for significance in terms of the above NRHP eligibility criteria. Both sites were previously determined eligible for listing on the NRHP. No changes to these sites were observed that would require revision of the previous determination. No historic-period structures were observed within the APE.

Table 3-5. Cultural Resources Within the Study Area.

ID	Description	NRHP Eligibility
42UT1134	Salt Lake Aqueduct	Eligible
42UT1758	Olmsted Hydroelectric Plant	Eligible

Site 42UT1134 was previously documented by Baseline Data in 2000, Earth Touch in 2007, and Sagebrush Consultants in 2011 (Allison 2000; Billat and Billat 2007; Pagano 2011). Other recorded segments have been previously determined eligible for the NRHP under Criterion A, due to its association with broad patterns of water manipulation and control in Utah Valley in the early to mid-20th century in 2001. This segment, though mostly a subsurface feature, retains integrity of location, design, setting, materials, and association, and it is recommended that the site remain eligible for the NRHP.

Site 42UT1758 has been previously determined eligible for the NRHP as one of the earliest hydroelectric sites in Utah. The power generation building is listed on the NRHP and has provided an important power source to the Tintic mining district as well as local municipalities and was one of the earliest training facilities for electrical engineers in the United States. The plant was closely associated with Lucian Nunn, an important early developer of hydroelectric power. The buildings on the site, as well as the contributing archaeological features, are excellent and rare examples of the style of early hydroelectric plants. It is also possible that additional information regarding the daily lives of early students and employees at the site could be recovered through excavation.

3.4.2 Environmental Consequences

Preferred Alternative and Variations A or B

The Preferred Alternative nor Variations A or B would avoid impacting the cultural resources listed in Table 3-5 and would completely avoid impacts to 42UT1134, the Salt Lake Aqueduct. Improvements and realignment of the AA-1 pipeline would remain south of the Salt Lake Aqueduct's alignment and not interrupt its service. The Preferred Alternative nor Variations A or B would completely avoid impacts to 42UT1758, the Olmsted Hydroelectric Plant site. It was determined that the overall Section 106 effect of the AA-1 realignment on historic properties is No Historic Properties Affected. The Utah State Historic Preservation Office (SHPO) concurred with that determination on May 16, 2022. There would be no direct or indirect impacts on cultural resources.

Variation C

Variation C would completely avoid impacts to 42UT1134, the Salt Lake Aqueduct. Although an access road to Site 42UT1758 traverses the hillside from the west to the east, it would not be impacted by construction activities associated with the boring of the pipeline under Variation C, and no historic properties would be affected. There would be no direct or indirect impacts on cultural resources.

No Action Alternative

The District would continue ongoing OM&R of existing facilities as needed. The No Action Alternative would have no direct or indirect impacts on cultural resources.

3.5 Geological Hazards

A geological hazard is an adverse geologic condition that can cause widespread damage or loss of property and life. The *Resiliency Assessment* (Jacobs 2020) provides an in-depth discussion on geotechnical investigations completed to identify geologic hazards.

3.5.1 Affected Environment

Geologic Setting of the Study Area

Located at the base of the Wasatch Mountains' western slope, the study area is characterized by young alluvial and river terrace deposits of the Provo River, underlain by the Manning Canyon Shale and the Great Blue Limestone of Mississippian/Pennsylvanian age. Natural slopes in the study area are composed of alluvial terrace deposits at a relatively steep slope, containing sub-angular to rounded cobbles and boulders which could be loosened and roll down the slope in a seismic event (Golder 2013). The study area is in a highly geologically active area, which is subject to a variety of geological hazards such as landslides, steeply incised canyons, and unstable bedrock conditions.

Wasatch Fault Zone

The study area is located within the 230-mile-long Wasatch Fault Zone (WFZ), with several suspected active fault lines extending through the study area. In general, an "active" fault is defined as one that shows evidence of movement within the last 10,000 to 11,000 years, or within the Holocene Epoch. The Provo Segment of the WFZ has produced five surface-rupturing events over the last 7,000 years, causing substantial displacements along the fault. Estimates for a future seismic event range from 8 to 17 feet of displacement, which would damage critical infrastructure including the AA-1 pipeline. Any project improvements would require crossing the eastern and central strands of the WFZ.

Landslide Complex

In addition to the WFZ, geologic mapping by the United States Geological Survey (USGS), Utah Geological Survey (UGS), and Lettis Consultants International (LCI) shows the presence of a landslide complex in the foothills above Orem City that is approximately 5,000 feet long and 1,800 feet wide. The complex consists of unstable fractured limestone and shale, and multiple smaller slides within Lake Bonneville deposits. This area has experienced multiple landslides, requiring repairs to the AA-1 pipeline in 1985,1986,1988 (2 failures), 2000, and most recently 2017. This landslide complex area is considered a geological hazard to be avoided as infrastructure crossing over or through would likely not survive the 975-year seismic event because of significant ground deformation (landslide slippage). Triggers known to activate a landslide includes high moisture content and seismic activity.

Due to the landslide and its potential to move and damage the AA-1 pipeline, the District installed inclinometers and piezometers through the landslide complex. The inclinometers, installed between 50 – 150 in depth, measure the amount of landslide movement occurring. A piezometer measures the underground water pressure in the aquifer.

3.5.2 Environmental Consequences

Preferred Alternative and Variations A, B, or C

The Preferred Alternative would provide a more reliable and resilient pipeline by avoiding the landslide complex. While it would cross the WFZ in several locations, the design and construction would include seismic mitigations as described in Section 2.5.1. The Preferred Alternative and Variations A, B, and C are all located outside the landslide complex. The Preferred Alternative alignment crosses the WFZ, as shown in Figure 2-2. Variations A, B, and C represent only a partial change in alignment to the Preferred Alternative and are outside of the WFZ. As the WFZ is unavoidable, any alignment chosen would need to cross the WFZ. There would be direct and temporary impacts with the implementation of the Preferred Alternative.

No Action Alternative

The District would continue ongoing OM&R of existing facilities as needed. In the event of landslide or fault movement, the AA-1 pipeline is anticipated to withstand a very limited amount of ground displacement before rupturing, causing damage to the pipeline and surrounding area. Direct impacts could include the loss of water conveyance in the pipeline while repairs are made and erosion and flooding in surrounding areas due to uncontrolled release of flows.

3.6 Groundwater

According to the U.S. Geological Survey, Utah Valley is bounded by the Wasatch Range, West Mountain, and the northern extension of Long Ridge. The valley is divided into two groundwater basins, northern and southern, which are separated by Provo Bay in northern Utah Valley. Groundwater in Utah Valley occurs in unconsolidated basin-fill deposits under both water-table and artesian conditions, but most wells discharge from artesian aquifers. The principal groundwater recharge area for the basin-fill deposits is in the eastern part of the valley, along the base of the Wasatch Range (USGS 2018).

According to *Hydrology of Northern Utah Valley, Utah County, Utah 1975-2005*, measured groundwater levels have declined an average of 22 feet from 1981 to 2004. Recharge areas along the mountain front is focused over areas where streams and creeks enter the valley. With persistent drought conditions, groundwater levels will likely continue to decline.

Groundwater conditions and quantities can vary considerably depending on the season, climate conditions, withdrawals, and proximity to the river. Groundwater may occur in permeable gravel zones, and/or locally perch on top of bedrock surfaces. (Golder 2013).

3.6.1 Affected Environment

There is limited data on the presence of groundwater and the piezometric surface along the Preferred Alternative's alignment. Boreholes were drilled in connection with the investigation presented in the Resiliency Assessment (Jacobs 2020), which did not show any significant volumes of groundwater. Regular measurements of standing water within each borehole prior to and after drilling operations reported "dry holes," suggesting low, or no, groundwater. In addition, a geotechnical investigation conducted as part of the development of the Canyon Cove Estates neighborhood did not encounter groundwater.

Only a few wells are within the study area, of which well logs indicate that water depth at the time of drilling ranged between 140 and 219 feet below the surface (55-13419 and 55-12639). USGS Well Station 401853111401501, located south of the study area, ranged from a high of 294 feet below the surface in 1985 to a low of 346 in 2004.

Orem City has two spring sources located in Provo Canyon, Alta Springs, which is 3 miles northeast from the mouth of the canyon, and Canyon Springs, which is located near Mount Timpanogos Park. There are no other documented springs near the study area.

3.6.2 Environmental Consequences

Preferred Alternative and Variations A, B, or C

The Preferred Alternative nor Variations A, B, or C would change the surface water that infiltrates into the ground and would have no impact to the groundwater supply, quality, or quantity. From the few well logs in the study area, recorded groundwater levels are well below the depth that would be impacted by construction of the Project. Additionally, there are no recorded springs along the alignments. There would be no direct or indirect impacts to groundwater.

No Action Alternative

The No Action Alternative would have no direct or indirect impacts to groundwater, as there would be no change to the amount of water that infiltrates into the ground.

3.7 Indian Trust Assets

Indian Trust Assets (ITA) are legal interests in property held in trust by the United States for Indian tribes or individuals. The U.S. Department of the Interior, Central Utah Project Completion Act Office's (Interior) policy is to recognize and fulfill its legal obligations to identify, protect, and preserve 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 (see Departmental Manual, 512 DM 2). All impacts to ITAs, even those considered nonsignificant, must be discussed in NEPA compliance documents and appropriate compensation or mitigation must be implemented.

Trust assets may include agricultural lands, minerals, hunting and fishing rights, traditional gathering grounds, and water rights. Impacts to ITAs are evaluated by assessing how the action affects the use and quality of ITAs. Any action that adversely affects the use, value, quality, or enjoyment of an ITA is considered to have an adverse impact to the resources.

3.7.1 Affected Environment - Indian Trust Asset Status

The Interior CUPCA office sent letters requesting consultation for the Project on potential properties of religions or cultural importance to Native American Tribal Governments and Bureau of Indian Affairs Agency Offices on November 15, 2021. The Hopi Cultural Preservation Office and the Navajo Nation responded. The Hopi Tribe requests that if the cultural resource survey identifies prehistoric sites that may be adversely affected by the Project, to consult with them. The Navajo Nation responded that the project could continue without further coordination with them. Additionally, if any Native American human remains or funerary objects are discovered during construction, to immediately stop construction and report the findings.

3.7.2 Environmental Consequences

Preferred Alternative and Variations A, B, or C

Implementation of the Preferred Alternative nor Variations A, B, or C would have no foreseeable negative impacts on ITAs. There would be no direct or indirect impacts to ITAs.

No Action Alternative

The No Action Alternative would have no direct or indirect impacts to ITAs.

3.8 Public Health and Safety

3.8.1 Affected Environment

During construction, there would be temporary effects to public health and safety with respect to local residents, public, and construction workers. With deep open trenches in the residential streets, maintaining and limiting working areas for construction workers would be challenging. Ensuring safety would require coordination and cooperation between the involved parties.

There would be no long-term effects to public health and safety during regular operation. An Emergency Action Plan (EAP) would be developed providing procedures to be followed in the event of a rupture. Although a seismic event is much less likely to cause a rupture in the new pipeline, should a problem arise, the EAP would be followed. Possible procedures may include closing the slide gates at the 10 MG Olmsted Reservoir as fast as possible but at a systematically controlled rate so as to not damage other facilities connected to AA-1 (e.g., DACRWTP, Alpine Aqueduct Reach 3, Olmsted Flowline). The EAP would also notify those affected by the AA-1 pipeline's rupture and subsequent shut down. Repairing the new AA-1 pipeline could occur relatively quickly because of the shallow bury depth and repair materials that the District would have on hand.

3.8.2 Environmental Consequences

Preferred Alternative and Variations A, B, or C

Based on the existing failure hazards of the AA-1 pipeline, the Project would have an overall beneficial long-term impact on public health and safety due to the reliability of the water supply. Although the Preferred Alternative would place the pipeline adjacent to multiple houses, the pipeline's design, alignment, and construction would be such that it is less likely to rupture and cause flooding to residential areas. In the event of pipeline damage, the quantity of water would be consistent with the existing pipeline's capacity and would follow the natural drainage path, first along curb and gutter and then any flows exceeding the roadway's capacity would follow the natural topography of the ground.

During construction, there would be temporary impacts to local residents, including the potential risk and safety concerns related to the proximity of a deep open trench and operating equipment located within the neighborhood. Residents and children would be unable to recreate near construction zones. The active construction areas would be fenced and secured at all times. All open trenches would be covered with heavy metal plates.

Overall, there would be indirect and long-term beneficial impacts to public health and safety from the implementation of the Preferred Alternative and Variations A, B, or C.

No Action Alternative

Under the No Action Alternative, there would be no beneficial or negative direct or indirect impacts to public health and safety unless there was a rupture to the AA-1 pipeline. As a result of a landslide or earthquake, a rupture of the AA-1 pipeline would result in health and safety impacts adjacent to the break, likely resulting in large volumes of water flowing from the break and erosion of soils. Additionally, a break could result in loss of water supply to the 1.6 million water users. Construction crews would be required on short notice to perform emergency maintenance. In the event of a pipeline rupture, there could be direct impacts to local residents depending on the location of the rupture but could include large amounts of water and soil erosion which could impact public health and safety.

3.9 Socioeconomics

3.9.1 Affected Environment

The 13.2 mile-long Alpine Aqueduct pipeline is an integral facility of the Bonneville Unit M&I System's vast network of water facilities. It delivers water for irrigation, municipal, and industrial uses to approximately 1.6 million people in northern Utah and Salt Lake Counties, which is half of Utah's population. The water is essential for the population's livelihoods including domestic and productive needs. Failure of the AA-1 pipeline would result in significant economic impact to the communities that would no longer have this water source. Other critical infrastructure and services rely on water, including power, medical care, and fire response. Without water,

interdependent systems and infrastructure would remain offline. Impacts would extend to the rest of Utah, which is reliant on food, fuel, and other supplies sourced in the Wasatch Front. If communities are without water for months, businesses would collapse, and families would relocate (USSC, 2021). Another impact due to failure of the AA-1 pipeline could be water damage to downstream properties and hazards to human life.

3.9.2 Environmental Consequences

Preferred Alternative and Variations A, B, or C

Indirect, long-term benefits of the Preferred Alternative and Variations A, B, or C to socioeconomics include meeting existing contractual obligations and providing safe and efficient operation of the AA-1 pipeline. The new AA-1 pipeline section would be connected to the existing AA-1 pipeline during the winter when water users are not dependent on that water supply. There would be temporary beneficial impacts from the employment of construction crews and spending on goods, services, and materials during the construction phase, which would benefit local businesses and the county from collected taxes.

No Action Alternative

Under the No Action Alternative, there would be no beneficial or negative direct or indirect impacts while the AA-1 pipeline is functioning properly. The District would continue ongoing OM&R of existing facilities as needed. In the event of a pipeline rupture, there could be a significant direct economic impact to the 1.6 million water users that rely on the water and a substantial hazard to human life and property.

3.10 Soils

3.10.1 Affected Environment

A portion of the AA-1 pipeline was constructed between two drainages consisting primarily of colluvium and Manning Canyon Shale spoil from the tunnel's excavation that was used to construct the embankment. The remainder of the AA-1 pipeline was constructed in a trench installation through the underlying native materials. It appears from investigations that the embankment was constructed of colluvium materials, fragmented shale, and limestone, which appear to be landslide materials consisting of silty to clayey gravel with sand and cobbles. Although the soils from the tunnel's excavation were placed directly atop the natural soil deposits and compacted when placed, many of the shale fragments have degraded into clay (URS 2001). Soil units and man-made fills and grading are described below.

Soil Units

Manning Canyon Shale is prone to slumping, landslides, and related instability and is known to cause problems. Field studies conducted prior to the AA-1 construction indicated the predominant near-surface soil types to be brown silty and clayey gravel with sand and limestone cobbles, with some limestone and shale blocks greater than 10 feet in diameter.

Reclamation broadly classified these soils as generally with "slopewash" or landslide deposits. Additionally, silts and clays underlain by highly weathered Manning Canyon Shale was observed above the Alpine Tunnel outlet. Alpine Aqueduct reaches 2 and 3 were installed in native materials, which do not have these issues and are outside the landslide area. (URS 2001)

Specific surficial soil deposits consist of several distinct units including the following:

- Quaternary Lake Bonneville lacustrine gravel and sand (Qlb): consist of beds of sand, gravel, silt, and some clay deposited during the Bonneville phase of the Lake Bonneville cycle. Deposits range from clast supported pebble and cobble gravel with sand and silt matrix, to laminated sand with minor pebbly gravel and silt, to massive silt with sand. Sand and gravel are typically subrounded to well-rounded.
- Quaternary stream alluvium (Qsa): consist of pebble and cobble gravel with sand and silt matrix, occasional sand lenses, poorly to moderately sorted, and subangular to rounded clasts. Typically found at the mouths of drainages.
- Quaternary alluvial fan (Qaf): consist of intermixed sand, silt, and gravel. Typically, angular to subrounded, with occasional rounded clasts derived from Bonneville Lake cycle sediments. Typically found at the mouths of drainages.
- Quaternary colluvium (Qc): consist of well-graded silt, sand, and gravel. Clasts are angular and derived from various upslope bedrock units.

Manmade Fills and Grading

There are nine general areas where substantial amounts of fill were placed upslope of the AA-1 pipeline, most of which were for the former Cascade Golf Course. These areas were spread using a crawler tractor-type excavator with no compaction control. The fill material appears to be principally native material cut during mass grading from adjacent ridges and hillsides, with the remaining portion being imported.

The area closest to the Don A. Christiansen Regional Water Treatment Plan (DACRWTP) has fill along the AA-1 pipeline of up to 10 to 20 feet. Other fill depths moving east along the alignment range from 5 to 10 feet. Localized fill placed along drainages and erosion channels are estimated to range from 10 to 20 feet thick.

3.10.2 Environmental Consequences

Preferred Alternative and Variations B or C

The Preferred Alternative and Variations B or C would result in soil disturbance and vegetation removal associated with construction activities. Exposure to soils include vegetation removal, mixing of soil gradations, loss of topsoil productivity, soil compaction, and increased susceptibility to erosion. The Preferred Alternative's alignment would have less potential for slope and seismic instability when compared with the No Action Alternative which crosses the landslide complex. BMPs would be implemented as described in Section 3.17. Areas disturbed would be restored and stabilized through re-establishment of vegetation and would

diminish over time as reclamation is achieved. The Preferred Alternative and Variations B or C would have direct and temporary impacts to areas disturbed during construction.

Variation A

Variation A would have direct, indirect, and permanent impacts related to the construction of the pipeline including open cutting and rock bolting to the hillside. Although disturbed areas would be restored and stabilized through re-establishment of vegetation, there would be permanent changes to soils and vegetation on the hillside potentially leading to increased erosion. BMPs would be implemented as described in Section 3.17. Areas disturbed would be restored and stabilized through re-establishment of vegetation.

No Action Alternative

The No Action Alternative would have no direct or indirect impact to soils while the pipeline is functioning properly. In the event of a rupture, the District would perform OM&R activities to remediate pipeline issues. The associated disturbance to soils would be direct, temporary, and localized to the immediate work area to complete the necessary repairs. There are no long-term or permanent impacts expected for soils.

3.11 Threatened and Endangered Species

3.11.1 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) of 1973 (7 United States Code [USC] §136, 16 USC §1531 et seq.), as amended, requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) if listed species or designated Critical Habitat may be affected by the Preferred Alternative. If adverse impacts would occur as a result of the Preferred Alternative, the ESA requires federal agencies to evaluate the likely effects and ensure that it neither jeopardizes the continued existence of federally listed ESA species nor results in the destruction or adverse modification of designated Critical Habitat.

3.11.2 Affected Environment

Table 3-6 lists the federally listed ESA species that are known to occur within Utah County, Utah, and are considered in this analysis. No designated critical habitat for federally listed ESA species occurs within a half mile of the study area.

Table 3-6. ESA Species List.

Species	Status	Occurrence in the Study Area
Yellow-billed cuckoo (*Coccyzus americanus*)	Threatened	Found in mixed native and non-native riparian woodlands. Patches vary in size and shape but must be ≥12-acres and 100-meters wide or more in at least one location. Quality habitat is structurally diverse with a multi-layered overstory and dense understory. Although there is suitable habitat, consisting of multi-layered riparian vegetation, for yellow-billed cuckoo within 0.5 miles of the study area, no documented occurrences of yellow-billed cuckoo within 2 miles. However, due to the presence of suitable habitat, it is possible this species could occur in and near the study area.
June sucker (*Chasmistes liorus*)	Threatened	Endemic to Utah Lake and the Provo River. Designated critical habitat for the June sucker is in the lower 4.9 miles of the Provo River, measured from its confluence with Utah Lake. The Tanner Race diversion falls within the critical habitat and is approximately 4.5 miles from the study area. There are four diversions between the study area and Tanner Race diversion. These diversions are not passable by June sucker. Therefore, this species is not found in or near the study area.
Canada lynx (*Lynx canadensis*)	Threatened	Found in moist, montane, boreal forests with an abundance of snowshoe hare. No suitable habitat and no documented occurrences within or near the study area have been recorded. Therefore, this species is not found in or near the study area.
Monarch Butterfly (*Danaus plexippus*)	Candidate	A milkweed obligate species. There are many species of milkweed that grow in a variety of habitat types, including those found in the study area. It is possible this species could occur in and near the study area.

Source: USFWS's Information for Planning and Consultation (IPaC), accessed on February 16, 2022.

3.11.3 Environmental Consequences

Preferred Alternative and Variations A, B, or C

Yellow-billed cuckoo

Suitable habitat for yellow-billed cuckoo occurs about 740 feet to the east of the study area. No suitable habitat would be removed during construction or otherwise directly impacted by Project activities. A noise screening analysis determined that noise from equipment used during project construction would not exceed the ambient noise level of the adjacent US-189. There would be no direct or indirect impacts from the implementation of the Preferred Alternative nor Variations A, B, or C.

Monarch Butterfly

There is potentially suitable habitat for monarch butterfly in the study area due to the diverse habitat types in which milkweed can occur. However, because monarch butterfly is a candidate species, no conservation actions are currently required.

No Action Alternative

Under the No Action Alternative, there would be no direct or indirect impacts to listed species or critical habitat.

3.12 Transportation and Utilities

3.12.1 Affected Environment

The affected environment for the transportation and utility impacts includes roads that would be used by construction crews to access the project site in Orem from 800 North to either 1400 East or 1560 East and for pipeline construction in the 1060 North and 1360 East roadways. The remainder of the Preferred Alternative's alignment is in undeveloped areas and the former Cascade Golf Course. The Preferred Alternative would cross under several large above ground powerlines located east of the neighborhood. From the *Resiliency Assessment* (Jacobs 2020), existing utilities in the 1060 North and 1360 East roadways include fiber optic, gas, power, 8-inch waterline, and an 8-inch sewer line, and 1360 East also has a 24-inch storm drain line.

3.12.2 Environmental Consequences

Preferred Alternative and Variations A, B, or C

The Preferred Alternative and Variations A, B, or C would have direct and temporary impacts to traffic due to construction including traffic increase with construction traffic moving equipment, materials, and workers to the construction site, detours, delays, and residential access restrictions, all of which could increase the risk of accidents. Vehicular access to properties may be restricted during construction with alternate routes identified. The contractors would be required to address traffic concerns with notification prior to impacts to local residents and flagging if necessary. Children would be unable to recreate near construction zones during construction. There would be no long-term adverse impacts to transportation or utilities.

Construction in the residential streets would require the existing sewer to be lowered or the installation of a parallel sewer line. The District has routinely relocated sewers and smaller utilities as part of other pipeline projects without issues or significant challenges. Figures 3-1 and 3-2 show a typical cross-section in 1060 North and 1360 East (Jacobs 2020). There would be a direct and temporary impact (completed within 6-8 hours) to the sewer utility when the relocated sewer pipeline would be connected to the existing sewer pipeline. Relocation of other utilities, if necessary, would be determined during the final design.

No Action Alternative

Under the No Action Alternative, there would be no direct or indirect impacts to transportation and utilities. In the event of a rupture of the AA-1 pipeline, access to the pipeline would be from 800 North to either 1400 East or 1560 East and from the DACRWTP. Impacts to traffic would be minimal and temporary.

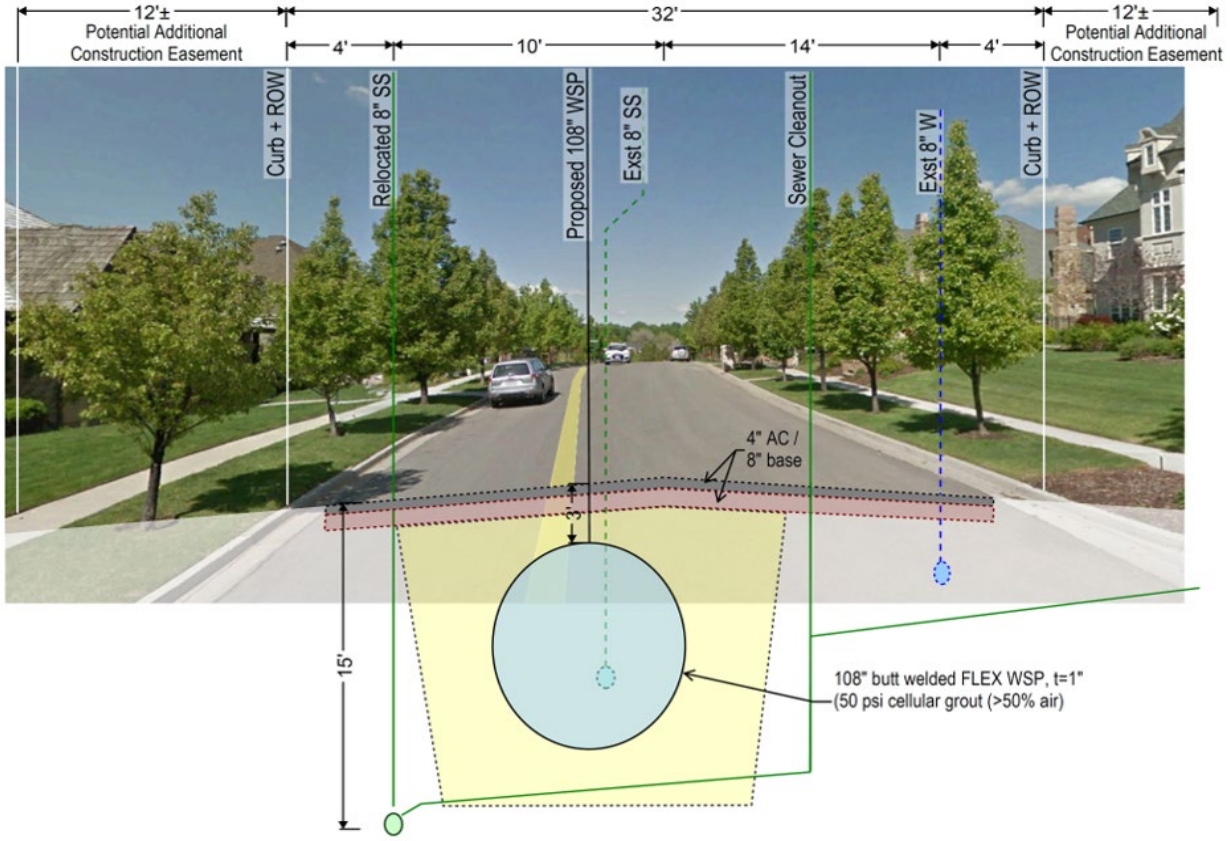

Figure 3-1. Cross-Section View of 1060 North.

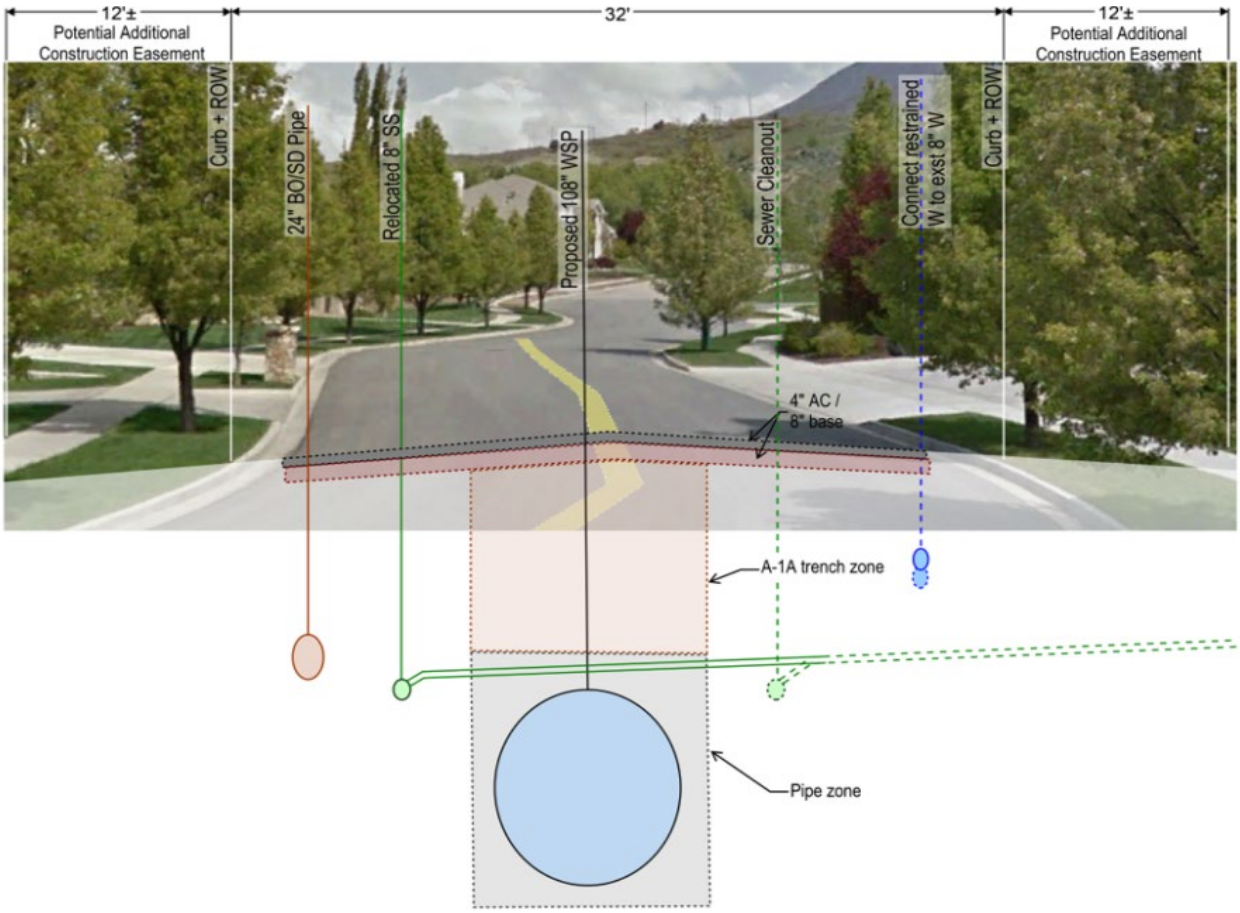

Figure 3-2. Cross-Section View of 1360 East.

3.13 Vegetation and Invasive Species

Invasive species are non-native species that spread at the expense of native vegetation and are considered harmful to plants, animals, or the environment. Prevention and early treatment are the most cost-effective BMPs. Vegetation in the study area has declined due to drought conditions and land use practices.

3.13.1 Affected Environment

Vegetation

The habitat in the study area can be classified as northern mountain brush complex using Woody Plants of Utah (Van Buren et al. 2011). This vegetative community occurs in the foothills of mountain ranges and is dominated by shrubs such as Gambel oak (*Quercus gambelii*), bigtooth maple (*Acer grandidentatum*), box elder (Acer negundo), curl-leaf mountain mahogany (*Cercocarpus ledifolius*), alderleaf mountain mahogany (*Cercocarpus montanus*), and sagebrush (*Artemisia spp.).*

Due to the 2020 Range Fire, which burned approximately 3,500 acres at the mouth of Provo Canyon, very few trees and shrubs are present in the study area. Instead, the study area is dominated by various species of native and non-native grasses and forbs such as intermediate wheatgrass (*Thinopyrum intermedium*), crested wheatgrass (*Agropyron cristatum*), bulbous bluegrass (*Poa bulbosa*), and cheat grass (*Bromus tectorum*) (see Figure 1).

In addition to the grassland habitats available in the study area, suitable habitat for migratory birds occurs in small patches of oakbrush (*Quercus gambelii*), sagebrush (*Artemisia tridentata*), and Utah juniper (*Juniperus osteosperma*) as well as along the large limestone cliffs at the mouth of Provo Canyon.

Invasive Species

During an onsite survey, invasive species and noxious weeds were identified including hoary cress (*Lepidium draba*) a Class 3 Containment Noxious Weed, and Dalmatian Toadflax (*Linaria dalmatica*) a Class 2 Control Noxious Weed. Other invasive species identified in the study area include cheatgrass (*Bromus tectorum*), Jim Hill Mustard (*Sisymbrium altyissimum*), storksbill (*Erodium cicutarium*), and bulbous bluegrass (*Poa bulbosa*). Invasive species were observed throughout the study area but were most abundant in disturbed areas.

3.13.2 Environmental Consequences

Preferred Alternative and Variations A, B, or C

The Preferred Alternative would include construction activities that would disturb the vegetation. The ground disturbance would be direct and temporary, and there could be an increase in the spread of invasive or noxious weeds. The risk of spreading weeds during construction would be temporary but would reduce as reclamation was completed and disturbed surfaces were re-established with desirable vegetation. However, BMPs would be utilized during construction and the District's Integrated Pest Management Plan would be implemented after construction for ongoing monitoring and treatment of invasive species. There would be no long-term or permanent risk of spreading invasive species because of construction.

No Action Alternative

Under the No Action Alternative, there would be no direct or indirect impacts to vegetation or invasive species. However, if OM&R activities are required, impacts would be consistent with construction activities and BMPs and the District's Integrated Pest Management Plan would be implemented during and after OM&R activities.

3.14 Visual Resources

This section describes the existing visual resources and assesses the extent to which the Project would change the perceived visual character and quality of the environment where the Project is located. The analysis addresses changes to the existing landscape characteristics that would result from construction, operation, or maintenance of either alternative or variations.

3.14.1 Affected Environment

Visual or scenic resources within the study area are the natural and built features of the landscape that contribute to the public's experience and appreciation of the environment. For the study area, these include historical structures and site features and established vegetation and landscapes. Visual resources or scenic impacts are generally defined in terms of a project's physical characteristics and potential visibility and the extent to which the Project's presence would change the perceived visual character and quality of the environment in which it would be located. For this study, the primary viewer groups of the study area include those adjacent to the study area (residents and recreationists) and those traveling near the study area (motorists on adjacent roadways).

3.14.2 Environmental Consequences

Preferred Alternative

During construction of the Preferred Alternative, construction activities and equipment used for tunneling, excavating, pipe placement, and material hauling would be visible along the proposed alignment. After installation, project facilities would have minimal visual impact. The completed pipeline would be underground with access points at ground level via manhole covers. Visible elements may include blowoff structures connected to the Orem City storm drain system at the intersection of 1060 North and 1360 East, manways, tunnel inlet and outlet portals, air vents, access points to the strain gauges, which create minor long-term visual impacts in the landscape. Disturbed areas would be reclaimed and restored to preconstruction conditions upon construction completion. The visible portion of the existing AA-1 pipeline, approximately a 400-foot section, would be removed and no longer visible. If easements for use of the park strips were obtained, the removal of mature trees and the replacement with new trees would be a visual impact along the residential streets. There would be a direct and temporary impacts with the implementation of the Preferred Alternative.

Variation A

Construction of Variation A would require considerable earthwork disturbance to reach the elevation for the new pipeline, stable soils, and to create a 'shelf' suitable for the approximately 1,750 feet of open cut construction from the Alpine Tunnel outlet along the steep hillsides. Located northeast of the Canyon Cove Estates neighborhood, the construction activities as well as the completed pipeline would be visible from locations west of the Project (see Figure 3-3). Rock bolts and reinforced concrete encasement would be used to anchor the pipeline

into the hillside including a texturized concrete overlay intended for blending with the existing landscape. There would be direct, indirect, and permanent impacts to visual resources from the pipeline being anchored to the hillside. After construction, the disturbed areas (not the concrete encasement) would be restored to a natural landscape. This would be visible during construction and until adequate time has passed to reclaim the site. There would be direct and temporary impacts with the implementation of this variation alignment.

Figure 3-3. Visual Impact from Variation A's Alignment.

Variation B

Variation B would include boring a new tunnel, approximately 1,450 feet long, that would intersect the existing Alpine Tunnel and terminate at an area east of the1060 North/1560 East intersection. The construction for the 156-inch diameter tunnel would require drilling a vertical shaft about 200 feet above the existing Alpine Tunnel near the intersection point of the new tunnel to remove the boring equipment and to connect the Variation B tunnel with the existing Alpine Tunnel. After construction, the area would be restored to a natural hillside landscape. This would be visible during construction and until adequate time has passed to reclaim the site. There would be a direct and temporary impacts with the implementation of this variation alignment.

Variation C

Construction activities would involve boring through the hillside for construction of a156-inch-diameter tunnel. Construction areas would be reconstructed and reclaimed to ensure a natural hillside landscape after construction. There would be a direct and temporary impacts with the implementation of this variation alignment. After construction, disturbed areas would be restored to their natural landscape. This would be visible during construction and until adequate time has passed to reclaim the site. There would be a direct and temporary impacts with the implementation of this variation alignment.

No Action Alternative

The No Action Alternative would not have direct or indirect impacts to the existing visual resources.

3.15 Wildlife

3.15.1 General Wildlife

The study area is located adjacent to the Timpanogos Wildlife Management Area (WMA). The Timpanogos WMA consists of rolling hills and steep foothills containing sagebrush, native grasses, and Gamble oak brush habitat. This land provides winter habitat for chukar, cottontail rabbit, mourning dove, mule deer, elk, and Rocky Mountain bighorn sheep.

3.15.2 Conservation Agreement Species

A conservation agreement (CA) is a voluntary agreement that provides incentives for non-federal landowners to conserve candidate and other unlisted species that are likely to become candidates for listing in the future. Under Title 43, Section 24.6 of the Code of Federal Regulations and Title 23 Chapter 22.1 of the Utah Code, the Utah Division of Wildlife Resources (UDWR) may enter into cooperative agreements for purposes of wildlife conservation. All parties involved in these agreements have statutory responsibilities that cannot be delegated, particularly with respect to the management and conservation of wildlife, its habitat and the management, development, and allocation of water resources.

3.15.3 Greater Sage Grouse

Greater sage-grouse (*Centrocercus urophasianus*) is given special conservation considerations through a conservation partnership involving multiple federal agencies and western states, including the State of Utah. Although greater sage-grouse is not protected under a formal CA, it is afforded special protections and potential impacts to the species resulting from state or federal actions must be considered.

3.15.4 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) established protection for migratory birds and their parts (including eggs, nests, and feathers) from hunting, capture, or sale. Executive Order 13186, signed on January 10, 2001, directs federal agencies to take actions to further implement the MBTA. Specifically, the Order directs agencies, whose direct activities will likely result in the take of migratory birds, to develop and implement a Memorandum of Understanding (MOU) with USFWS that promotes the conservation of bird populations.

3.15.5 Bald Eagle Protection Act of 1940

This law provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.

3.15.6 Affected Environment

General Wildlife

The study area is in the foothills near the Timpanogos WMA but does not include mountainous or heavily forested areas. Due to the study area's proximity to roads, buildings, and the human environment, some of the area within and adjacent to the study area are highly disturbed and would not be considered ideal wildlife habitat. The less disturbed areas within the study area likely provide adequate foraging, cover, and breeding habitat for small mammals, game birds, songbirds, and ungulates.

Conservation Agreement Species

Table 3-7. Animal Species of Concern.

Animal Species	½ mile radius	2-mile radius	Last Observation Year
Columbia Spotted Frog (*Rana luteiventris*)	Y	N	1965
Least Chub (*Lotichthys phlegethontis*)	Y	N	1931

Source: Utah Natural Heritage Program Online Species Search Report, March 16, 2022.

Greater Sage-grouse

Occupied lek data and the boundaries of established Sage-grouse Management Areas (SGMAs) were reviewed to determine the likelihood of greater sage-grouse occurring in the study area. The study area is more than 23 miles from the closest known lek and is not located in an SGMA. There is no suitable habitat for greater sage-grouse in the study. Given these conditions, greater sage-grouse does not occur in the study area.

Eagles and Migratory Birds

The Utah Natural Heritage Program (UNHP) data revealed two peregrine falcon nesting sites 0.5 to 2 miles outside of the study area. The data indicated that the sites have been observed over multiple years and were last recorded in 2006. Both nesting sites were recorded outside of the study area. In addition, the May 6, 2022, onsite survey indicated the presence of red-tail hawks and their nest in the rocky bluffs located near the study area. Nesting has potentially occurred for several years at this location. Within the study area, several potential migratory bird nests were noted during the onsite survey.

3.15.7 Environmental Consequences

Preferred Alternative and Variations A, B, or C

General Wildlife

The Preferred Alternative nor Variations A, B, or C would have no long-term negative effects to wildlife. No construction would occur within the Timpanogos WMA, and effects to wildlife would be isolated and unlikely to contribute to declines in local population levels. Wildlife in the area is likely familiar with human disturbance due to the number of biking and walking trails in the area and would be able to use adjacent lands during the temporary construction window. Additionally, wildlife disturbance would be localized, temporary, and minimal due to the linear and fast-moving nature of the construction activities. Revegetation in the spring and early summer at the project's elevation and location would likely occur rapidly, which would minimize the disruption of habitat use by wildlife.

Conservation Agreement Species

No species protected under a CA occur in the study area. Therefore, there would be no direct or indirect impacts to CA species from the Preferred Alternative or variations.

Greater Sage-grouse

Greater sage-grouse do not occur in the study area. Therefore, there would be no direct or indirect impacts to the species from the Preferred Alternative or variations.

Eagles and Migratory Birds

Potential impacts to migratory birds would be avoided through implementation of the BMPs and mitigation measures identified in Section 3.17.11. Neither the Preferred Alternative nor any of the variations would result in take to migratory birds. Eagles do not occur in the study area. Therefore, neither the Preferred Alternative nor any of the variations would result in take to eagles.

No Action Alternative

The No Action Alternative would have no direct or indirect impacts to CA species, greater sage-grouse, migratory birds, eagles, or other wildlife species. The District would continue ongoing OM&R of existing facilities as needed. In the event of a pipeline rupture, there could be minor direct temporary impacts to wildlife during OM&R activities.

3.16 Cumulative Impacts

Cumulative impacts are the impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (40 CFR §1508.7). Cumulative impact analysis is focused on the sustainability of the environmental resource in light of all the forces acting upon it and can result from individually minor but collectively significant actions taking place over time.

The cumulative impact analysis focuses on environmental resources that would have direct or indirect impacts, or which may be affected by a connected action. However, it must first have a direct or indirect effect on the resource concern or be connected to the associated action to have a cumulative effect.

3.16.1 Cumulative Impacts Analysis

All resources of concern analyzed would not be subject to cumulative impacts because there are neither direct nor indirect impacts, or the resources would not be subject to cumulative impacts because they by nature do not result in cumulative impacts. Table 3-8 identifies the resources and whether the Preferred Alternative would have a cumulative impact.

Table 3-8. Cumulative Impacts.

Resource	Cumulative Impact (Yes/No)	Rationale
Air Quality	No	Temporary impacts
Climate Change	No	Temporary impacts
Cultural Resources	No	No impacts
Geological Hazards	No	Unavoidable crossing of WFZ
Groundwater	No	No impacts
Indian Trust Assets	No	No impacts
Public Health and Safety	No	Temporary impacts
Socioeconomics	No	No impacts
Soils	No	Temporary impacts
Threatened and Endangered Species	No	No impacts
Transportation and Utilities	No	Temporary impacts
Vegetation and Invasive Species	No	Temporary impacts
Visual Resources	No	Temporary impacts
Wildlife	No	Temporary impacts

3.17 Mitigation Commitments

Proactive measures would be implemented to avoid or prevent adverse impacts that could otherwise result from project measures. In addition to BMPs, the following mitigation commitments for air quality, climate change, cultural resources, geological hazards, hazardous

wastes, invasive species, noise and vibration, soils and vegetation, transportation and utilities and wildlife, would be part of the construction contract.

3.17.1 Air Quality

BMPs would be employed during construction to mitigate for temporary impacts on air quality due to construction related activities. The BMPs may include:

- The application of dust suppressants and watering to control fugitive dust.
- Minimizing the extent of disturbed surfaces.
- Restricting earthwork activities during times of high wind.
- Establishing appropriate construction zone areas and stabilizing exits to reduce soil track-out onto the adjacent roadways.
- Slower speed limits on access roads to limit the amount of dust.
- If sediment is tracked off-site onto adjacent roadways, the sediment would be collected by sweeping and/or shoveling and disposed of in a stable location.
- Material stockpiles would be wetted to prevent wind-blown emissions.
- Vegetative cover would be established on bare ground as soon as possible after grading to reduce wind-blown dust.
- Use of properly operating well-maintained construction equipment.

3.17.2 Climate Change

BMPs would be employed during construction to mitigate for temporary impacts on climate change due to construction-related activities. The BMPs may include requirement of appropriate emission-control devices on all construction equipment.

3.17.3 Cultural Resources

Construction activities could have the potential to discover previous, unknown, cultural resources or Native American artifacts. In the event of a discovery, construction activity would be suspended, a treatment plan developed immediately, and coordination with SHPO.

3.17.4 Geological Hazards

Design considerations for crossing the WFZ must be accommodated by movement in the pipeline, or the surrounding ground as opposed to resisting the movement through force. Some methods include increasing pipe wall thickness, using welded steel pipe, pipe yielding, pipe stacking (zig-zag configuration across the fault so that the pipe can expand and contract during an earthquake), designing around pipe strain limits, and providing movable and yielding backfill around the pipeline. Recommendations also include a soil/pipe structural analysis to identify and confirm reasonable design and mitigation approaches (Jacobs 2020).

3.17.5 Hazardous Wastes

BMPs would be employed during construction to mitigate for hazardous wastes due to construction-related activities. The BMPs may include:

- All hazardous waste materials, including wastes, petroleum products, and solid wastes, would be handled, stored, and disposed of in conformance with federal and state regulations to prevent soil, groundwater, or surface water contamination.
- The Utah Division of Environmental Response and Remediation (DERR) would be contacted immediately if any contaminated soil or hazardous material is discovered during construction, including petroleum hydrocarbons or other previously unidentified hazardous materials or contaminated soils. The appropriate characterization and handling of the material would be conducted in accordance with DERR guidance.
- Absorbent pads or sheets would be readily available onsite. If onsite maintenance of construction equipment is required, absorbent pads would be placed under likely leak or spill sources. Mitigation for incidental spills or leaks of hydraulic fluid or diesel fuel from construction equipment would be implemented, including cleaning up the spill immediately, removing contaminated soil from the site, and properly disposing of it in conformance with federal and state regulations.

3.17.6 Invasive Species

BMPs would be employed during construction to mitigate for invasive species due to construction-related activities. The BMPs may include:

- Weed removal or reseeding after construction would be applied as required by landowners.
- BMPs would be utilized during construction and the District's Integrated Pest Management Plan would be implemented after construction for ongoing monitoring and treatment of invasive species.

3.17.7 Noise and Vibration

BMPs would be employed during construction to mitigate for noise and vibration due to construction-related activities. The BMPs may include:

- The JLAs would comply with applicable federal, state, and local laws, orders, and regulations concerning the prevention, control, and abatement of excessive noise and vibration.
- The contractor may be required to monitor for vibration when construction activities are within city streets and near residential dwellings.

3.17.8 Public Safety and Health

BMPs would be implemented to minimize the potential for risk and safety concerns during construction in the residential streets. The BMPs may include:

- At all times, construction fencing would be around the perimeter of construction zones to warn and keep out non-construction persons.

- Cover all open trenches with heavy metal plates outside of construction times.
- Use of orange construction signs warning of risk.
- A public information plan would be prepared and distributed, including project schedule, status, utility disruptions, and contact information.
- Construction traffic would maintain minimum driving speeds within residential neighborhoods.

3.17.9 Soils and Vegetation

The following BMPs would be implemented to minimize the potential for soil erosion, particularly in areas with steep slopes within all alignments:

- Erosion-control measures would be installed as necessary immediately during and after construction to control and minimize erosion and runoff; including but not limited to silt fencing, straw bales, application of gravel or riprap, and minimization of disturbed vegetated areas.
- Topsoil and excavated soil would be salvaged and stockpiled adjacent to trenching activities and used to fill in the open trenches as soon as possible upon completion of pipe installation.
- Where compatible with land use, disturbed areas would be reseeded to stabilize soils and reduce erosion with native vegetation.
- A Stormwater Pollution Prevention Plan (SWPPP) would be prepared in compliance with Section 402 of the Clean Water Act (CWA); which would describe measures to minimize erosion and soils from leaving the Project site during construction activities.
- The Preferred Alternative and alignment variations would avoid the landslide complex. The Preferred Alternative would be designed to current seismic standards for the 975-year event. More information regarding the design techniques used for crossing seismic zones is found in Section 2.5.1 in Chapter 2.
- If vegetation is removed during the migratory bird breeding season (May 1 through August 31), a qualified biologist would conduct nesting surveys within the construction footprint and within 100-foot buffer zone, prior to construction activities, to verify that no migratory birds are nesting in the vegetation to be removed. The surveys would be conducted in consultation with USFWS.
- Disturbed areas would be reseeded with native vegetation, and the District's Integrated Pest Management Plan would be implemented after construction for ongoing monitoring and treatment of invasive species.

3.17.10 Transportation and Utilities

BMPs would be required by the contractor during construction to mitigate for expected transportation impacts including:

- Where possible, the use of residential urban streets for construction haul routes would be minimized.

- Traffic control plans would be developed in coordination with Orem City and Utah Department of Transportation (UDOT) to minimize impacts to the public.
- A public information plan would be prepared and distributed, including project schedule, status, utility disruptions, and contact information.
- Advance notice for road closures, detours, and delays would be provided.
- Access to residences would be maintained as possible. Although vehicle access to driveways would be restricted for likely several weeks, walk-in and emergency access would be provided.
- Detailed inventory of utilities and utility providers would be prepared to minimize disruption in utility service.

3.17.11 Wildlife

The following mitigations would be implemented to minimize disturbance to migratory birds and raptors caused by construction:

- All vegetation in the construction area would be cleared and grubbed outside the nesting season for most migratory birds (April 1 – July 15).
- Construction activities, including storing equipment and parking vehicles, would not take place directly above or below the red-tailed hawk nest during the seasonal buffer for the nesting season (March 15 – August 15).

4 Consultation and Coordination

Chapter 4 describes the early and ongoing coordination activities and summarizes key issues and pertinent information received through coordination with the public and various agencies.

4.1 Public and Agency Scoping Process

As part of the National Environmental Policy Act (NEPA) process, the Section 106 process of the National Historic Preservation Act (NHPA) of 1966 and requirements found in Central Utah Project Completion Act (CUPCA) legislation, the Joint Lead Agencies (JLAs) initiated a public scoping process to inform the public and agencies about the Environmental Assessment (EA), the purpose and need (as defined by NEPA), and the proposed Alpine Aqueduct Reach 1 Replacement and Resiliency Project (Project) and to gather input regarding issues to be analyzed in the EA.

Scoping was conducted in accordance with the Central Utah Water Conservancy District's (District) 2016 *Handbook for the National Environmental Policy Act* and NEPA regulations in 40 Code of Federal Regulations [CFR] §1501.9. Both outline an early and open process to determine the scope of issues for analysis to be addressed and for identifying the significant issues related to a proposed action.

The purpose of scoping is to obtain information that will focus the NEPA analysis on the potentially significant environmental issues and de-emphasize insignificant issues. Scoping engages the general public and other entities that may have an interest in the project with the goal of soliciting input on the issues, impacts, and potential alternatives to be addressed in the NEPA document.

4.1.1 Scoping Process

The public scoping process was initiated in October of 2021 using a variety of methods to advertise the beginning of the NEPA process. A Public Meeting was held on November 30, 2021. The actions for the public meeting included the following:

- Letters mailed to Orem residents located near the study area.
- Letters mailed to federal, state, and local agencies and interested parties, Native American Tribal Governments, and Bureau of Indian Affairs.
- An announcement posted on the District's website with project information, including the *Resiliency Assessment* (Jacobs 2020), the Scoping Document, the Public Meeting presentation materials, and instructions on how to provide feedback.
- Legal notices with pertinent information were advertised in the *Daily Herald, Salt Lake Tribune,* and *Deseret News* two weeks prior to the meeting.
- Social media posts were published on Orem City's page and the District's pages during the scoping process.

All the previous forms of notification included Project information:

- Listing the project proponents (the Joint Lead Agencies).
- Stating that a NEPA document will be prepared.
- Including the Project purpose and need.
- Soliciting comments as part of scoping.
- Announcing the Public Meeting.
- Publishing contact information, including telephone numbers and email and website addresses.

The formal comment period began on November 15, 2021 and ended on December 20, 2021. Interested parties were offered a variety of ways to submit comments.

4.1.2 Scoping and Coordination Meetings

In addition to the Public Meeting, Table 4-1 lists other meetings held to discuss comments and concerns with agencies, stakeholders, and the public as part of the coordination process for this EA. A summary of the discussion points for each meeting are included. In addition to the meetings listed, internal study team meetings were held throughout the development of this EA.

Table 4-1. Scoping and Coordination Meetings.

Date/Meeting Type	Attendees	Discussion Items
Oct. 8, 2021 Orem City Coordination Meeting	District Horrocks Engineers Orem City	• Study overview and NEPA process. • Stakeholder outreach. • Ongoing coordination.
Oct. 26, 2021 Orem City Council Work Session	District Orem City	• Study overview. • Environmental schedule. • Public Meeting. • Ongoing coordination.
Nov. 2021 Canyon Cove Neighborhood	District Canyon Cove Neighborhood Representative	• Study overview. • Environmental schedule. • Next Steps.
Nov. 2021 Utah County Commission	District Bill Lee, Utah County Commissioner	• Study overview. • Environmental schedule. • Next Steps.
Nov. 2021 Utah Senate	District Senator Mike Kennedy	• Study overview. • Environmental schedule. • Next Steps.

4.1.3 Public Scoping Meeting

The JLAs held an in person Public Scoping Meeting to present overall project information, answer questions, and gather public input. It was held on Tuesday, November 30, 2021, from 5:30 – 7:30 p.m. at the District's Building 2 (1426 East 750 North, Building 2, Orem, UT 84097). Twenty-four people signed in at the Public Meeting.

4.1.4 Input Received During the Scoping Period

The study team received a total of 11 comments throughout the scoping period. The commenters addressed topics such as suggested pipeline alignments, resiliency measures, construction timeline and process, pipeline materials, accessibility to homes during construction, the right-of-way process, maintenance disruptions, and safety. Comments and responses can be found in Table 4-2.

Table 4-2. Public Comments and Responses.

Number	Comments	Responses
1	I have the following questions/concerns: 1A. I haven't been able to find a map of the fault lines that run through our neighborhood that matches the one you gave me. Would you mind giving me the source of the map? 1B. The proposed route for the new pipeline avoids the landslide but still crosses a number of fault lines on the map you provided. In the information you provided, it states that fault displacement may range from 8-17 feet. If we have an event, I'm not sure having a pipeline run through our neighborhood is any better than having one above it. In my opinion, it would be best to avoid having the pipeline cross any of the fault lines. Could the pipeline be brought down the road that leads to Mama Chus/ gas station then go up 800 North? I know there is a pipeline already there but could a second one be installed that parallels the other one? Would that allow the pipeline to avoid the fault lines? Also, I have heard several concerns from the neighbors. They are listed as follows: 1C. Limited access to their homes during construction. 1D. Traffic flow through the neighborhood during construction. 1E. Easements that may be granted to the CUWCD to access private property to install and maintain the pipeline. 1F. Risk of flooding if we have an earthquake.	1A. Current mapping of the faults is based on work completed by Jacobs/LCI as part of the AA-1 Resiliency Assessment Project Final Project Report (Resiliency Assessment). Section 3 and the references included in Section 11 of the Resiliency Assessment describe the geological characteristics of the site and present the current mapping of faults and other geological features. 1B. Unfortunately, crossing of the Wasatch Fault is not avoidable with any of the alignment variations as the Wasatch Fault extends north and south along the Wasatch Front and the pipeline is required to cross from east to west from the 10 MG Olmsted Reservoir to the DACRWTP. For pipelines that must cross fault lines, the best practice for design is to cross normal fault lines near perpendicular (60 degrees to 90 degrees) where possible and avoid alignments that are parallel to fault lines. This reduces potential damage to the pipeline to one crossing location rather than multiple ruptures along the length of the pipeline that parallels the fault. The realigned AA-1 pipeline would be designed and constructed to include specific measures to withstand and prevent rupture during a 975-year seismic event. An alignment down 1560 East south toward Mama Chus Restaurant would put a significant length of the AA-1 pipeline running parallel to the Wasatch Fault (between the eastern and central strand) on the hanging wall side of the fault which is expected to experience the greatest amount of displacement during a seismic event (see Figure 2-1). This is not considered to be as resilient of a design alternative compared to the Preferred Alternative on 1060 North which would cross the fault lines near perpendicular. Additionally, a pipeline in 800 North would be parallel to the 126-inch diameter Provo River Aqueduct and the older 1940's 96-inch diameter reinforced concrete Provo River Olmsted Siphon Pipeline. All three pipelines would cross the central strand of the Wasatch Fault in the same location. Since these pipelines are considered critical life-line facilities for water supply, placing these three pipelines in close proximity to one another greatly decreases the resiliency of each pipeline during a seismic event, as the failure of one pipeline could result in failure of another. 1C and 1D. See Section 3.17 for a full list of construction mitigations and commitments. During construction, vehicle access along the residential streets would be restricted during working hours and for extended periods of time depending on construction activities taking place. At all times emergency vehicle access to residential homes would be maintained. The contractor would be required to temporarily fence the work area to keep non-project related persons out of the construction site. As part of construction, the JLAs would implement construction scheduling and sequencing requirements to reduce disruption to the neighborhood. 1E. The Preferred Alternative and variations would require easements from landowners and Orem City for the pipeline alignment, access points, and construction right-of-way not located in the public road right-of-way or existing easement. Construction time could be shortened in residential neighborhoods if easements are granted for construction in landowner's park strips, which would be restored after construction. 1F. Leaving the Alpine Aqueduct Reach 1 in its current location has a greater chance of rupturing due to landslide activity and movement caused by an earthquake. The existing Alpine Aqueduct Reach 1 was designed and constructed in the late 1970s and early 1980s without fully understanding the risk of the landslide complex that the current pipeline traverses. Since the construction of AA-1, an increased understanding of the landslide risk has been gained. In addition, seismic design and construction standard practices have been improved to provide a more resilient pipeline design to accommodate the anticipated earthquake along the Wasatch Fault. The realigned AA-1 pipeline would be designed and constructed to specific measures to withstand a 975-year seismic event. A main consideration of realigning AA-1 is to avoid the active landslide and the issues associated with it. This risk of flooding due to a break caused by both landslide and fault displacement of the AA-1 would be much less by installing the pipeline around the landslide rather than leaving the existing pipeline in its current location.

Number	Comments	Responses
2	Reed R. Murray, Program Director Attention: W. Russ Findlay Department of the Interior, Office of the Secretary CUPCA Office 302 East Lakeview Parkway Provo, Utah 84606 Re: Alpine Aqueduct Reach I Replacement and Resiliency Project Environmental Assessment Dear Mr. Murray, Thank you for your correspondence, regarding the Department of the Interior, Central Utah Project Completion Act Office and the Central Utah Water Conservancy District evaluating a replacement alternative and resiliency measures for the Alpine Aqueduct Reach I (AA-I) near the mouth of Provo Canyon Environmental Assessment. The Hopi Cultural Preservation Office appreciates the Central Utah Project Completion Act Office's solicitation of our input and your efforts to address our concerns. The Hopi Tribe claims cultural affiliation to earlier identifiable cultural groups in Utah, including the Fremont cultural group. The Hopi Cultural Preservation Office supports the identification and avoidance of our ancestral sites and Traditional Cultural Properties, and we consider the archaeological sites of our ancestors to be "footprints" and Traditional Cultural Properties. The Hopi Cultural Preservation Office requests consultation on any proposal with the potential to adversely affect prehistoric cultural resources in Utah. If the cultural resource survey of the area of potential affect identifies prehistoric sites that may be adversely affected by project activities, please provide us with copies of the survey report, draft environmental assessment and any proposed treatment plans for review and comment. In addition, we recommend that if any cultural features or deposits are encountered during project activities, these activities must be discontinued in the immediate area of the remains, and the State Historic Preservation Office must be consulted to evaluate their nature and significance. If any Native American human remains or funerary objects are discovered during construction, they must be immediately reported as required by law. Thank you again for your consideration. Respectfully, Stewart B. Koyiyumptewa, Program Manager/THPO	The JLAs conducted a cultural resources investigation within the study area. No prehistoric cultural resources were identified. In addition, if any cultural features or deposits are encountered during construction, the JLAs would immediately cease activities in the area and consult with SHPO.
3	Chris, Thank you for the information. Three other questions for tonight. 3A. Why wasn't option 15 given more consideration? Cost? 3B. Is there any information on how the water would flow through the neighborhood if there were a rupture in the existing system and the current option under consideration? 3C. If the aqueduct were to rupture and flood homes in the neighborhood, would the CUWCD help with any of the costs to repair damage due to the flooding? Thanks,	3A. Option 15 in the Resiliency Assessment (Around the Landslide from Olmsted Reservoir, through Provo Canyon, 800 North, and paralleling the Provo River Aqueduct) was given detailed analysis and consideration. Although this option completely avoids the landslide, it crosses the eastern and central strands of the Wasatch Fault. Also, Option 15 would parallel the Provo River Aqueduct and the Provo River Olmsted Siphon Pipeline which are other major water delivery pipelines for north Utah and Salt Lake counties (see Response 1B above). Locating these major water supply pipelines within the same corridor reduces the overall resiliency of water supply for the Wasatch Front especially considering these pipes cross the Wasatch Fault in the same pipeline corridor. If one pipeline failed in this location, it could damage and/or remove the other pipelines from service, which could result in disrupting water service to approximately half of the Utah residents along the Wasatch Front. Additionally, Option 15 is substantially longer than other alignments considered, therefore increasing project costs and introducing additional constructability challenges associated with crossing of the Provo River and construction in the heavy traffic and utility congested 800 North roadway and along the Provo River Parkway trail. 3B. How the water would flow through the neighborhood upon a break or rupture largely depends upon where the break occurred and the surrounding topography. The previous breaks occurred at or near the above ground section of AA-1 near the Alpine Tunnel outlet portal. In this case, water flowed down through a natural ravine below the AA-1 pipeline and to 1560 East. However, since the proposed pipeline would be located in the public road right-of-way, it is anticipated in the event of a rupture, the flows would follow the natural drainage path of the roadway along curb and gutter and then into the storm drain. For flows that exceed the capacity of the roadway drainage, overland flow is likely and would follow the natural topography of the ground. Outside of the roadway, and where practical, drainage berms would be considered during preliminary and final design to help mitigate any potential overland flow. 3C. The District has a duty to use reasonable care in the engineering, design, and construction of the Alpine Aqueduct Reach 1 Relocation and Resiliency Project, and to continue to exercise that duty of reasonable care in the on-going operation, maintenance, repair, and replacement of this facility. The District could be held liable if the District is negligent in the performance of its duties and its negligence is determined to be the cause of any damages to person or property. As a governmental entity, the liability of the District would be subject to the provisions of the Governmental Immunity Act, Section 63G-6a-101, including its caps on liability. The District has liability insurance that would be responsible in the event the District were determined to have been negligent, and that negligence resulted in damages. The District could not be held liable for injuries caused by the negligence of others.

Number	Comments	Responses
4	This is the ideal pump location. Extend the green line to the headworks for the plant. This is likely more feasible that going north from the pump site, running the aqueduct above ground and into the headworks. Noting the projections from AIG Climate models for 2070, any routing of the distribution system would be negatively impacted from erosion caused by the projected increase in precipitation.	Thank you for your comment. The pump stations were removed from consideration as part of this Environmental Assessment. The installation of the new AA-1 pipeline may temporarily impact erosion during construction. The new pipeline would be buried or tunneled and designed to withstand the projected increase in erosion caused by increased precipitation.
5	Please try to schedule construction through the neighborhood - 1060 North/1360 East in spring/summer/fall - not during winter months when snow would further inconvenience residents having to park away from homes and make plowing of the streets difficult.	Please see Section 3.17 for a detailed list of construction mitigations and commitments. As part of construction, the JLAs would implement construction scheduling and sequencing requirements to reduce disruption to the neighborhood. A typical construction season in Utah extends from the springtime, through summer, and into fall. At this time, the construction schedule has not been set for the proposed reconstruction and realignment of AA-1.
6	I am writing to request access daily to my house on [Redacted] when you are doing the construction of the new pipeline. Please write it into the contractor's contract. Thank you, [Redacted]	See Section 3.17 for a complete list of construction mitigations and commitments. Walking and emergency access to homes would be provided. During construction, vehicle access along the residential streets in areas where active construction is taking place would be restricted during working hours and for extended periods of time depending on construction activities taking place. At all times, emergency vehicle access to residential homes would be provided. As part of construction, the JLAs would implement construction scheduling and sequencing requirements to reduce disruption to the neighborhood. Based on the location of your home on 1110 North, it would be anticipated that you would have continual access from either Ashby Place or 1360 East.
7	Please make daily access during the hours of 7 am thru 6 pm to the neighborhood and homes. Some are medical professional and need immediate access in and out of the neighborhood. Some homes have home businesses and have daily freight deliveries which need access as well. Please limit the working "closed" area to 200 feet or less at any one time. Keep the neighborhood clear of debris and dangers for children and mischievous teens.	As part of construction, the District would implement construction scheduling and sequencing requirements to reduce disruption to the neighborhood. See Section 3.17 for a complete list of construction mitigations and commitments. During construction, vehicle access along the residential streets in areas where active construction is taking place may be restricted during working hours and for extended periods of time depending on construction activities taking place. At all times, emergency vehicle access to residential homes would be provided. The JLAs and selected contractor would coordinate and communicate construction activities with the city, neighborhood, affected residents, and others that may be impacted during construction.

Number	Comments	Responses
8	I would like to thank you for holding the public meeting on November 30, 2021 regarding the Alpine Aqueduct Reach 1 Replacement and Resiliency Project. Many of the questions and concerns that I had with the project were addressed at the meeting; however, a few remain. At the meeting, I was told by Adam, Dave and Chris that I would receive follow-up on my remaining concerns. They are as follows: 8A. It is my understanding that the majority of structural issues with the current pipeline have occurred in the area of the pipeline that is now above ground located north of the cul-de-sac on 1560 East. The natural flow of water from this area of pipeline is down 1560 East and if there were a problem with the pipeline, water from it would flow down the road avoiding the majority of homes in the Canyon Cove Estates neighborhood. If there is an issue with the pipeline west of the exposed area, I'm not sure how it being underground would affect the flow of the water but, any surface water should flow downhill and a good portion of that water would probably run through the Pedersen's property avoiding most of the homes in our neighborhood. Moving the pipeline would disrupt the natural flow of water and increase the risk of water damage to homes in our neighborhood. 8B. It is my understanding that CUWCD is going to use materials to construct the new pipeline and the immediate area around the pipeline that will mitigate the likelihood of the aqueduct rupturing or being displaced or compressed in a seismic event. I was shown an example of the material that may be used at the meeting and told about various other materials that may be used. I would like to know what materials will be used and that they have been tested to withstand the potential 8-17 feet of vertical displacement and other damage that may occur in a seismic event. I've looked at companies that make pipelines in Japan that are engineered to withstand earthquakes, material such as Geofoam, etc. and if you read the small print I am not sure they are made to withstand the amount of displacement that is described in the report generated for the CUWCD by Jacobs. 8C. At the meeting, we were told that it takes 30-60 minutes to stop the water upstream after a leak is detected. Is there current technology that would allow CUWCD to determine a leak sooner than the technology currently in place and that would decrease the time window of turning the water off upstream? 8D. In proposal #3, the new aqueduct would turn uphill onto 1360 East. If there were a leak, I assume the pipeline would lose pressure and the water headed uphill to the treatment facility would lose its forward momentum and reverse direction and run downhill. Is there a way to gate the pipeline to minimize the amount of water that would run downhill if a leak were to occur? 8E. Last, I know in other areas such as golf courses next to neighborhoods that liability is determined by what was built first. For example, if the golf course was built prior to the homes, the golf course does not have any liability for a window in a home being broken by a golf ball. If the homes were there first, then the golf course is liable for the damage. With this proposed aqueduct route through our neighborhood, would CUWCD have any financial responsible for water damage to homes from a failed pipeline? Dave told me he would ask CUWCD's legal department this question and get back with me. Sincerely, [Redacted]	8A. Historical failures of the AA-1 pipeline at the location where it is currently above ground occurred prior to 2002 when the pipeline was still located below ground. These failures have occurred because of landslide movement. The 2017 landslide movement along the pipeline, which occurred to the west of previous failures, has raised concern for the entire length of AA-1's resiliency and reliability due to the ongoing landslide issues. Construction of a new pipeline would not change the drainage patterns of the existing site as the new pipeline would be buried below ground and the surface drainage features would remain unchanged. In the event that a shallow groundwater layer was encountered during construction, its flow path would naturally follow the pipeline due to the soils. 8B. It is proposed that the replacement AA-1 pipeline be constructed of welded steel with restrained welded pipe joints and designed to current seismic standards to withstand a 975-year seismic event. Welded steel is considered a flexible and ductile material capable of handling displacement and movement during a seismic event. Other measures may include: • Use of movable and lightweight backfill material around the pipeline to reduce pipeline stresses during a seismic event. • Use of minimal fill material on top of the pipeline which would allow the pipe to lift out of the ground during a seismic event (see Section 4.1.2.2 in the *Resiliency Assessment*, Jacobs 2020); and avoid rupture due to external soil loads imposed on the pipeline. • Stack the pipe or using a zig zag alignment to accommodate the elongation of the pipeline (see Section 4.1.2.3 in the *Resiliency Assessment*, Jacobs 2020) and provide the ability to accommodate fault displacement. Other measures as outlined in section 4.1.2 in the Resiliency Assessment may be utilized. Chapter 2 of the Environmental Assessment provides more design information. 8C. Currently, the time to close the valve at the 10 MG Olmsted Reservoir is dictated by operations and safety protocols. Rapidly closing a valve on a large diameter pipeline causes an unsafe environment and can cause major damage to the pipeline, its appurtenances, and adjoining systems. The JLAs are committed to designing and constructing the safest and most reliable pipeline for the AA-1 project. In the event of an emergency, the District would close the valve as fast as possible without endangering employees, the public, or damaging the pipeline. 8D. Adding a valve at this location would require a large concrete valve box to be located in the street or within private property. The comment suggests that if the break occurred between this new valve and the DACRWTP, it could be shut to reduce water leaving the pipe and damaging homes in the area. However, valving for large diameter pipelines cannot be closed rapidly (see discussion about valve shut times on large diameter pipelines above in Response 8C). 8E. See Response 3C.

Number	Comments	Responses
9	Central Utah Water Conservancy District c/o Alpine Aqueduct Reach 1 Project 1426 East 750 North, Suite 400 Orem, UT 84097-54742 On behalf of the [Redacted], we appreciate the opportunity to comment on the proposed Alpine Aqueduct Reach 1 Replacement and Resiliency Project. My wife and I attended the November 30, 2021 Open House and we have considered the explanations we received at that time and we have studied the materials you provided. In summary, we are very concerned about the proposal to route a new aqueduct along 1060 North. Our primary concern is that this proposal exposes our home – and all other homes in our neighborhood that are downhill from the proposed route – to greater long-term risk of water problems than the risk we currently have. In addition, we have the normal concerns about construction and maintenance disruptions in the neighborhood. Risk Exposure We moved into our home in the spring of 2011. With the first spring rains, we discovered that our window wells would rapidly fill with water. We (and our extended family when we were out of town) were constantly on-call to drop submersible pumps into the window wells whenever it rained. 9A. In speaking with neighbors, we discovered that they also had ground water problems, and many had installed drainage systems to mitigate the problem. After fighting the problem for a few years, we ultimately installed drainage systems in each of the three window wells that had the problem. Those holes for those systems were deep, well below the house footings. Much to our relief, this seemed to solve the problem. However, after several months, the same problem began appearing in other window wells that had never had the problem. We ultimately applied the same solution, and we have not had a problem in any of our window wells since. What we suspect is that there are groundwater flows under our neighborhood. When those flows are disrupted – as will most certainly be the case if the aqueduct is installed along 1060 North – the water will move to the next route of least resistance, and we will see new groundwater problems in neighborhood homes. Further, if there is ever a leak in the new aqueduct, the leaked water will find its way into our underground water flows, and potentially be exposed as water problems in neighborhood houses. As you likely know, the resolution of a groundwater problem in a house is not a trivial expense. So, the question is – will the Central Utah Water Conservancy District indemnify our neighborhood against any new groundwater problems our houses encounter during or after construction of the new 1060 North aqueduct? At the Open House when we expressed concern about potential flooding and groundwater problems, the response was to minimize the concern. We heard responses like: 1. "The pipe used for the new aqueduct will be very thick and won't have many leaks." Our reaction – if that's the case, replace the existing aqueduct with that kind of pipe or better – or put that kind of pipe along 800 North. 9B. "If there is an earthquake that breaks the new aqueduct, water flooding will be the least of our problems." Our reaction – the same logic applies to the existing aqueduct. We should not minimize the ongoing concern by simply referencing an extreme catastrophe. 9C. "Your neighborhood already has water problems, just think of the heavy rainstorm several years ago that flooded homes in your neighborhood." Our reaction – that was a heavy rainstorm over a broad area that affected a few houses. It was not a concentrated break in a 7 or 8-foot pipe that is full of water. Imagine the pressure and resulting blast of water and erosion that will surely inundate houses that are only a few yards from such a break. 9D. Construction and Maintenance Problems All the problems associated with a major construction project in a compact neighborhood with many children are too many to mention. However, in addition to the disruption and inconvenience for months, we are extremely concerned about the danger such a project presents for children. This is a neighborhood that is busy with children in the streets and yards – and that is one of the desirable things about our neighborhood. Heavy machinery, large pipes, deep holes, re-routed traffic, etc. all seem like a recipe for serious accident. 9E. The same is true as maintenance will surely be required over time, and that maintenance may bring heavy equipment, excavation and industrial materials into the neighborhood. All of these create the same risk to children as the original construction. Summary All in all – it seems that installing a major pipeline in a hillside neighborhood that already has groundwater and soil stability problems has great potential for more extreme problems. It seems to move the problem from one point in our neighborhood to another – but much closer to many more houses. There are groundwater issues in our neighborhood, and people have adapted to and resolved most of those problems. A new pipeline along 1060 North potentially disrupts those solutions and opens the door to more concentrated water problems in houses that are right next to the pipeline. The risks to children that are created by heavy construction, excavation, and pipeline maintenance in a neighborhood full of children cannot be minimized. Given the nature of our neighborhood, these risks alone may necessitate moving the plan to an alternative route. 9F. We believe there must be other solutions to the aqueduct issues that currently exist – and suggest those alternatives take priority. Sincerely, [Redacted]	9A. Refer to Section 3.6 in Chapter 3 for more information on groundwater. In researching groundwater for the analysis, the recorded groundwater depths either from water rights well logs or from studies indicate that the groundwater levels in the study area are more than 140 feet below the surface and could be deeper in today's drought conditions. There are no recorded springs other than Orem City's two springs located in Provo Canyon which are well outside the study area. The pipeline installation would include bedding and filling materials for the support and structural stability of the pipeline. These soil types are coarse-grained soils which are porous and conducive for conveying any water in the ground. In the event that a shallow groundwater layer was encountered during construction, its flow path would naturally follow the pipeline due to the soils. The depth of the trench for the realigned AA-1 pipeline through the neighborhood is anticipated to be about 12 feet. A geotechnical report that was required for the development of the eastern portion of the subdivision was reviewed as part of this project. To determine the geotechnical characteristics for this area, 11 test pits were dug that ranged between 8-12 feet in depth. No groundwater was found at any of these test pits. More detailed geotechnical investigations would be conducted during the design phase of the proposed Project. 9B. See response 8B. To summarize what was discussed during the open house, the pipeline would be constructed of welded steel with watertight (zero leakage) welded joints and designed to withstand a 975-year seismic event. The potential for leakage is if the pipeline ruptures following a seismic event greater than the 975-year event. The realigned AA-1 pipeline would be designed and constructed away from the landslide (cause and location of previous breaks) and would not be placed into service until pressure testing the pipeline and confirmation that the pipeline has zero leakage. 9C. Locating the pipeline away from the existing landslide increases the overall resiliency of the system and greatly reduces the chances of pipeline rupture, leakage, and flooding. 9D. See section 3.17 in Chapter 3. The contractor would be required to temporarily fence the work area to keep non-project related persons out of the construction site. The JLAs are committed to maintaining a safe construction zone for all those that either live nearby or are part of the construction process. 9E. Ongoing and routine maintenance is part of any buried utility. It is anticipated that the majority of the maintenance activities would not be intrusive (e.g., above ground visual inspections, inspections inside the pipeline) and would not require ground disturbing activities. However, should the need to uncover the pipeline through the neighborhood arise, those impacts would be temporary in nature. Coordination and communication with the city and nearby residents would take place. 9F. The JLAs conducted an extensive evaluation of 15 different options as part of the *Resiliency Assessment*. The JLAs have determined that the Preferred Alternative (and its variations) meet the Project purpose and need as defined in Chapter 1.

Number	Comments	Responses
10	1452 E 920 N Orem To whom it may concern, My name is [Redacted] and I live at [Redacted] which is next to the new proposed path foe the new aqueduct. I do have a few questions? 10A. Have you found that there is a drop in home values because people prefer not to live next to the aqueduct? 10B. Are you planning to compensate homeowners for the loss in value of their homes because people prefer not to live next to this aqueduct? 10C. If there is ever a break in the aqueduct that causes damage to homes nearby is there an insurance policy in place to compensate homeowners? 10D. Is there an earthquake policy in place that covers damage to homes in the event of an earthquake? 10E. What is the timeframe to complete the new aqueduct? 10F. When will the new route be decided? Thanks for your time. I look forward to hearing back from you. Can you please reply that you received these questions?	10A. In other areas of Utah County where large diameter water pipelines have been constructed through existing neighborhoods, there has not been a drop in home values. The value of homes continues to increase in today's housing market. The pipeline would be buried and not visible and unless a seismic event occurs causing ground movement and exposure of the pipeline, there would be no issues as a result of a pipeline being under the streets. As part of the Bonneville Unit of the CUP, the JLAs have constructed over 128 miles of pipelines. One example is the Spanish Fork-Provo Reservoir Canal Pipeline (SFPRC) which is part of the ULS. The SFPRC delivers water from Strawberry Reservoir to Salt Lake County (though a connection to AA-1). This pipeline extends for about 30 miles beginning at the mouth of Spanish Fork Canyon to the mouth of Provo Canyon. It is a buried 60-inch welded steel pipeline which was constructed through residential areas including the cities of Mapleton, Springville, Provo, before terminating in Orem with a connection to AA-1. The home values along the alignment of this pipeline have not dropped in value since construction. 10B. See Response 10A above. After construction, there would be no long-term impact to homeowners. 10C. See Response 3C above. 10D. Please contact your homeowners insurance company to determine what policies could be obtained. 10E. Design of the AA-1 project is anticipated to start in late fall of 2022 and would last for approximately one year. Construction is estimated to begin in the spring of 2024 and be completed by the fall of 2026. Construction in the neighborhoods would take approximately 6 to 9 months, with full construction of the pipeline schedule being closer to 2 years. 10F. Currently, the JLAs are in the NEPA phase of the project and are producing this EA. It is anticipated that the new route would have approval for construction upon completion of this EA and subsequent decision document. The EA is anticipated to be completed in the fall of 2022.
11	My concerns about the proposed rerouting of the Alpine Aqueduct are as follows: 11A. Moving it into our neighborhood increases the risk to life and property in the event of an earthquake. It does not reduce the number of fault lines crossed but put the risk directly among people and their homes. I understand that the intent is to avoid the landslide area but putting it through the neighborhood also makes it far less accessible for repairs, which seems like a paramount concern if the primary goal is to keep water flowing to the million + users. Surely there will be some repairs required either way. 11B. It also seems like the damage would be much more likely to be catastrophic in an earthquake as opposed to the damage and maintenance required in the slow-moving slide area. As a result, the risk to us and our homes would be compounded - from earthquake damage and then significant flood damage as well. 11C. At the open house, much was made of how much more flexible the new pipe would be - we were shown a sharply bent piece of metal. But surely replacing the current pipe in its current location with more flexible material would make it much more resilient to movement of the landslide as well. Wouldn't the likely maintenance be reduced in that case as well? I would like the team to consider the potential for reducing maintenance costs in the current location. 11D. I'd also like the team to consider and share the cost comparison between the expected maintenance at the current location, the costs if the existing pipe were upgraded in the current location, and the costs of building the pipe in alternate, much longer route plus its maintaining it there. I was surprised that a cost comparison did not figure more prominently in the criteria defined in the materials I was sent. I expect that costs are rapidly rising with the recent building boom in Utah and the inflation around the country. 11E. In addition, I'd like the study team to consider putting in a gate in the pipe at the east side of the slide area so that the flow of water could more easily be stopped if repairs were needed. It seems like that would mitigate flood damage and facilitate repair and continued water flow more quickly than if the aqueduct has to be accessed under our roads and the water flow stopped well above us in the canyon. 11F. Also, at the open house, we were told that the study team had drilled extensively in the slide area to determine that tunneling to put the aqueduct below ground there was not feasible. But when I asked whether they had drilled under our neighborhood to test the stability of that soil, I was told they had not. I would very much like to see the results of such testing. 11G. We had a sewer line leak about 14 years ago. It was dug up and repaired - about 12 feed down at the street in front of our home. The area in the road and our gutter almost immediately settled and created a dip in the road and the curb where water collects and mosquitos breed in the summer. Many of our neighbors have experienced significant settling of their homes as well - one of them has had to shore up their foundation at significant cost. So, I'm concerned about whether the construction would exacerbate all of that and whether it is really suitable for putting such a large pipe in. 11H. Finally, I'm concerned about the damage construction may cause to our homes. The digging and heavy equipment 30 feet from my front door and going 30+ feet down will surely case significant vibration. So, I'm concerned about what that will do to the stability of our foundation and the whole structure. Thanks for your consideration. I am hopeful that you can find the best solution and I wish you luck with the project.	11A. The *Resiliency Assessment* (Jacobs 2021) extensively evaluated 15 Options and what would provide the best long-term reliability and resiliency for the AA-1 pipeline that provides critical water supply to over 1.6 million residents. Several options were evaluated that would utilize the existing AA-1 alignment and right-of-way. However, these alternatives would not avoid the landslide complex and would still be at risk of failure. The JLAs have determined that in order to provide the highest degree of resiliency and reliability, the pipeline should be moved outside of the landslide complex, which is located directly north of the residential area. Monitors in the landslide complex indicate that the area is constantly moving and continues to put more stress and strain on the existing AA-1 pipeline. As described in the EA and Resiliency Assessment, other alternatives were evaluated but eliminated. 11B and 11C. The realigned AA-1 pipeline would be designed and constructed to withstand the 975-year seismic event. The landslide is anticipated to move up to 10 feet during a 975-year seismic which would result in damage to the pipeline if it remained in that location. No upgrades or replacement within the alignment of the existing AA-1 pipeline would be able to withstand the amount of landslide movement that is anticipated during an earthquake. 11D. Reconstructing the pipeline in place would be a shorter route and require less capital investment than the Preferred Alternative. However, the Resiliency Assessment has shown that the Preferred Alternative would be 8 times more resilient than the existing alignment. Future costs of normal and extraordinary operation, maintenance, and replacement (OM&R) of a pipeline in the existing alignment would exceed the costs OM&R of the Preferred Alternative. Of a greater magnitude would be the cost of the interruption of water delivery to 1.6 million people due to the lower resiliency of the existing alignment which would make re-construction far too costly. 11E. See Responses 8C and 8D. 11F. During the Resiliency Assessment, the JLAs reviewed geotechnical reports. A geotechnical report was prepared prior to construction of the neighborhood per Orem City code. The subsurface materials appear to support the realignment of the AA-1 pipeline. 11G and 11H. See Section 3.17 in Chapter 3 for more information.

4.2 Agency Consultation and Coordination

This section contains a record of correspondence between the study team and federal, state, local, and tribal agencies. All correspondence letters (both sent and received) are shown in Table 4-3.

Cooperating agencies, as defined in the Council of Environmental Quality (CEQ) Regulations 40 CFR §1501.8, participate in the preparation and review of the EA because of their jurisdiction by law or special expertise (e.g., Section 106 of the NHPA, Endangered Species Act, and Section 404 of the Clean Water Act [CWA]). Cooperating agency letters were sent by the JLAs to Orem City, U.S. Bureau of Reclamation (Reclamation), Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission), and Utah County on November 11, 2021. Reclamation and the Mitigation Commission accepted the request.

Consultation letters were sent to Native American Tribal Governments that may have an interest in the proposed Project. These letters were sent by the U.S. Department of the Interior, Central Utah Project Completion Act Office (Interior) and included a copy of the scoping document.

Table 4-3. List of Cooperating Agencies and Native American Tribal Governments Consultation Letters Sent.

Date	To	From	Subject
Nov. 11, 2021	Orem City	Sarah Sutherland Environmental Programs Manager, District	Request to be a Cooperating Agency for the Alpine Aqueduct Reach 1 Replacement and Resiliency Project.
Nov. 11, 2021	Bureau of Reclamation	Sarah Sutherland Environmental Programs Manager, District	Request to be a Cooperating Agency for the Alpine Aqueduct Reach 1 Replacement and Resiliency Project.
Nov. 11, 2021	Utah Reclamation Mitigation and Conservation Commission	Sarah Sutherland Environmental Programs Manager, District	Request to be a Cooperating Agency for the Alpine Aqueduct Reach 1 Replacement and Resiliency Project.
Nov. 11, 2021	Utah County	Sarah Sutherland Environmental Programs Manager, District	Request to be a Cooperating Agency for the Alpine Aqueduct Reach 1 Replacement and Resiliency Project.
Nov. 15, 2021	Candance Bear Chairwoman Skull Valley Band of Goshute Indians	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.

Date	To	From	Subject
Nov. 15, 2021	Shaun Chapoose Chairman Ute Tribe Business Committee	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Harold Cuthair Chairman Ute Mountain Ute Tribe	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Vernon Hill Chairman Shoshone Tribe of the Wind River Reservation of Wyoming	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Jonathan Nez Chairman Navajo Nation, Arizona, New Mexico, Utah Navajo Nation Tribal Council	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Timothy Nuvangyaoma Chairman Hopi Tribe of Arizona	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Val Panteah Governor Zuni Tribe of the Zuni Reservation, New Mexico	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Darren Parry Chairman Northwestern Band of Shoshoni Nation of Utah	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Antonio Pingree Acting Superintendent Uintah & Ouray Agency Bureau of Indian Affairs	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.

Date	To	From	Subject
Nov. 15, 2021	Ona Segundo Chairwoman Kaibab Band of Paiute Indians	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Vickie Simmons Chairman Moapa Band of Paiute Indians	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Pami Borchardt Slayton Chairwoman Paiute Indian Tribe	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Nathan Small Chairman Shoshone-Bannock Tribes	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Lee Spoonhunter Chairman Northern Arapaho Tribe	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Rupert Steele Chairman Confederated Tribes of the Goshute Reservation	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Randy Thompson Acting Superintendent Fort Hall Agency	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	James Williams Superintendent Southern Paiute Agency	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 15, 2021	Mike Addy Superintendent Wind River Agency	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.

Date	To	From	Subject
Nov. 15, 2021	Curtis Anderson Chairman Las Vegas Tribe of Paiute Indians	Reed Murray Program Director, Interior	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment – Tribal Consultation – Section 202(a)(1) – Central Utah Project Completion Act.
Nov. 23, 2021	Reed Murray Program Director, Interior	Richard M. Begay Navajo Nation Heritage and Historic Preservation Department	Alpine Aqueduct Reach 1 Replacement and Resiliency Project.
Nov. 29, 2021	Reed Murray Program Director, Interior	Stewart Koyiyumptewa Program Manager Hopi Tribe	Alpine Aqueduct Reach 1 Replacement and Resiliency Project Environmental Assessment.
Jan. 24, 2022	Sarah Sutherland Environmental Programs Manager, District	Kent Kofford Area Manager, Reclamation	Request to be a Cooperating Agency for the Alpine Aqueduct Reach 1 Replacement and Resiliency Project.

5 List of References

American Lifelines Alliance (ALA), *Seismic Guidelines for Water Pipelines*, March 2005

https://www.americanlifelinesalliance.com/pdf/SeismicGuidelines_WaterPipelines_P1.pdf

Bowen Collins & Associated, Inc., *Orem City Water Master Plan*, March 2016 *http://orem.org/wp-content/uploads/2017/05/Orem-City-Water-Master-Plan-3_18_reduced.pdf*

U.S. Department of the Interior (Interior), Departmental Manual, Part 512 Chapter 2, December 1995

Jacobs Engineering Group Inc., Alpine Aqueduct Reach 1 Resiliency Assessment Project, October 2020

Golder Associates Inc, *Summary of Geotechnical Data Spanish Fork Provo Reservoir Canal Pipeline - Orem Reach 1B and Areas to North*, June 2013

Horrocks Engineers, Alpine Aqueduct Reach 1 Replacement and Resiliency Project. Utah Antiquities Project Number*U22HX0280,* May 2022

URS Corporation, *Geotechnical Evaluations Alpine Aqueduct – Reach 1*, August 2001

U.S. Department of the Interior, Central Utah Project Completion Act Office, Central Utah Water Conservancy District, Utah Reclamation Mitigation and Conservation Commission, *Utah Lake Drainage Basin Water Delivery System (ULS) Orem Reach 2 Realignment Environmental Assessment*, July 2015 *https://www.doi.gov/sites/doi.gov/files/uls-oremreach2-ea.pdf*

U.S. Fish & Wildlife Service (USFWS), *IPaC resource list*, February 16, 2022

U.S. Geological Survey (UGS), *Liquefaction Potential Map for a Part of Utah County, Utah*, August 1994

U.S. Geological Survey (UGS), *Groundwater Conditions in Utah Spring of 2018*, Cooperative Investigations Report No. 59, 2018 *https://waterrights.utah.gov/techinfo/wwwpub/GW2018.pdf*

U.S. Geological Survey (UGS), *Hydrology of Northern Utah Valley, Utah County, Utah 1975-2005 https://pubs.usgs.gov/sir/2008/5197/*

U.S. Geological Survey (USGS), Well Station 401853111401501, April 2022, *https://groundwaterwatch.usgs.gov/AWLSites.asp?mt=g&S=401853111401501&ncd=awl*

Utah Division of Air Quality (UDAQ), *Utah Nonattainment Areas*, March 2022

Utah Natural Heritage Program (UNHP), Utah Division of Wildlife Resources (UDWR), GIS files obtained March 16, 2022

Utah Seismic Safety Commission (USSC), *Utah Seismic Safety Commission Recommendations*, November 2021

Van Buren, R., Cooper, J.G., Shultz, L.M., and Harper, K.T. 2011. *Woody Plants of Utah*. Utah State University Press. Logan, Utah.

6 List of Preparers

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Abbreviations and Acronyms

AA-1	Alpine Aqueduct Reach 1
ACHP	Advisory Council on Historic Preservation
ALA	American Lifelines Alliance
APE	Area of Potential Effects
BMPs	Best Management Practice
CA	Conservation Agreement
CAAA	Clean Air Act Amendments
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CO_2	carbon dioxide
CUP	Central Utah Project
CUPCA	Central Utah Project Completion Act
CWA	Clean Water Act
CWP	Central Water Project
DACRWTP	Don A. Christiansen Regional Water Treatment Plan
DERR	Utah Division of Environmental Response and Remediation
District	Central Utah Water Conservancy District
EA	Environmental Assessment
EAP	Emergency Action Plan
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FPPA	Farmland Protection Policy Act
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
Interior	U.S. Department of the Interior, Central Utah Project Completion Act Office
IPaC	Information for Planning and Consultation
ITA	Indian Trust Asset
JLAs	Joint Lead Agencies
JVWTP	Jordan Valley Water Treatment Plant
JVWCD	Jordan Valley Water Conservancy District
LCI	Lettis Consultants International
M&I	Municipal and Industrial
M&I System	Municipal and Industrial System
MBTA	Migratory Bird Treaty Act

MG	million gallon
MGD	million gallons per day
Mitigation Commission	Utah Reclamation Mitigation and Conservation Commission
MOU	Memorandum of Understanding
MWDSLS	Metropolitan Water District of Salt Lake and Sandy
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NRHP	National Register of Historic Places
O_3	ozone
OM&R	operation maintenance & repair
Pb	lead
PM	particulate matter
$PM_{2.5}$	particulate matter 2.5 micrometers
PM_{10}	particulate matter 10 micrometers
POMWTP	Point of the Mountain Water Treatment Plant
PRA	Provo River Aqueduct
Project	Alpine Aqueduct Reach 1 Replacement and Resiliency Project
PRWUA	Provo River Water Users Association
Qaf	Quaternary alluvial fan
Qc	Quaternary colluvium
Qlb	Quaternary Lake Bonneville lacustrine gravel and sand
Qsa	Quaternary stream alluvium
Reclamation	Bureau of Reclamation
Resiliency Assessment	Alpine Aqueduct Reach 1 Resiliency Assessment Project
SGMAs	Sage-grouse Management Areas
Secretary	Secretary of the Interior
SFPRCP	Spanish Fork Provo Reservoir Canal Pipeline
SHPO	State Historic Preservation Office
SLA	Salt Lake Aqueduct
SO_2	sulfur dioxide
SWPPP	Storm Water Pollution Prevention Plan
UAC	Utah Administrative Code
UDAQ	Utah Division of Air Quality
UDOT	Utah Department of Transportation
UDWR	Utah Division of Wildlife Resources

UGS	Utah Geological Survey
ULS	Utah Lake Drainage Basin Water Delivery System
UNHP	Utah Natural Heritage Program
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USSC	Utah Seismic Safety Commission
WCWEP/DPR	Wasatch County Water Efficiency/Daniel Replacement Project
WFZ	Wasatch Fault Zone
WMA	Wildlife Management Area
WOTUS	Waters of the U.S.