BUREAU OF RECLAMATION

Draft Environmental Impact Statement
Truckee Canal Extraordinary Maintenance

Newlands Project, Nevada
Interior Region 10 · California-Great Basin

Estimated Lead Agency Total Costs Associated with Developing and Producing this EIS
$2,179,000

U.S. Department of the Interior

February 2020

Mission Statements

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The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Truckee Canal Extraordinary Maintenance Administrative Draft Environmental Impact Statement

Lead Agency: Bureau of Reclamation, Interior Region 10, California-Great Basin

Cooperating Agencies:
Federal
Bureau of Indian Affairs
US Fish and Wildlife Service

Tribal
Fallon Paiute-Shoshone Tribe
Pyramid Lake Paiute Tribe

State and Local
City of Fallon
City of Fernley
Churchill County
Truckee-Carson Irrigation District (TCID)

Abstract:
The Bureau of Reclamation is proposing to assist the TCID with extraordinary maintenance to address safety needs along the Truckee Canal in western Nevada (Lyon and Churchill Counties). In accordance with the 1996 operations and maintenance contract, Reclamation needs to evaluate the TCID's request to improve the structural integrity to reduce the risk of a canal breach for public safety. The purpose is to enable the TCID to complete necessary repairs to restore safe operation of the Truckee Canal, so Newlands Project water rights can be served under the existing Newlands Project Operating Criteria and Procedures (43 CFR 418.20) and in compliance with decrees, contracts, and other applicable laws, as funding becomes available.

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Executive Summary

ES.1 Introduction

The United States (US) Department of the Interior (DOI), Bureau of Reclamation (Reclamation) has prepared this environmental impact statement (EIS) to analyze the environmental impacts of proposed extraordinary maintenance (XM) to address safety needs along the Truckee Canal (Canal), a part of the Newlands Project, in western Nevada. The Canal originates at the Derby Diversion Dam on the Truckee River, approximately 20 miles east of Reno, Nevada, and ends at Lahontan Reservoir. **Appendix C**, **Figure 1-1** represents the Truckee Canal XM EIS Project Area (Project Area).

On January 5, 2008, the Canal's north embankment, approximately 12 miles downstream of the Derby Diversion Dam, breached after a storm. This resulted in an uncontrolled water release that caused flooding and damage to approximately 590 properties in the city of Fernley, Nevada. The Truckee-Carson Irrigation District (TCID), which operates and maintains the Canal, repaired the breach in February 2008, and the Canal reopened in March 2008. Following the January 2008 Canal breach, Reclamation completed several studies that identified areas requiring repair and maintenance to address safety concerns. Until long-term repairs are made, the Canal is required to be operated at a lower stage (height of water) to reduce risk.

As the lead federal agency, Reclamation has prepared the Draft EIS, in cooperation with the TCID, the Bureau of Indian Affairs (BIA), Churchill County, the City of Fallon, the City of Fernley, the Fallon Paiute-Shoshone Tribe (FPST), the Pyramid Lake Paiute Tribe (PLPT), and the US Fish and Wildlife Service (USFWS).

This EIS is prepared pursuant to the National Environmental Policy Act of 1969 (NEPA; 42 US Code 4321, et seq.), the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] 1500–1508), the DOI's NEPA Regulations (43 CFR 46), and other relevant federal and state laws and regulations. **Chapter 1** of this EIS presents the purpose of and need for action. **Chapter 2** provides a description of each alternative considered for analysis and the preferred alternative. **Chapter 3** presents the affected environment as well as the potential direct, indirect, and cumulative impacts on the human and natural environment that could occur from implementing the alternatives. **Chapter 4** summarizes the coordination and consultation with other agencies and stakeholders during preparation of the EIS. **Appendices A**, Acronyms and Glossary, **and B**, References, outline the acronyms, glossary terms, and references cited throughout this document. **Appendix D**, List of Preparers, includes a list of preparers.

ES.2 Setting

The Project Area, totaling approximately 860 acres, includes the entire 31 miles of the Canal, from Derby Dam to Lahontan Reservoir, including a 100-foot buffer from the centerline of the Canal on each side and four staging areas. The Project Area is shown in **Appendix C**, **Figure 1-1**.

ES.3 Purpose of and Need for Action

In accordance with the 1996 operation and maintenance (O&M) contract, Reclamation needs to evaluate the TCID's request to improve the structural integrity to reduce the risk of a Canal breach for public safety. The purpose is to enable the TCID to complete necessary repairs to restore safe long-term operation of the Canal, so Newlands Project water rights can be served under the existing Newlands Project operating criteria and procedures (OCAP; 43 CFR 418.20) and in compliance with decrees, contracts, and other applicable laws, as funding becomes available.

ES.4 Proposed Federal Action

The proposed federal action is to determine necessary repairs for safe operation of the Canal, as follows:

- Provide engineering designs, specifications, and plans
- Provide construction oversight
- Work with TCID to identify and develop funding strategies, including, but not limited to, repayment contracts pursuant to Public Law 111-11, Omnibus Public Land Management Act of 2009
- Issue the TCID a notice to proceed with necessary repairs to the Canal under the contract

ES.5 Project Alternatives

This EIS assesses the potential environmental impacts of the six alternatives under consideration: The No Action Alternative and five action alternatives (Alternatives 1, 2, 3, 4 and 5). The different ways these alternatives can be implemented are called project elements. Each of the action alternatives addresses three main elements: Element 1, Embankment; Element 2, Structure; and Element 3, Hydrologic Actions. Screening criteria were developed with the project cooperating agencies (see **Section 1.5**, Lead and Cooperating Agencies) to evaluate each project element. Project elements that satisfy the criteria were combined into complete alternatives. The action alternatives are summarized below in **Table ES-1**, Action Alternatives Analyzed in this EIS.

Table ES-1. Action Alternatives Analyzed in this EIS

Alternative Number	Element 1 (Embankment)	Element 2 (Structure)	Element 3 (Hydrologic Actions [HAs])
1	Line the Canal—full prism—geomembrane/concrete 5.99 miles	Replace four check structures (Fernley, Anderson, Allendale, and Mason) and remove and replace Hazen Gage with a long-throated flume	Armor Pour Point 8—full prism—geomembrane/concrete (2,700 feet [ft]) at 3 inflow points and geomembrane/soil (3,000 ft) AND construct TC 11 detention pond (322 acre-feet [AF]) and Mason detention pond (101 AF) AND Line the Canal—full prism Geomembrane/concrete 5.71 miles
2	Line the Canal—full prism—geomembrane/soil 5.99 miles	Replace four check structures (Fernley, Anderson, Allendale, and Mason) and remove and replace Hazen Gage with a long-throated flume	Armor Pour Point 8—full prism—geomembrane/concrete (2,700 ft) at 3 inflow points and geomembrane/soil (3,000 ft) AND Line the Canal—full prism Geomembrane/soil 8.01 miles
3	Line the Canal—full prism—geomembrane/concrete, 27 miles of the Canal (31 miles of the Canal minus 4 miles that are currently lined)	Replace five check structures (Fernley, Anderson, Allendale, Mason, and Bango) and remove and replace Hazen Gage with a long-throated flume	N/A
4	Line the Canal—full prism—geomembrane/concrete (1,600 ft), geomembrane/half concrete (1,000 ft), and geomembrane/soil (5.5 miles) from near the Fernley area to Pour Point 13	Replace four check structures (Fernley, Anderson, Allendale, and Mason) and remove and replace Hazen Gage with a long-throated flume	Armor Pour Point 8—full prism—geomembrane/concrete (2,700 ft) at 3 inflow points and geomembrane/soil (3,000 ft) AND construct TC 11 detention pond (322 AF), Mason detention pond (180 AF), and Downstream detention pond (17 AF)
5	Line the Canal—full prism Geomembrane/concrete 5.99 miles	Replace four check structures (Fernley, Anderson, Allendale, and Mason), modify radial gates at Bango Check structure, and remove and replace Hazen Gage with a long-throated flume	Armor Pour Point 8 full prism—geomembrane/concrete (5,800 ft.) AND Line the Canal—full prism Geomembrane/concrete 6.69 miles

In construction projects such as the one proposed, it is common to make refinements to final designs during construction. The alternatives contain sufficient information to capture all of the impacts of the alternatives; however, the elements analyzed in detail may evolve before construction design is finalized. Reclamation would conduct additional environmental analyses, as needed, to address the impacts of any design changes not analyzed in this EIS. For example, this documentation could include a determination of NEPA adequacy, a categorical exclusion, a supplemental environmental assessment, or a supplemental EIS. Reclamation may also combine elements from different alternatives into the final design, rather than implementing a single complete alternative analyzed in this EIS in accordance with the Council on Environmental Quality (CEQ 1997).

ES.5.1 No Action Alternative

Under the No Action Alternative, the Canal would continue to be operated under current conditions, contracts, and laws. The TCID would not implement any of the risk mitigation measures identified in the risk analysis (Reclamation 2015a); however, it would perform routine maintenance to minimize short-term risks and maintain the flow stages in accordance with the O&M contract and Reclamation requirements. Routine maintenance would not comprehensively address the risk factors, thereby potentially resulting in long-term deterioration of the Canal. Reclamation would conduct a risk analysis every 5 years and could implement other actions, such as stage restrictions, to meet safety requirements. Any substantial changes to the Canal would be subject to additional environmental review, including NEPA analysis.

ES.5.2 Action Alternatives

Reclamation developed a range of action alternatives to address the purpose and need by evaluating the risk reduction recommendations and alternatives identified in the Corrective Action Study (Reclamation 2017a). Embankment repairs include a geomembrane liner with concrete cover or geomembrane liner with soil cover to prevent embankment failure. Structure repairs include replacing check structures to prevent ice jams and backflow in the event of a breach, and replacing the Hazen Gage that currently restricts flows. Hydrologic actions include armoring Pour Point 8, construction of detention basins, and/or extended Canal lining. **Table ES-1**, Action Alternatives Analyzed in this EIS, briefly describes the action alternatives analyzed in this EIS.

ES.5.3 Alternative Elements Considered but Eliminated

Federal agencies are required to rigorously explore and objectively evaluate all reasonable alternatives and to discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). During this process, Reclamation considered 14 other alternative elements, ranging from various construction methodologies (methods of storing water or reducing demand), to decommissioning the entire Canal. These alternative elements, however, were not brought forward for detailed analysis, because they are beyond the scope of the project, would require an uncertain amount of time to implement, or would not definitively address the purpose and need.

ES.6 Summary of Environmental Consequences

The purpose of the environmental consequences analysis is to describe the anticipated environmental and socioeconomic impacts that would result from each alternative, including the No Action Alternative. **Chapter 3**, Affected Environment and Environmental Consequences, presents the potential direct, indirect, and cumulative impacts on the human and natural environment that could occur from implementing the alternatives. Key findings of the impact analysis of the action alternatives are summarized in **Table ES-2**, Summary of Environmental Consequences from Action Alternatives, below. Under the No Action Alternative, the TCID would perform routine maintenance to minimize short-term risks and maintain the flow stages in accordance with the O&M contract and Reclamation requirements. Routine maintenance would not comprehensively address the risk factors, thereby potentially resulting in long-term deterioration of the Canal.

ES.7 Preferred Alternative

The CEQ regulations (40 CFR 1502.14(e)) require identifying a preferred alternative in the Draft EIS, if such a preference is known. Alternative 5 (Lining the Canal—Full Prism—Geomembrane/Concrete) is the preferred alternative based on several factors evaluated in the engineering and economic study and this Draft EIS. Alternative 5 provides the highest risk reduction compared to all other alternatives, and it reduces risk without introducing new risks. It is also among the least cost alternatives to maintain. Minor differences in potential environmental impacts exist for each of the action alternatives.

While Reclamation has identified a preferred alternative in this Draft EIS, actual selection of a preferred alternative will not occur until the Record of Decision. The decision on the alternative to implement will consider public comments and the full analysis in the final EIS.

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Table ES-2. Summary of Environmental Consequences from Action Alternatives

Resource	Key Findings
Water resources	While minor differences in water resource impacts exist among each action alternative, compliance with applicable environmental protection measures (EPMs; see **Table 3-1**, Environmental Protection Measures), environmental laws, and regulations would ensure the action alternatives would not result in direct, indirect, or cumulative impacts on surface water or water quality. The action alternatives would reduce artificial groundwater recharge, thereby resulting in an adverse indirect effect. Dr. Greg Pohll's 2012 modeling indicated that Canal seepage in the Fernley area ranged from 14,000 to 22,000 acre-feet per year (AFY). A review of current supply (less Canal seepage) versus demand indicates possible shortages of groundwater if groundwater is the only water supply. Water Resource EPMs 9, 10, 32, and 34 could be implemented to reduce impacts on shallow groundwater users.
Cultural and historic resources	Results from the cultural resources analysis indicate that replacement and modifications of features and historic characteristics of the Canal, a historic property, may result in an adverse effect on the Canal and would have an adverse impact on cultural resources. Section 106 consultation, the implementation of the programmatic agreement, and compliance with EPMs would lessen the impacts on cultural resources.
Indian trust assets	The implementation of any of the action alternatives would not adversely affect Indian trust assets (ITAs).
Vegetation	While minor differences in vegetation impacts exist among each action alternative, based on compliance with applicable EPMs, environmental laws, and regulations; the action alternatives would not result in significant direct, indirect, or cumulative impacts on vegetation.
Wildlife	While minor differences in wildlife impacts exist among each action alternative, based on compliance with applicable EPMs, environmental laws, and regulations; the action alternatives would not result in significant direct, indirect, or cumulative impacts on wildlife.
Aquatic resources	While minor differences in aquatic resources impacts exist among each action alternative, based on compliance with EPMs, applicable environmental laws, and regulations; the action alternatives would not result in significant direct, indirect, or cumulative impacts on aquatic resources.
Listed species	While minor differences in the potential for impacts on listed species exist among each action alternative, based on compliance with EPMs, applicable environmental laws, and regulations, the action alternatives would not result in significant direct, indirect, or cumulative impacts on listed species. There would be no impacts on western yellow-billed cuckoo proposed critical habitat under any alternative.
Air quality	Impacts on air quality would be localized and short term under all action alternatives. Because EPMs would reduce fugitive dust emissions generated by soil-disturbing activities during construction, the action alternatives would not result in significant direct, indirect, or cumulative impacts on air quality.
Geology and soils	Impacts on geology and soils would be localized and short term under all action alternatives. Because EPMs would reduce impacts on geology and soils during construction, the action alternatives would not result in significant direct, indirect, or cumulative impacts on geology.
Health and safety	Impacts on health and safety would be localized and short term under all action alternatives. Because EPMs would reduce impacts on health and safety, the action alternatives would not result in significant direct, indirect, or cumulative impacts.
Socioeconomic resources	All action alternatives would temporarily increase construction employment and direct and indirect economic contributions; however, based on the Project Area construction workforce and economy, impacts would be minimal. All action alternatives include lining that would reduce the risk of flooding, thereby reducing the socioeconomic impacts on adjacent property owners and the local community. These lined areas would eliminate Canal seepage that results in a reduction in artificial groundwater recharge. Potential indirect economic impacts on groundwater users may be reduced by implementing EPMs 9, 10, 32, and 36.
Environmental justice	No disproportionate adverse impacts are anticipated on low-income or minority populations under any alternative. Under all action alternatives, construction could result in short-term, location-specific impacts on area populations from increased dust; however, low-income or minority populations would not be disproportionately affected. Under all action alternatives, the proposed Canal lining and other measures would reduce the potential for flooding but would increase the impacts on groundwater users in all populations.

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Chapter 1
Purpose of and Need for Action

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1. Purpose of and Need for Action

1.1 Introduction

Reclamation has prepared this EIS to analyze the environmental impacts of proposed XM to address safety needs along the Canal in western Nevada (Lyon and Churchill Counties). The Canal originates at the Derby Diversion Dam on the Truckee River, approximately 20 miles east of Reno, Nevada, and ends at Lahontan Reservoir. **Appendix C**, **Figure 1-1** presents the Truckee Canal XM EIS Project Area. The Project Area is defined as the entire 31 miles of the Canal, including a 100-foot buffer from the centerline of the Canal on each side and 4 staging areas.

The EIS is prepared pursuant to the National Environmental Policy Act of 1969 (NEPA; 42 US Code [USC] 4321, et seq.), the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500–1508), the DOI's NEPA Regulations (43 CFR 46), and other relevant federal and state laws and regulations.

The Canal is part of the Newlands Project. The Secretary of the Interior authorized it in 1903, and it was constructed between 1903 and 1905. It is among Reclamation's first projects (Hardesty 1906). Although the US owns, and Reclamation administers the Canal, in 1926 it transferred the care and O&M of the Newlands Project to the TCID (Contract No. I1r–93). The current 25-year contract between Reclamation and the TCID was executed in 1996 (Contract No. 7–07–20–X0348). Reclamation's Lahontan Basin Area Office (LBAO) oversees the contract for the TCID's O&M of the Canal.

Ten breaches have occurred on the Canal since its construction (Paul and Slaven 2009). On January 5, 2008, the Canal's north embankment breached after a storm. This resulted in an uncontrolled water release that caused flooding and damage to 590 properties in the City of Fernley, Nevada. The breach occurred approximately 12 miles downstream of the Derby Diversion Dam **Appendix C**, **Figure 1-1**. The TCID repaired the breach in February 2008, and the Canal reopened in March 2008.

Following the January 2008 Canal breach, Reclamation completed the following pertinent studies and analyses: Newlands Project Planning Study (Reclamation 2013a), an updated Risk Analysis (Reclamation 2015a), and the Corrective Action Study (Reclamation 2017a). These studies identified areas requiring repair and maintenance to address safety concerns. The TCID board requested support from Reclamation and formally agreed to enter into a repayment contract with Reclamation for the planning, engineering, and feasibility studies. In the interim, until long-term repairs are made, the Canal is operated at a stage (height of water) that complies with short-term risk reduction measures.

Public Law 111-11 provides Reclamation with the authority to complete or fund work on a project such as the Newlands Project, where the O&M responsibilities have been

transferred to a local entity, subject to a repayment contract. The TCID entered into a preconstruction repayment contract (Contract No. 14-WC-20-4597) with Reclamation for the purposes of funding and completing this EIS and final construction designs and contracting specifications.

1.2 Purpose of and Need for Action

In accordance with the 1996 O&M contract, Reclamation needs to evaluate the TCID's request to improve the structural integrity to reduce the risk of a Canal breach for public safety. The purpose is to enable the TCID to complete necessary repairs to restore safe long-term operation of the Canal, so Newlands Project water rights can be served under the existing Newlands Project OCAP (43 CFR 418.20) and in compliance with decrees, contracts, and other applicable laws, as funding becomes available.

1.3 Proposed Federal Action

The proposed federal action is to determine necessary repairs for safe operation of the Canal, as follows:

- Provide engineering designs, specifications, and plans
- Provide construction oversight
- Work with TCID to identify and develop funding strategies, including, but not limited to, repayment contracts pursuant to Public Law 111-11, Omnibus Public Land Management Act of 2009
- Issue the TCID a notice to proceed with necessary repairs to the Canal under the contract

1.4 Project Background

1.4.1 Newlands Project

The Secretary of the Interior authorized the Canal as part of the Newlands Project. Formerly known as the Truckee-Carson Project, the Newlands Project was authorized under the Reclamation Act of 1902 (Public Law 57–161). The Newlands Project provides irrigation water from the Truckee and Carson Rivers to bench lands near Fernley (Truckee Division) and to the Lahontan Valley near Fallon (Carson Division). It also provides this water to non-project decreed water right holders along the Derby Reach and in the Carson Division. The Newlands Project also serves nonagricultural water users, including wetlands water rights at Stillwater National Wildlife Refuge (SNWR), the FPST Indian Reservation, and Carson Lake and Pasture (Nevada Department of Wildlife [NDOW]) (**Appendix C**, **Figure 1-1**).

The Newlands Project delivers water to approximately 59,000 acres of lands with water rights. It does this through a system of nearly 70 miles of main canals, 300 miles of Canal laterals, and 350 miles of drains (Reclamation 2016a). Truckee Division water users

receive their water entirely from the Canal that is supplied via diversions from the Truckee River. Carson Division water users receive their water from Lahontan Reservoir that stores water from the Carson River and the Canal (Reclamation 2016a).

1.4.2 Truckee Canal

The diversion of Truckee River water for use in the Truckee Division and Carson Division began in 1906 (Townley 1977). The purposes of the Canal are to convey water to water rights holders in the Truckee Division and to provide a supplemental water source for water rights holders in the Carson Division when sufficient flow and storage are not available from the Carson River (**Appendix C**, **Figure 1-1**).

The Derby Diversion Dam diverts Truckee River water into the 31-mile-long Canal. Some of the water is used to irrigate lands in the Truckee Division. The Canal also conveys Truckee River water to Lahontan Reservoir for storage and irrigation in the Carson Division. For the purposes of this EIS, the Canal is divided into three reaches:

- Derby Reach, approximately 10 Canal-miles from Derby Diversion Dam to Fernley, Nevada
- Fernley Reach, approximately 11 Canal-miles within Fernley
- Lahontan Reach, approximately 10 Canal-miles from Fernley to Lahontan Reservoir (**Appendix C**, **Figure 1-1**)

1.4.3 Truckee Canal Operations

Truckee River water is diverted at Derby Diversion Dam into the Canal for use in the Newlands Project, as provided in Claim No. 3 of the Orr Ditch Decree (*United States v. Orr Water Ditch Co.*, Equity No. A3 [D. Nev. 1944]) and in accordance with the OCAP. The Truckee Canal XM EIS Legal and Operational Context Memorandum (Reclamation 2018a) summarizes the laws and agreements governing water use of the Truckee and Carson River systems, as well as related actions. It includes a summary of the operational context of the two systems, which dictates Reclamation's ability to supply water through the Canal to holders of water rights in the Newlands Project.

The Canal parallels the Truckee River for about 10 miles and then turns southeast toward Fernley, following the topographic contour along the north-facing slope of the hills skirting the southern edge of Fernley before turning south again and ultimately discharging into Lahontan Reservoir about 31 miles below Derby Dam. The Canal is operated by controlling diversions from the Truckee River at Derby Dam. The maximum design capacity in the upper Derby Reach is approximately 1,500 cubic feet per second (cfs) reducing to 1,200 cfs before the Fernley Reach (Hardesty and Buhr 2001). Historical operational flow has ranged from about 300 to nearly 1,000 cfs. Between March and November of each year, water deliveries are made to the Truckee Division from the Canal. The Canal is operated year-round to convey water to Lahontan Reservoir for storage, subject to the OCAP.

There are 4 tunnels along the Canal, ranging in length from approximately 115 feet to over 1,500 feet, as well as a shorter tunnel associated with the Gilpin Wasteway. There are also 2 gated wasteway structures (Derby and Gilpin Wasteways); 2 passive overflow

spillway sections in the Derby Reach; 2 flow measurement features (Wadsworth and Hazen); 5 check structures, 4 of which are active (Fernley, Anderson, Allendale, and Bango); and 27 active turnout structures.

After the breach in 2008, the Federal District Court for the District of Nevada issued an interim temporary restraining order on May 28, 2008 (*Kroshus et al. v. United States of America et al.*, Case No. 3:08-cv-0246-LDG-RAM). The order limited the maximum flow to 350 cfs. This limit was based on inspection findings, concerns about the Canal's immediate and long-term structural integrity, and the observation that no historical Canal breaches had occurred below 400 cfs. The court order also required daily inspections of portions of the Canal. In addition, Reclamation established a stage restriction to limit the height of the water in the Canal in 2009. In 2016, the court order was lifted, with settlement of the lawsuit, which eliminated the flow restriction of 350 cfs. Reclamation readjusted the stage restriction to reflect the findings in the most recent risk analysis.

1.5 Lead and Cooperating Agencies

Reclamation is the lead federal agency under NEPA for the preparation of the Truckee Canal XM EIS. Reclamation requested federal, state, and local agencies; Native American tribes; and the TCID to participate as cooperating agencies in the environmental analysis and preparation of the EIS. A cooperating agency is any federal, state, or local government agency or Native American tribe that enters into a formal agreement—a memorandum of understanding (MOU)—with the lead federal agency to help in the environmental analysis. Cooperating agencies for the project are the TCID, the BIA, Churchill County, the City of Fallon, the City of Fernley, the FPST, the PLPT, and the USFWS.

Reclamation held eight joint cooperating agency meetings between 2016 and 2017 in Fernley, Nevada. All cooperating agencies were represented at these meetings. Reclamation also met with each cooperating agency separately in the fall of 2016 and 2017, and the summer of 2018. The one-to-one meetings discussed the project status and presented the alternatives under consideration for analysis. Meeting notes were taken to document issues and concerns identified by each cooperating agency.

1.6 Public Involvement

Public involvement is a vital part of the EIS process. Reclamation published the notice of intent for the Truckee Canal XM EIS in November 2015. The Truckee Canal XM EIS public scoping period was from October 2015 to November 2015. Outcomes of the scoping process are summarized in a scoping report published in May 2016 (Reclamation 2016c). The project website is http://www.usbr.gov/mp/lbao/programs/truckee-canal-eis/. The website provides access to background material and Project Area maps.

Executive Order (EO) 13175 requires federal agencies to coordinate and consult on a government-to-government basis with sovereign Native American Tribal governments whose interests may be directly and substantially affected by activities on government-

administered lands. Consultation with Native American tribes is part of the NEPA scoping process. Government-to-government consultation began in October 2015, with Reclamation sending requests for consultation letters to all area tribes. Government-to-government consultation will continue throughout the EIS development process (see **Chapter 4**, Section 4.3.2).

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Chapter 2
Description of Alternatives

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2. Description of Alternatives

2.1 Introduction

NEPA and implementing regulations require that an agency evaluate a reasonable range of alternatives to a proposed action. This chapter describes the Truckee Canal XM EIS alternatives development and proposed alternatives, including those considered and eliminated from further study. The preferred alternative is also described.

2.2 Alternatives Development Process

The alternatives development process defined the project objectives and selected alternatives for consideration and analysis to meet the purpose and need of the project. Reclamation's risk analysis, corrective action study, and hydrologic analysis evaluated risk areas in the Canal and the actions needed to reduce the risk of a potential future Canal breach. These studies informed the EIS alternatives selection process.

2.2.1 Identifying Planning Issues

The Truckee Canal XM EIS alternatives development process has involved external cooperating agency collaboration and internal engineering and feasibility analysis. Reclamation asked for initial public input on the scope of the analysis and the alternatives to be considered during a scoping period, from October to November 2015. Scoping comments received were analyzed in a scoping report, which Reclamation published in May 2016 (Reclamation 2016c). Comments related to alternatives were carried forward into the alternatives development process.

From January 2016 to March 2017, Reclamation held eight alternatives development meetings with cooperating agencies to identify different ways to address the purpose of and need for action. The screening processes are detailed further in the two alternative screening technical memorandums, the Truckee Canal XM EIS Alternative Screening Analysis (Reclamation 2017b) and the Technical Memorandum: Hydrologic Alternative Screening Analysis (Reclamation 2018b).

2.3 Alternatives

2.3.1 No Action Alternative

Under the No Action Alternative, the Canal would continue to be operated under current conditions, contracts, and laws. The TCID would not implement any of the risk reduction measures identified in the risk analysis (Reclamation 2015a); however, it would perform routine maintenance to minimize short-term risks and maintain the flow stages in accordance with the O&M contract and Reclamation requirements. Routine maintenance would not comprehensively address the risk factors, thereby potentially resulting in long-

term deterioration of the Canal. Reclamation would conduct a risk analysis every 5 years and could implement other actions, such as changing stage restrictions, to meet safety requirements. Any substantial changes to the Canal would be subject to additional environmental review, including NEPA analysis.

2.3.2 Action Alternatives

Reclamation developed a range of action alternatives to address the purpose and need. Reclamation recognized that the alternatives to effectively reduce risk may need to be combined; therefore "alternatives elements" were developed as defined here. The three elements of the action alternatives include improvements to address embankment, structural, and/or hydrologic-related risks. The elements are not stand-alone alternatives; rather, they are the pieces of an alternative that, when combined, provide a possible solution for addressing the project's need.

Proposed embankment repairs included a geomembrane liner with concrete cover or geomembrane liner with soil cover to prevent embankment failure. Structure repairs included replacing check structures to prevent ice jams and backflow in the event of a breach, and replacing the Hazen Gage that currently restricts flows.

Reclamation completed the Technical Memorandum: Enhanced Truckee Canal Hydrologic Hazard Analysis and the Technical Memorandum: Truckee Canal Flood Hydraulic Analysis (Reclamation 2017c, 2018b). The results of these studies indicated that additional hydrologic risk reduction recommendations should be evaluated. Hydrologic fixes include armoring Pour Point 8, construction of detention basins, and/or extended Canal lining.

Reclamation evaluated the risk reduction recommendations, along with the alternatives identified in the Corrective Action Study (Reclamation 2017a), to develop the action alternative combinations to be carried forward for analysis in the EIS and engineering and economic study (EES). The EES will be included in the Final EIS upon completion. **Table 2-1,** Action Alternatives Analyzed in the EIS, briefly describes the action alternatives analyzed in this EIS. Element 1 addresses the embankment repairs to address the greatest risk and varies by alternative. Sections 2.3.2.3 through 2.3.2.7 describe the proposed embankment repairs in greater detail.

2.3.2.1 Project Activities and Elements Common to All Action Alternatives

Staging Areas

Temporary equipment and material staging areas would be required near the Canal. These would serve as reporting locations for workers, parking spaces for vehicles, and storage spaces for equipment and materials. The staging areas would be located on Reclamation lands within the project area and each would be about 400 by 400 feet.

Easements and Access Roads

Access to the Canal would be from existing roads or within the Reclamation easement. Grading would be necessary for the construction of ingress and egress temporary equipment ramps horizontal to the existing embankment. After construction, these ramps would be removed and graded, and the soil would be compacted to conform to the original embankment slope.

Table 2-1. Action Alternatives Analyzed in the EIS

Alternative Number	Element 1 (Embankment)	Element 2 (Structure)	Element 3 (Hydrologic Actions [HAs])
1	Line the Canal—full prism—geomembrane/concrete 5.99 miles	Replace four check structures (Fernley, Anderson, Allendale, and Mason) and remove and replace Hazen Gage with a long-throated flume	Armor Pour Point 8—full prism—geomembrane/concrete (2,700 feet [ft]) at 3 inflow points and geomembrane/soil (3,000 ft) AND construct TC 11 detention pond (322 AF) and Mason detention pond (101 AF) AND Line the Canal –full prism Geomembrane/concrete 5.71 miles
2	Line the Canal—full prism—geomembrane/soil 5.99 miles	Replace four check structures (Fernley, Anderson, Allendale, and Mason) and remove and replace Hazen Gage with a long-throated flume	Armor Pour Point 8—full prism—geomembrane/concrete (2,700 ft) at 3 inflow points and geomembrane/soil (3,000 ft) AND Line the Canal –full prism Geomembrane/soil 8.01 miles
3	Line the Canal—full prism—geomembrane/concrete, 27 miles of the Canal (31 miles of the Canal minus 4 miles that are currently lined)	Replace five check structures (Fernley, Anderson, Allendale, Mason, and Bango) and remove and replace Hazen Gage with a long-throated flume	N/A
4	Line the Canal—full prism—geomembrane/concrete (1,600 ft), geomembrane/half concrete (1,000 ft), and geomembrane/soil (5.5 miles) from near the Fernley area to Pour Point 13	Replace four check structures (Fernley, Anderson, Allendale, and Mason) and remove and replace Hazen Gage with a long-throated flume	Armor Pour Point 8—full prism—geomembrane/concrete (2,700 ft) at 3 inflow points and geomembrane/soil (3,000 ft) AND construct TC 11 detention pond (322 AF), Mason detention pond (180 AF), and Downstream detention pond (17 AF)
5	Line the Canal –full prism Geomembrane/concrete 5.99 miles	Replace four check structures (Fernley, Anderson, Allendale, and Mason), modify radial gates at Bango Check structure, and remove and replace Hazen Gage with a long-throated flume	Armor Pour Point 8 full prism—geomembrane/concrete (5,800 ft.) AND Line the Canal –full prism Geomembrane/concrete 6.69 miles

Check Structure Replacement and Modification

Under all action alternatives, four check structures would be replaced; in addition, the Bango check structure would be replaced under Alternative 3; it would be modified to include automated radial gates under Alternative 5. The new check structures would have wider, automated radial gates, with side overflow weirs to more easily pass ice flows and prevent overtopping. The automated gates would allow for Canal reaches to be isolated in the event of a breach. Isolating the affected Canal reach would limit the volume of water that exits the breach, thereby lowering the flood impacts and consequence levels. The side overflow weirs would allow the flow to bypass the gates, if the gates become inoperable during normal operations or during an extreme hydrologic event.

Demolition of the existing structures would be required at each of the locations. This work would be performed when there is no water in the Canal, and the duration is estimated to be 2 to 3 weeks at each site. Once the check structures have been removed, the foundations of the new structures would be prepared. Construction would include excavating the new structure footprints to a depth of about 5 feet and backfilling to the bearing elevation with compacted structural fill. Foundation seepage cutoff walls would be constructed during this period. Preparing the foundation and placing the cutoff walls is expected to take 3 to 4 weeks to complete. All check structures would require less than 1 acre of surface disturbance.

The construction would be a phased approach over 4 years, from November through March to avoid the irrigation season, with a total timeline of approximately 480 days. Once all of the concrete placements are completed, the Canal would be put back in operation during installation of the mechanical equipment. Mechanical equipment includes radial gates, hoists, electrical controls, a control building, a supervisory control and data acquisition system, and a backup power system.

Maintenance of the check structures would be similar to what is required now. Periodic gate rehabilitation, coating reapplication, and concrete repair would be required. **Table 2-2**, Check Structure Locations, lists the check structures that would be replaced and their locations.

Table 2-2. Check Structure Locations

Check Structure Name	Canal Location[1]
Fernley check structure	696+60
Anderson check structure	850+30
Allendale check structure	1059+00
Mason check structure	1304+10
Bango check structure[2]	1466+24

Source: Reclamation 2017a

[1]Delivery station unit

[2] Bango check structure would be replaced only under Alternative 3 and would be modified under Alternative 5.

Approximately 20 construction personnel would be needed to complete this work, using the following equipment: excavator, backhoe, side compactor, loader, dump truck, water truck, forklift, wheeled loader, crane, grader, and concrete trucks. Employees would also

bring their own vehicles onto the site. Surface disturbance outside of the Canal or staging areas is estimated at less than 1 acre per check structure.

Gage Structure: Replace Hazen Gage with a Long-Throated Flume

The Hazen Gage is currently a combined low-flow V-notch and broad-crested weir.[1] The sill of the weir is about 3 feet above the Canal invert. This configuration "checks" the water surface and slows the flow velocity upstream of this location. The slower velocities contribute to sediment and aquatic vegetation accumulation in the lower Lahontan Reach. The sedimentation and vegetation increase the stage (height) of the water in the Canal and pose an elevated risk of hydrologic overtopping.

All action alternatives would replace the existing Hazen Gage weir with a long-throated flume. This would reduce sediment accumulation and reduce the backwater effect of the current Hazen Gage in the Lahontan and lower Fernley Reaches. Water stage (height) would be reduced through the Lahontan Reach, thereby reducing the risk and increasing safety. The Hazen Gage would be replaced early in the construction process using similar types of equipment; the amount of surface disturbance would be the same as it would be for the check structures.

Phased Construction and Contracting

The construction schedule in the EES assumed at least four contracts would be utilized to complete the work. In addition, each contract would be structured with the flexibility of awarding contract options. The contracts would be engaged as funding permits.

The construction schedule was based on a logical sequence of work activities and interdependencies between the elements and specific features. The embankment elements have the highest priority due to greatest risk. The canal reaches to be lined under the embankment element would be prioritized by level of risk.

2.3.2.2 Hydrologic Elements (Hydrologic Fixes to Address Runoff from Storm Events)

Under Action Alternatives 1, 2, 4, and 5, a combination of hydrologic fixes would be implemented to address inflows to the Canal from storm events. While Alternative 3 does not include specific hydrologic fixes, lining the entire Canal would address the hydrologic risk. The hydrologic fixes include Canal armoring, construction of detention ponds, and additional Canal lining as described below:

Armor Pour Point 8

Proposed improvements would include armoring the Canal at Pour Point 8, including reinforcing three natural flow locations (approximately 2,700 linear feet) on the south side of the Canal. These areas would be lined full prism with a geomembrane liner with a concrete cover. Approximately 3,000 additional linear feet would be lined full prism geomembrane liner with soil cover for Alternatives 1, 2, and 4. Approximately 3,100

[1] An overflow structure built across an open channel to raise the upstream water level and/or to measure the flow of water. A measuring or gaging weir is calibrated for depth of flow over the crest. A weir generally consists of a rectangular, trapezoidal, triangular, or other shaped notch, located in a vertical, thin plate over which water flows. The height of water above the weir crest is used to determine the rate of flow.

additional linear feet would be lined full prism geomembrane liner with concrete cover for Alternative 5. This would prevent the south embankment from eroding as the runoff enters the Canal and protect the north embankment from scour.

Armoring Pour Point 8 would take approximately 20 construction personnel 120 days to complete, between November and March. The anticipated surface disturbance outside the Canal or staging areas would be less than 1 acre. The equipment required would be an excavator, backhoe, side compactor, trimmer, trencher, loader, water truck, forklift, wheeled loader, hot air fusion welder, and concrete trucks. Employees would also bring their own vehicles onto the site.

Detention Ponds

The detention ponds would be unlined and excavated below the existing grade. Excavated material would be used to build up a containment berm around the perimeter of the pond. The TC 11 detention pond would be designed to contain 322 AF of water under Alternatives 1 and 4 (see **Figure 2-1** and **Figure 2-4**). The Mason detention pond would be designed to contain 101 AF or 180 AF of water under Alternatives 1 and 4, respectively. Alternative 4 also includes the Downstream detention pond that is designed to contain 17 AF of water.

Construction of the detention ponds would take approximately 20 construction personnel 120 to 500 days to complete. The anticipated surface disturbance outside the Canal or staging areas would range from 2.2 to 23 acres. The ponds construction schedule could be anytime of the year. The equipment required would be earth movers (3), an excavator, backhoe, side compactor, motor grader trencher, loader, water truck, and forklift. Employees would bring their own vehicles onto the site.

Line the Canal

The Canal would be lined under Alternatives 1, 2, and 5 for Element 3 (**Table 2-1**), as described in the following sections.

2.3.2.3 Alternative 1: Line the Canal, Full Prism—Geomembrane/Concrete Liner, 11.7 miles

Alternative 1 would be the construction of a total of 11.7 miles (**Table 2-1**) of a full prism geomembrane liner covered with concrete to protect the geomembrane (see **Appendix C**, **Figure 2-1**). Of the 11.7 miles, 5.99 miles are to address embankment risk and 5.71 miles are to address hydrologic risk. The geomembrane would be secured in an anchor trench near the embankment crest. For all alternatives, the lined prism would have a minimum depth of 13.6 feet; prism restoration would support a bottom width in the Canal of 33 feet. The Canal would have a 2-foot horizontal to 1-foot vertical side slope.

The Fernley, Anderson, Allendale, and Mason check structures would be replaced along with the Hazen Gage. Pour Point 8 would be armored, and the TC 11 detention pond (322 AF) and the Mason detention pond (101 AF) would be constructed. The anticipated surface disturbance outside the Canal or staging areas for lining of the Canal and construction of the detention ponds would range from 19.7 to 23 acres.

Approximately 15 construction personnel would be needed to line the Canal. Construction would take place over 240 days, in a phased approach over 10 years due to

funding constraints, with most construction beginning in November and ending in March to not disturb the irrigation season. The approximate surface disturbance outside of the Canal or staging areas for lining of the Canal would be less than 1 acre. Workers would use an excavator, backhoe, side compactor, trimmer, loader, water truck, forklift, wheeled loader, hot air fusion welder, and concrete trucks. Employees would also bring their own vehicles onto the site.

2.3.2.4 Alternative 2: Line the Canal—Full Prism—Geomembrane/Soil, 14 miles from TC-1 to Mason Check Structure

Alternative 2 would be the construction of a total of 14 miles of a full prism geomembrane liner covered with soil to protect the geomembrane (**Table 2-1**). Of the 14 miles, 5.99 miles are to address embankment risk and 8.01 miles are to address hydrologic risk. Liner design criteria are described under Alternative 1. The Fernley, Anderson, Allendale, and Mason check structures would be replaced along with the Hazen Gage. Pour Point 8 would be armored, as described above.

This alternative is similar to Alternative 1, except that the geomembrane would be covered with an 18- to 24-inch-thick compacted soil cover (see **Appendix C**, **Figure 2-2**). The soil covered liner is more susceptible to burrowing animals and tree roots and to being torn during sediment removal activities. Operational controls and practices must be in place to control animal burrowing, woody vegetation, and equipment puncture of the geomembrane liner. The 8.01 miles of additional lining provide enough Canal capacity to handle inflows; no detention ponds are required.

Approximately 20 construction personnel would be needed to line the Canal for 14 miles. Construction would take place over 300 days, in a phased approach over 10 years, due to funding constraints, with most construction beginning in November and ending in March to not disturb the irrigation season. The approximate surface disturbance outside of the Canal or staging areas for lining of the Canal would be less than 1 acre. Workers would use an excavator, backhoe, side compactor, trimmer, loader, water truck, forklift, wheeled loader, and hot air fusion welder. Employees would also bring their own vehicles onto the site.

2.3.2.5 Alternative 3: Lining the Canal—Full Prism—Geomembrane/Concrete, 27 miles of Canal

Alternative 3 would be the construction of 27 miles of a full prism geomembrane liner covered with concrete to protect the geomembrane (see **Appendix C**, **Figure 2-3**). Liner design criteria are described under Alternative 1. The Fernley, Anderson, Allendale, Mason, and Bango check structures would be replaced along with the Hazen Gage. There would be no need for additional hydrologic fixes, because the whole Canal would be lined.

Approximately 20 construction personnel would be needed to line the Canal for 27 miles. Construction would take place over 500 days for the liner and 180 days for the Bango check structure, in a phased approach, over 10 years due to funding constraints. Most construction would begin in November and end in March to not disturb the irrigation season. The approximate surface disturbance outside of the Canal or staging areas for lining of the Canal would be less than 1 acre. Workers would use an excavator, backhoe,

side compactor, trimmer, loader, forklift, wheeled loader, hot air fusion welder, dump truck, water truck, crane, and concrete trucks. Employees would also bring their own vehicles onto the site.

2.3.2.6 Alternative 4: Lining the Canal—Full Prism—Geomembrane/Concrete, Geomembrane/Soil and Geomembrane/Half Concrete

Alternative 4 would use a combination of lining covers (see **Appendix C**, **Figure 2-4**) for a total of 5.99 miles. The covers would include 1,600 feet of a full prism geomembrane liner covered with concrete; 1,000 feet of a full prism geomembrane liner with the bottom and the north side covered with concrete and the south side covered with soil (half concrete liner); and 5.5 miles of a full prism geomembrane liner covered with soil. Liner design criteria are described under Alternative 1.

The Fernley, Anderson, Allendale, and Mason check structures would be replaced along with the Hazen Gage. Pour Point 8 would be armored, and the TC 11 detention pond (322 AF), the Mason detention pond (180 AF), and the Downstream detention pond (17 AF) would be constructed.

Approximately 20 construction personnel would be needed to line the Canal. Construction would take place over 240 days, in a phased approach, over 10 years due to funding constraints. Most construction would begin in November and end in March to not disturb the irrigation season. The approximate surface disturbance outside of the Canal or staging areas for lining of the Canal would be less than 1 acre. Workers would use an excavator, backhoe, side compactor, trimmer, loader, water truck, forklift, wheeled loader, hot air fusion welder, and concrete trucks. Employees would also bring their own vehicles onto the site.

2.3.2.7 Alternative 5: Lining the Canal—Full Prism—Geomembrane/Concrete

Alternative 5 would be the construction of a total of 12.7 miles (**Table 2-1**) of a full prism geomembrane liner, covered with concrete to protect the geomembrane (see **Appendix C**, **Figure 2-5**). Of the 12.7 miles, 5.99 miles are to address embankment risk and 6.69 miles are to address hydrologic risk. Liner design criteria are described under Alternative 1. Alternative 5 would include replacement of Fernley, Anderson, Allendale, and Mason check structures and Hazen Gage; replacement of existing stop logs with radial gates in two of three bays at the Bango check structure; and automation of all radial gates at the Bango check structure. Pour Point 8 (5,800 feet) would be armored, as described previously.

Approximately 20 construction personnel would be needed to line the Canal for 12.7 miles. Construction would take place over 300 days, in a phased approach over 10 years due to funding constraints, with most construction beginning in November and ending in March to not disturb the irrigation season. The approximate surface disturbance outside of the Canal or staging areas for lining of the Canal would be less than 1 acre. Workers would use an excavator, backhoe, side compactor, trimmer, loader, water truck, forklift, wheeled loader, and hot air fusion welder. Employees would also bring their own vehicles onto the site.

2.4 Alternatives Elements Considered but Eliminated

2.4.1 Alternatives Elements Considered and Eliminated from Detailed Study

When Reclamation and the cooperating agencies completed the screening process, several alternatives elements were eliminated because they did not meet the purpose and need screening criteria, and they typically scored a low ranking of two or less out of five under the practicability and financial screening criteria. The Truckee Canal XM EIS Alternative Screening Analysis (Reclamation 2018b) provides the detailed process.

Alternatives elements eliminated from detailed study are listed below, along with the rationale for their elimination. Some of these elements have the potential to benefit operations of the Canal and the Newlands Project; however, they are beyond the scope of the project, would require an uncertain amount of time to implement, and would not definitively address the purpose and need. Although these actions are not analyzed further in the EIS, they may be pursued under a separate NEPA analysis independently of this EIS.

2.4.1.1 Install Sheet Pile Walls

Sheet pile walls would cut off embankment flows, reduce seepage through the embankment, and stabilize the embankment from the threat of breach from internal erosion. They are a physical barrier to burrowing rodents and tree roots. Rodent deterrent chemicals may be added to the synthetic material in order to prevent future intrusion.

Sheet pile walls were eliminated because the field trial in September 2017 showed that the vinyl sheet piles could not be driven through the geologic strata at two of the three test locations (Reclamation 2018c); therefore, sheet pile walls were not carried forward for further analysis.

2.4.1.2 Reconstruct the Left (North) Side of the Canal Embankment (in High-risk Areas Only)

The left (north) side of the Canal would be fully deconstructed in high-risk areas, totaling 5.99 miles, by removing all earthen embankments. Following deconstruction, the earthen embankments would be rebuilt to match their current size and location. The left embankment would be rebuilt meeting current engineering standards.

Reconstructing the left embankment using modern compaction technology would address safety and seepage concerns in the short term; however, because the reconstruction would use earthen materials only, there would be the potential for rodents, tree roots, and seepage to weaken the embankment over time. This could lead to embankment failure in the long term.

2.4.1.3 Install Pipes in High-risk Areas

Up to five 60-inch pipes would be placed in the current Canal footprint to convey water through areas of unacceptable risk, for up to 5.99 miles. Conveyance efficiency would be improved. In these areas, all check structures would be removed. The pipes would contain valves to release water to the current distribution laterals, as necessary. There would also be a 1,700-horsepower pump station installed at a location to be determined.

This element does not address the hydrologic risk from inflows to the Canal and may exacerbate that risk by constricting flows where the pipelines are installed.

2.4.1.4 Decommission the Entire Canal

The Canal would be decommissioned. There would be no diversion of Truckee River water to the Truckee or Carson Divisions. Decommissioning would remove the Derby Diversion Dam, remove all check structures, and fill and recontour the Canal and embankments. Decommissioning the Canal would eliminate the potential for a future breach; however, the Project would not be able to convey any water for storage and delivery of Newlands Project water rights. Because this element did not meet this fundamental purpose and need criterion, it could not be carried forward for detailed analysis.

2.4.1.5 Pipe Treated Effluent to the Canal

A portion of the treated effluent from the Truckee Meadows Water Reclamation Facility (TMWRF) in Sparks would be diverted via a pipe directly into the Canal. The piped, treated effluent would account for a portion of the flows into the Canal. The pipe would allow less water to be diverted from the Truckee River at the Derby Diversion Dam. Piping treated effluent to the Canal would not address the purpose and need of reducing the risk of a Canal breach. It would provide little to no improvement relative to several of the practicability screening criteria.

2.4.1.6 Lower the Canal below Grade

The Canal would be excavated in certain locations so that its entire length would be below grade. The installation of new pumping equipment would likely be required. While this element could meet the purpose and need screening criteria, lowering the Canal below grade would maintain the current earthen embankment. This would likely degrade over time. This element would result in extended periods of downtime to the Canal during construction and would not alleviate risks from hydrologic inflows. Therefore, it was not carried forward for detailed analysis.

2.4.1.7 Install Pipes below the Bango Check Structure

Piping would be installed in the Lahontan Reach, below the last check structure, to deliver water to Lahontan Reservoir. Conveyance efficiency would be improved. The Bango and Mason check structures would also be removed. This element would provide little to no improvement in the structural integrity of the Canal and this element does not address the hydrologic risk from inflows to the Canal.

2.4.1.8 Decommission the Portion of the Canal below Fernley

The Canal would be decommissioned below the Allendale check structure. Water would be diverted only from the Truckee River for the Truckee Division. Decommissioning would remove all check structures below the Allendale check structure and would fill and recontour the Canal and embankments. The Carson Division would rely on water exclusively from the Carson River. Decommissioning the Canal from the Truckee Division to Lahontan Reservoir would convey only enough water to serve the Truckee Division, and would result in consistent long-term deficits to the Project water right holders in the Carson Division; therefore, it was not carried forward for detailed analysis.

2.4.2 Hydrologic Elements Considered and Eliminated from Detailed Study

Reclamation completed additional hydrologic studies in 2017 and continued to screen hydrologic risk reduction recommendations that would eliminate the risk from Canal overtopping. The Technical Memorandum: Hydrologic Alternative Screening Analysis (Reclamation 2018b) provides the detailed process. The recommendations were ranked into the determination categories of eliminated or potential.

2.4.2.1 Clearwater Parkway Detention Pond

The Clearwater Parkway detention pond was initially considered a potential risk reduction recommendation. It would take water above a design stage level to mitigate the hydrologic risk of overtopping downstream in the lower Fernley Reach and the Lahontan Reach. The detention pond would be unlined, and the water would be allowed to evaporate or could be released back into the Canal when the stage level subsides. Reclamation completed modeling and determined that the location of the pond did not resolve the overtopping risk in the Lahontan Reach; therefore, this recommendation was not carried forward for detailed analysis.

2.4.3 Alternatives Elements Considered and Eliminated from Detailed Study That May be Pursued as Separate Actions

Following are the elements discussed previously that are not analyzed further in the EIS but that may be pursued independently of the Truckee Canal XM EIS project.

2.4.3.1 Buying Agricultural Water Rights to Reduce Demand

A sufficient volume of agricultural water rights would be retired. Water rights would be obtained from willing sellers and would then be retired from production or transferred to other uses, thereby reducing diversions from the Truckee River or the volume of shortage experienced by the Newlands Project's remaining water rights holders.

Since the mid-1990s, the USFWS has had a water rights acquisition program in the Carson Division. Through the program, the USFWS purchases irrigation water rights from willing sellers and transfers the consumptive use portion of those rights for use on wetlands. Implementing a similar program would also be contingent on the level of participation by willing sellers and in competition with the existing federal program. Reclamation does not have the authority to purchase water rights outside of the Desert Terminal Lakes program.

Such programs aimed at reducing demand are implemented incrementally over the long run and, therefore, do not result in any immediate reduction to the capacity of the Truckee Canal; therefore, water right acquisitions for demand reduction do not meet the purpose and need of the project and are independent from the proposed action.

2.4.3.2 Using Upstream Reservoirs for Storage or Banking

Newlands Project water would be stored or banked in upstream Truckee River reservoirs. This would allow the timing of deliveries during the year to be altered, which could reduce peak diversions to the Canal. This element would provide little to no improvement to the structural integrity of the Canal.

2.4.3.3 Expanding Lahontan Reservoir Capacity

The height of Lahontan Dam would be increased to enlarge the storage capacity of Lahontan Reservoir. This would be done by rehabilitating flash boards, recommissioning the Carp Dam, or dredging. This element would provide little to no improvement in the structural integrity of the Canal and the ability to meet long-term safety needs.

2.4.3.4 Lining the Lahontan Reach

This element was considered to address water conveyance efficiency and safety needs; however, this element is out of the scope for this project, as it would not specifically address the purpose and need of reducing the risk of a Canal breach.

2.4.3.5 Lining the Carson Division

This element was considered to conserve water in the Carson Division; however, it would provide little to no improvement in the structural integrity of the Canal and the ability to meet long-term safety needs. This element is discussed in further detail in a separate efficiency technical memorandum (Reclamation 2018d).

2.5 Preferred Alternative

The CEQ requires identifying a preferred alternative in the draft EIS, if such a preference is known. Alternative 5 (Lining the Canal—Full Prism—Geomembrane/Concrete) is the preferred alternative based on several factors evaluated in the engineering and economic study and this draft EIS. Alternative 5 provides the highest risk reduction compared with all other alternatives, and it reduces risk without introducing new risks. It is also among the least cost alternatives to maintain. Minor differences in potential environmental impacts exist for each of the action alternatives and are described in Chapter 3.

While Reclamation has identified a preferred alternative in this Draft EIS, actual selection of a preferred alternative will not be until the Record of Decision. The decision on the alternative to implement will consider public comments and the full analysis in the final EIS.

Chapter 3

Affected Environment and Environmental Consequences

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3. Affected Environment and Environmental Consequences

3.1 Introduction

This chapter summarizes the current environmental resources and resource uses that could be directly, indirectly, or cumulatively affected by the range of alternatives discussed in **Chapter 2**, Description of Alternatives. Potential impacts are described in terms of context, duration, and intensity. The discussion of impact indicators, analysis methods, and assumptions are included in **Appendix E**, Regulatory Framework and Methods of Analysis. Presented at the end of the chapter are separate sections describing unavoidable adverse impacts and irreversible and irretrievable commitments of resources. Many of the baseline conditions are displayed in **Appendix C**, Figures.

3.1.1 Environmental Protection Measures (EPMs)

Reclamation developed EPMs to reduce environmental consequences associated with the construction and the resultant O&M activities for the Canal. The EPMs that may be implemented are included in this chapter in each resource section and also below in **Table 3-1**, Environmental Protection Measures.

Table 3-1. Environmental Protection Measures

Number	Description
1	Structure foundations or earthwork operations next to or encroaching on natural drainage channels would be dewatered to prevent muddy water and eroded materials from entering the natural drainage channels.
2	Erosion control measures would be implemented to prevent soil loss and sedimentation transport from entering natural drainage channels.
3	Runoff from the construction and O&M sites would be controlled and would meet applicable State of Nevada stormwater requirements.
4	All contaminated discharge water created by construction and O&M activities, such as concrete washout, pumping for work area isolation, vehicle wash water, and drilling fluids, would be contained and disposed of in accordance with applicable federal, state, and local regulations.
5	All equipment would be stored, fueled, and maintained in vehicle staging areas 300 feet or the maximum feasible distance from any aquatic habitat (grassland, seasonal wetland, seep, spring, pond, lake, river, stream, or marsh). Vehicles and construction equipment would be inspected daily for fluid leaks before being driven off the staging areas.
6	Excavation or other construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters.
7	If wet areas cannot be avoided, Reclamation would use vehicles, ground mats, and equipment that minimize ground impacts.
8	Construction vehicle movement outside of the easement would be restricted, to the extent feasible, to approved access or public roads.

Number	Description
9	The City of Fernley may extend its water system infrastructure to provide water hookups to residences within the city limits that are currently on groundwater wells.
10	The United States and the City of Fernley entered into a settlement agreement in 2009, in which they established a process to enable the City to move forward with a turnout on the Truckee Canal to deliver the City's surface water rights to its water treatment plant. In March 2017, Reclamation and the City entered into a storage contract to store City water rights in upstream Truckee River reservoirs. The City has submitted a request to Reclamation to construct the turnout to the water treatment plant. On final approval by Reclamation, the City can construct the turnout and begin taking its surface water right of 10,200 acre-feet per year (AFY).
11	Before construction, Reclamation would instruct all supervisory construction personnel on protecting traditional cultural properties (TCPs), historic, cultural, and paleontological resources in the Project Area.
12	Construction personnel would avoid all culturally sensitive areas. These areas would be temporarily fenced where activities are planned to take place near cultural resources.
13	At completion of work, all work areas except access roads would be recontoured to provide for proper drainage and to prevent erosion.
14	In areas where ground disturbance is substantial or where recontouring is required, vegetation would be restored. The method of restoration typically would consist of seeding or revegetating with native plants (if required), installing cross drains for erosion control, and placing water bars in the road or centerline travel route. Seed used for revegetation would be certified as weed-free.
15	A qualified biologist would conduct surveys in sensitive habitats before clearing vegetation. The purpose of this would be to identify biologically sensitive issues, such as sensitive plant species.
16	Pre-project clearance surveys would be conducted for sensitive animal species with the potential to occur in or close to the Project Area and could be affected by the project. If sensitive animal species are identified, impacts would be avoided by flagging or fencing and by applying appropriate avoidance buffers.
17	Surface-disturbing activities would typically not occur during the migratory bird or raptor nesting season, generally from March 1 to August 31. If surface-disturbing activities must occur during this period, qualified biologists would conduct preconstruction avian surveys in appropriate habitats not less than 3 days and not more than 7 days before surface-disturbing activities begin. The specific area to be surveyed would be based on the scope of the activities. If ground-disturbing activities do not take place within 7 days of surveys, the work areas would be resurveyed. If nesting migratory birds or raptors are detected during surveys, appropriate buffers would be applied. Buffers would remain in effect until the qualified biologist determines the young have fledged or the nest has failed.
18	Avian species may nest in idle equipment or construction materials. If construction equipment is idle for more than 7 days during the breeding season, preconstruction surveys would be conducted in such areas before construction resumes.
19	Any pits that present a wildlife trapping hazard would be fitted or constructed with an escape ramp. Open, uncapped hollow pipes or other openings would be capped, screened, or otherwise covered to prevent unintentional wildlife entrapment.

Number	Description
20	Hazardous materials would not be drained onto the ground or into streams or drainage areas. All construction and maintenance waste would be removed daily. This would include trash and litter, garbage, other solid waste, petroleum products, and other regulated materials. The materials would be sent to a disposal facility authorized to accept such materials.
21	If nighttime construction is necessary, minimal-impact measures for lighting would be implemented, such as using the minimum amount necessary to complete the task, narrow-spectrum lighting, and minimal ultraviolet-emitting lights.
22	Before potential bat day roosts are removed, a qualified biologist would ensure that roosting bats would not be affected.
23	Reclamation would use measures to reduce fugitive dust generation, such as limiting vehicle speeds to reduce visible dust emissions and posting speed limit signs at construction site entrances.
24	Sandbags or equivalent effective measures would be used to prevent runoff to roadways in construction areas next to paved roadways.
25	Disturbed soils would be stabilized after construction, using a nontoxic soil stabilizer, soil weighting agent, or other approved soil stabilizing method.
26	Soil storage piles and disturbed areas would be covered or treated with appropriate dust suppressants.
27	Vehicles used to transport solid bulk material on public roadways and that could cause visible emissions would be covered.
28	Wind erosion control techniques, such as windbreaks, water, silt fences, chemical dust suppressants, and vegetation, would be used where soils are disturbed in construction and access areas and on material stockpile areas.
29	Repairs and/or construction of new embankments and structures would meet Reclamation seismic design standards.
30	All soil excavated for structure foundations would be backfilled and tamped around the foundations to provide positive drainage around the structure foundations. Excess soil would be removed from the site and disposed of appropriately.
31	Local entities could implement stormwater management plans to prevent flooding.
32	The City of Fernley may consider purchasing water rights to increase its water supply.
33	Vehicles will be inspected and cleaned before being driven onto the project site to avoid spread of noxious weeds or invasive plant species.
34	The City of Fernley would ensure that as agricultural lands are developed for municipal and industrial (M&I) uses, applicants for water service dedicate sufficient valid water rights to meet future needs.

3.2 Setting

The history and purpose of the Canal is summarized in **Section 1.1**, Introduction.

3.2.1 Region of Influence and Project Area

The Project Area, totaling approximately 860 acres, includes the entire 31 miles of the Canal, from Derby Dam to Lahontan Reservoir, four staging areas, and areas within a 100-foot buffer from the staging areas and Canal. The Project Area may include the TC-11, Mason, and the Downstream detention ponds that were needed to prevent overtopping from hydrologic inflows for two of the alternatives. The Project Area is shown in **Appendix C**, **Figure 1-1**.

The region of influence for each resource includes, at a minimum, the Project Area. The region of influence differs for each resource, depending on where potential direct and indirect impacts may occur for that resource. In instances where the region of influence varies from the Project Area, this is specified in the resource description.

Planning issues were identified and are outlined in the scoping report (Reclamation 2016c). There is potential that the following resources could be affected by project activities:

- Water resources
- Water quality
- Cultural and historic resources
- ITAs
- Vegetation
- Wildlife
- Aquatic resources
- Listed species
- Air quality and climate change
- Geology and soils
- Health and safety
- Socioeconomic resources
- Environmental justice

The following resources are not affected by this project, based on proposed activities and Reclamation regulations for Canal O&M:

- Access
- Paleontological resources
- Land use
- Noise
- Recreation
- Visual resources

3.3 Water Resources

3.3.1 Affected Environment

Water resources and hydrology include surface water, groundwater, and water quality. Water resources provide drinking water and agricultural and wetland irrigation waters in

the region of influence. This section characterizes and addresses the potential impacts on water resources from the alternatives.

Data from the following studies by Reclamation provided surface water and hydrologic conditions in the region of influence: Truckee Canal Corrective Action Study (2017a), Truckee River Basin Study (2015b), and the Enhanced Truckee Canal Hydrologic Hazard Analysis Technical Memorandum (2017c). Data sources for the groundwater evaluation consisted of aquifer and regional geology descriptions, studies and datasets, and local project-specific studies. Additional detail on groundwater resources and projects affecting those resources in the region of influence can be found in **Appendix C**, **Figures C-01** to **C-22**. The water quality evaluation was derived from water quality data of the US Environmental Protection Agency (EPA), the US Geological Survey (USGS), the Nevada Division of Environmental Protection (NDEP), and other sources, along with National Pollutant Discharge Elimination System permits.

3.3.1.1 Resource Study Area

The region of influence for water resources impacts is the Project Area, shown in **Appendix C**, **Figure 1-1**. The region of influence for surface water, groundwater, and water quality is discussed in each section.

3.3.1.2 Issues of Environmental Concern

Issues of environmental concern for water resources are Canal seepage reduction and the impact on artificial groundwater recharge; unpredictable severe storms causing flooding during construction and before long-term repairs are completed; and erosion and sedimentation transport from a Canal breach or disturbance during construction.

3.3.1.3 Characterization

Regional Hydrologic (Surface Water) Conditions

The region of influence for surface water includes the Virginia Range south of Fernley and the watershed basins and subbasins that are upslope of the Canal (see **Appendix C**, **Figures 1-1**, **3-1**, and **3-2**). Surface water runoff from the basins is conveyed by naturally occurring drainage channels and enters the Canal via Pour Points; therefore, watersheds and lands next to the Canal are considered in this analysis.

The climate in the region of influence is arid, with average annual precipitation of 6.06 inches, most of which falls in the winter (Western Regional Climate Center 2016; available period of record 1949–2005); however, rainfall can vary significantly from year to year. Runoff, between April and July, as the snowpack in the Sierra Nevada melts, is the primary source of surface water supply for the Truckee and Carson River Basins. Most of the annual precipitation falls during the winter, with peak precipitation in January. Peak runoff typically occurs in May.

Flood hazards in Nevada are typically underestimated due to the arid climate, few perennial streams, and low precipitation (Nevada Division of Water Resources [NDWR] 2005). Flood hazards in the Project Area are mapped in **Appendix C**, **Figures C-01** to **C-22**. The region is subject to two types of flooding: rivers overtopping their banks and alluvial fan flash flooding. The Federal Emergency Management Agency (FEMA) provides maps of flood hazards from river flooding. The standard flood zone is defined as

an area subject to inundation by the 1 percent, annual chance flood, or the 100-year flood. Alluvial fan flash flooding is potentially more dangerous than river flooding because it is less predictable.

FEMA mapped those areas in the Project Area that would be flooded under certain conditions (see **Appendix C**, **Figures C-01** to **C-22**). These conditions are described in the flood insurance studies (FEMA 2016, 2009a). On the Derby Reach, only the headworks of the Canal at Derby Dam are in a flood zone. This point would flood because of high flows in the Truckee River (FEMA 2009b). FEMA estimates the 1 percent probability flow at Vista, above Derby Dam, at 20,500 cfs. Similarly, the US Army Corps of Engineers (USACE 2013) has estimated that the 1 percent probability flow at Tracy Pond, in the same general location upstream of Derby Dam, would be 21,500 cfs. The FEMA maps do not identify any other flood zones along the Derby Reach of the Canal.

The Enhanced Truckee Canal Hydrologic Hazard Analysis Technical Memorandum documents the hydrologic inflows into the Canal (Reclamation 2017c). During the time this analysis was in progress, a large, regional storm occurred from January 4 to 12, 2017. Reclamation collected rainfall and runoff data from the event. The January 2017 and an August 2013 storm were incorporated for additional calibration for the hazard analysis. Rainfall-based recurrence intervals were about 50 years for the 24-hour duration and about 20 years for the 48-hour duration. The 48-hour period of maximum rainfall (January 8 to 9, 2017) had rainfall totals ranging from about 6 inches in the northwest portion of the watershed to about 1 inch in the eastern portion of the watershed.

The results of the analysis were a set of Canal inflow hydrographs representing 100-year runoff from the Canal watershed. The data developed in the analysis was used to inform the Hydrologic Engineering Centers River Analysis System (HEC-RAS) model for selecting alternatives for analysis in the EES. The HEC-RAS modeling for each EES alternative indicated that there was a potential for overtopping in the Lahontan Reach, given base flows of 350 to 600 cfs; the possibility of a large storm; and that parts of the Derby and Fernley Reaches are lined. Replacing the Hazen Gage and modifying the Bango check structure would help to reduce backwater effects that could exacerbate the risk of overtopping above the gage. Replacing the Mason Check would reduce the risk of malfunction or clogging of the check that could raise the stage upstream.

To address the increased potential for higher stage levels on the unlined portion of the Canal, Alternatives 1 and 4 require construction of unlined detention ponds. The detention ponds would be strategically located on the lower reaches of the Canal, where the water depths are at their highest points due to the lower Canal embankment or adjacent natural topography. The three ponds are on Reclamation property, in areas with little or no urban development.

The detention ponds were sized to prevent Canal overtopping by diverting Canal waters during major storm events. The diversions to the detention ponds would be fixed at a certain elevation, so that when the Canal stage rises to that elevation, flow from the Canal would be diverted to the detention ponds. These diversions would reduce the stage in the

Canal, and the water stored in the unlined detention ponds would infiltrate to groundwater or evaporate.

Regional Groundwater Conditions

The region of influence for groundwater is the West Central, Truckee, and Carson hydrologic basins (see **Appendix C**, **Figure 3-1**). Groundwater in the region of influence moves generally from recharge areas in the mountains and alluvial slopes to the valley floor (Tracy and Unger 2008). The principal groundwater aquifers in the region of influence are basin-fill; however, near Fallon there is a volcanic-rock aquifer that is used for municipal and industrial purposes (see **Appendix C**, **Figure 3-3**).

Basin-fill aquifers are composed primarily of alluvium, colluvium, and lacustrine deposits, and most groundwater has come from the upper 500 feet of the aquifers (Nevada Division of Water Planning 1999). Groundwater from one basin may flow into another, and often there is insufficient information to fully characterize this flow (see **Appendix C**, **Figure 3-3**).

Carson River Basin

Surface water irrigation from the Newlands Project has contributed to groundwater recharge since the early 1900s. Below Lahontan Reservoir, groundwater recharge resulting from precipitation in the Lahontan Valley is estimated at about 1,300 AFY (WRD 2003), occurring only on the eastern side of the valley. Most private wells in the basin are for domestic purposes; irrigation needs usually are supplied by surface water.

Truckee River Basin

Estimated groundwater recharge in Truckee Meadows is 29,000 AFY. The sources are infiltration of precipitation (mainly snowmelt), irrigation return flows, and seepage from ditches, canals, and streambeds (United States Department of the Interior [USDOI] and California Department of Water Resources [CDWR] 2008). Monitoring wells next to the Truckee River indicate that groundwater is moving into the river (Nimbus Engineers 2001).

West Central Region

The regional groundwater system in the Fernley and Wadsworth areas can be subdivided into eastern and western components. There is a groundwater divide in the eastern portion of Fernley that differentiates the west and east flow systems. The western component of the groundwater system flows to the east, from below Derby Dam, and then flows parallel to the Truckee River as it moves north toward Pyramid Lake. In the southern portion of the Project Area, groundwater flows north through Fernley, and then northwest toward the Truckee River. Groundwater that originates on the eastern side of the divide flows toward the Fernley sink or southeast toward Hazen (Epstein et al. 2007). Truckee River water provides 75 percent of the groundwater recharge to the Fernley and Wadsworth areas from artificial and irrigation recharge (Pohll 2004).

Canal Seepage

Several publications have attempted to quantify the Canal seepage, including Sinclair and Loeltz 1963, Van Denburgh et al. 1973, Van Denburgh and Arteaga 1985, Mihevc et al. 2002, Epstein et al. 2007, Shanafield 2010, and Stanka 2012. These reports are based on a variety of proposed methods to give seepage estimates. They estimate the total losses

between the Wadsworth and Hazen Gage or in a specific portion of the Canal within the Fernley Reach.

In 2007, Epstein developed the Fernley-Wadsworth steady state groundwater flow model water budget. The budget estimated that recharge was a combination of the infiltration from the following: irrigation 2,539 AFY, mountain 5,115 AFY, Truckee River 573 AFY, Truckee Canal 14,151 AFY, and laterals 3,584 AFY. Using the water balance information, Epstein developed the DRI MODFLOW hydrologic model for the Fernley/Wadsworth hydrographic basins. The model was used to assess water supply scenarios regarding expected production well yield in the Wadsworth area, groundwater supply in the Fernley area with changes in diversions to the Truckee Canal, and potential impacts of additional pumping on the Truckee River flows.

In 2011, Pohll updated the DRI MODFLOW hydrologic model for the Fernley area; he estimated that Canal seepage ranged from 14,000 and 22,000 AFY (Stanka 2012). The Truckee Canal Seepage Loss Investigation (Stanka 2012) examined seepage losses from the Canal within the Fernley Reach and quantified how these losses vary with Canal flows of 150, 350, 550, and 750 cfs. The 2018 City of Fernley's Master Plan indicates the city will be preparing a water resource plan to further address water availability (City of Fernley 2018a). It may include specific seepage studies in the Fernley Reach and the verification or updates to the DRI MODFLOW hydrologic model.

Groundwater Wells

The City of Fernley and other domestic water users rely on groundwater to supply drinking water. Reclamation reviewed the State Engineers' record of groundwater wells that may be affected by eliminating the artificial groundwater recharge caused by lining the Canal. Reclamation determined that approximately 698 wells may be affected (Derby Reach, 12 wells; Fernley Reach, 481 wells; and Lahontan Reach, 205 wells).

There are 622 domestic groundwater wells that may be affected (NDWR 2018) within the City of Fernley municipal boundary, ranging from 14 to 1,075 feet in depth. The average depth of the domestic wells is 197 feet. Each domestic well is screened at varying depths. In shallow wells, some of the screening begins 1 foot below the ground. The domestic wells vary in diameter from 2 to 20 inches. The City of Fernley's production wells range from 199 to 1,000 feet deep. Casing diameters range from 6.62 to 20 inches. **Table 3-2**, City of Fernley Production Wells, lists the NDWR data available for Fernley's production wells (NDWR 2018; City of Fernley 2016; Whalen 2018).

Table 3-2. City of Fernley Production Wells

Well Name	NDWR Well Log Number	Sealing Depth (feet)	Drilling Depth (feet)	Casing Depth (feet)	Casing Diameter (inches)	Top of Perforations (feet)	Bottom of Perforations (feet)
COF Well 1[1]	4031	No Data	207	207	10	90	207
COF Well 2[1]	8508	No Data	199	199	10	76	196
COF Well 3[1]	19446	100	220	220	9	150	220
COF Well 4[4]	36682	109	703	703	20	No Data	703
COF Well 5A[2] (Well 5[3])	19776	240	273	273	13	252	273

Well Name	NDWR Well Log Number	Sealing Depth (feet)	Drilling Depth (feet)	Casing Depth (feet)	Casing Diameter (inches)	Top of Perforations (feet)	Bottom of Perforations (feet)
COF Well 8[4]	17952	50	340	336	16	168	336
COF Well 9[4]	21352	281	330	330	16	282	330
COF Well 9A[4]	19775	265	343	343	16	295	343
COF Well 10[3]	50302	100	770	610	7	197	610
COF Well 11[4]	63815	100	770	745	18	250	735
COF Well 12[3] - Wade Well	104486	160	1,000	975	7	240	970
COF Well 13[4]	94682	100	360	340	14	150	300
COF Well 14[4]	93913	100	815	800	14	300	790

Sources: NDWR 2018; City of Fernley 2016; Whalen 2018

[1] Wells 1, 2, and 3 have been abandoned and capped, per State regulations
[2] Well 5A is a monitoring well
[3] Wells 5, 10, and 12 are monitored monthly but are not currently used for production
[4] Wells 4, 9, 9A, 11, 13, and 14 are City of Fernley municipal wells; Well 8 does not connect to infrastructure and is used and metered for construction water only.

Regional Water Quality Conditions

The region of influence for water quality is the Project Area and downstream water interests associated with the Truckee and Carson Rivers, groundwater, and inflows to Pyramid Lake.

Surface Water Quality

Most public land water resources in the region of influence are small, discrete water bodies, such as springs, seeps, wet meadows, and short stream segments. Few water bodies on public land have designated uses, so typically only the narrative standards[1] apply; however, unless properly managed, activities on public land can have off-site impacts on water bodies with designated uses.

Section 303(d) of the Clean Water Act requires that states develop a list of water bodies needing additional work beyond existing controls to achieve or maintain water quality standards. The Section 303(d) list provides a comprehensive inventory of water bodies impaired by all sources, including point sources, nonpoint sources, or a combination of both. The 303(d) list is the basis for targeting water bodies for watershed-based solutions; the total maximum daily load (TMDL) process provides an organized framework to develop these solutions.

[1] Criteria or statements that guide protection of beneficial uses from impairment by pollutants.

A TMDL is a calculation of a specific pollutant that a water body, such as the Truckee River, can carry daily without becoming impaired. A TMDL identifies a specific limit for a pollutant, generally in pounds per day. **Table 3-3**, Impaired Water Bodies on the Section 303(d) List in the Region of Influence, lists the miles of impaired waters in the region of influence based on Section 303(d).

Table 3-3. Impaired Water Bodies on the Section 303(d) List in the Region of Influence

Watershed	Miles Listed as Impaired	Cause of Impairment
Unnamed features	21	TMDL needed; cause of impairment: mercury (Hg), iron (Fe), phosphorus (P), pH, dissolved oxygen (DO), total suspended solids (TSS), and turbidity
A-line canal	3	TMDL needed; cause of impairment: Hg
Carson River	71	TMDL completed for total P, turbidity, and total dissolved solid (TDS); TMDL under review for Hg, Fe, magnesium (Mg), DO, total suspended solids (TSS), and *E. coli*
Truckee River	23	TMDL completed for arsenic (As), nitrogen (N), P, and TDS (TMDL under review for temperature)
Total	**118**	**–**

Source: EPA 2016a

Truckee River Basin Surface Water Quality

The primary water quality concern for the reach from Reno to Pyramid Lake is the potential for warm water temperatures downstream of the discharges of the TMWRF, particularly during periods of low flow (USDOI and CDWR 2008). Established actions, such as water storage and releases during low-flow conditions, may be used to meet water quality objectives for nutrients and dissolved oxygen.

The Truckee River TMDL addresses total nitrogen, total phosphorus, and TDS upstream of Lockwood, Nevada. Water diverted at Derby Dam, from the diversion to the Canal, has an average turbidity of 7.0 nephelometric turbidity units, TDS of less than 200 parts per million (ppm), and arsenic concentrations of 14 parts per billion (ppb; WRD 2003). Within a 100-foot buffer of the Canal and staging areas, no waters are listed as impaired under Section 303(d) of the Clean Water Act.

Groundwater Quality

The USGS has defined four aquifers in the Lahontan Valley, which include the shallow, intermediate, deep, and basalt aquifers. The shallow aquifer extends from the water table to a depth of approximately 50 feet and is associated with hard water quality, defined as water with high dissolved mineral content. Most of the domestic wells in the valley are completed in the shallow aquifer. The intermediate aquifer extends from 50-500 feet below ground and is generally soft water (relatively low concentration of dissolved minerals). Nearly all of the community water system wells are completed in the intermediate aquifer, and any permits issued by the State Engineer require the wells to be sealed from ground surface to 100 feet below ground surface that are completed in this

aquifer. The deep aquifer extends from 500–1,000 to in excess of 8,000 feet below ground; it is saline and generally nonpotable (Churchill County 2007).

In the Fernley and Wadsworth areas, groundwater occurs in the valley fill under both unconfined (water table) and confined (artesian) conditions. The confined groundwater generally occurs in the deeper aquifers. The confined aquifer is generally 10 to 20 feet below the unconfined aquifer (Sinclair and Loeltz 1963). The groundwater in the Fernley area may be highly mineralized and have increased TDS, due to the lake sediments' readily soluble material.

The deeper aquifers contain water of good chemical quality along the south edge of the Fernley farm district, but north of this area they generally contain more highly mineralized water. The shallow aquifers generally contain water of good chemical quality, but locally they may contain highly mineralized water. The beds of river gravel that underlie the Wadsworth area are recharged by the Truckee River and by groundwater moving toward the Truckee River (Sinclair and Loeltz 1963).

The City of Fernley operates six municipal groundwater wells (4, 9, 9A, 11, 13 and 14). They are all cased 330 to 975 feet below ground and receive water from the deep aquifer. The well water tested high in arsenic prior to 2008 and is now treated at the Fernley water treatment plant for arsenic removal and disinfection for safe consumption. In 2017, Fernley's water treatment plant did not exceed any of the maximum contaminant levels for regulated contaminants (City of Fernley 2017).

3.3.2 Environmental Consequences

3.3.2.1 Impact Indicators

Impacts on water resources would occur under the following conditions:

- Increased long-term susceptibility to on- or off-site flooding, erosion, and sedimentation transport resulting from Canal breach or altered surface hydrology
- Interference with groundwater quantity, elevations, gradients, and distribution of recharge
- Degradation to surface water quality

3.3.2.2 Environmental Protection Measures

EPMs for water resources from **Table 3-1**, above, are the following:

1 Structure foundations or earthwork operations next to or encroaching on natural drainage channels would be dewatered to prevent muddy water and eroded materials from entering the natural drainage channels.

2 Erosion control measures would be implemented to prevent loss of soil and sedimentation transport from entering natural drainage channels.

3 Runoff from the construction and O&M sites would be controlled and would meet applicable State of Nevada stormwater requirements.

4 All contaminated discharge water created by construction and O&M activities—such as concrete washout, pumping for work area isolation, vehicle wash water, and drilling fluids—would be contained and disposed of in accordance with applicable federal, state, and local regulations.

5 All equipment would be stored, fueled, and maintained in vehicle staging areas 300 feet or the maximum feasible distance from any aquatic habitat (grassland, seasonal wetland, seep, spring, pond, lake, river, stream, or marsh). Vehicles and construction equipment would be inspected daily for fluid leaks before being driven off the staging areas.

6 Excavation or other construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters.

7 If wet areas cannot be avoided, Reclamation would use vehicles, ground mats, and equipment that minimize ground impacts.

8 Construction vehicle movement outside of the easement would be restricted, to the extent feasible, to approved access or public roads.

9 The City of Fernley may extend its water system infrastructure to provide water hookups to residences within the city limits that are currently on groundwater wells.

10 The United States and the City of Fernley entered into a settlement agreement in 2009, in which they established a process to enable the City to move forward with a turnout on the Truckee Canal to deliver the City's surface water rights to its water treatment plant. In March 2017, Reclamation and the City entered into a storage contract to store City water rights in upstream Truckee River reservoirs. The City has submitted a request to Reclamation to construct the turnout to the water treatment plant. On final approval by Reclamation, the City can construct the turnout and begin taking its surface water right of 10,200 AFY.

32 The City of Fernley may consider purchasing water rights to increase its water supply.

34 The City of Fernley would ensure that as agricultural lands are developed for M&I uses, applicants for water service dedicate sufficient valid water rights to meet future needs.

3.3.2.3 Impacts from the Action Alternatives

Hydrology and Surface Water

Impacts during construction, such as increased turbidity, would be prevented by complying with the EPMs and stormwater pollution prevention measures. The TCID would continue long-term O&M activities to control vegetation and equipment corrosion and will paint, repair, or replace gates and features. Liner repairs and embankment

stabilization to prevent seeps may be needed. Alternatives 1 and 4 would require additional maintenance and repairs for the detention ponds. The long-term O&M of the Canal would not substantially degrade water quality, contaminate a public water supply, or cause any substantial flooding, erosion, or siltation. During O&M activities, compliance with EPMs 1 through 8 would avoid or reduce significant impacts on water resources.

An indirect beneficial effect would be that the geomembrane liner would provide surface water delivery efficiency. Under certain circumstances, this could result in less Truckee River water diversion, and more Truckee River water would flow to Pyramid Lake.

Groundwater

The prevention of artificial recharge of the groundwater due to the installation of an impermeable geomembrane liner, with either a concrete or soil protective cover, would be an indirect adverse effect for the City of Fernley and water users relying on this groundwater. These lined areas would eliminate artificial groundwater recharge. Pohll's 2012 modeling indicated that Canal seepage in the Fernley area ranged from 14,000 to 22,000 AFY (average 18,000 AFY). Shallow wells near the Canal are almost certainly drawing their supply from Canal seepage and will go dry. EPMs may be implemented to reduce impacts on groundwater users (see EPMs 9, 10, 32, and 34).

Table 3-4 shows the current supply (less Canal seepage) versus demand. This indicates possible shortages of groundwater if groundwater is the only water supply. Water Resource EPMs 9, 10, 32, and 34 could be implemented to reduce, but not eliminate, impacts on groundwater users.

Table 3-4. Current Groundwater Recharge Versus Demand in the Fernley Area

Fernley Area Recharge	Alternatives 1–3 (AFY)	Alternatives 4–5 (AFY)	Citation
Truckee Canal Seepage[1]	–	3,924	Pohll 2011
Laterals	3,584	3,584	Epstein 2007
Irrigation	2,539	2,539	Epstein 2007
Natural Recharge	600	600	DWR, Van Denburgh 1973
Total Recharge	**6,723**	**10,647**	**–**

Water Usage	Alternatives 1–3 (AFY)	Alternatives 4–5 (AFY)	Citation
Fernley Municipal Wells	4,096	4,096	ASR 2014, Table 2.19
Cement Plan	2,014	2,014	Epstein 2007
Private Wells	560	560	ASR 2014, Table 2.19
Evapotranspiration	4,649	4,649	Epstein 2007
Total Usage	**11,319**	**11,319**	**–**

[1]Alternatives 4 and 5 are unlined from Station 838+00 to Station 888+05 and from Station 958+05 to Station 1023+00 in the Fernley Reach (2.18 miles). The estimated Truckee Canal seepage volume is calculated as the average of Pohll's loss estimate (18,000 AFY) multiplied by 21.8 percent (2.18 unlined miles within the 10-mile reach).

Water Quality

Implementation of the action alternatives helps to prevent sediment and contaminant transport by reducing the risk of overtopping or a Canal breach as follows:

- Stabilization of embankments to prevent internal erosion that may lead to a breach
- Automated gates at the check structures to respond more quickly during storms or a breach
- Larger gates at the check structures to prevent ice jams that would lead to overtopping or a breach
- The ability to quickly "check water" in the event of a breach
- Replacement of the Hazen Gage and modification of the Bango check structure, which eliminate Canal backwater effects in the Lahontan and lower Fernley Reaches to prevent potential overtopping and flooding
- Construction of detention ponds to provide safety from overtopping and embankment failure during a storm. Water would be diverted from the Canal to prevent overtopping and embankment erosion and failure.

3.3.2.4 Impacts from the No Action Alternative

Under the No Action Alternative, routine maintenance associated with Canal operations would be ongoing in the Project Area. The TCID would not construct embankment, structural, or hydrologic elements to address identified safety risks. It is likely that the Canal embankment would continue to degrade, storm runoff could erode and scour embankments, and the potential for failure of the embankment would not be reduced. In the event of a breach, the check structures would not be automated to open and shut the gates to reduce Canal water outflow; loss of life and property may occur. Hazen Gage would not be replaced nor would Bango check structure be modified to eliminate Canal backwater effects in the Lahontan and lower Fernley Reaches. Detention ponds to divert Canal water during storms would not be constructed, resulting in no reduction in the potential for overtopping in the Lahontan Reach.

Hydrology and Surface Water

Under the No Action Alternative, flows would continue to be adjusted to maintain a safe stage level—the elevation of the water in the Canal. Stage depends on both the rate of flow and the cross-sectional area of the channel at a given location. The narrower the channel, the higher the stage for a given rate of flow.

The TCID would not improve the areas identified by FEMA as vulnerable to storm flooding, including the Canal diversion structure at Derby Dam and an area in Fernley, on both sides of the Canal near the Alternative Highway 95 Bridge (Pour Point 8). There would be few operational controls available to reduce the flow or stage in the Canal in response to the conditions presented by a severe storm. Unpredictable severe storms and changing runoff conditions, combined with embankment vulnerabilities of the Canal, would continue to present a potential threat to the integrity of the Canal and public safety due to flooding. The reduction in stage to ensure safe water delivery would affect the systems' ability to deliver requested volumes during the irrigation season.

Groundwater

Under the No Action Alternative, unlined sections would continue to allow water to infiltrate through the bottom and sides of the Canal, contributing to the artificial recharge of the shallow groundwater aquifer. Shallow groundwater users who rely on the artificial groundwater recharge would not be affected. The shallow water table would continue to fluctuate in response to changes in the amount of recharge due to infiltration from runoff and irrigation water, and the amount of groundwater pumped. Under the No Action Alternative, the stage level would continue to decrease as the Canal deteriorates. Water deliveries may not meet demand, resulting in less water and the potential for irrigated agricultural lands to be taken out of production. Many water users may sell, convert, or retire their water rights, resulting in a reduction of irrigation infiltration water.

Water Quality

Under the No Action Alternative, maintenance associated with current Canal operations would continue, as needed, with the potential for surface water and groundwater quality to be affected by spills and releases of contaminants, such as petroleum hydrocarbons. Heavy equipment would continue to remove sediment and debris and remove vegetation and to repair the embankment.

The Canal would remain vulnerable to overtopping from runoff entering the Canal at the 21 Pour Points. In the event of an embankment failure, constituents and sediment may be transported into the natural drainage channels.

3.3.2.5 Cumulative Impacts

In general, past and present impacts on water resources in the cumulative effects area (CEA) are water diversions, water depletions, impoundments, and other infrastructure development; all could result in a decline in surface and groundwater quality and quantity. These impacts have come about from federal water management projects for agriculture, storage, and municipal use, and private residential, commercial, and agricultural development in the CEA.

Groundwater extraction and surface water diversion for agricultural, commercial, and domestic use are common in the CEA. Such activities lower the groundwater levels, affecting groundwater quantity. Impacts have also resulted from constructing various administrative rights-of-way for roads, railroads, and interstate highways, mineral materials site development, and geothermal energy development. Impacts are likely to continue.

Reasonably foreseeable future conditions will also contribute to impacts on water resources in the CEA (see **Appendix G**, List of Concurrent Projects). Future projects include commercial and residential developments that would result in substantial conversion of agricultural land to urban uses. Growth and development in the Project Area would increase water demand and present challenges, due to a lack of adequate drought-period water supplies. Changing climatic and weather extremes could increase the severity and frequency of droughts, floods, and wildfires and changes in the timing of snowmelt and peak flows (Haak et al. 2010; Rieman and Isaak 2010; Wenger et al. 2011). All of these could affect water quantity and quality. Climate change could also change the timing and magnitude of municipal and agricultural water demand.

Construction of Interstate 11 near Fernley could involve modifying drainage features in the highway project alignment, altering the Alternative Highway 95 crossing at the Canal, or making other modifications. The Interstate 11 project is at a very early stage of planning; therefore, the nature of any effects on water resources can only be generally foreseen. Highway construction could alter storm drainage systems, potentially affecting the amount or timing of stormwater runoff at Pour Point 8. It could also alter the quality of storm runoff that enters the Canal.

3.3.2.6 Summary of Impacts from the Action Alternatives

Minor differences in water resource impacts exist among each alternative; however, based on compliance with applicable EPMs, environmental laws, and regulations, the action alternatives would not result in significant direct, indirect, or cumulative impacts on surface water or water quality. As discussed above, the installation of an impermeable geomembrane liner with either a soil or concrete protective cover would result in an indirect adverse effect on groundwater users. These lined areas would eliminate Canal seepage, and the indirect adverse effect would be the reduction of artificial groundwater recharge. Pohll's 2012 modeling indicated that Canal seepage in the Fernley area ranged from 14,000 to 22,000 AFY.

An indirect beneficial effect would be that the geomembrane liner would provide surface water delivery efficiency. Under certain circumstances, this could result in less Truckee River water diversion, and more Truckee River water would flow to Pyramid Lake.

3.4 Cultural and Historic Resources

3.4.1 Affected Environment

This section describes cultural resources in the proposed Project Area and the impacts the proposed project may have on these resources. Cultural resources are the expressions of human culture and the physical remains of past activities, such as buildings, structures, objects, districts, landscapes, and archaeological sites. These resources can be significant in the context of national, regional, or local history, architecture, archaeology, engineering, or culture. They may also include sacred sites and natural features significant to extant communities or peoples.

In general, prehistoric resources are those that predate written records and therefore are associated with cultural activities that occurred before Euro-American contact and settlement in the New World. Historic resources are those that date to the period of written records. This period began with the establishment of Euro-American settlement and thus varies in origination date by specific region. Ethnographic resources are those that are directly associated with the cultural practices and beliefs of living cultures.

3.4.1.1 Resource Study Area

The region of influence for cultural resources includes the Area of Potential Effects (APE), as defined by 36 CFR Part 800.16(d) (see **Appendix C**, **Figure 3-4**). Reclamation has defined the APE as "the geographic area or areas in which an undertaking may directly or indirectly change the character or use of historic properties." The direct effects APE is the Project Area and additional staging areas; the indirect effects APE is the direct

effects APE plus a quarter-mile buffer, where temporary visual or other impacts may occur. The indirect effects APE covers approximately 10,990 acres; it was used during a Class I literature review and to determine if any known historic properties are in or near it.

3.4.1.2 Issues of Environmental Concern

Impacts on historic properties are assessed by applying the criteria of adverse effect, as defined in the implementing regulations of the National Historic Preservation Act of 1966 (NHPA; 36 CFR 800.5(a)): "An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative." Reclamation, the Nevada SHPO, and other consulting parties are negotiating a programmatic agreement for managing the Newlands Project and the resolution of adverse effects resulting from the proposed Canal XM project.

3.4.1.3 Characterization

This section summarizes the existing conditions within the APE based on cultural resource inventories. Additional details of the cultural and historic resources can be found in the Cultural and Historic Resources and Indian Trust Assets Memorandum (Reclamation 2018g).

Archaeological Resources

The cultural resources inventory (Clay et al. 2016) identified 18 cultural resources in the direct effects APE. Six are updates or revisits to previously recorded sites, while 12 are newly identified sites. A summary of the archaeological resources, site description, and NRHP eligibility status appears in **Table 3-5**, Summary of Archaeological Resources. Historic properties or NRHP-eligible sites are the Canal and its associated debris, which are described in *Built Environment*, below, and a prehistoric, Paleoarchaic component site that was bisected by the construction of the Canal. Sites considered ineligible for listing on the NRHP are eight unimproved road segments, two historic debris scatters, and five prehistoric lithic scatters. The scatters are of unknown temporal affiliation and represent tool stone reduction of local cryptocrystalline silicate cobbles.

Table 3-5. Summary of Archaeological Resources

County	Trinomial	Site Description	Land Status[1]	National Register Eligibility[1]	Criteria
Site Updates					
Lyon, Storey, Churchill	LY917, ST657, CH4317	Canal; associated debris along the Canal	PVT, BOR, BLM	E	A
Churchill	CH3275	Paleoarchaic, simple, flaked stone assemblage, with a historic debris scatter	BOR	P: E H: NE	D
Churchill	CH3370	Road segment	BLM	NE	—
Churchill	CH3372	Road segment	BLM	NE	—

County	Trinomial	Site Description	Land Status[1]	National Register Eligibility[1]	Criteria
Lyon	LY1916	—	BLM	NE	—
Lyon	LY1934	Road segment	BLM	NE	—
Newly Recorded Sites					
Churchill	CH4309	Road segment	PVT	NE	—
Churchill	CH4310	Domestic scatter	BOR	NE	—
Churchill	CH4311	Road segment	BOR, PVT	NE	—
Churchill	CH4312	Simple, flaked stone assemblage	PVT	NE	—
Churchill	CH4313	Simple, flaked stone assemblage	PVT	NE	—
Churchill	CH4314	Simple, flaked stone assemblage	BOR	NE	—
Churchill	CH4315	Simple, flaked stone assemblage	BOR	NE	—
Churchill	CH4316	Road segment	BOR, PVT	NE	—
Lyon	LY2655	Simple, flaked stone assemblage	PVT	NE	—
Storey	ST654	Road segment	PVT	NE	—
Storey	ST655	Domestic dump	PVT	NE	—
Storey	ST656	Road segments	PVT	NE	—

Source: Clay et al. 2016

[1]PVT: Private; BOR: Reclamation; BLM: Bureau of Land Management; P: Prehistoric; H: Historic; E: Eligible: NE: Not eligible

Built Environment

The built environment inventory (Clay et al. 2016) identified 18 built environment resources in the direct effects APE. Five are updates or revisits to previously recorded resources, while 13 are newly identified (see **Table 3-6**, Built Environment Resources Summary). Three resources are identified as eligible for listing on the NRHP. Eligibility recommendations are addressed below.

Table 3-6. Built Environment Resources Summary

State Architectural Resource Number	Resource Description/Name	County	National Register Eligibility
Newly Recorded Resources			
S1644	Union Pacific Railroad Hazen Branch and bridge	Churchill	Not eligible
S1645	Union Pacific Railroad/Southern Pacific Railroad utility lines	Storey	Not eligible
S1656	Telephone poles	Lyon	Not eligible
S1649	Bridge Number B-1707	Lyon	Not eligible
D209	995 Mason Road	Churchill	Not eligible
S1650	Bridge Number B-1706	Churchill	Not eligible
B14666	Airport hangar	Churchill	Not eligible
B1651	Civilian Conservation Corps rock wall	Churchill	Not eligible

State Architectural Resource Number	Resource Description/Name	County	National Register Eligibility
S1652	Lahontan Reservoir	Churchill	Eligible
S1657	Paiute pipeline	Churchill	Not eligible
S1643	Bridge abutments	Churchill	Not eligible
S1642	Old Lincoln Highway abutments	Churchill	Not eligible
S846	Canal and accessory structures	Lyon, Storey, Churchill	Eligible
Updates of Previously Recorded Resources			
S1647	US Route 50 bridge/Bridge Number B-608	Churchill	Not eligible
S1641	Derby Diversion Dam	Storey	Eligible
S1646	US Route 95A bridge/Bridge Number B-238	Lyon	Not eligible
S1648/LY1424	Utility line	Lyon	Not eligible
B13448	Pump House; formerly Derby Diversion Dam dam-tender's residential complex	Storey	Not eligible

Source: Clay et al. 2016

Listed Properties and Historic Districts

The Newlands Project Thematic Resource was listed on the NRHP on March 25, 1981, under the theme of conservation and the reclaiming of arid lands for agricultural use (National Park Service 1981). The Nevada SHPO has designated the Newlands Project Historic District as District 20 and assigned the Canal structure number S846.

Canal and Appurtenant Structures

Twenty-five appurtenant structures appear eligible for listing on the NRHP as contributors to the Newlands Project; the Canal was listed on the NRHP in 1981 as part of the Newlands Reclamation Thematic Resources (Truckee-Carson Project).

The present study evaluates the entire length of the Canal and 25 historic-era structures on it. The study authors concluded that, like the Fernley Reach, the entire Canal contributes to the significance of the Newlands Project. It is significant under NRHP Criterion A as an important and early feature of the Newlands Project, which contributed to the significant impact on settlement patterns and agricultural development throughout the region. The Canal is not eligible under NRHP Criterion B, because it is not significant for any associations with individuals who made demonstrably important contributions to history.

Under NRHP Criterion C, the Canal does not represent distinctive characteristics of Reclamation design or methods of construction. The Canal does not represent the best or a rare surviving example of a distinctive type, it is not an important representation of evolving technology in the design of water conveyance structures, and it does not embody the work of a significant builder or engineer.

Derby Dam

Like the Canal, the Derby Dam operated by the TCID is listed on the NRHP as part of the Newlands Project Thematic Resource listing.

Lahontan Reservoir

Lahontan Reservoir had not been previously evaluated for listing on the NRHP. As part of this analysis, Reclamation considered whether the reservoir was eligible for listing as a contributor to the Newlands Project under NRHP Criterion A or other criteria. While Lahontan Dam is listed on the NRHP, Reclamation determined that Lahontan Reservoir is not individually eligible for listing or as a contributor to the Newlands Project. Because only a small section of Lahontan Reservoir is in the APE, this analysis does not assess the integrity of the entire reservoir. In the direct effects APE, Lahontan Reservoir appears to retain integrity. For the purposes of this project, Lahontan Reservoir is assumed to retain its overall integrity.

3.4.2 Environmental Consequences

3.4.2.1 Impact Indicators

The following indicators are used to analyze impacts on cultural resources:

- Adverse effects on historic properties, as defined in 36 CFR 800
- Changes in access or nature of sacred sites, either temporary or permanent
- Changes to cultural resources of Native American significance or concern

3.4.2.2 Environmental Protection Measures

EPMs for cultural resources from **Table 3-1**, above, are the following:

11 Before construction, Reclamation would instruct all supervisory construction personnel on protecting TCPs, historic, cultural, and paleontological resources in the Project Area.

12 Construction personnel would avoid all culturally sensitive areas. These areas would be temporarily fenced where activities are planned to take place near cultural resources.

3.4.2.3 Impacts from the Action Alternatives

Construction could affect the Canal and archaeological resources in the APE. Permanent and temporary replacement and modifications of features and historic characteristics of the Canal, a historic property, may result in an adverse effect on the Canal. Ground-disturbing activities for construction, such as grading and using staging areas, creating access roads, and creating temporary water diversion structures, could damage or destroy archaeological resources by removing or displacing artifacts and features or by constructing features out of character with a historic setting. Additional surveys and revisions to the APE may be necessary in some areas, due to project changes, to determine if cultural resources are present.

Before Reclamation approves any changes, it would document the existing Canal, including detailed documentation of the current condition of the areas of the Canal that would be modified. Pursuant to Section 106 of the NHPA, Reclamation consulted with the Nevada SHPO, the Advisory Council on Historic Preservation, and interested parties regarding mitigation measures to resolve the adverse effect on the Canal from the action alternatives. Before it selects an action alternative, Reclamation and the consulting parties

would execute a programmatic agreement document to resolve the adverse effect, as defined in 36 CFR 800. The Derby Diversion Dam, a historic property, is in the APE, but no changes or effects would occur under any of the action alternatives. There would be no direct or indirect effects on Lahontan Dam under any of the action alternatives.

Construction could damage or destroy archaeological and built environment historic properties identified in the APE. Only one of the archaeological sites in the direct effects APE has significance, as identified through the NHPA Section 106 process. This Native American prehistoric site was bisected when the Canal was constructed. The remaining intact portions of this site are outside zones of construction and would be avoided through fencing if necessary.

The PLPT and the FPST also expressed concern with five other prehistoric sites in the APE. These sites are in areas proposed for staging and would be avoided through design and EPMs, such as temporarily fencing off areas where activities are planned near cultural resources. The remaining historic-era cultural resources do not have significance; therefore, impacts from the action alternatives would not be significant. No Indian sacred sites are identified in or near the APE that would be affected by any of the action alternatives.

3.4.2.4 Impacts from the No Action Alternative

Under the No Action Alternative, the Canal would continue to be operated under OCAP and subject to current conditions, contracts, and laws. The TCID would continue to perform routine maintenance to minimize risk and maintain the flow stages, in accordance with the O&M contract and Reclamation guidance. Any changes that may affect cultural resources owned or managed by a federal agency, on federal land, or involving a federal undertaking would be subject to compliance with federal laws, including the NHPA. There would be no impacts on historic properties, changes in access or nature of sacred sites, or changes to cultural resources of Native American significance from the No Action Alternative.

3.4.2.5 Cumulative Impacts

Past and present impacts on cultural resources in the CEA include disturbance of archaeological sites, alterations of historic structures, changes in access or nature of sacred sites, and alterations to setting of cultural resources from industrial, commercial, agricultural, and residential development; transportation and utility infrastructure; and resource extraction as identified in Appendix G. Ongoing and future activities within the CEA may have cumulative effects on cultural resources, particularly on the Canal, a historic property, and other features such as the integrity of the Lahontan Dam. Reclamation is constructing a fish screen at the head of the Canal to ensure threatened and endangered species remain in the Truckee River. The BLM Carson City Management Plan area includes portions of the APE that may be available for transfer or disposal out of federal ownership. Implementation of the Nevada Department of Transportation's Interstate 11 project, which crosses the Canal, may contribute to cumulative effects on the Canal. Ongoing repairs and maintenance of the Canal to continue operations may also contribute to cumulative effects on the Canal and the prehistoric NRHP-eligible property bisected by the Canal. No known Indian Sacred Sites have been identified within the

APE, although any future federal actions may be subject to additional consultations under Executive Order 13007.

If none of the action alternatives are adopted, maintenance of the Canal would continue on an as-needed basis, and would be subject to compliance by Reclamation with federal cultural resources laws, including Section 106 of the NHPA. Any changes that may affect cultural resources owned by a federal agency, on federal land, or involving a federal undertaking within the APE would be subject to compliance with federal laws, including the NHPA, on a project-by-project basis.

Under all action alternatives, the combination of the proposed activities, ongoing maintenance of the Canal, and other future actions within the APE have the potential to result in adverse effects on the Canal. Reclamation is currently in the process of documenting the Canal for archival records through consultations under Section 106 of the NHPA. In addition, Reclamation is currently in consultations under Section 106 of the NHPA to revise an existing Programmatic Agreement for O&M of the Newlands Project, which includes O&M of the Canal. A separate agreement has been executed related to the fish screen. These agreement documents will include procedures for avoiding, minimizing, and mitigating any adverse effects on the overall Newlands Project and on the Canal.

3.4.2.6 Summary of Impacts from the Action Alternatives

Results from the cultural resources analysis indicate that replacement and modifications of features and historic characteristics of the Canal, a historic property, may result in an adverse effect on the Canal and would have an adverse impact on cultural resources. Section 106 consultation, the implementation of the programmatic agreement, and compliance with EPMs would lessen the impacts on cultural resources.

3.5 Indian Trust Assets

3.5.1 Affected Environment

ITAs are legal interests in property held in trust by the United States for federally recognized Indian tribes or individual Indians. An Indian trust has three components: the trustee, the beneficiary, and the trust asset. ITAs can include land, minerals, federally reserved hunting, fishing, and water rights, and in-stream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally recognized Indian tribes with trust land; the United States is the trustee. ITAs cannot be sold, leased, or otherwise encumbered without the approval of the United States. The characterization and application of the trust relationship have been defined by case law that interprets congressional acts, executive orders, and historic treaty provisions.

Reclamation assesses the impact of its programs and projects on tribal trust resources and federally recognized tribal governments. It engages federally recognized tribal governments and consults with them on a government-to-government level when its actions would affect ITAs. Reclamation, along with all bureaus in the DOI, is responsible for, among other things, the following:

- Identifying any impact of its plans, projects, programs, or activities on ITAs
- Ensuring that potential impacts are explicitly addressed in planning, decision, and operational documents
- Consulting with recognized tribes that may be affected by proposed activities

Consistent with this, Reclamation's Indian trust policy states that it will carry out its activities in a manner that protects ITAs and avoids adverse impacts when possible or, when this is not possible, provides appropriate mitigation or compensation. To carry out this policy, Reclamation's NEPA compliance procedures guide evaluation of the potential impacts of its proposed actions on ITAs.

3.5.1.1 Resource Study Area

The region of influence for ITAs is the Project Area and the reach of the Truckee River, from Derby Dam to Pyramid Lake.

3.5.1.2 Issues of Environmental Concern

Issues of environmental concern for ITAs are project activities that may result in loss, damage, or waste of ITAs. These could include water rights, water quality, land, native plants, wildlife, and fish, as incomes are derived from these resources.

3.5.1.3 Characterization

ITAs are primarily identified by consulting with the appropriate tribes that may have aboriginal claims or interests. Reclamation initiated tribal consultation in 2015 on a government-to-government basis. Reclamation sent letters to the FPST, PLPT, Reno-Sparks Indian Colony, and Washoe Tribe of Nevada and California. Reclamation identified the PLPT and the FPST as having cultural affiliation and potential trust issues that may be affected by the proposed action and, as such, invited them to be cooperating agencies. Reclamation also received comments during scoping concerning trust assets. Discussions are ongoing on a variety of topics and issues, including the identification of ITAs. Impacts would be determined if their implementation would result in the loss, damage, depletion, or waste of ITAs (Reclamation 2018g).

Trust Resources

The two federally recognized tribes with ITAs that may be relevant to the Canal XM EIS Project are the PLPT and the FPST. Trust resources of these tribes are land, water rights, native plants, wildlife, and fish, as incomes are derived from these resources. Both tribes are primarily concerned with regional water quality and quantity, water distribution, fish and wildlife, and wetlands.

Pyramid Lake Paiute Tribe

The Pyramid Lake Reservation is approximately 40 miles northeast of Reno. The communities of Nixon, Sutcliffe, and Wadsworth are on the reservation, and Fernley is 3 miles southeast. In 1859, the General Land Office ordered the establishment of the reservation, and the area was withdrawn from sale and settlement in 1861. President Grant issued his executive order confirming the Pyramid Lake Reservation in 1874. Much of the land is high desert, used for grazing (Tiller 1995).

The Canal passes through reservation lands held in trust by the BIA near Wadsworth. The tribe maintains sovereignty on these lands. It also has trust assets related to fisheries in Pyramid Lake and on its reservation. Although not served by the Canal, Pyramid Lake is fed by the Truckee River.

In addition to agricultural and domestic needs, the PLPT values two fishes as part of their cultural heritage and economic importance: the cui-ui (*Chasmistes cujus*), listed as endangered, and the Lahontan cutthroat trout (LCT; *Oncorhynchus clarkii henshawi*), listed as threatened. The cui-ui is currently found only in Pyramid Lake.

Fallon Paiute-Shoshone Tribe

The Fallon Reservation and Colony spans approximately 5,540 acres in the high desert of west-central Nevada, southwest of the Carson Sink. The reservation lies entirely in Churchill County. The town of Stillwater lies 6 miles west of the reservation, along State Road 116. Major Nevada cities near the reservation are Reno (65 miles west), Fallon (8 miles west), and Carson City (65 miles southwest).

The Fallon Reservation was established under the 1890 allotment schedule approved by the Secretary of the Interior. Fifty allotments, each 160 acres, were made under the General Allotment Act of February 8, 1887 (Tiller 1995). The Reservation contains 8,216 acres, 5,470.4 of which are water-righted.

The Canal provides water through the Newlands Project to reservation lands of the Fallon-Paiute Shoshone Tribe. The water is used for agricultural irrigation and to support wetlands within the reservation.

3.5.2 Environmental Consequences

3.5.2.1 Impact Indicators

The indicators used to analyze impacts on ITAs are whether any assets would be affected by the following:

- Changes in water rights that support tribal fisheries, wildlife, irrigation, or trust income
- Interference with regional water quality and quantity, and water distribution
- Impacts on native plants, wildlife, and federally reserved hunting and fishing areas

3.5.2.2 Environmental Protection Measures

EPMs identified for cultural, biological, and water resources in **Table 3-1**, would be applicable for the protection of assets.

1 Structure foundations or earthwork operations next to or encroaching on natural drainage channels would be dewatered to prevent muddy water and eroded materials from entering the natural drainage channels.

2 Erosion control measures would be implemented to prevent loss of soil and sedimentation transport from entering natural drainage channels.

3 Runoff from the construction and O&M sites would be controlled and would meet applicable State of Nevada stormwater requirements.

4 All contaminated discharge water created by construction and O&M activities—such as concrete washout, pumping for work area isolation, vehicle wash water, and drilling fluids—would be contained and disposed of in accordance with applicable federal, state, and local regulations.

5 All equipment would be stored, fueled, and maintained in vehicle staging areas 300 feet or the maximum feasible distance from any aquatic habitat (grassland, seasonal wetland, seep, spring, pond, lake, river, stream, or marsh). Vehicles and construction equipment would be inspected daily for fluid leaks before being driven off the staging areas.

6 Excavation or other construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters.

7 If wet areas cannot be avoided, Reclamation would use vehicles, ground mats, and equipment that minimize ground impacts.

11 Before construction, Reclamation would instruct all supervisory construction personnel on protecting TCPs, historic, cultural, and paleontological resources in the Project Area.

12 Construction personnel would avoid all culturally sensitive areas. These areas would be temporarily fenced where activities are planned to take place near cultural resources.

3.5.2.3 Impacts from the Action Alternatives

This project would not result in any changes to water rights that support tribal fisheries, native plants, wildlife, irrigation, or trust income. Diversions from the Truckee River would continue to be regulated by the 1997 OCAP. The action alternatives would not have any adverse effects on ITAs.

3.5.2.4 Impacts from the No Action Alternative

Under the No Action Alternative, the Canal would continue to be operated under the OCAP and to be subject to current conditions, contracts, and laws. There would be no changes in water rights that support tribal fisheries, native plants, wildlife, irrigation, or trust income; however, safety risks would be evaluated every 5 years, and the maximum water level (stage) would be adjusted to minimize new risks as the Canal deteriorates. In the long term, if the Canal deteriorates and stage restrictions are imposed, the FPST may not have access to its full allocation of water.

3.5.2.5 Cumulative Impacts

The ITAs CEA is defined as the Project Area and tribal lands, water rights, natural resources, and fisheries. Actions in the CEA that may affect tribal lands, rights, resources, and fisheries are sprawl, development, regional water demand, trespass, and invasive species.

Under the No Action Alternative, the Canal would continue to be operated under the OCAP and subject to current conditions, contracts, and laws. There would be no changes in water rights or deliveries that support tribal fisheries, wildlife issues, irrigation, or trust income. There would be no contribution to cumulative impacts, when added to the past, present, and reasonably foreseeable future actions in the CEA.

Reclamation has reviewed the proposed project and its relationship to tribal land and trust assets. It has determined that land, resources, or property in trust for Indians would not be affected by this project. This project does not address any changes in water rights or deliveries that support tribal fisheries, wildlife issues, irrigation, or trust income. There would be no contribution to cumulative impacts, when added to the past, present, and reasonably foreseeable future actions in the CEA.

The alternatives addressing ongoing maintenance of the Canal would not affect tribal lands, rights, resources, and fisheries. The Canal would continue to be operated under the OCAP and subject to current conditions, contracts, and laws. There would be no changes in water rights or deliveries that support tribal fisheries, wildlife issues, irrigation, or trust income. There would be no contribution to cumulative impacts, when added to the past, present, and reasonably foreseeable future actions in the CEA.

3.5.2.6 Summary of Impacts from the Action Alternatives

None of the action alternatives would adversely affect ITAs and would not contribute to cumulative impacts on ITAs.

3.6 Vegetation

3.6.1 Affected Environment

Vegetation includes general vegetation communities, wetlands and riparian vegetation, special status plant species, and noxious weeds and nonnative, invasive plants (referred to collectively as weeds).

Data from the Reclamation Biological Survey Report (Reclamation 2016d) provided existing vegetation conditions in the Project Area and region of influence. A summary of the survey report and additional information on vegetation is outlined in the Biological Resources Memorandum (Reclamation 2018h). Additional detail on vegetation in the region of influence can also be found in **Appendix C**, **Figures B-01** to **B-22**. They depict the extent and locations of vegetation communities and weeds discussed below.

3.6.1.1 Resource Study Area

The primary region of influence for vegetation is the Project Area, shown in **Appendix C**, **Figure 1-1**. The region of influence also includes the Truckee River near Derby Dam.

3.6.1.2 Issues of Environmental Concern

Issues of environmental concern are that project activities may result in loss or degradation of general vegetation communities, wetlands and riparian vegetation, special status plants and their habitat, and increased weed establishment and spread. These issues are described in detail below.

3.6.1.3 Characterization

General Vegetation

The Project Area spans several habitat types. The three main vegetation types along the Canal are intermountain basins salt desert shrub, Great Basin foothill and lower montane riparian woodland and shrubland, and intermountain basins big sagebrush shrubland; however, the plant community composition varies slightly across the landscape.

The topography is generally flat, except in Canal tunnel areas in the northwestern portion of the Project Area. Vegetation types in the Project Area are summarized in **Table 3-7**, Vegetation Types, below. A complete list of plant species observed during the field survey is in the biological survey report (Reclamation 2016d).

Table 3-7. Vegetation Types

Southwest Regional Gap Analysis Project (SWReGAP) Land Cover Type	Acres
Intermountain basins mixed salt desert scrub	648
Great Basin foothill and lower montane riparian woodland and shrubland	62
Intermountain basins big sagebrush shrubland	113
Intermountain basins greasewood flat	14
Intermountain basins playa	1
Other	18

Sources: Reclamation geographic information system (GIS) 2016; SWReGAP GIS 2016

Wetlands and Riparian Vegetation

Wetlands are defined as lands that are inundated or saturated by water for at least several weeks of the year and contain hydric soils[2] and hydrophytic[3] vegetation. Riparian refers to the habitat next to or near streams, lakes, ponds, and wetlands that is influenced by water (Wisdom et al. 2003).

Numerous laterals originate from the Canal to deliver water to users. Many of these features contain thin bands of herbaceous, native and nonnative invasive, wetland, and riparian vegetation near the waterline.

Several other wetland and riparian areas exist in the Lahontan Valley, to the east of the Canal. The Fernley Wildlife Management Area (WMA) is approximately 1 mile north of the Canal's Fernley Reach. The WMA contains several intermittent water bodies and wetland vegetation. Similar wetland and riparian areas exist in the Lahontan Valley near Hazen, along portions of the Lahontan Reservoir shoreline, and in the SNWR and portions of the FPST reservation, which are both over 20 miles east of the Canal's Lahontan Reach.

Canal

There is a thin band of herbaceous wetland and riparian vegetation, composed of both native and nonnative, invasive vegetation near the Canal prism waterline. Dominant species are redtop (*Agrostis gigantea*), Baltic rush (*Juncus balticus*), cattail (*Typha* spp.),

[2] Soils "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (*Federal Register,* July 13, 1994)
[3] Vegetation comprised of hydrophytes, or plants that grow wholly or partly submerged in water

stinging nettle (*Urtica dioica*), English plantain (*Plantago lanceolata*), Mexican whorled milkweed (*Asclepias fascicularis*), and common sunflower (*Helianthus annuus*). This vegetation is disturbed annually during Canal maintenance.

In addition, several small (less than 0.1 acre) seeps occur, generally immediately downgradient of the Canal in topographic concavities. They are presumably supported by a surface or near-surface expression of Canal flows. These areas support native and nonnative vegetation, like the herbaceous species observed growing on the Canal banks. In the region of influence, riparian vegetation is widespread in and along the main stem of the Truckee River, between the Derby Diversion Dam and Pyramid Lake.

Truckee River

Riparian areas and wetlands along the Truckee River were assessed as part of the Truckee River Operating Agreement Environmental Impact Statement (USDOI and CDWR 2008). The study authors found that three general types of riparian/wetland areas exist in the Truckee River main stem: palustrine[4] emergent wetlands, palustrine scrub-shrub wetlands, and palustrine forested wetlands. Approximate acres of riparian and wetland habitats on the Truckee River between the Derby Diversion Dam and Pyramid Lake are summarized in **Table 3-8**, Truckee River Riparian and Wetland Habitat.

Table 3-8. Truckee River Riparian and Wetland Habitat

Riparian and Wetland Habitat	Acres (from Derby Diversion Dam to Pyramid Lake)
Palustrine Emergent Wetlands	
Transmontane[1] freshwater marsh	25
Palustrine Scrub-Shrub Wetlands	
Modoc-Great Basin riparian scrub	481
Palustrine Forested Wetlands	
Modoc-Great Basin cottonwood-willow riparian forest	337
Other Wetlands[2]	
Pond-like areas	7.1
Ponds	5.8

Source: USDOI and CDWR 2008

[1]East of the Sierra Nevada Range of the Great Basin
[2]Several small ponds and pond-like areas in cutoff meanders and low-lying areas are believed to be hydrologically influenced by the Truckee River.

Special Status Plant Species

Reclamation used the current BLM special status species list to identify special status plant species that occur in or that have the potential to occur in the region of influence (see **Table 3-9**, Sensitive Plants, below). Agency coordination did not identify any known occurrences of sensitive plants in or near the Project Area (Reclamation 2016d).

[4] A wetland lacking flowing water

Table 3-9. Sensitive Plants

Species	Habitat	Occurrence Potential
Lahontan beardtongue *Penstemon palmeri* var. *macranthus*	Along washes, roadsides, and canyon floors, particularly on carbonate-containing substrates, usually where subsurface moisture is available throughout most of the summer	Potential habitat present; not observed during surveys
Lahontan milkvetch *Astragalus porrectus*	Open, calcareous or alkaline, sandy to gravelly washes, alluvium, or gullies on clay badlands, knolls, or playa edges in the shadscale zone	Potential habitat present; not observed during surveys
Nevada dune beardtongue *Penstemon arenarius*	Sandy soils of valley bottoms, sometimes on road banks and other recovering disturbances	Potential habitat present; not observed during surveys
Nevada suncup *Camissonia nevadensis*	Open, sandy, gravelly, or clay slopes and flats in the salt-desert, shadscale, and lower sagebrush zones	Potential habitat present; not observed during surveys
Sand cholla *Grusonia pulchella*	Sand dunes, dry-lake borders, river bottoms, washes, valleys, and plains on sandy soils	Confirmed; one individual observed in mixed salt desert scrub on Reclamation lands
Tonopah milkvetch *Astragalus pseudiodanthus*	Deep, loose, sandy soils of stabilized and active dune margins, old beaches, valley floors, or drainages in Salt Desert Shrub	Potential habitat present; not observed during surveys

Source: Reclamation 2016d

One BLM sensitive plant species, sand cholla (*Grusonia pulchella*), was observed on Reclamation lands on the Derby Reach of the Canal. This plant is on a ridge, approximately 80 feet from the Canal access road. No BLM sensitive plant species were observed on BLM-administered land during the field survey.

Noxious Weeds and Nonnative, Invasive Plants

The Nevada Department of Agriculture (NDA) maintains the Nevada Noxious Weed List (NDA 2016) under the Nevada Administrative Code (NAC Section 555.10). It contains 54 species of noxious weeds in Nevada, defined as "any species of plant which is, or likely to be, detrimental or destructive and difficult to control or eradicate." In addition to noxious weeds, there are also nonnative, invasive plants that are not listed but that can also be problematic. Both noxious and nonnative, invasive plants could affect the ecological integrity of the region; thus, both noxious and nonnative, invasive plants are discussed in this section.

Weeds on the Nevada Noxious Weed List are organized by threat category. Generally, categories reflect the level of potential threat provided by the particular weed; thus, weeds in Category A provide the greatest risk of ecological and economic impact, while weeds in Categories B and C provide lesser risk. No Category A noxious weeds were observed in the Project Area.

Six of the 54 noxious weed species identified by the NDA were found in the Project Area, as summarized in **Table 3-10**, Noxious Weeds, below, and as shown in **Appendix C**, **Figures B-01** to **B-22**. Perennial pepperweed had the highest rate of occurrence, but Russian knapweed (*Acroptilon repens*), hoary cress (*Cardaria draba*), musk thistle (*Carduus nutans*), poison hemlock (*Conium maculatum*), and saltcedar (*Tamarix* spp.) were all found in multiple locations throughout the Project Area (Reclamation 2016d).

Table 3-10. Noxious Weeds

Common Name	Scientific Name	State Category[1]
Musk thistle	*Carduus nutans*	B
Russian knapweed	*Acroptilon repens*	B
Hoary cress	*Cardaria draba*	C
Perennial pepperweed (tall whitetop)	*Lepidium latifolium*	C
Poison hemlock	*Conium maculatum*	C
Saltcedar	*Tamarix* spp.	C

Source: NDA 2016

[1] **Category A**
- Weeds not found or limited in distribution throughout the state
- Actively excluded from the state and actively eradicated wherever found
- Actively eradicated from nursery premises
- Control required by the state in all infestations

Category B
- Weeds currently established in scattered populations in some counties of the state
- Actively excluded where possible
- Actively eradicated from nursery premises
- Control required by the state in areas where populations are not well established or previously unknown to occur

Category C
- Weeds currently established and generally widespread in many counties of the state
- Actively eradicated from nursery premises
- Abatement at the discretion of the State Quarantine Officer

Nonnative, invasive plant species can also disrupt ecosystems, but the severity of their impact depends on other contextual biotic and abiotic factors (Bell et al. 2007). All of the nonnative, invasive species tend to occur most regularly in disturbed open areas, along roadsides and other clearings, and in other similar areas where native vegetation is sparse or previously disturbed. Nonnative, invasive species in the region of influence are cheatgrass (*Bromus tectorum*), redtop (*Agrostis gigantea*), field bindweed (*Convolusus arvensis*), flixweed (*Descurainia sophia*), Russian olive (*Eleagnus angustifolia*), halogeton (*Halogeton glomeratus*), curlycup gumweed (*Gindelia squarrosa*), burningbush (*Bassia scoparia*), forage kochia (*Kochia prostrata*), prickly lettuce (*Lactuca serriola*), alfalfa (*Medicago sativa*), sweetclover (*Melilotus* spp.), English plantain (*Plantago lanceolata*), Russian thistle (*Salsola tragus*), prickly sow thistle (*Sonchus asper*), American elm (*Ulmus americana*), and common mullein (*Verbascum thapsus*).

Some nonnative, invasive plants, notably Russian olive, appear to have been planted as ornamental trees or wind or visual screens. Approximately 60 Russian olive trees were mapped throughout the Project Area, particularly in the Fernley area. The Russian olive trees do provide riparian habitat along the Canal; however, the tree root systems cause

instability to the embankment and may result in Canal breach. The TCID developed a prioritization for removing invasive species and operates in accordance with the Newlands Project Pest Management Plan.

3.6.2 Environmental Consequences

3.6.2.1 Impact Indicators

The following indicators are used to analyze impacts on vegetation:

- Loss of habitats, or natural communities recognized for ecological, scientific, recreational, or commercial purposes, or as biologically significant in local, state, or federal policies, statutes, or regulations
- Introduction or spread of noxious weed or nonnative, invasive plant species populations

3.6.2.2 Environmental Protection Measures

EPMs for vegetation from **Table 3-1**, above, are the following:

13 At completion of work, all work areas except access roads would be recontoured to provide for proper drainage and to prevent erosion.

14 In areas where ground disturbance is substantial or where recontouring is required, vegetation would be restored. The method of restoration typically would consist of seeding or revegetating with native plants (if required), installing cross drains for erosion control, and placing water bars in the road or centerline travel route. Seed used for revegetation would be certified as weed-free.

15 A qualified biologist would conduct surveys in sensitive habitats before clearing vegetation. The purpose of this survey would be to identify biologically sensitive issues, such as sensitive plant species.

23 Reclamation would use measures to reduce fugitive dust generation, such as limiting vehicle speeds to reduce visible dust emissions and posting speed limit signs at construction site entrances.

33 Vehicles will be inspected and cleaned before being driven onto the project site to avoid spread of noxious weeds or invasive plant species.

3.6.2.3 Impacts from the Action Alternatives

General Vegetation

New construction would directly remove vegetation communities. This would primarily occur during work area clearing. The amount and type of vegetation community that would be affected are summarized in **Table 3-11**, Vegetation Community Impacts, Action Alternatives, below.

Table 3-11. Vegetation Community Impacts, Action Alternatives

Element	Disturbance Acres[1]	Primary Vegetation Community Affected	Other Vegetation Communities that May Be Affected
Line the Canal—full prism—geomembrane/concrete (5.99 miles)	Less than 1 acre	Intermountain basins mixed salt desert scrub	Great Basin foothill and lower montane riparian woodland and shrubland; Agriculture; Intermountain basins big sagebrush shrubland; Intermountain basins greasewood flat
Line Full Prism (14 miles) with geomembrane and soil	Less than 1 acre	Intermountain basins mixed salt desert scrub	Great Basin foothill and lower montane riparian woodland and shrubland
Line the Canal—full prism—geomembrane and concrete, 27 miles	Less than 1 acre	Intermountain basins mixed salt desert scrub	Intermountain basins greasewood flat
Line the Canal—geomembrane/concrete full prism 1,600 feet; geomembrane/½ concrete 1,000 feet; geomembrane/soil 5.5 miles	Less than 1 acre	Intermountain basins mixed salt desert scrub	Great Basin foothill and lower montane riparian woodland and shrubland
Armor Pour Point 8	Less than 1 acre	Intermountain basins mixed salt desert scrub; Great Basin foothill and lower montane riparian woodland and shrubland	None
TC 11 detention pond, Mason detention pond, Downstream detention pond	45.4 acres[2]	Intermountain basins mixed salt desert scrub	Great Basin foothill and lower montane riparian woodland and shrubland; Intermountain basins greasewood flat
Replace Five Check Structures: Fernley, Anderson, Allendale, Mason, and Bango	Up to 5 acres (less than 1 acre for each structure)	Intermountain basins mixed salt desert scrub	Great Basin foothill and lower montane riparian woodland and shrubland; Intermountain basins greasewood flat
Remove and replace Hazen Gage with a long-throated flume	Less than 1 acre	Intermountain basins mixed salt desert scrub	None

Sources: Reclamation GIS 2016; SWReGAP GIS 2004

[1] Disturbance acres are estimates of disturbance for vegetation communities.
[2] Because most of the detention pond footprints were not included in the biological surveys (Reclamation 2016d), these areas would be surveyed to verify the vegetation communities that are present before the project begins.

Construction would alter the amount of acres and species composition of vegetation communities in the Project Area. Most construction work associated with Canal lining and Pour Point 8 armoring would be conducted from existing disturbed areas, such as within the Canal prism, on access roads, and other disturbed areas. This would reduce the amount of undisturbed vegetation that would be removed. Incorporating EPMs would minimize this impact. Detention ponds could disturb the most acres of vegetation, because they would generally be constructed in undisturbed areas next to the Canal.

Indirect impacts on general vegetation from surface-disturbing activities may include weed spread or establishment into native vegetation communities (Brooks and Lair 2005). Vehicles or equipment may transport weed seeds in the Project Area, indirectly affecting vegetation communities by facilitating weed establishment and spread and altering vegetation composition in native vegetation communities. Incorporating measures to minimize surface disturbance and prevent weed transport would minimize this impact.

Even if no direct vegetation removal is proposed, construction may indirectly affect general vegetation communities by producing fugitive dust, which could settle on nearby vegetation. Fugitive dust settling on vegetation surfaces can impair plant physiological processes (Wijayratne et al. 2009; Zia-Khan et al. 2015), reducing vegetation health and impairing pollinator efficiency (Lewis 2013). Incorporating measures to reduce fugitive dust generation during construction would minimize this impact.

Construction duration would vary, depending on the element constructed and the length and method used to line the Canal. Overall, duration would generally last between 2 and 10 years. The duration of the impact could be permanent or temporary. Incorporating revegetation EPMs would reduce impact duration. Depending on the vegetation type affected and the type of restoration proposed, impacts could be permanent by replacing one vegetation type with another, such as replacing salt desert scrub vegetation with annual grassland vegetation. The potential indirect impacts from weed spread could last longer than construction duration if new weed populations become established in the work areas.

Construction under all action alternatives may necessitate direct removal of cottonwood (*Populus fremontii*) trees in the Canal prism to accommodate equipment or clear work areas. For trees near work areas that would not be removed, heavy equipment unintentionally striking or delimbing trees can cause mechanical damage and reduced physiological function. Severely damaged trees may die shortly following damage; this would be an indirect impact. Because work would generally be conducted from existing staging areas and the existing access road, removal is expected to be limited. Lining the Canal could indirectly affect adjacent cottonwood and other trees by eliminating the hydrological source supporting them. This could lead to increased water stress, a decline in physiological function, and eventual tree mortality.

Wetlands and Riparian Areas

Routine maintenance along with lining the Canal, replacing the check structures and the Hazen Gage, and armoring Pour Point 8 would require work within the Canal prism. Riparian vegetation growing in the Canal prism would be directly removed during site

preparation for construction. Where the banks are finished with a suitable growing substrate, such as soil, as opposed to concrete, riparian vegetation would likely recolonize relatively quickly from adjacent and upstream areas, limiting the duration of this impact; however, the TCID would strive to keep riparian vegetation out of the Canal and from growing on the embankment through routine maintenance. Riparian vegetation would not recolonize areas finished with concrete because concrete is not a suitable growing substrate; therefore, vegetation removal at these locations would be a permanent but minor impact. Impacts would be minor because vegetation in the Canal prism is routinely removed during maintenance, and several other wetland and riparian areas exit within the region of influence including the Truckee River, WMA, and SNWR.

There would be no effects on riparian vegetation along the Truckee River. This is because no wetland or riparian vegetation would be directly removed, and proposed construction would not affect the hydrological conditions. Further, EPMs 2 through 8, 13, 14, 33, and 34 would be implemented to avoid and minimize soil disturbance, vegetation removal, weed spread, and the potential for water quality degradation during construction on the Canal.

Lining the full prism of the Canal would prevent water from seeping through the bottom and banks. Small wetland seeps immediately downgradient of the Canal in topographic concavities are likely hydrologically supported by this seepage; therefore, any seeps would likely have their source of water removed. As a result, some or all riparian vegetation growing in these locations would eventually be replaced with upland vegetation.

The intensity of these impacts would vary between alternatives, depending on the length of Canal lining, the lining material used, and how many seep areas are in construction areas. Impacts would likely be greatest under Alternative 3, which would line the longest portion of the Canal with concrete. The amount of potential riparian vegetation loss resulting from Canal lining would be minor; this is relative to the amount of similar vegetation directly outside the Project Area and in the region that would not be affected under the alternatives.

Lining the Canal, replacing the check structures and the Hazen Gage, and armoring Pour Point 8 would not affect other wetlands and riparian areas in the vicinity of the Canal, such as in the Truckee River, Canal laterals, and in the WMA, SNWR, and Lahontan Reservoir. This is because there would be no vegetation removal, surface disturbance, or changes to the hydrological sources supporting wetlands and riparian vegetation in these areas.

In summary, the extent of wetland and riparian vegetation loss in the Canal prism and in downgradient seeps would be minor, relative to the amount of similar vegetation directly outside the Project Area and in the region. As described in **Section 3.7**, Wildlife, population viability for any one wildlife species, including migratory birds, BLM sensitive species, and general wildlife, would not be affected by riparian vegetation loss resulting from the project.

Special Status Plant Species

Direct impacts on special status plant species could come from crushing or uprooting, potentially resulting in mortality or reduced reproductive success. Indirect impacts could occur if excessive dust mobilized during nearby construction were to settle on individual plants, potentially temporarily suppressing physiological processes or pollinator success (Wijayratne et al. 2009; Lewis 2013; Zia-Khan et al. 2015). Indirect impacts could also occur if nearby surface disturbance encourages weeds to spread into sensitive plant areas. Weeds could directly compete for moisture, light, and nutrients, and they could affect suitable habitat by altering ecological processes, such as community productivity, soil moisture and nutrient dynamics, community successional patterns, and disturbance cycles (D'Antonio and Vitousek 1992; Brooks et al. 2004). Incorporating EPMs to minimize fugitive dust and weed establishment and spread would minimize the potential for these impacts.

The closest construction area under any alternative is over 0.5 miles away from the known sand cholla area. Even if construction vehicles used the nearest Canal access road, the area is approximately 80 feet uphill (Reclamation GIS 2016). Given this distance, no direct or indirect impacts on the area are anticipated.

Removing or disturbing vegetation communities in the Project Area would cause the loss or alteration of potentially suitable habitat for the special status plant species considered in this analysis: Lahontan beardtongue (*Penstemon palmeri* var. *macranthus*), Lahontan milkvetch (*Astragalus porrectus*), Tonopah milkvetch (*A. pseudiodanthus*), Nevada dune beardtongue (*Penstemon arenarius*), Nevada suncup (*Camissonia nevadensis*), and sand cholla (*Grusonia pulchella*). As outlined in **Table 3-11**, construction (especially detention basin excavation) could directly remove or disturb up to 50 acres of previously undisturbed vegetation. Minimizing surface disturbance to the smallest necessary area would reduce impact intensity.

No special status plant species were observed in the vicinity of proposed construction areas during the field survey (Reclamation 2016d); however, the proposed detention basin areas were not included in biological surveys of the Project Area. These areas would be surveyed for special status plant species before the project begins. If special status plants are found, appropriate measures would be implemented to avoid or reduce impacts, such as avoiding the area of occurrence during construction or transplanting the individual plants outside the disturbance footprint.

Noxious Weeds and Nonnative, Invasive Plants

Construction activities, especially detention basin excavation, could directly remove or disturb up to 50 acres of previously undisturbed vegetation (Reclamation GIS 2016). This could increase weed population sizes or cause new populations to become established in the Project Area.

Surface-disturbing activities may increase the potential for weed establishment or spread (Gelbard and Belnap 2003; Brooks and Lair 2005). Further, vehicles and equipment used during construction could spread weeds by moving weed seeds or vegetation to new, uninfested locations. Roads and other disturbance corridors promote weed dispersal by altering habitats, stressing native species, and providing movement corridors over

relatively long distances (Trombulak and Frissell 2000). Improved roads can indirectly act as conduits for weed invasion in nearby habitats (Gelbard and Belnap 2003; Brooks and Lair 2005). Traffic movement, wind, and water in such places as roadside ditches can provide mechanisms for weed spread along and away from the roadway (Robison 2009). Canals and natural drainage ways can similarly transport weed seeds and facilitate new or expanded infestations, especially for weeds that are adapted to aquatic or moist soil conditions.

Weed species observed near potential construction areas under the action alternatives are perennial pepperweed, musk thistle, hoary cress, and Russian knapweed (Reclamation GIS 2016). Because these species are present in or near the work areas, they may have a higher chance of establishing new populations or spreading, compared with other weeds observed in other portions of the Project Area. EPMs for reducing weed spread would be in place to reduce the intensity of this impact. EPMs include using certified weed-free erosion control materials and ensuring machinery and equipment are free of mud, seeds, and other vegetation material before being brought onto the work site.

Of the construction activities under the action alternatives, constructing the detention ponds likely has the highest potential to result in weed establishment and spread. This is because pond excavation would result in the most ground disturbance, compared with other construction activities. Implementing EPMs would reduce the impacts. Construction may necessitate direct removal of Russian olive trees along the Canal to accommodate equipment or clear work areas. Russian olive extraction and disposal would necessitate proper procedures to prevent the spread.

3.6.2.4 Impacts from the No Action Alternative

Under the No Action Alternative, no new construction on the Canal would occur; therefore, there would be no impacts on general vegetation, wetlands and riparian vegetation, special status plant species, or weeds. Ongoing routine maintenance associated with current Canal operations would continue in the Project Area under the No Action Alternative. These actions would have impacts on vegetation, as described below.

General Vegetation

Ongoing, routine maintenance would directly affect general vegetation communities through periodic removal. Removal would be limited to the work area in the immediate vicinity of any necessary maintenance. For the most part, work areas would be in previously disturbed areas, such as the Canal access road or other staging areas, and undisturbed vegetation communities would be avoided; however, depending on the nature of the necessary maintenance, work areas may extend into previously undisturbed vegetation. This could result in vegetation removal in the work area. These activities can alter the acreage and species composition of vegetation in the Project Area.

Indirect impacts on general vegetation from surface-disturbing activities may include weed spread or establishment into native vegetation, and impacts from fugitive dust, as described under *Impacts from the Action Alternatives*. The TCID currently removes trees and other woody vegetation within the Canal prism on an as-needed basis. Removal would continue under the No Action Alternative on the Canal easement and on lands under Reclamation jurisdiction.

Wetlands and Riparian Areas

Ongoing routine maintenance would periodically remove wetland and riparian vegetation growing in the Canal prism. It may also indirectly affect one or more of the several small seeps immediately downgradient of the Canal in topographic concavities, as described under *Impacts from the Action Alternatives*.

Conversely, maintenance can include actions such as sediment removal that may temporarily increase seepage rates, incidentally improving growing conditions or increasing the area of suitable growing conditions for wetland vegetation.

Special Status Plant Species

Ongoing, routine maintenance could affect the known BLM sensitive sand cholla individual in the Project Area, if activities were proposed near it; however, given the location of this individual, the potential for such impacts is low. There are no other known special status plant species in the Project Area.

Noxious Weeds and Nonnative, Invasive Plants

Under the No Action Alternative, ongoing, routine maintenance could increase the potential for the establishment and spread of weed populations. This would come about if maintenance activities resulted in new soil disturbance, even in previously disturbed areas. As described under *Impacts from the Action Alternatives*, standard EPMs for reducing weed spread would be in place to reduce the intensity of this impact. The TCID currently removes nonnative, invasive Russian olive trees from the Canal prism, in accordance with the Newlands Project Pest Management Plan. Removal would continue under the No Action Alternative on the Canal easement and lands under Reclamation jurisdiction.

3.6.2.5 Cumulative Impacts

In general, past and present impacts on vegetation in the CEA include removal, alteration, or fragmentation of native vegetation communities, loss or degradation of wetlands and riparian vegetation, removal of special status plants and loss of suitable habitat for these plants, and establishment and spread of noxious weeds and nonnative, invasive plant species. These impacts have come about from private residential, commercial, and agricultural development in the CEA, as identified in **Appendix G**, List of Concurrent Projects. Impacts have also resulted from construction of various administrative rights-of-way for roads, railroad, and interstate highway systems; buried and overhead electrical and telecommunication infrastructure; mineral materials site development; and geothermal development projects. Impacts are likely to continue.

Vegetation management has also affected vegetation in the CEA. Management on BLM-administered lands in the CEA has been conducted under the relevant resource management plans; these actions will continue to include special status plant and weed management and management to improve functioning conditions of wetlands and riparian vegetation. Weed management is also conducted on county and local municipality lands in the CEA.

Vegetation will continue to be affected by the effects of changing climatic and weather extremes. Future climatic conditions will likely favor increased invasion by nonnative plant species in general vegetation communities and special status plant habitat. This

would be brought on by increasing frequency, extent, and severity of drought and wildfire (Seager et al. 2007; Littell et al. 2009; Abatzoglou and Kolden 2011). Changes in precipitation and temperature patterns (Stewart et al. 2005) and declines in snowpack (Knowles et al. 2006; Mote et al. 2005) may change riparian and wetland vegetation composition and extent. These processes may result in physiological stress, altered phenology,[5] and reduced recruitment and seedling establishment (Parmesan 2006; Hawkins et al. 2008), which can alter vegetation composition and ecological function.

Based on the alternatives analysis above, incremental impacts on vegetation under the No Action Alternative would be minimal, when added to the past, present, and reasonably foreseeable future actions in the CEA (see **Appendix G**, List of Concurrent Projects). Additional, incremental impacts on vegetation would occur as a result of implementing any of the action alternatives. EPMs would be put in place to minimize the intensity of cumulative impacts. These include minimizing new surface disturbances, revegetating temporarily disturbed areas, avoiding impacts on sensitive plant species, and minimizing weed establishment and spread.

3.6.2.6 Summary of Impacts from the Action Alternatives

While there are minor differences in vegetation impacts between the alternatives, based on compliance with applicable EPMs, environmental laws, and regulations; the action alternatives would not result in significant direct, indirect, or cumulative impacts on vegetation.

3.7 Wildlife

3.7.1 Affected Environment

Wildlife includes general wildlife, migratory birds and USFWS Birds of Conservation Concern, BLM sensitive wildlife species, and game species. This section characterizes and addresses potential impacts on wildlife from the alternatives.

Data from the Reclamation Biological Survey Report (Reclamation 2016d) provide existing wildlife conditions in the Project Area. The report describes the survey method, results, and coordination with wildlife agencies. A summary of the survey report and additional information on wildlife is outlined in the Biological Resources Memorandum (Reclamation 2018h). Additional detail on wildlife in the Project Area can also be found in **Appendix C**, **Figure B-01** to **B-22**, which depict the extent and locations of vegetation communities that comprise wildlife habitat.

3.7.1.1 Resource Study Area

The region of influence for wildlife is the Project Area (**Appendix C**, **Figure 1-1**), Truckee Canal XM EIS Project Area. Additionally, nearby foraging and habitat areas for selected wildlife species are included in the region of influence and are discussed in this section.

[5] The study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life.

3.7.1.2 Issues of Environmental Concern

Issues of environmental concern for wildlife are that project activities may result in loss or degradation of wildlife habitat, as well as impacts on wildlife species. These issues are described in detail below.

3.7.1.3 Characterization

General Wildlife

Species documented in the Project Area during surveys were typical for the habitat types found there. Thirty-five bird, seven mammal, five reptile, and one amphibian species were directly observed or detected by sign, such as tracks, burrows, or scat. Small mammal species were observed in the Project Area during surveys, such as the black-tailed jackrabbit (*Lepus californicus*), desert cottontail rabbit (*Sylvilagus audubonii*), California ground squirrel (*Otospermophilus beecheyi*), white-tailed antelope ground squirrel (*Ammospermophilus leucurus*), and woodrat. Coyotes (*Canis latrans*) were observed along the Lahontan Reach, and coyote scat was observed throughout the Project Area. Additional predator species, such as American badger (*Taxidea taxus*) and kit fox (*Vulpes macrotis*), have the potential to occur throughout the Project Area, but none were observed during surveys.

Historically, the Canal provided marginal habitat for semiaquatic mammals, such as the North American beaver (*Castor canadensis*) and the muskrat (*Ondatra zibethicus*). Both species were found in the Canal prism before the 2008 breach. Beaver and muskrat burrows in the Canal walls are a safety issue; therefore, the TCID has a trapping program to remove these species from the Canal. Recent drought conditions and periodic drying of the Canal have also reduced the quality of the habitat for these species. No beavers or muskrats or their signs were observed during the biological survey.

Bats have also been reported in the vicinity of the region of influence (Reclamation 2016d). Bats use various habitats for roosting, including caves and abandoned mine lands, trees, bridges, and buildings. In the region of influence, there may be suitable roosting habitat in mature trees and day roosting habitat in check control structures and bridges. Bats also likely use the region of influence for foraging. They are further discussed under *BLM Sensitive Wildlife Species*.

Common reptiles inhabit the rocky, brush, and scrub habitats that are found in the Project Area. Reptile species observed are the desert spiny lizard (*Sceloporus magister*), western fence lizard (*S. occidentalis*), long-nosed leopard lizard (*Gambelia wislizenii*, a BLM sensitive species), western whiptail (*Cnemidophorus tigris*), and zebra-tailed lizard (*Callisaurus draconoides*).

Migratory Birds

Based on the habitats observed, numerous migratory bird species regulated under the Migratory Bird Treaty Act have the potential to occur in the Project Area. Thirty-five bird species were observed there during field surveys. Several additional avian species not covered by the Migratory Bird Treaty Act were observed in the Project Area during surveys: Eurasian collared dove (*Streptopelia decaocto*), European starling (*Strunus vulgaris*), house sparrow (*Passer domesticus*), and rock pigeon (*Columba livia*). Two killdeer (*Charadrius vociferus*) nests were observed in the Project Area, near the service

road along the Canal. One was in the Derby Reach and the other in the Lahontan Reach of the Canal. Both nests had four eggs and were in the gravel, within several feet of the Canal service road.

A cliff swallow (*Petrochelidon pyrrhonota*) nesting colony was observed outside of one of the Canal tunnels, along the Derby Reach. Approximately 50 nests were observed in the Canal bank and in the tunnel. The cliff swallows showed defensive behavior for approximately 100 feet surrounding the tunnel entrance. A Brewer's blackbird (*Euphagus cyanocephalus*) nest was observed near the joining of the Canal and Lahontan Reservoir. A male and female were observed carrying food and displaying defensive behavior in the Canal embankment. A common raven (*Corvus corax*) nest was observed in the raptor survey area, north of the Derby Reach, in the hills north of Interstate 80.

Birds of Conservation Concern

The USFWS has identified Birds of Conservation Concern in the Great Basin Bird Conservation Region. These are bird species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA. There are 28 species of birds on the list for the Great Basin Bird Conservation Region (USFWS 2008).

Golden Eagle and Other Raptors

The wildlife biologists searched riparian woodlands along the Canal for signs of raptor use, such as stick nests and whitewash. They searched the bases of isolated trees for raptor pellets, feathers, and prey remains; they used binoculars to search cliffs, rock outcrops, and trees for evidence of any nesting activity, such as whitewash and stick nests. Any sites with signs that suggested nesting activity, such as perched raptors and whitewash, were examined on foot for pellets, feathers, prey remains, or other evidence indicating nesting activity.

The following seven raptor species were directly observed during field surveys: American kestrel (*Falco sparverius*), great horned owl (*Bubo virginianus*), northern harrier (*Circus cyaneus*), osprey (*Pandion haliaetus*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*B. swainsoni*), and turkey vulture (*Cathartes aura*). Northern harrier and Swainson's hawk are also BLM sensitive species. Five active red-tailed hawk nests, one active Swainson's hawk nest, and two inactive Swainson's hawk nests were observed in cottonwood trees in Fernley. An osprey nest was observed where the Canal meets Lahontan Reservoir. An active American kestrel nest was observed near the Canal, along the Derby Reach.

Bald eagles (*Haliaeetus leucocephalus*, a BLM sensitive species) traditionally winter along the Truckee River and at Lahontan Reservoir (USDOI and CDWR 2008) and are dependent on a reliable food supply (Herron et al. 1985 *in* USDOI and CDWR 2008). A variety of nonnative fish species have been introduced into Lahontan Reservoir (NDOW 2016a), including crappie (*Pomoxis* spp.), channel catfish (*Ictalurus punctatus*), and bass (order Perciformes), which have been shown to be an important component of bald eagle diet (BioSystems 1992 *in* USDOI and CDWR 2008). Bald eagles currently nest at Lahontan Reservoir (Jurek 2003 *in* USDOI and CDWR 2008). No bald eagles were observed during the field survey.

BLM Sensitive Wildlife Species

Reclamation is using the current BLM special status species list to identify existing species of concern in the Project Area. From this list, three BLM sensitive wildlife species were observed on Reclamation lands in the Project Area. Brewer's sparrows (*Spizella breweri*) were observed in several locations in big sagebrush shrubland along the Derby Reach of the Canal. Swainson's hawk observations are discussed under *Golden Eagle and Other Raptors*. Long-nosed leopard lizard was observed in sandy soils along the Lahontan Reach. No BLM sensitive species were observed on Reclamation lands during the surveys.

Greater Sage-Grouse

Habitat for greater sage-grouse is mapped in the Project Area. It has been primarily classified as general habitat by the Nevada Sagebrush Ecosystem Program, though priority habitat is also mapped in the region of influence (Reclamation 2016d, Appendix A). Approximately 0.2 miles of the Canal's Derby Reach passes through priority habitat (10 acres within the 100-foot buffer). Approximately 5.6 miles of the Derby Reach passes through general habitat (130 acres within the 100-foot buffer), as shown in **Appendix C**, **Figures B-01** through **B-04**. No greater sage-grouse individuals, scat, or associated sign were observed during surveys, including in priority and general habitats in the Project Area.

Bats

Bats in Nevada are considered BLM sensitive species. They use various habitats for roosting, including caves and abandoned mine lands, trees, and buildings. In the Project Area there may be suitable roosting habitat in mature trees. Check control structures and bridges over the Canal may also serve as day roosts. Potential foraging habitat exists throughout the region of influence for bats. Suitable bat roosting habitat is also likely found in the Project Area, in live and dead trees, rock outcrops, and abandoned mine workings in the adjacent ranges.

Acoustic bat detection surveys were not conducted in the Project Area; however, the NDOW has documented several bat species there: Arizona myotis (*Myotis occultus*), big brown bat (*Eptesicus fuscus*), Mexican free-tailed bat, hoary bat (*Lasiurus cinereus*), long-legged myotis (*M. volans*), pallid bat (*Antrozous pallidus*), canyon bat (*Parastrellus hesperus*), western red bat (*L. blossevillii*), small-footed myotis (*M. ciliolabrum*), and Yuma myotis (*M. yumanensis*) (Reclamation 2016d).

The Nevada Division of Minerals (NDOM) maintains a database of abandoned mine workings in the state. The NDOM indicates that there are five abandoned mine workings within 0.5 miles of the Canal.[6] These features may provide suitable roosting areas for bat species. Four workings are along the Derby Reach of the Canal; all are north of both the Truckee River and Interstate 80, between 1,800 and 2,350 feet from the Canal (Reclamation GIS 2016). Three of these sites are on private lands and are made inaccessible by either a wooden barrier or fences. The fourth is on BLM-administered land and has a bat-compatible closure. The Nevada Natural Heritage Program (NNHP)

[6] Robert Ghiglieri, NDOM, email to Jacob Accola, EMPSi, regarding Truckee EIS AML data request, December 1, 2016.

reports that Townsend's big-eared bat (*Corynorhinus townsendii*) has been recorded near these workings.

The fifth abandoned mine working is a shaft on Reclamation land near the Canal terminus at Lahontan Reservoir, approximately 2,150 feet from the Canal (Reclamation GIS 2016). This shaft is not closed, but the NDOM is in the process of closing it. The NNHP reports that Mexican free-tailed bat and pallid bat have both been documented in the vicinity, though it is not clear if the observations are associated with the shaft or not (the observations have radii of between 2 and 4.5 miles).

Game Species

The NDOW manages game species in Nevada. The western half of the Derby Reach is identified as year-round mule deer (*Odocoileus hemionus*) and bighorn sheep (*Ovis canadensis*) range. Pronghorn antelope (*Antilocapra americana*) range is identified outside the Project Area, in the northern portions of the 4-mile buffer (Reclamation 2016d). Pronghorn antelope was the only big game species observed in the region of influence during field surveys. One antelope was observed southeast of Fernley, in mixed salt desert scrub and invasive grassland habitats. Antelope scat and tracks were also noted in this area.

The NDOW also manages upland game bird species. A portion of the Derby Reach (from Derby Diversion Dam to approximately Painted Rock) is identified as occupied chukar partridge (*Alectoris chukar*) distribution (NDOW 2008). In this reach, chukar likely use the Canal for water, especially during the summer.

Aquatic wildlife species, including fish, amphibians, and aquatic invertebrates, are discussed under **Section 3.8**, Aquatic Resources.

3.7.2 Environmental Consequences

3.7.2.1 Impact Indicators

The following indicators are used to analyze impacts on wildlife:

- Loss or alteration of wildlife habitat or wildlife resulting in listing or jeopardizing the continued existence of any species
- Loss or alteration of migratory bird nesting or foraging habitats, loss of nests, or project features that could alter breeding and fledging, or pose a risk of injury or mortality

3.7.2.2 Environmental Protection Measures

EPMs for wildlife include the following from **Table 3-1**:

16 Pre-project clearance surveys would be conducted for sensitive animal species with the potential to occur in or close to the Project Area and could be affected by the project. If sensitive animal species are identified, impacts would be avoided by flagging or fencing and by applying appropriate avoidance buffers.

17 Surface-disturbing activities would typically not occur during the migratory bird or raptor nesting season, generally from March 1 to August 31. If surface-disturbing activities must occur during this period, qualified biologists would conduct preconstruction avian surveys in appropriate habitats not less than 3 days and not more than 7 days before surface-disturbing activities begin. The specific area to be surveyed would be based on the scope of the surface-disturbing activities. If ground-disturbing activities do not take place within 7 days of surveys, the work areas would be resurveyed. If nesting migratory birds or raptors are detected during surveys, appropriate buffers would be applied. Buffers would remain in effect until a qualified biologist determines the young have fledged or the nest has failed.

18 Avian species may nest in idle equipment or construction materials. If construction equipment is idle for more than 7 days during the breeding season, preconstruction surveys would be conducted in such areas before construction resumes.

19 Any pits that present a wildlife trapping hazard would be fitted or constructed with an escape ramp. Open, uncapped hollow pipes or other openings would be capped, screened, or otherwise covered to prevent unintentional wildlife entrapment.

20 Hazardous materials would not be drained onto the ground or into streams or drainage areas. All construction and maintenance waste would be removed daily. This would include trash and litter, garbage, other solid waste, petroleum products, and other regulated materials. The materials would be sent to a disposal facility authorized to accept such materials.

21 If nighttime construction is necessary, minimal-impact measures for lighting would be implemented, such as using the minimum amount necessary to complete the task, using narrow-spectrum lighting, and using minimal ultraviolet-emitting lights.

22 Before potential bat day roosts are removed, a qualified biologist would ensure that roosting bats would not be affected.

3.7.2.3 Impacts from the Action Alternatives

General Wildlife

Depending on the alternative, construction could remove up to 50 acres of vegetation habitat for general wildlife species in the Project Area (see **Table 3-11**, above, and *Action Alternatives* in **Section 3.6**, Vegetation). Most potential vegetation that would be removed would be intermountain basins mixed salt desert scrub, though other types could also be removed. The amount of habitat loss would be small relative to the abundant similar habitat available directly outside the Project Area. Because construction would be phased over several years, habitat loss would likewise be phased over this time. Incorporating EPMs to minimize surface disturbance and vegetation removal and revegetation measures would reduce impact duration.

Construction could also result in habitat degradation for general wildlife. This could come about in areas where vegetation was not directly removed but affected by increased weed spread and fugitive dust generation, as described in **Section 3.6**, Vegetation. Incorporating EPMs to prevent weed transport and reduce fugitive dust generation during construction would minimize this impact.

Surface disturbance during construction could result in mortality from destruction of underground burrows for reptiles and small mammals. Limiting the amount of vegetation removal to what is necessary during construction would reduce the impact.

Many birds, such as raptors and corvids,[7] may use temporary fencing and construction equipment for perching or roosting. This may increase predation on both avian and terrestrial wildlife prey species.

Construction vehicle traffic can pose a risk to wildlife species from collisions. Risk would be elevated at dawn and dusk when wildlife species are generally most active. Additional risk may occur for scavenger species, such as turkey vulture (*Cathartes aura*), raven, and raptors foraging along roads for road kill. To lower the potential for this impact, vehicle operators would adhere to strict speed limits on Project Area roads.

Indirect, temporary effects from noise, human presence, and heavy construction equipment may disturb and displace wildlife from suitable habitat in or near the Project Area. Raptor species that prey on small mammals, rodents, and lizards may avoid foraging in or near the work area during construction. Rodents that chirp to warn of predators may be susceptible to increased predation because these chirps may be masked by construction-related noise (Barber et al. 2009).

The intensity of the impacts above would generally be higher for alternatives involving more surface disturbance and longer construction durations. Impacts from the action alternatives would likely increase, compared with the No Action Alternative, since the level of surface disturbance and construction duration under all action alternatives would be greater than under the No Action Alternative.

Migratory Birds

Migratory birds, raptors, and birds of conservation concern (referred to collectively as "avian species") would experience habitat loss due to vegetation removal, as described in *General Wildlife*, above. The amount of habitat loss would be small relative to the similar habitat available directly outside the Project Area and in the region. Population viability for any one species would not be affected because of the habitat loss resulting from the project.

Construction could result in direct mortality of avian species. Activities, including site preparation, vegetation clearing, and grading, could injure or kill birds or destroy nests, eggs, or young, particularly those species that nest in shrubs or on the ground. Surface-disturbing activities would typically not occur during the migratory bird or raptor nesting season, generally from March 1 to August 31 each year. This is because the breeding

[7] Corvids are members of the crow family, such as American crow (*Corvus brachyrhynchos*) and raven (*C. corax*).

season generally overlaps with the irrigation season. If surface-disturbing activities must occur during this period, preconstruction avian surveys would be conducted, as described in the Wildlife EPMs found in **Section 3.7.2.2**.

Construction under all action alternatives may necessitate direct removal of cottonwood and Russian olive trees along the Canal, to accommodate equipment or clear work areas. If construction were to occur during the breeding season, nearby trees that may support nesting avian species would be included in the preconstruction avian surveys described above.

Indirect, temporary effects from noise, human presence, and heavy equipment during construction may displace avian species from suitable habitat. This may reduce foraging success for individuals in or near the work areas. Avian species would avoid the temporary work areas during construction and instead would use available nearby habitat to forage. Construction equipment and vehicles using access roads could strike avian species, leading to injury or mortality. To lower the potential for this impact, vehicle operators would adhere to strict speed limits in the Project Area.

Nighttime lighting, including temporary lighting used during construction, can affect night-migrating birds, which may become attracted to or disoriented by artificial lights, particularly during inclement weather (Rich and Longcore 2006). Nighttime construction is not anticipated. No permanent lighting is associated with any of the elements; therefore, impacts on avian species from night lighting would not occur. If nighttime construction were necessary, minimal-impact measures for lighting would be implemented, as described in the wildlife EPMs.

BLM Sensitive Wildlife Species

Potential impacts on the two BLM sensitive avian species observed in the Project Area, Swainson's hawk and Brewer's sparrow, would be as described under *Migratory Birds*, above. Depending on the alternative, small amounts (up to 1 acre) of the vegetation community intermountain basins big sagebrush shrubland could be removed (see **Table 3-11**, above, and the action alternatives in **Section 3.6**, Vegetation). Because of this, potential impacts on the sagebrush obligate Brewer's sparrow may be possible, due to loss of foraging and nesting habitat. Reclamation would conduct preconstruction avian surveys to ensure that impacts on this species during the breeding season are avoided.

Potential impacts on the BLM sensitive reptile species, long-nosed leopard lizard, would be as described under *General Wildlife*, above. EPMs to avoid or minimize impacts on this species, including conducting preconstruction surveys for identified sensitive species, would be in place under all action alternatives.

Bats

Construction noise and activity under all action alternatives may disturb day-roosting bats in or near the Project Area. Suitable day-roosting habitat may be present in mature trees along the Canal and also potentially on check structures and bridges over the Canal. Surveying potential roosts before removal would ensure that impacts on roosting bats could be avoided.

Bat roosting habitat is also present in abandoned mine workings in the region of influence. The nearest workings are approximately 1,800 feet from the Canal and over 2 miles from the nearest construction activity under the action alternatives (Reclamation GIS 2016). Given the distance from proposed construction to these workings, no impacts on roosting bats in abandoned mine workings in the region are anticipated.

Foraging habitat for bats is available throughout the Project Area, particularly along the Canal, where insect density would likely be highest when water is present. Impacts could occur if bats were prevented from foraging in these areas during construction. Impacts on foraging habitat would affect only individual bats and would not affect the local or regional bat population. This is because bats would likely forage in adjacent undisturbed habitats along the Canal or the nearby Truckee River.

Nighttime lighting may attract and concentrate moths and other insects on which bats feed. This may increase bat foraging opportunities, though this could also alter bat behavior. The potential for these effects is limited because nighttime construction is not anticipated to occur, and no permanent lighting is proposed.

Greater Sage-Grouse

Under Alternative 3, approximately 4 miles of the Canal in greater sage-grouse general habitat would be lined (BLM 2015; Reclamation GIS 2016). Vegetation removal from mapped general habitat would be minimal, since most work would be conducted from areas that are already disturbed, such as the Canal access road. Potential impacts on greater sage-grouse could stem mainly from construction noise, human presence, and vehicle access. If present, greater sage-grouse may avoid the area during construction due to construction noise or human presence. Vehicle use on the existing Canal access road could increase the potential for injury or mortality from vehicle strike. Vegetation removal and vehicle use may increase the potential for weed establishment and spread, resulting in habitat degradation.

To avoid or minimize impacts, construction would adhere to EPMs for project speed limits, dust abatement, and weed spread. These measures would satisfy applicable required design features (BLM 2015) for work in general habitat. As a result, there would be no impacts in sage-grouse general habitat.

Under other action alternatives, the nearest proposed construction, at the Fernley check structure, is nearly 5 miles from mapped greater sage-grouse habitat (Reclamation GIS 2016). As a result, there would be no impacts on this species or its habitat under other action alternatives.

Game Species

Larger species, such as big game, may be affected by noise and may avoid foraging or migrating through the Project Area. Wildlife species would avoid the temporary work areas during construction and would use available nearby habitat instead. Further, construction sites would be limited to the smallest possible area, minimizing this effect.

Game species may be directly affected by construction noise or human presence under all action alternatives. These impacts are expected to be minimal and would affect

individuals and local groups of animals using or migrating through the area. Impacts would be temporary, occurring only during construction periods.

The Canal largely parallels several potential migration barriers, including the Truckee River, US Interstate 80, US Highway 50, the railroad right-of-way, the City of Fernley, and the Canal itself may be potential migration barriers; because of this, it is unlikely that game species regularly migrate across these barriers. Conversely, the Canal and the Truckee River likely facilitate migration. The potential for impacts would be higher for species that use the Canal as a movement corridor.

Impacts on upland game species, such as chukar partridge, would be as described under *Migratory Birds*, above.

3.7.2.4 Impacts from the No Action Alternative

Under the No Action Alternative, there would be no construction in the Canal prism; therefore, there would be no impacts on wildlife. Ongoing, routine maintenance would occur in the Project Area, which could have impacts on wildlife, as described under *Impacts from the Action Alternatives*, above. Impacts would generally be temporary, lasting the duration of the maintenance activity, and be limited to the work area and immediate vicinity.

The No Action Alternative may affect wildlife that rely on Canal water. It is likely that over time water levels in the Canal would be reduced based on risk-adjusted stage levels. This may cause breeding or foraging habitat to be lost or habitat quality to be reduced for certain wildlife species.

3.7.2.5 Cumulative Impacts

In general, past and present impacts on wildlife in the CEA include removal, alteration, or fragmentation of upland and aquatic habitat. Impacts have also included displacement from habitat, normal behavioral pattern disruption, and movement corridor obstruction. These impacts have come about from private residential, commercial, and agricultural development in the CEA. Impacts have also resulted from construction of various administrative rights-of-way for roads, railroad, and interstate highway systems, buried and overhead electrical and telecommunication infrastructure, mineral materials site development, and geothermal development. Impacts are likely to continue.

Management has also affected wildlife in the CEA. Management on BLM-administered lands in the CEA has been conducted under the relevant resource management plans; these actions will continue to include management to improve habitat, regulations on recreation and other human uses, and stipulations on minerals development to prevent or reduce disturbance. Weed management affecting wildlife habitat is also conducted on county and local municipality lands in the CEA.

Wildlife will continue to be affected by the effects of changing climate and weather extremes. Effects on wildlife habitat have included increased invasion by nonnative annual grasses and increasing frequency, extent, and severity of drought and wildfire (Seager et al. 2007; Littell et al. 2009; Abatzoglou and Kolden 2011). These factors have degraded wildlife habitat quality in the region of influence.

Based on the alternatives analysis above, incremental impacts on wildlife under the No Action Alternative would be minimal, when added to the past, present, and reasonably foreseeable future actions in the CEA (see **Appendix G**, List of Concurrent Projects). For the Action Alternatives, EPMs would be put in place to minimize the intensity of cumulative impacts. These include minimizing new surface disturbance, revegetating temporarily disturbed areas, and implementing measures to avoid impacts on sensitive species and to minimize weed establishment and spread.

3.7.2.6 Summary of Impacts from the Action Alternatives

While minor differences in wildlife impacts exist among each alternative, based on compliance with applicable EPMs, environmental laws, and regulations the action alternatives would not result in significant direct, indirect, or cumulative impacts on wildlife.

3.8 Aquatic Resources

3.8.1 Affected Environment

The following sections summarize aquatic wildlife that are not special status species, followed by a description of existing aquatic resource conditions. Wetland and riparian vegetation is described in detail in **Section 3.6**, Vegetation. This section characterizes and addresses potential impacts on aquatic resources from the alternatives. Data from the Reclamation Biological Survey Report (Reclamation 2016d) provided existing aquatic resource conditions in the region of influence. A summary of the survey report and additional information on aquatic resources is outlined in the Biological Resources Memorandum (Reclamation 2018h).

3.8.1.1 Resource Study Area

The region of influence for aquatic resources is the Project Area, shown in **Appendix C**, **Figure 1-1**. Additionally, selected aquatic resources in the main stem of the Truckee River, Pyramid Lake, and Lahontan Reservoir are included in the region of influence and are discussed in this section.

3.8.1.2 Issues of Environmental Concern

Issues of environmental concern for aquatic resources are that project activities may result in loss or degradation of aquatic habitat, as well as impacts on aquatic wildlife species. These issues are described in detail below.

3.8.1.3 Characterization

Fishes

Nevada's native fish consist of at least 87 described species and subspecies, although the precise number is difficult to determine. Twenty species of nonnative game fishes, most of them occurring from intentional introductions, support a significant part of Nevada's sport fisheries (Wildlife Action Plan Team 2013). Coordination with the NDOW (Reclamation 2016d) identified several nonnative and native fishes that have been documented in the region of influence (generally, within the Truckee and Carson Rivers, Lahontan Reservoir, Pyramid Lake, and in some cases, the Canal itself).

Native fishes identified by the NDOW are Lahontan redside (*Richardsonius egregius*), redside shiner (*R. balteatus*), mountain sucker (*Catostomus platyrhynchus*), Tahoe sucker (*C. tahoensis*), mountain whitefish (*Prosopium williamsoni*), and speckled dace (*Rhinichthys osculus*). Nonnative and sport fishes identified by the NDOW are bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), common carp (*Cyprinus carpio*), fathead minnow (*Pimephales promelas*), Sacramento blackfish (*Orthodon microlepidotus*), Sacramento perch (*Archoplites interruptu*), smallmouth bass (*Micropterus dolomieu*), and western mosquitofish (*Gambusia affinis*). Additional details are provided below.

Canal

NDOW has stocked rainbow trout in the Canal, most recently in May 10, 2018 (NDOW 2018), when it released 1,054 individuals. To date, over 4,000 rainbow trout have been released into the Canal. No fish were observed in the Canal during the biological survey.

Truckee River

Both native and nonnative fish species are found in the Truckee River. Fish species native to the Truckee River are adapted to the highly variable flows of the river system. Native fishes have been forced to adapt to dam and reservoir construction and channelization and to the resulting regulated flow patterns and secondary effects, such as higher water temperatures. These changes have contributed to the reduction in populations of many native fish in the Truckee River (USDOI and CDWR 2008).

Beginning in the late 1800s, many nonnative fish species were introduced into the Truckee River Basin (TRIT 2003; Sigler and Sigler 1987). Rainbow and brown trout have been the two most successful species; their populations have been supplemented with releases to improve recreational fishing. NDOW has released over 90,000 rainbow trout into the Truckee River, most recently in September 2016. The agency also regularly stocks LCT in the river (NDOW 2016a). Information on relative abundance of fishes in the remainder of the river, including in upstream tributaries, is available from the USDOI and CDWR (2008).

Lahontan Reservoir

Native and nonnative fish species occur in Lahontan Reservoir, which provides relatively good shallow-water, fish spawning habitat; this is because its water may not fluctuate in elevation or its slopes may not be as steep as other reservoirs or lakes in the Carson River watershed (USDOI and CDWR 2008).

A variety of nonnative fish species have been introduced into Lahontan Reservoir; it is stocked with walleye fry (*Sander vitreus*) and fingerling wipers (a hybrid of striped and white bass [*Morone saxatilis* x *M. chrysops*]) most years. Other sport fish in Lahontan Reservoir are channel catfish (*Ictalurus punctatus*), white catfish (*I. catus*), largemouth bass (*Micropterus salmoides*), spotted bass (*M. punctulatus*), white bass, and crappie (*Pomoxis* spp.; NDOW 2016b).

Waterfowl and Shorebirds

Canal

The Canal provides foraging habitat for waterfowl and shorebirds, several of which were observed during biological surveys, as follows:

- American white pelican (*Pelecanus erythrorhynchos*; observed where the Canal meets Lahontan Reservoir and in Pyramid Lake)
- Canada goose (*Branta canadensis*)
- Mallard (*Anas platyrhynchos*)
- Snowy egret (*Egretta thula*)

Due to the steep Canal banks and frequent human disturbance on its access road, the Canal provides only marginal nesting habitat for these species.

Truckee River

Truckee River open water, wetland, and riparian areas provide suitable habitat for waterfowl and shorebirds. Habitat quality is superior to that in the Canal. In the lower reaches of the river, from Derby Dam to Pyramid Lake, Lynn et al. (1998) observed 21 species of waterfowl or shorebirds. The most common species were Canada goose, mallard, common merganser (*Mergus merganser*), killdeer, spotted sandpiper (*Actitis macularia*), and gulls (*Larus* spp.). American white pelican, double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), snowy egret, and black-crowned night heron (*Nycticorax nycticorax*) were also observed, with less frequency, along this reach.

Lahontan Reservoir and Pyramid Lake

Pyramid Lake and Lahontan Reservoir provide large quantities of relatively stable, high-quality habitat for waterfowl. Deeper portions of the waterbodies provide habitat for diving ducks and cormorants, while dabbling ducks and shorebirds use shallow edges. Both water bodies also have islands where many bird species nest. During summer, water bird use at these water bodies is limited, due to human recreation.

Lahontan Reservoir is an important nesting and feeding area for Canada geese. American white pelicans also use Lahontan Reservoir during the spring, particularly when lakes and ponds at SNWR and other Lahontan Valley wetlands are reduced during drought years (Saake 1994 *in* USDOI and CDWR 2008). Waterbirds nest on Gull and Evans Islands in Lahontan Reservoir. Colonial nesting species also nest there, from March through July (Neel 1995 *in* USDOI and CDWR 2008). Examples are California gull (*Larus californicus*), ring-billed gulls (*L. delawarensis*), double-crested cormorant, great blue heron, great egret (*Ardea alba*), snowy egret, cattle egret (*Bubulcus ibis*), and black-crowned night heron.

Of the 51 waterfowl species that occur at Pyramid Lake, 29 potentially breed at or near the lake; 10 species are winter visitors and 12 are transients during fall and spring migration (USDOI and CDWR 2008). The USFWS manages Anaho Island National Wildlife Refuge in Pyramid Lake under a MOU with the PLPT. Anaho Island has no

mammal predators and is closed to the public. If lake elevation is below 3,795 feet, Anaho Island could be accessed by predators. It provides undisturbed breeding habitat for colonial nesting birds, such as American white pelicans, double-crested cormorants (*Phalacrocorax auritus*), California gulls, and great blue herons. Waterfowl use at Pyramid Lake is greatest during the fall and winter.

Amphibians and Reptiles

Riparian areas provide breeding sites, areas of escape, and foraging sites for reptiles and amphibians. Riparian habitat in the region of influence is most extensive in the Truckee River; accordingly, most species observations and most potential suitable habitat occurs there. Less potential habitat exists in the Canal, Pyramid Lake, and Lahontan Reservoir, because there is less riparian habitat and wetlands in these areas (see **Section 3.6**, Vegetation).

Reclamation coordinated with the NDOW in 2016 and identified five native amphibians that have been documented in the vicinity of the Canal: California toad (*Anaxyrus boreas halophilus*), boreal toad (*A. b. boreas*), northern leopard frog (*Lithobates pipiens*), Pacific chorus frog (*Pseudacris regilla*), and an additional but unidentified species of frog. The NDOW has documented western pond turtles (*Actinemys marmorata*) in the vicinity, likely in the Truckee River. No native amphibians or aquatic reptiles were observed in the Canal during biological surveys.

The NDOW also documented the nonnative amphibian American bullfrog (*Lithobates catesbeianus*) in the vicinity of the Canal (Reclamation 2016d); it was observed in the Canal during the biological survey. Bullfrogs have become a dominant species in marsh and pond habitats and prey on the young of native amphibians, fish, and reptiles (Wildlife Action Plan Team 2013).

Invertebrates

Many invertebrates depend on water for the larval stage of their life cycle, tying them closely with aquatic habitats. As a result, aquatic habitats in the region of influence, such as rivers, lakes, and reservoirs, contain a range of aquatic invertebrate species (Reclamation 2014). Five species of true freshwater mussels have been reported in Nevada and are assumed to be native. Freshwater mussels are found in various aquatic habitats and can live for 100 years or more. They may have a wide distribution that is generally limited to the northern half of the state. Fingernail clams and pea clams are small freshwater bivalves that appear to be widely distributed throughout the state (Wildlife Action Plan Team 2013).

Most crayfish species found in Nevada have been introduced and exist outside their native range. They are one of the major problems facing many of Nevada's native and sensitive aquatic species. Some of the main impacts of nonnative crayfish are predation on early life stage fish and amphibians and also on small adult fish. Nonnative crayfish also compete for resources at the expense of native species (Wildlife Action Plan Team 2013). The USGS reports signal crayfish (*Pacifastacus leniusculus*) in Lahontan Reservoir (USGS 2016b) and the sooty crayfish (*P. nigrescens*) in the Truckee and Carson Rivers, upstream of Lahontan Reservoir (USGS 2016c). The NDOW reported

crayfish observations in the vicinity of the Canal (Reclamation 2016d). None were observed during biological surveys.

In 2012, nonnative New Zealand mud snails (*Potamopyrgus antipodarum*) were documented in the Truckee River in Washoe County, upstream of the Derby Diversion Dam (USGS 2016d). The extent of the infestation is not currently known (Reclamation 2014; USGS 2016d). These invasive snails can reproduce quickly and mass in high densities. There is concern that mud snails will affect the food chain of native trout, because their sheer numbers can disrupt the ecosystems they infest. They spread easily by attaching themselves to aquatic plants, fishing gear, and boats (Forest Service, no date).

Nonnative quagga mussels (*Dreissena rostriformis bugensis*) are small, freshwater, bivalve filter feeders that can cause extensive changes in ecosystems. They attach to hard substrates and through their filter feeding remove large amounts of plankton from the water, starving other mussels and affecting fish and birds up the food chain. Quagga mussels take in and concentrate contaminants via filter feeding, which harm wildlife that eat them. The mussels can also cause substantial economic damage by infesting the components of aquatic equipment or watercraft (Reclamation 2014).

Lahontan Reservoir tested positive for quagga mussel larvae during routine monthly plankton monitoring in April 2011; however, subsequent monitoring by the NDOW and Reclamation have found no quagga mussels. A boat inspection program began in spring 2013, and two decontamination stations were operated through the summer (NDOW 2014). No adult mussel or snail species were observed in the Canal during the biological survey, though substrate in the Canal was not sampled during the survey, due to safety concerns for the surveyors.

Mammals

Mammals observed in the region of influence during the biological survey are typically associated with upland habitats. These are discussed in **Section 3.7**, Wildlife. Riparian- and wetland-associated mammal species with the potential to occur in the vicinity, including in the Truckee River, are discussed below.

Wetland mammals known or expected to occur along the Truckee River are muskrat, mink (*Neovison vison*), water shrew (*Sorex palustris*), beaver, and river otter (*Lontra canadensis*). Other terrestrial mammals may forage on the abundant invertebrates associated with emergent wetlands (USDOI and CDWR 2008). Historically, river otters occurred throughout the Truckee River system; however, they are currently believed to be present only along the Truckee River near Wadsworth (USDOI and CDWR 2008).

3.8.2 Environmental Consequences

3.8.2.1 Impact Indicators

The following indicators are used to analyze impacts on aquatic resources:

- Number of acres of in-stream or in-Canal disturbance and number of linear feet of downstream river or the Canal potentially exposed to reduced water quality from disturbance

- Changes to aquatic habitat, as measured by changes to flow volume and duration and water quality
- Loss or alteration of aquatic breeding, foraging, or migration habitat or loss or alteration of fish passage

3.8.2.2 Environmental Protection Measures

EPMs for aquatic species from **Table 3-1**, above, are the following:

1 Structure foundations or earthwork operations next to or encroaching on natural drainage channels would be dewatered to prevent muddy water and eroded materials from entering the natural drainage channels.

2 Erosion control measures would be implemented to prevent soil loss and sedimentation transport from entering natural drainage channels.

3 Runoff from the construction and O&M sites would be controlled and would meet applicable State of Nevada stormwater requirements.

4 All contaminated discharge water created by construction and O&M activities, such as concrete washout, pumping for work area isolation, vehicle wash water, and drilling fluids, would be contained and disposed of, in accordance with applicable federal, state, and local regulations.

5 All equipment would be stored, fueled, and maintained in vehicle staging areas 300 feet, or the maximum feasible distance, from any aquatic habitat (grassland, seasonal wetland, seep, spring, pond, lake, river, stream, or marsh). Vehicles and construction equipment would be inspected daily for fluid leaks before being driven off the staging areas.

6 Excavation or other construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters.

8 Construction vehicle movement outside of the easement would be restricted (to the extent feasible) to approved access or public roads.

13 At completion of work, all work areas except access roads would be recontoured to provide for proper drainage and to prevent erosion.

20 Hazardous materials would not be drained onto the ground or into streams or drainage areas. All construction and maintenance waste would be removed daily. This would include trash and litter, garbage, other solid waste, petroleum products, and other regulated materials. The materials would be sent to a disposal facility authorized to accept such materials.

24 Sandbags or equivalent effective measures would be used to prevent runoff to roadways in construction areas next to paved roadways.

25 Disturbed soils would be stabilized after construction, using a nontoxic soil stabilizer, soil weighting agent, or other approved soil stabilizing method.

3.8.2.3 Impacts from the Action Alternatives

Fishes

Construction resulting in sediment mobilization in aquatic habitats can have direct impacts on fish species. Impacts would come about from mortality or injury to fish or from loss of or reduced aquatic habitat quality, rendering it inhospitable to fish. Indirect impacts would cause a reduction or loss of suitable aquatic habitat resulting from changes in water condition, sediment, and temperature. Construction in aquatic habitats can also result in physical barriers to movement or the introduction of invasive species that compete with or prey on native fish.

Construction in the Canal prism would be conducted when the Canal is not in use. As a result, sediment would not be mobilized into aquatic habitats in the Canal, and sediment would not be transported to downstream water bodies. This would minimize or prevent water quality impacts that can degrade fish habitat or render it unsuitable.

Construction would also be required outside the Canal prism under all action alternatives, typically for clearing temporary construction work areas. This work could be conducted when the Canal is in use. Construction activities that remove vegetation or disturb soils can increase the likelihood of soil erosion and sediment transport into nearby aquatic habitats. This could lead to the types of impacts on fishes and their habitat described above. The potential for this impact would be highest under Alternatives 1 and 4, which include excavating detention ponds in uplands near the Canal. To prevent this impact, erosion control measures would be implemented, including following the project stormwater pollution prevention plan and avoiding soil stockpiles near aquatic habitats. This would minimize or prevent sediment delivery into aquatic habitat in the Canal from surface disturbance in nearby uplands.

Indirect impacts on fish species and their habitats in the Truckee River corridor could occur under the action alternatives if construction results in sediment mobilization into the Truckee River. Alternatives 1, 3, 4, and 5 include Canal lining along the Derby Reach; at several points along this reach, the Truckee River is less than 200 feet from the Canal. The potential for this impact would be avoided by implementing erosion control and stormwater pollution prevention measures.

Waterfowl and Shorebirds

The steep banks and swift flows of the Canal and frequent human disturbance make nesting habitat for waterfowl and shorebirds only marginal. These species are not expected to nest in the Canal, so no impacts on them from construction are expected. Nonetheless, if construction were proposed during the nesting season, preconstruction avian surveys would be conducted by qualified biologists. Implementing surveys and buffers around any nests observed would avoid impacts on nesting waterfowl and shorebirds, if present.

If construction crews improperly dispose of trash in the work area, nest predators could be attracted. Nesting waterfowl and shorebirds, if present, could indirectly experience increased nest predation as a result. Following EPMs for proper trash disposal would avoid this impact.

Construction noise and human presence may disturb foraging or resting waterfowl and shorebird species in or near the Project Area, as waterfowl can be sensitive to disturbance from noise and human presence. Nesting colonial waterfowl, such as gulls, terns, and pelicans, are particularly sensitive to disturbance; such disturbance can cause the birds to flush and reduce reproductive success (Carney and Sydeman 1999). These species would avoid the temporary work areas during construction and would use available nearby habitat instead. The potential for this impact would be elevated under all action alternatives, compared with the No Action Alternative, because the action alternatives would involve additional miles of lining and other work along the Canal.

Amphibians and Reptiles

The nonnative amphibian American bullfrog was observed in the Canal during the biological survey; other native amphibian and reptile species have the potential to use habitat in the Canal. Under the action alternatives, impacts on amphibian and reptile species could occur during construction, such as vehicles, workers, or equipment crushing or inadvertently injuring individuals in the work area. The potential for this impact is low because work in the Canal prism would occur only when the Canal is not in use, reducing the chances that such species would be present in the work area during construction.

Alternatives 1 and 4 include additional construction in uplands near the Canal to construct detention basins. It is possible, though unlikely, that some species of amphibians, such as toads, that use terrestrial habitats could be present in these work areas. If present during construction, the potential for injury or mortality during vegetation clearing or construction would be increased.

Invertebrates

Common native and nonnative aquatic invertebrate species use the Canal for a part of their life cycle. Work in the Canal prism would occur under all action alternatives, which would result in temporary or permanent habitat removal for aquatic invertebrate species where work is conducted. This impact is expected to be minor, due to the relatively large amounts of adjacent aquatic habitat in the Canal laterals and the Truckee River corridor that would not be disturbed by construction. Aquatic invertebrates would not be present in the work areas during construction, because all work in the Canal prism would be conducted when the Canal is not in use.

Several species of crayfish, New Zealand mud snails, and potentially quagga mussels have been reported in the region of influence. Presence in the region of influence increases the potential that these invasive species are present in the Canal and thus may be spread by construction activities. Before being brought on and off the work area, all construction equipment would be cleaned to ensure it is free of mud, vegetation, and other materials that may transport these species, which reduces the potential for invasive species spread.

Mammals

Semiaquatic mammals, such as North American beaver or muskrat, are known to burrow in the Canal banks (Cobos Roa et al. 2014). They may be directly affected from loss of suitable burrowing substrate or existing burrow systems as a result of construction in the Canal prism under the action alternatives. The TCID maintains a trapping program and periodically removes these species from the Canal; this program would be suspended during construction when the Canal is not in use because these species would not be present at these times. Because these are considered nuisance species, any impacts from habitat loss would be minor.

3.8.2.4 Impacts from the No Action Alternative

Under the No Action Alternative, there would be no new construction in the Canal; therefore, there would be no impacts on aquatic resources due to new construction. Ongoing routine maintenance would occur in the Project Area; these actions could have impacts on aquatic resources, as described in *Impacts from the Action Alternatives*, above.

When routine maintenance on structures in the Canal prism, such as check structures or flow gages, are necessary, the work would be conducted when the Canal is not in use. Conducting all work when there is no water in the Canal would minimize or prevent sediment mobilization and associated impacts on aquatic resources.

Since routine maintenance under the No Action Alternative may not address all risk, necessary stage restrictions to meet safety requirements may occur. In this scenario, less water would be diverted from the Truckee River below Derby Diversion Dam. Under certain circumstances, the additional flows in the Truckee River and Pyramid Lake would help maintain habitat quality for aquatic species.

Semiaquatic mammals such as North American beaver or muskrat, which are known to burrow in the Canal banks (Cobos Roa et al. 2014), may be displaced under the No Action Alternative. This is because over time, water levels in the Canal would be reduced based on risk-adjusted stage levels. This may cause loss of suitable burrowing substrate or existing burrow systems.

3.8.2.5 Cumulative Impacts

In general, past and present impacts on aquatic resources in the CEA include water diversions, depletions, or impoundments; loss or degradation of wetlands and riparian vegetation; decline in habitat quality from water quality degradation; and aquatic invasive species introduction and spread. These impacts have come about from federal water management projects for agriculture, storage, and municipal use and from private residential, commercial, and agricultural development in the CEA. Impacts have also resulted from construction of various administrative rights-of-way for roads, railroad, and interstate highway systems, mineral materials site development, and geothermal development. Impacts are likely to continue.

River alterations, including dams, reservoirs, diversions, and other flood control infrastructure, have significantly altered various river reaches in the CEA, reducing habitat for aquatic resources. Groundwater extraction and surface water diversion for

agricultural, commercial, and domestic use are common in the CEA. Such activities can negatively affect riparian vegetation by lowering groundwater levels, reducing riparian vegetation extent, and facilitating conversion to nonnative species, such as tamarisk (Poff et al. 1997).

BLM-administered lands in the CEA have been managed under the relevant resource management plans; these actions will continue to include management to improve wetlands and riparian habitat for aquatic wildlife.

Reasonably foreseeable future conditions will also contribute to impacts on aquatic resources in the CEA. Changing climatic and weather extremes could affect aquatic habitats and fish species by reducing suitable habitat, changing distributions, altering food webs and water quality, including water temperature, and changing the distribution and extent of wetlands and riparian vegetation. Additional effects may include increasing severity and frequency of droughts, floods, and wildfires and changing the timing of snowmelt and peak flows (Haak et al. 2010; Rieman and Isaak 2010; and Wenger et al. 2011), all of which may affect aquatic habitat quality.

Based on the alternatives analysis above, incremental impacts on aquatic resources under the No Action Alternative would be minimal, when added to the past, present, and reasonably foreseeable future actions in the CEA. Any additional flows in the Truckee River and Pyramid Lake from safety-related, reduced stage flows in the Canal would help maintain aquatic habitat quality in these locations. Additional, incremental impacts on aquatic resources would occur as a result of implementing any of the action alternatives and would generally be the result of construction. EPMs would be put in place to minimize the intensity of cumulative impacts. These include working in the Canal prism when the Canal is not in use, implementing erosion control and stormwater pollution prevention measures, and ensuring equipment does not transport aquatic invasive species.

3.8.2.6 Summary of Impacts from the Action Alternatives

While minor differences in aquatic resources impacts exist among each alternative, based on compliance with EPMs, applicable environmental laws, and regulations, the action alternatives would not result in significant direct, indirect, or cumulative impacts on aquatic resources.

3.9 Listed Species

3.9.1 Affected Environment

This section characterizes and addresses potential impacts on listed species from the alternatives. Data from the Reclamation Biological Survey Report (Reclamation 2016d) provided existing listed species conditions in the Project Area.

The USFWS issued a biological opinion (November 6, 1997; File No. 1-5-86-F-81R.AMD) on the 1997 Adjusted OCAP for the endangered cui-ui and threatened LCT in the Truckee River Basin, in accordance with Section 7 of the ESA (16 USC 1531 et seq.). That document concluded that implementing the 1997 Adjusted OCAP would not jeopardize threatened and endangered species in the action area (lower Truckee River).

This project addresses the Canal safety risks and the proposed repairs (action alternatives) to prevent an embankment breach. Truckee River water will continue to be diverted in accordance with the 1997 Adjusted OCAP.

3.9.1.1 Resource Study Area

The region of influence for listed species is the Project Area, shown in **Appendix C**, **Figure 1-1**. Additionally, selected aquatic- and riparian-dependent listed species in the Truckee River and Carson River watersheds are included in the region of influence and are discussed in this section.

3.9.1.2 Issues of Environmental Concern

Issues of environmental concern for listed species are that project activities may result in changes in critical habitat, loss or degradation of listed species habitat, and impacts on listed species. These issues are described in detail below.

3.9.1.3 Characterization

The USFWS (Reclamation 2016d) identified one federally listed endangered wildlife species, two federally listed threatened wildlife species, and proposed critical habitat that could be affected by the proposed project. These are described below.

Western Yellow-Billed Cuckoo

The western distinct population segment of the yellow-billed cuckoo (*Coccyzus americanus*) was listed as threatened under the ESA on November 3, 2014 (79 *Federal Register* 59992); critical habitat was proposed to be designated on August 15, 2014 (79 *Federal Register* 48548). Proposed critical habitat in the region of influence is Unit Nevada-4, a 4,348-acre, 12-mile-long, continuous segment of the Carson River in Lyon County, upstream of Lahontan Reservoir. There is no proposed critical habitat along the Canal, in Lahontan Reservoir, or downstream of Lahontan Dam.

In the Project Area, no breeding habitat for western yellow-billed cuckoo is present. Limited foraging habitat may be present in the Project Area, along portions of the Derby Reach, where riparian woodlands in the Truckee River floodplain encroach into the Project Area; however, no foraging habitat for cuckoo is present in the Canal itself.

Cui-ui

Cui-ui is a large sucker with a long, broad, and deep head. It weighs up to 7.7 pounds (USFWS 1992). Cui-ui was federally listed as endangered on March 11, 1967 (32 *Federal Register* 4001). The species occurs only in Pyramid Lake and the lower Truckee River, downstream of Derby Dam (USFWS 1992). No proposed or designated critical habitat exists for cui-ui.

Pyramid Lake provides rearing habitat for larvae, juveniles, and adult cui-ui, while the lower Truckee River provides the primary spawning habitat. A single cui-ui larva was captured near Painted Rock, approximately 5.5 miles downstream of the Derby Diversion Dam,[8] indicating that there is potentially suitable spawning habitat at this location.

[8] Email from Selena Werdon, Reclamation, to Morgan Trieger, EMPSi, on December 11, 2017, regarding cui-ui spawning in the Truckee River.

Adults, eggs, and larvae may be present in the Truckee River for a maximum of several weeks. Adults access the river via the Truckee River delta or through the Pyramid Lake fishway. They spawn during April and May, and most spawners migrate less than 6 miles upstream. Spawning runs may continue for 4 to 8 weeks, but most fish migrate during a 1- to 2-week period (USFWS 1992).

Recovery

The greatest ongoing threat to cui-ui is alteration of the natural Truckee River Basin hydrologic regime. Dams and diversions have degraded habitat in the lower Truckee River and Pyramid Lake due to their impacts on annual and seasonal flow variability (volume and timing). The most recent cui-ui recovery plan (second revision) was published in 1992 (USFWS 1992). Recovery is predicated on conserving the ecosystem that cui-ui occupy, while recognizing that Truckee River flows will continue to be managed to satisfy many uses.

As described in the recovery plan, cui-ui recovery has benefitted from several past actions and events, including from implementing recommendations by the DOI's 1964 Task Force on the Newlands Project and adoption of OCAP and other management measures on the Truckee and Carson Rivers; construction and operation of the Marble Bluff Fish Facility and Pyramid Lake Fishway; and storage releases from Stampede Reservoir.

Several conservation measures for cui-ui recovery are ongoing. These are passage of the Truckee-Carson-Pyramid Lake Settlement Act of 1990 (PL 101-618), which, in part, authorizes acquisition of sufficient water rights to promote cui-ui recovery and emphasizes lower Truckee River rehabilitation; ongoing research and monitoring; and continued operation of fisheries infrastructure and hatcheries (USFWS 1992; Wildlife Action Plan Team 2013). As part of PL 101-618, implementation of the Truckee River Operating Agreement is also expected to continue recovery.

Lahontan Cutthroat Trout

LCT is the largest subspecies of cutthroat trout and the state fish of Nevada. LCT evolved into a large (up to 39 inches) and moderately long-lived predator of chub, suckers, and other fish as long as 16 inches. LCT was federally listed as endangered on October 13, 1970; it was reclassified as threatened under the act on July 16, 1975, to facilitate management and allow regulated fishing. The combined impacts of loss of habitat, nonnative species introductions, and habitat fragmentation were the primary reasons LCT was listed and remains threatened (USFWS 2009). There is no designated critical habitat for LCT.

Starting in the early 2000s, the Lahontan National Fish Hatchery Complex began producing this strain (hereafter referred to as the Pilot Peak strain) for stocking of Pyramid Lake. Throughout this time, improvements to water storage and management, water and habitat quality, water availability, and dam facilities created the opportunity for LCT to spawn in the lower Truckee River again. Recently, LCT began naturally spawning again in the lower Truckee River due to the above-mentioned efforts.

Historically, LCT populations in Pyramid Lake migrated as far as 100 miles up the Truckee River into Lake Tahoe and its tributary streams to spawn (USFWS 1995). Spawning generally occurs from April through July, depending on stream flow, elevation, and water temperature. The Pilot Peak strain of LCT reaches reproductive maturity between 3 and 4 years of age. Spawning behavior of LCT is similar to other stream-spawning trout; they pair up, display courtship, and lay eggs in redds (nests). Females dig the redds in well-oxygenated and relatively silt-free gravel beds and defend them from intruders. Fry (recently hatched fish) emerge from the redds and remain in shallow shoreline areas with small gravel and cobble for cover. By early fall they develop into 2- to 3-inch fingerlings. Out-migrating individuals of lake populations will move downstream in the spring out of spawning tributaries and into lake habitats, while stream resident LCT progeny will remain in stream habitat.

Recovery

A recovery plan for LCT (USFWS 1995) specifically mentions Pyramid Lake and the Truckee River. LCT will likely rely on the region of influence to complete a portion of its life cycle once fish passage over Derby Dam is accomplished, which is planned to occur by 2022. This is the largest lake population, and it is likely the location of the largest historical population; however, recovery actions are also occurring in the Tahoe and Walker River Basins to further the recovery of LCT in the western portion of its range, as well as throughout most of its historical range (Northwestern and Humboldt Geographic Management Units). Recovery of LCT in the region of influence hinges on improvements to water flow and quality, riverine and riparian habitat, and the removal or mitigation of fish passage barriers. Other threats are invasive, aquatic invertebrate species and increasing subpopulation isolation, due to physical and biological habitat fragmentation (USFWS 2009; Wildlife Action Plan Team 2013).

3.9.2 Environmental Consequences

3.9.2.1 Impact Indicators

The following indicators are used to analyze impacts on listed species:

- Changes to aquatic habitat, as measured by changes to in-stream flow characteristics, such as flow volume and duration, and water quality
- Loss or alteration of breeding, foraging, or migration habitats or loss or alteration of fish passages
- Loss of critical habitat

3.9.2.2 Environmental Protection Measures

EPMs for aquatic species from **Table 3-1** are the following:

1 Structure foundations or earthwork operations adjacent to or encroaching on natural drainage channels would be dewatered to prevent muddy water and eroded materials from entering the natural drainage channels.

2 Erosion control measures would be implemented to prevent soil loss and sedimentation transport from entering natural drainage channels.

3 Runoff from the construction and O&M sites would be controlled and would meet applicable State of Nevada stormwater requirements.

4 All contaminated discharge water created by construction and O&M activities, such as concrete washout, pumping for work area isolation, vehicle wash water, and drilling fluids, would be contained and disposed of in accordance with applicable federal, state, and local regulations.

5 All equipment would be stored, fueled, and maintained in vehicle staging areas 300 feet, or the maximum feasible distance, from any aquatic habitat (grassland, seasonal wetland, seep, spring, pond, lake, river, stream, or marsh). Vehicles and construction equipment would be inspected daily for fluid leaks before leaving staging areas during construction.

6 Excavation or other construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters.

8 Construction vehicle movement outside of the easement would be restricted (to the extent feasible) to approved access or public roads.

13 At completion of work, all work areas except access roads would be recontoured to provide for proper drainage and to prevent erosion.

20 Hazardous materials would not be drained onto the ground or into streams or drainage areas. All construction and maintenance waste would be removed daily. This would include trash and litter, garbage, other solid waste, petroleum products, and other regulated materials. The materials would be sent to a disposal facility authorized to accept such materials.

24 Sandbags or equivalent effective measures would be used to prevent runoff to roadways in construction areas next to paved roadways.

25 Disturbed soils would be stabilized after construction, using a nontoxic soil stabilizer, soil weighting agent, or other approved soil stabilizing method.

3.9.2.3 Impacts from the Action Alternatives

Western Yellow-Billed Cuckoo and Proposed Critical Habitat

As described in *Characterization*, above, there is no breeding habitat for western yellow-billed cuckoo in the Project Area. As a result, there would be no potential for impacts on breeding cuckoos under the action alternatives.

Limited foraging habitat for western yellow-billed cuckoo may be present in the Project Area along portions of the Derby Reach of the Canal, where riparian woodlands in the Truckee River floodplain encroach into the Project Area of the Canal. Construction and the associated noise and human presence in these areas could disturb any foraging cuckoos. This impact would be most likely to occur under Alternative 3, which includes

lining along the Derby Reach of the Canal, in places less than 200 feet from potentially suitable foraging habitat in the Truckee River corridor. The potential for this impact is low, because construction would occur between November and February, when this migratory species is generally not present in the region.

No impacts on foraging cuckoos are anticipated under Alternatives 1, 2, 4, or 5 because the nearest potential foraging habitat in the Truckee River is over 0.5 miles from the nearest work location. The nearest proposed critical habitat unit (Unit NV-4) is over 8 miles from the Canal at its nearest point. As a result, there would be no impacts on proposed critical habitat under the action alternatives.

Cui-ui and LCT

Impacts on fish physiology, such as gill trauma from sediments (Berg and Northcote 1985) and increased stress levels, can also result. Sedimentation can reduce the extent of spawning habitat by filling space between larger gravels and reducing oxygenated water flow to developing embryos, thereby indirectly reducing their survival (Kondolf 2000).

The Truckee Canal headworks is the diversion structure on the Truckee River. The headworks is at the start of the Derby Reach, about 1,800 feet (0.34 miles) upstream of the nearest action alternative construction site. Construction and equipment storage would take place when the Canal is dry and within the confines of the Canal or staging areas. Vehicle operators would enter the work area from the south side of the Canal, avoiding the Truckee River on the north side. Materials and soil would be stockpiled only on the south embankment to prevent runoff or sediment from leaving the site and entering the Truckee River.

No impacts on cui-ui or LCT are anticipated under any action alternatives. Alternatives 1, 2, 4, and 5 construction activities are over 0.5 miles from the nearest habitat in the Truckee River. Alternative 3 does have several points that would be less than 200 feet from the Truckee River in the Derby Reach. The contractor would be required to implement EPMs 1, 2, 3, 4, 5, 6, 8, 13, 20, 24, and 25 and adequate stormwater pollution prevention measures to prevent runoff and sediment from leaving the site and entering the Truckee River.

An indirect beneficial effect would be that the geomembrane liner would provide surface water delivery efficiency. Under certain circumstances, this could result in less Truckee River water diversion, and more Truckee River water would flow to Pyramid Lake.

3.9.2.4 Impacts from the No Action Alternative

Under the No Action Alternative, ongoing, routine maintenance would occur in the Project Area; these actions could have impacts on listed species, as described below.

Western Yellow-Billed Cuckoo and Proposed Critical Habitat

As described in *Characterization*, above, there is no breeding habitat for western yellow-billed cuckoo in the Project Area. As a result, there would be no potential for impacts on breeding cuckoos under the No Action Alternative.

Limited foraging habitat for western yellow-billed cuckoo may be present in the Project Area along portions of the Derby Reach of the Canal, as described under *Impacts from*

the Action Alternatives. If ongoing, routine maintenance activities were conducted in these areas, any foraging cuckoos could be disturbed from noise and human presence. No impacts on proposed critical habitat for western yellow-billed cuckoo would occur under the No Action Alternative. This is because the nearest proposed critical habitat unit is over 8 miles from the Canal.

Cui-ui and LCT

Ongoing, routine maintenance under the No Action Alternative could affect cui-ui and LCT in the Truckee River, if ground-disturbing activities increase sedimentation into the river. Impacts would be as described under *Impacts from the Action Alternatives*. These impacts would be most likely to occur if maintenance work were required at the Derby Diversion Dam, where the Canal connects with the Truckee River. The potential for increased sedimentation from ongoing, routine maintenance exists, but to a lesser extent, if activities occur along the Derby Reach near the Truckee River, as described under *Impacts from the Action Alternatives*.

Because routine maintenance under the No Action Alternative may not address all risks, long-term stage restrictions to meet safety requirements may be implemented. In this scenario, less water would be diverted from the Truckee River below Derby Diversion Dam. Under certain circumstances, this could result in additional flows in the Truckee River below Derby Diversion Dam and may help maintain habitat quality for cui-ui and LCT.

3.9.2.5 Cumulative Impacts

In general, the past and present impacts on listed species in the CEA are those discussed under **Section 3.8**, Aquatic Resources. Additional past and present impacts on listed species in the CEA are discussed below.

Livestock grazing occurs on lands adjacent to the Canal and may contribute to riparian habitat loss and degradation. Effects generally include vegetation removal and trampling, soil compaction, and increased dispersal of nonnative vegetation (Belsky et al. 1999). This can convert suitable riparian habitat for western yellow-billed cuckoo to a nonnative-dominated canopy that is poor breeding and foraging habitat (Krueper et al. 2003). Perennial pepperweed is currently the most prevalent weed in proposed critical habitat for western yellow-billed cuckoo.[9]

Nonnative fish, especially trout species (USFWS 2009), are the greatest threat to LCT range-wide. Nonnatives result in range constrictions and loss of available habitat, primarily through competition and hybridization. Nonnative trout are abundant in the CEA; they would continue to affect LCT and its habitats.

Both native and nonnative fish prey on cui-ui in the Truckee River. Eggs and emergent larvae are eaten by Lahontan redside, and young are eaten by tui chub (*Gila bicolor*) and LCT (USFWS 1992). Nonnative trout also likely prey on young cui-ui in the Truckee River. Predation will continue to cumulatively affect cui-ui.

[9] Email from Selena Werdon, Reclamation, to Morgan Trieger, EMPSi, on December 11, 2017, regarding impacts on listed species.

Reasonably foreseeable future conditions will also contribute to impacts on listed species in the CEA. Changing climatic conditions and weather extremes could affect aquatic habitats and fish species, including listed fish species, as described in the cumulative impacts in **Section 3.8**, Aquatic Resources. Wetlands and riparian habitats supporting listed avian species in the CEA may also be affected, as described in the cumulative impacts in **Section 3.6**, Vegetation. Changing Canal operations resulting from construction of the fish screen at Derby Dam and a future revised OCAP could also contribute to impacts on listed species.

Based on the alternatives analysis above, incremental impacts on listed species under the No Action Alternative would be minimal, when added to the past, present, and reasonably foreseeable future actions in the CEA. Any additional flows in the Truckee River below Derby Diversion Dam from safety-related reduced stage flows in the Canal may help maintain cui-ui and LCT habitat quality in the lower Truckee River. Any potential for additional incremental impacts from action alternatives would generally be due to temporary construction activities.

EPMs would be put in place to minimize the intensity of cumulative impacts. These include implementing erosion control and stormwater pollution prevention measures whenever construction would be within 200 feet of the Truckee River. There would be no cumulative impacts on western yellow-billed cuckoo proposed critical habitat under any alternative.

3.9.2.6 Summary of Impacts from the Action Alternatives

There are minor differences in the potential for impacts on listed species between each alternative; however, based on compliance with EPMs, applicable environmental laws, and regulations, the action alternatives would not result in significant direct, indirect, or cumulative impacts on listed species. There would be no impacts on western yellow-billed cuckoo proposed critical habitat under any alternative.

3.10 Air Quality and Climate Change (Greenhouse Gases)

3.10.1 Affected Environment

This section summarizes the existing air quality for the counties in the region of influence, including the National Ambient Air Quality Standards (NAAQS), the attainment status of each county with these standards, and monitored air pollutant concentrations as an indicator of air quality trends. It also discusses the climate of the region of influence, climate change, and greenhouse gas (GHG) emissions. The Truckee Canal XM EIS Air Quality and Climate Change (Greenhouse Gases) Memorandum provides additional air emissions information to support this Draft EIS (Reclamation 2018e).

3.10.1.1 Resource Study Area

The region of influence includes the Project Area, shown in **Appendix C**, **Figure 1-1**. The dispersive nature of air pollutants makes it appropriate to consider a broader region of influence that includes portions of Churchill, Lyon, Storey, and Washoe Counties.

3.10.1.2 Issues of Environmental Concern

Issues of environmental concern for air quality would be short-term pollutant emissions related to vehicle exhaust and particulates generated by soil-disturbing activities during construction.

3.10.1.3 Characterization

The Canal is in the Truckee and Carson River Basins, which are part of the Great Basin. Temperatures vary widely, with normal winter lows in the Sierra Nevada below freezing and summer highs above 100 degrees Fahrenheit in the lower areas. Precipitation declines from west to east in the Truckee River Basin; the areas around the Carson River, which is near the eastern terminus of the Canal, receive less than 5 inches of precipitation annually (Reclamation 2015b). The predominant wind direction in Nevada is from the west. In the Reno and Fallon areas, to the west and the east of the region of influence, winds are mostly southerly in the winter and westerly to northwesterly from spring to fall (Western Regional Climate Center 2016).

Air pollutant concentrations are below the NAAQS for all monitored pollutants, except for ozone. Average ozone concentrations at the monitoring stations in Fallon (Churchill County), Fernley (Lyon County), and Reno (Washoe County) are at 92, 96, and 100 percent of the NAAQS for ozone. Churchill, Lyon, and Storey Counties are in attainment or are unclassified for all of the NAAQS. Portions of Washoe County are maintenance areas for particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) and carbon monoxide (EPA 2016b).

Climate change over time is due to natural internal processes and variability or as a result of human activity (International Panel on Climate Change 2014). GHGs are compounds that contribute to climate change by trapping heat in the atmosphere. The most important naturally occurring GHG compounds are carbon dioxide (CO_2), methane, nitrous oxide, ozone, and water vapor. The NDEP estimated that Nevada's statewide GHG emissions in 2013 (the most recent year for which state data have been tabulated) totaled the equivalent of 44 million metric tons of CO_2 equivalents (CO_2e) (NDEP 2016). This was 0.65 percent of 2013 US GHG emissions. The major sectors contributing to Nevada's GHG emissions in 2013 were electric power generation (34 percent), transportation (33 percent), residential, commercial, and industrial sources (16 percent), industrial processes (8 percent), waste management (4 percent), agriculture (3 percent), and the fossil fuel industry 2 percent; NDEP 2016).

3.10.2 Environmental Consequences

3.10.2.1 Impact Indicators

The following indicators were used to analyze impacts on air quality and GHG emissions:

- Amount of surface disturbance
- On-road or off-road vehicle and equipment use, based on the type and duration of construction activities

- The level of GHG emissions from on-road or off-road vehicle and equipment use

3.10.2.2 Environmental Protection Measures

EPMs for air quality are the following from **Table 3-1**:

23 Reclamation would use measures to reduce fugitive dust generation, such as limiting vehicle speeds to reduce visible dust emissions and posting speed limit signs at construction site entrances.

24 Sandbags or equivalent effective measures would be used to prevent runoff to roadways in construction areas next to paved roadways.

25 Disturbed soils would be stabilized after construction, using a nontoxic soil stabilizer, soil weighting agent, or other approved soil stabilizing method.

26 Soil storage piles and disturbed areas would be covered or treated with appropriate dust suppressants.

27 Vehicles used to transport solid bulk material on public roadways and that could cause visible emissions would be covered.

28 Wind erosion control techniques, such as windbreaks, water, silt fences, chemical dust suppressants, and vegetation, would be used where soils are disturbed in construction and access areas and on material stockpile areas.

3.10.2.3 Impacts from the Action Alternatives

Constructing each element would have a direct impact on air quality by generating fugitive dust, including PM_{10} and particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$). Sources of temporary and localized fugitive dust emissions are soil excavation and disturbance of the Canal embankment during Canal lining, soil excavation to demolish and replace check structures and Hazen Gage, soil disturbance to armor Pour Point 8, site excavation, and grading to construct detention ponds.

Additional sources of fugitive dust would be construction equipment, commute vehicle, delivery truck, and water truck traffic on unpaved surfaces and entrained dust caused by commute vehicles and delivery trucks on paved roads. Emissions would vary over the course of construction, based on the level of activity during each element of construction. The amount of fugitive dust emissions would depend on the type of activity, type of equipment, area disturbed, vehicle speed, and wind speed. Emissions would be specific to the area surrounding any construction activity and would cease when construction ends, and temporary disturbance areas are revegetated, or water returns to the Canal section.

The standard construction and dust abatement EPMs described above would be implemented to minimize air quality impacts during construction. Implementing fugitive dust control measures would minimize impacts on local air quality, particularly on any nearby receptors that would be sensitive to excessive dust, such as residences, agricultural areas, or roadways.

In addition to fugitive dust, construction equipment would produce combustion-related emissions, including carbon monoxide, nitrogen dioxide, volatile organic compounds, and sulfur dioxide; small quantities of PM_{10} and $PM_{2.5}$; hazardous air pollutants, such as diesel particulate matter, acetaldehyde, benzene, and formaldehyde; and GHGs, such as CO_2, nitrous oxide, and methane. Exhaust from construction equipment, delivery trucks bringing in and moving equipment and materials, and construction workers' personal vehicles would be temporary sources of criteria air pollutants and GHG emissions. A summary of on-road and off-road emissions by alternative is included in the Truckee Canal XM EIS Air Quality and Climate Change (Greenhouse Gases) Memorandum (Reclamation 2018e). Overall, emissions would be similar under all of the alternatives.

Emissions associated with maintenance would be a continuation of similar types of activities that occur now as part of the TCID operations to maintain the Canal and associated infrastructure. According to the Truckee Canal Corrective Action Study (Reclamation 2017a), the geomembrane/soil cover under Alternatives 2 and 4 would require more maintenance over the long term than the geomembrane/concrete cover under Alternatives 1, 3, and 5. As such, air pollutant and GHG emissions from maintenance may be higher over the long term under Alternatives 2 and 4, compared with Alternatives 1, 3, and 5.

3.10.2.4 Impacts from the No Action Alternative

Under the No Action Alternative, there would continue to be temporary and localized air pollutant and GHG emissions from maintenance vehicles and equipment.

3.10.2.5 Cumulative Impacts

Cumulative air quality effects occur when multiple projects affect the same geographic areas at the same time or when sequential projects extend the duration of air quality effects on a given area over a longer period of time.

In general, past and present impacts on air quality in the CEA are residential and infrastructure development, which could increase emissions from equipment and soil disturbance. Impacts have also resulted from constructing various administrative rights-of-way for roads, railroads, and interstate highway systems, from mineral materials site development, and from geothermal energy development. Impacts are likely to continue.

Reasonably foreseeable future actions will also contribute to impacts on air resources in the CEA (see **Appendix G**, List of Concurrent Projects). Future projects include commercial and residential developments that would result in temporary emissions for construction and longer-term impacts from commercial operations.

Air quality monitoring data trends can predict future air quality conditions in the CEA. As described above, monitored air pollutant concentrations are well below the NAAQS for all monitored pollutants in the Project Area except for ozone, which has concentrations that are approaching the NAAQS. The action alternatives primarily would produce short-term pollutant emissions only during construction; therefore, actions under these alternatives in combination with reasonably foreseeable future actions, would not have a significant cumulative effect on regional air quality. The No Action Alternative would not increase air pollutant emissions.

Current scientific technology makes it difficult to link a specific action to a specific climate change-related impact. Emissions of GHGs from construction and operation under all of the action alternatives would be small. The duration of these activities, particularly construction-related activities, would be shorter than predicted changes in climatic conditions. Short-term, direct, and indirect impacts on climate from any of the action alternatives would be negligible; however, over the long term, GHG emissions do contribute to total global emission levels. These, in turn, could contribute to future long-term, anticipated climate changes to a very minor degree. Overall, the contribution would be a very small portion of the total from other state, national, and global sources.

3.10.2.6 Summary of Impacts from the Action Alternatives

Impacts on air quality would be localized and short term under all action alternatives. Because EPMs would reduce fugitive dust emissions generated by soil-disturbing activities during construction, the action alternatives would not result in significant direct, indirect, or cumulative impacts on air quality.

3.11 Geology and Soils

3.11.1 Affected Environment

This section describes the geology and soils in the proposed Project Area and the potential impacts the proposed project alternatives may have on these resources. Baseline conditions for geology and soils were based on existing Reclamation data and pertinent information from previous studies and reports, including the Newlands Project Planning Study Special Report (Reclamation 2013a) and the Canal Updated Risk Analysis (Reclamation 2015a).

3.11.1.1 Resource Study Area

The region of influence for geology and soils is the Project Area, shown in **Appendix C**, **Figure 1-1**.

3.11.1.2 Issues of Environmental Concern

Issues of environmental concern for geologic and soils resources are erosion or soil loss; slope instability; effects of earthquake (fault rupture, ground shaking, liquefaction, and landslide); slumps; adverse soil conditions such as compressible, expansive, or corrosive soils; and long-term soil productivity loss.

3.11.1.3 Characterization

Topography

The region of influence has a low slope, and the Canal follows elevation contours, losing elevation slowly. Most of the Project Area has low slopes, but the surrounding land has a much greater slope on many adjacent hillsides.

Geology

The geology in the region of influence can be condensed into three broad groupings. Each has a unique and relatively consistent set of engineering geologic properties relevant to the stability of the Canal and the design of alternatives to address Canal safety (Reclamation 2015a). The geologic map units included in these three groupings are

Volcanic rock (Tba and Ts3), Lakebed sediments (Qpl), and Alluvial fan deposits (Qal, Qya, QTg, and QToa).

Table 3-12, Geologic Units in the Region of Influence, below, presents the approximate combined acreage of each of the geologic units in the region of influence. They are listed by the relative geologic ages of the units, from youngest to oldest. The mapped locations of the units listed in the table are shown in **Appendix C**, **Figure C-01 to C-22**.

Table 3-12. Geologic Units in the Region of Influence

Name	Acres
Qal—alluvium, undifferentiated	360
Qpl—playa, lake bed, and floodplain deposits	80
QTg——older gravels	70
QToa—older alluvium and alluvial fan deposits	140
Qya—younger alluvium	130
Tba—andesite and basalt flows	50
Ts3—younger andesite and intermediate flows and breccias	20
Total	**860**

Source: Reclamation GIS 2016

Volcanic rock (geologic units Tba and Ts3) is mostly hard, jointed, reddish brown, fragmental, extrusive, igneous rock (andesite breccia and agglomerate) and flows. Embankments that are constructed of coarse-grained, excavated volcanic rock are considered erosion resistant, not subject to liquefaction, and pervious (well drained). They require a lining to minimize seepage losses (Reclamation 2015a). Volcanic rock units occur primarily in the Lahontan Reach of the Canal, but they can also be found in other areas in the Derby Reach. Greater detail on the geology of the three reaches is available in the Truckee Canal Updated Risk Analysis (Reclamation 2015a).

Soils

The sedimentary soils in the region of influence are able to absorb large quantities of groundwater from flood irrigation and percolation from mountain streams. Further, they release large quantities of groundwater to ditches that partially or entirely rely on return flows from flood irrigation (Tracy and Unger 2008). The relatively flat soils underlying most of the region of influence are not highly susceptible to water erosion (Reclamation 2014). Potential wind erosion ratings for these soils vary.

Periods of saturation, flooding, or ponding during the growing season develop anaerobic conditions in the upper layer of soils. This creates hydric soils (Natural Resources Conservation Service [NRCS] 2016), which are found in the Lahontan Reach of the Canal. The NRCS classifies most of the soils in the region of influence as aridic, with sizable areas receiving less than 8 inches of precipitation per year.

Faults

The Canal is in a seismically active area, with at least two known Quaternary-aged faults, one of which crosses the Canal. In the Fernley Reach, the Pyramid Lake Fault bisects the Canal just west of the US Highway 95 bridge in Fernley. This fault is distributed, which means it consists of discontinuous faults that trace over a 0.5- to 2.5-mile-wide zone,

rather than a single fault alignment that passes through a discrete area (Reclamation 2015a).

Other faults occur in the area around the Canal, including inferred and concealed faults. Inferred faults are commonly based on the extrapolation of a fault line, and the true fault pattern may be more complex or discontinuous than shown. Concealed faults are those that are strongly believed to exist, but the precise surface location is not possible to know because of overlying young sediments.

Faults are most prevalent in the Derby Reach of the Canal, where there are two known faults, six concealed faults, and two inferred faults in or near the Project Area (**Appendix C**, **Figure C-01** to **C-22**). There are two inferred faults near the Project Area in the Lahontan Reach (Reclamation GIS 2016).

3.11.2 Environmental Consequences

3.11.2.1 Impact Indicators

This section addresses potential impacts on geology and soils from actions associated with each alternative. The following indicators are used to analyze impacts on geology and soils:

- Exposure of people or structures to potential substantial adverse effects due to slope instability, effects of earthquake (fault rupture, ground shaking, liquefaction, and landslide), slumps, rockfalls, or adverse soil conditions, such as compressible, expansive, or corrosive soils
- Substantial soil erosion or the loss of topsoil, including soil loss or accelerated erosion due to disturbance that results in the formation of rills or gullies or that results in sediment deposition in downgradient lands or water bodies to the extent that existing uses cannot be maintained
- Compaction or mixing of soils that would cause long-term loss of productivity
- Placement of a structure on unstable soils that would result in exposure to landslide, lateral spreading, subsidence, liquefaction, or collapse

3.11.2.2 Environmental Protection Measures

EPMs for geology and soils from **Table 3-1** are the following:

29 Repairs and/or construction of new embankments and structures would meet Reclamation seismic design standards.

30 All soil excavated for structure foundations would be backfilled and tamped around the foundations and used to provide positive drainage around the structure foundations. Excess soil would be removed from the site and disposed of appropriately.

3.11.2.3 Impacts from the Action Alternatives

Canal lining and construction of check structures and detention ponds would affect soils. Surface disturbance associated with these activities could cause erosion, topsoil loss,

compaction, and reduced soil productivity. The location and magnitude of the impacts would vary, depending on the elements under each action alternative. For example, impacts would likely be greatest under Alternatives 1 and 4, which both include detention pond excavation, and thus would both result in up to approximately 50 acres of surface disturbance in previously undisturbed areas (Reclamation GIS 2016). Impacts would be concentrated at the pond locations.

Alternatives 2, 3, and 5 would both have fewer impacts, because surface disturbance in previously undisturbed areas would be much less for Canal lining, check structure replacement, Pour Point 8 armoring, and removing and replacing the Hazen Gage; each of the elements would generally disturb less than 1 acre (Reclamation GIS 2016).

Implementing EPMs, including controlling erosion and following the project stormwater pollution prevention plan, would minimize impact intensity. Impacts from replacing structures and lining the Canal would be minor, because construction would occur in areas that have been previously disturbed. Post-construction erosion control would minimize impact intensity in the long term.

Impacts from constructing detention ponds, which would occur under Alternatives 1 and 4, would occur in areas of previously undisturbed top soils. The type of impacts would be similar to those described above, but the ponds would be constructed in alluvial fan deposits along the Lahontan Reach; these deposits are considered less erodible and less prone to liquefaction than lakebed sediments (Reclamation 2015a). This would reduce potential impacts from soil erosion and topsoil loss, but impacts would still be moderate. Following EPMs, such as designing to meet embankment stability standards, would minimize impact intensity. The detention ponds would have unlined banks, which would be inherently less stable than lined banks and thus could require more maintenance in the long term than lined banks. This would lead to additional heavy equipment use and ground disturbance and more potential impacts on geology and soils in the long term.

The Project Area crosses three broad geologic groupings, each with relatively consistent engineering properties (Reclamation 2015a). Most of the Canal is constructed in fine-grained lakebed sediments, which are both erodible and potentially liquefiable where they are saturated. Volcanic rock and alluvial fan deposits are less erodible and prone to liquefaction. Potential geological impacts, such as exposure of construction materials to liquefaction or collapse, would be similar across the action alternatives, although the specific locations would vary, depending on the specific alternative element. Geological hazards would be evaluated during final design of each structure location; standard design practices, such as designing to meet Reclamation seismic and embankment stability standards, would minimize the potential for impacts.

As discussed above, the Canal is in a seismically active area, with at least two known Quaternary-aged faults, one of which crosses the Canal just west of the US Highway 95 bridge in Fernley; therefore, the potential for structure and human exposure to substantial adverse earthquake effects, such as fault rupture, ground shaking, and liquefaction, would exist across all action alternatives. Designing all structures to meet Reclamation seismic design standards would reduce the potential for this impact.

3.11.2.4 Impacts from the No Action Alternative

Under the No Action Alternative, no construction on the Canal would occur; however, the TCID would continue to perform routine Canal maintenance, which could continue to affect soils in a similar manner as described above. The exact location of these impacts is unknown. Ongoing impacts would be minor, because maintenance activities would occur in areas that have been previously disturbed. Impacts on geology, including the potential for exposure of maintenance elements to adverse effects of earthquake, liquefaction, or collapse, would be the same as described under *Impacts from the Action Alternatives*. Ongoing maintenance would be assessed for geologic hazard potential, and any construction would conform to Reclamation seismic design standards and bank stability standards.

Reclamation would manage risk during Canal operations by restricting the stage level; however, if the Canal infrastructure degrades over time, it would become more susceptible to failure during extreme hydrologic events, such as rain storms. A breach under these conditions would have impacts on geology and soils. The level of impacts would depend on the location and quantity of water associated with the breach. The exact timing and location of this potential impact are unknown.

3.11.2.5 Cumulative Impacts

In general, past and present land use in the Project Area was primarily agricultural and urban. Future land use would include residential and commercial development in the Project Area that may increase the risk of soil impacts, including erosion, topsoil loss, and soil productivity loss from compaction during construction. Construction of Interstate 11 near Fernley could also result in similar impacts. These risks would be minimized by using sound construction principles, enforced by regulatory agencies.

Past and present land uses have not affected geology. Foreseeable future projects would follow standard design practices to minimize geologic impacts, such as assessing geologic risk and building to conform to seismic standards; therefore, the proposed project would not contribute to cumulative impacts on geology.

3.11.2.6 Summary of Impacts from the Action Alternatives

Impacts on geology and soils would be localized and short term under all action alternatives. Because EPMs would reduce impacts on geology and soils during construction, the action alternatives would not result in significant direct, indirect, or cumulative impacts on geology.

3.12 Health and Safety

3.12.1 Affected Environment

This section describes the health and safety issues in the Project Area. The infrastructure in the region of influence is water control and distribution facilities, major highways, rail lines and transportation corridors, and energy production and distribution facilities.

3.12.1.1 Resource Study Area

The region of influence for health and safety is the Project Area, shown in **Appendix C**, **Figure 1-1**, and the surrounding areas that would be inundated by a Canal breach.

3.12.1.2 Issues of Environmental Concern

Issues of environmental concern for health and safety are spills or mishandling of hazardous materials, including herbicides and petroleum products. Health and safety concerns to the public at large include falling into the Canal, or otherwise entering the Canal, and the risk of flooding from a Canal breach.

Canal Safety Risk Analysis

Following the January 2008 Canal breach and flooding, Reclamation investigated the risks and repairs necessary for resuming operations at capacities above 350 cfs. Risk analyses were conducted for each reach of the Canal and for flow stages associated with 250, 350, and 600 cfs. Risks were rated tolerable long-term, tolerable short-term, or unacceptable for each reach, with risk reduction actions corresponding to the risk level.

Reclamation assessed the likelihood of 22 separate possible methods that would lead to a Canal breach. Reclamation also evaluated the potential consequences for public health and safety that would result from each method. The identified general breach modes represent a range of potential static, hydrologic, and seismic breach for the full Canal structure and its individual reaches. The risk analysis provided the basis for identifying high-risk areas and assessed options to reduce risks and improve public health and safety.

3.12.1.3 Characterization

Hazardous Materials and Air Quality

Reclamation and contractors would be required to comply with all applicable federal and state hazardous materials handling, storage, and transportation laws. The implementation of EPMs 5 and 20 address hazardous materials management, EPMs 29 and 31 address seismic and flooding, and EPMs 23, 26, 27, and 28 address visible dust emissions.

Canal Safety

On January 5, 2008, a portion of the Canal embankment breached, causing extensive flooding and property damage in Fernley. The breach was believed to result from internal erosion created by animal burrows in the Canal embankment, combined with a rapid increase in flow stage levels to capture storm floodwaters from the Truckee River. The Canal is currently operated under short-term risk reduction measures, including monitoring, additional instrumentation, updated emergency action plans, and stockpiling materials to respond to emergencies. Reclamation performs annual risk inspections to evaluate any changes in factors affecting risk and safe operations until long-term improvements can be implemented (Reclamation 2015c).

Following the 2008 breach, numerous studies were completed to evaluate the cause, to evaluate the risk of future breaches, and to develop feasible alternatives for improving the safety of the Canal and reduce the risk of a Canal breach to acceptable levels. The risk analysis indicated that the highest risks are from internal erosion through the embankment, ice jams leading to internal erosion or overtopping, and, to a lesser degree, seismic deformation and cracking, leading to internal erosion. High risks were also estimated for embankment overtopping during large rainstorms due to inflows to the Canal.

Flood Control

The overall goal of flood risk management is to reduce the potential for loss of life and property from flooding caused by a Canal breach or overtopping. The Canal crosses a number of natural drainages, which collect precipitation from areas to the south and west. The original Canal construction did not include drainage crossings, so the drainages discharge directly into the Canal. These inflows accumulate in the Fernley and Lahontan Reaches of the Canal and could result in overtopping. Flood level inflows from surrounding areas may exacerbate internal erosion through the embankment from potentially rapid stage level rise or overtopping of the Canal (Reclamation 2015a).

Inflows to the Canal are controlled by releases from the Derby Diversion Dam. In the summer, check structures are used along the length of the Canal to increase the height of the water in the Canal to make irrigation deliveries. In the winter, the checks are generally left open, and diversions are routed directly to Lahontan Reservoir. The greatest risk of overtopping due to inflows from natural drainages is during the summer, when unpredictable precipitation can contribute to already high water levels in the Canal, required for water deliveries.

3.12.2 Environmental Consequences

3.12.2.1 Impact Indicators

A significant effect on health and safety would occur from floodwater from a Canal breach or overtopping.

EPMs for hazardous materials and air quality include the following from **Table 3-1**:

5 All equipment would be stored, fueled, and maintained in vehicle staging areas 300 feet or the maximum feasible distance from any aquatic habitat (grassland, seasonal wetland, seep, spring, pond, lake, river, stream, or marsh). Vehicles and construction equipment would be inspected daily for fluid leaks before being driven off the staging areas.

20 Hazardous materials would not be drained onto the ground or into streams or drainage areas. All construction and maintenance waste would be removed daily. This would include trash and litter, garbage, other solid waste, petroleum products, and other regulated materials. The materials would be sent to a disposal facility authorized to accept such materials.

23 Reclamation would use measures to reduce fugitive dust generation, such as limiting vehicle speeds to reduce visible dust emissions and posting speed limit signs at construction site entrances.

26 Soil storage piles and disturbed areas would be covered or treated with appropriate dust suppressant compounds.

27 Vehicles used to transport solid bulk material on public roadways and that could cause visible emissions would be covered.

28 Wind erosion control techniques, such as windbreaks, water, silt fences, chemical dust suppressants, and vegetation, would be used where soils are disturbed in construction and access areas and on material stockpile areas.

29 Repairs and/or construction of new embankments and structures would meet Reclamation seismic design standards.

31 Local entities could implement stormwater management plans to prevent flooding.

3.12.2.2 Environmental Protection Measures

EPMs for health and safety from **Table 3-1** are the following:

31 Local entities could implement stormwater management plans to prevent flooding.

3.12.2.3 Impacts from the Action Alternatives

New and improved infrastructure, such as the replacement of the Fernley, Anderson, Allendale, Mason, and Bango check structures, improvement of the embankments, and subsequent operation of the Canal would reduce the potential for threats to public health and safety from flooding due to a breach or overtopping. Additionally, building detention facilities (included under Alternatives 1 and 4) could decrease the risk of flooding from overtopping, compared with the No Action Alternative. Overall, the likelihood of a breach or overtopping would be reduced under all action alternatives, especially in high-risk areas, where Canal improvements would be constructed.

3.12.2.4 Impacts from the No Action Alternative

The TCID would not implement any of the risk mitigation measures identified in the risk assessment (Reclamation 2015a); however, it would continue to perform routine maintenance to minimize risk and maintain the flow stages. Under the No Action Alternative, there would be no construction to improve the structural integrity of the Canal. Additionally, there would be no detention facilities, which could increase the risk of flooding from overtopping; therefore, the potential for threats to public health and safety from flooding due to a breach or overtopping would be greatest under this alternative. Safety risks, however, would be evaluated every 5 years, and the maximum water level (stage) would be adjusted to minimize new risks as the Canal deteriorates. Over the long term, the risks would increase; the stage may be adjusted to a level where the water would remain primarily below the adjacent ground surface to minimize those risks. The reduction in stage to ensure safe water delivery would affect the system's ability to deliver requested volumes during the irrigation season.

3.12.2.5 Cumulative Impacts

Health and safety in the region of influence would be affected by reasonably foreseeable future actions, which include infrastructure development, such as for Interstate 11 and geothermal exploration and development, and industrial, agricultural, commercial, and residential development on private lands.

Depending on the location of future land uses, especially development to the south of the Canal, they may increase inflows to the Canal, thus increasing the risk of overtopping

during a storm. This could happen as development for residential and commercial uses increases the amount of impermeable land, for example from paving. Resulting loss of natural infiltration could increase runoff from the hills south of the Canal into the Canal.

Construction of Interstate 11 near Fernley could also have risks of increased runoff into the Canal. These risks could be minimized through implementation of ordinances that require all developers to ensure their developments' ability to retain the 100-year storm runoff. Furthermore, improving Canal infrastructure under the action alternatives would reduce the risk of flooding from overtopping, thus reducing the project's contribution to cumulative impacts on public health and safety.

3.12.2.6 Summary of Impacts from the Action Alternatives

Impacts on health and safety would be localized and short term under all action alternatives. Because EPMs, and the action alternatives themselves, would reduce impacts on health and safety, the action alternatives would not result in significant direct, indirect, or cumulative impacts.

3.13 Socioeconomic Resources

3.13.1 Affected Environment

This section describes the socioeconomic issues in the Project Area. Data were collected from publicly available sources, including the US Department of Commerce, Census Bureau; the US Bureau of Labor Statistics; and the US Department of Economic Analysis. Economic profiles were also created using Headwater Economics' economic profiles system tool.

3.13.1.1 Resource Study Area

The region of influence for socioeconomic resources is the Project Area, as shown in **Appendix C**, **Figure 1-1**. Data were collected from Lyon and Churchill Counties to best represent the region of influence.

3.13.1.2 Issues of Environmental Concern

Issues of environmental concern for socioeconomics include effects on employment, income, population change, availability of public services and infrastructure, local fiscal conditions, and the social setting. Impacts could occur temporarily during the construction period and long term during operation. The types of potential impacts listed above could have a positive or negative effect on the socioeconomic conditions of the Project Area. Potential socioeconomic benefits include those associated with a long-term increase in the reliability of the Canal and a temporary increase in employment and income during construction.

3.13.1.3 Characterization

Population

As shown in **Table 3-13**, Population Estimates 2000–2014, all region of influence populations increased between 2000 and 2010. The most significant of these was in Fernley, where the population grew by 55.89 percent. All region of influence areas, except the Nevada reference population, decreased in population slightly between 2010 and 2014.

Table 3-13. Population Estimates 2000–2014

Geographic Area	Population 2000	Population 2010	2000–2010 Percent Change	Population 2014	2010–2014 Percent Change
Churchill County	23,982	24,877	3.60	24,347	-2.18
City of Fallon	7,536	8,606	12.43	8,451	-1.83
Lyon County	34,501	51,980	33.63	51,579	-0.78
City of Fernley	8,543	19,368	55.89	19,184	-0.96
State of Nevada	1,998,257	2,700,551	26.01	2,761,584	2.21

Source: US Census Bureau 2000, 2010a, 2014a

Note: 2014 data are calculated by the US Census Bureau American Community Survey, using annual surveys conducted from 2009 to 2014; they represent average characteristics during this period.

Population Growth

As shown in **Table 3-14**, County Level Population Projections, population is expected to increase in all region of influence counties through 2030 (Nevada State Demographers Office 2014). All counties have similar growth projections, ranging from 4.79 percent to 5.86 percent growth by 2030.

Table 3-14. County Level Population Projections

County	2020 Population	2025 Population	2020–2025 Percent Change	2030 Population	2025–2030 Percent Change
Churchill	27,138	28,951	6.26	30,754	5.86
Lyon	56,309	59,284	5.02	62,269	4.79

Source: Nevada State Demographers Office 2014

Housing and Development

Region of influence counties have a similar percentage of occupied and vacant housing units for all years. Both counties have a slightly higher percentage of occupied housing units than the Nevada reference population for all years reported. The apparent reduction in the number of housing units at the county level between 2010 and 2014 may be due in part to data collection differences; 2010 data are summary census data, while 2014 data are estimated, based on data collected between 2009 and 2014; however, the housing boom of the early 2000s, followed by the crash in 2008, resulted in an increase in foreclosures and vacant and blighted homes throughout the region. The area is now making a recovery; housing vacancies are decreasing, and housing units are increasing.

According to the Churchill County Master Plan, housing affordability has not changed substantially; approximately 24.6 percent of renters and 16.5 percent of owners pay more than 30 percent of their income on housing, which is lower than the state average. The percentage of owner occupancy is higher in unincorporated Churchill County than in Fallon. Housing in Fallon is mostly renter occupied. This is due to the high percentage of military households and a lack of infrastructure in more rural areas to support high-density residential development. Churchill County (2010) anticipates that there would be enough land to support 20-year population growth forecasts, but planning would be required to ensure that growth occurs in concert with the county's rural character.

Lyon County is grappling with accommodating a recent increase in population growth, while preserving small town and rural settings. In total, 75 percent of Lyon County is public land; 25 percent of the county is privately owned, limiting the area in which development can occur. Approximately 10 percent of the county is agricultural lands. Private lands zoned for residential uses could accommodate over 50,000 new residential units. Providing adequate infrastructure, services, and water also is an issue affecting Lyon County (Lyon County 2010).

Income and Employment

The economic sectors employing the largest segment of the population vary by county. In Churchill County, real estate and rental and leasing, government and government enterprises, and finance and insurance have the highest proportions of employment; in Lyon County, retail trade, government and government enterprises, and manufacturing have the highest proportions of employment. Construction represented 4.6 and 5.1 percent of employment for Churchill and Lyon Counties in 2014, respectively (Bureau of Economic Analysis 2014).

In 2015, the employment sectors with the highest wages in Churchill County were manufacturing ($62,254), financial activities ($61,834), and construction ($54,237) (Churchill County 2015). In Lyon County, the employment sectors with the highest wages were natural resources and mining ($60,054), information ($56,093), and manufacturing ($49,932) (Lyon County 2015).

Income has generally declined in the area since 2000, based on inflation-adjusted values. Churchill and Lyon Counties have consistently lower median household incomes and per capita incomes than the state reference population. Income is derived from labor earnings, or income from the workplace, and nonlabor income, including dividends, interest, and rent,[10] and transfer payments. Nonlabor income is from governments to individuals, such as Medicare, disability and Social Security, and retirement income. The entire region of influence has a higher percentage of nonlabor income than the state reference population, though all are within 3 percentage points of the state.

Fiscal Conditions

Local fiscal conditions are affected by demands on public services and the levels of taxes collected in the region of influence. Lyon County has the potential for variable economic conditions in the medium term. Tesla is engaged in ongoing construction of a battery factory in a neighboring county that has the potential to bring an estimated 9,000 people to Lyon County over a number of years. Nevada Copper has postponed plans to bring into production a copper mine in Lyon County, due to decreases in copper prices (Lyon County 2015). According to the 2015 annual county financial report and after several years of a growth economy, Churchill County's taxable sales have decreased, due to a decline in population, high unemployment, and poor economic conditions (Churchill County 2015).

Public Services

In the socioeconomic region of influence, water is provided by a mixture of municipal water services and residential groundwater wells. Lyon County Utilities provides water

[10] Collectively often referred to as money earned from investments

for the Mound House and Dayton areas, Crystal Clear Water for Yerington, the Smith Valley water system in Smith Valley, and Dressler Park's water system in Wellington. All of the water supplied to these systems comes from groundwater wells (Lyon County 2016).

Fernley is serviced by six municipal groundwater wells. Groundwater is recharged from perennial precipitation and artificially recharged from Canal seepage. The water is then piped to the water treatment plant for arsenic removal and disinfection (City of Fernley 2016). The facility produces an average of 4 to 6 million gallons per day, with capacity to 20 million gallons per day and expansion capability to 30 million gallons per day to support community growth (City of Fernley 2018b).

The Sand Creek Water Treatment Plant serves portions of Churchill County—over 260 homes and businesses—with the ability to expand by 1,000 to 1,500 customers (Churchill County 2016a). The rest of Churchill County is served by the Moody Lane Wastewater Treatment Plant. It is sufficient to meet the demands in the county service area for 20 to 30 years (Churchill County 2016a).

Churchill County emergency services are provided by the county sheriff's office, the Fallon City Police, and the Fallon/Churchill Volunteer Fire Department. It runs 400 fire and extrication calls a year, with an average response time of less than 6 minutes for all calls (Churchill County 2016b).

Lyon County emergency services are provided primarily through fire protection districts. The North Lyon County Fire Protection District is a combination fire department of paid and volunteer staff who serve Fernley and the surrounding area with emergency services, including ambulance transport. The service area covers approximately 162 square miles, serving approximately 20,000 residents. In 2015, the district responded to approximately 2,700 incident calls. The district is staffed with 12 full-time firefighters, 12 volunteer firefighters, 6 reserve firefighters, a district chief, and an office manager. Each shift contains a minimum of two firefighters/emergency medical technicians, two firefighter paramedics, and a duty officer (North Lyon County Fire Protection District 2016).

Agricultural Land Use

During an average year, the TCID, including the Truckee Division, delivers water to about 2,500 water users, primarily for agricultural use (TCID 2018). Agriculture represents a locally important economic sector, due to ties to historical land uses in the region of influence. In both Churchill and Lyon Counties, farm employment represents a larger percentage of total employment than the state average for this employment sector.

3.13.2 Environmental Consequences

3.13.2.1 Impact Indicators

The following indicators are used to analyze impacts on socioeconomic resources:

- Employment, unemployment, and income levels and anticipated employment demands

- Population and anticipated short- and long-term population changes, as a result of project activities
- Public service infrastructure and capacity
- Housing price and vacancy levels and anticipated changes to housing price and availability
- Local community budgets and estimated project financial impacts
- Current and historical social setting and anticipated changes to the social setting
- Water use and associated economic impacts

3.13.2.2 Environmental Protection Measures

EPMs for socioeconomic resources include the following EPMs from **Table 3-1**.

5 All equipment would be stored, fueled, and maintained in vehicle staging areas 300 feet or the maximum feasible distance from any aquatic habitat (grassland, seasonal wetland, seep, spring, pond, lake, river, stream, or marsh). Vehicles and construction equipment would be inspected daily for fluid leaks before being driven off the staging areas.

20 Hazardous materials would not be drained onto the ground or into streams or drainage areas. All construction and maintenance waste would be removed daily. This would include trash and litter, garbage, other solid waste, petroleum products, and other regulated materials. The materials would be sent to a disposal facility authorized to accept such materials.

23 Reclamation would use measures to reduce fugitive dust generation, such as limiting vehicle speeds to reduce visible dust emissions and posting speed limit signs at construction site entrances.

26 Soil storage piles and disturbed areas would be covered or treated with appropriate dust suppressant compounds.

27 Vehicles used to transport solid bulk material on public roadways and that could cause visible emissions would be covered.

28 Wind erosion control techniques, such as windbreaks, water, silt fences, chemical dust suppressants, and vegetation, would be used where soils are disturbed in construction and access areas and on material stockpile areas.

29 Repairs and/or construction of new embankments and structures would meet Reclamation seismic design standards.

31 Local entities could implement stormwater management plans to prevent flooding.

3.13.2.3 Impacts from the Action Alternatives

Under all action alternatives, proposed construction would result in direct, short-term increases in employment and associated economic contributions to the local economy, compared with the No Action Alternative. This would be due to spending on materials, employment, and labor income. For each element, employment would occur over only a portion of the year; as a result, employment is examined in terms of person-years, where one person-year is a seasonal job, times the months of employment, divided by 12.

Total person-years employment over the course of the project were estimated based on personnel, equipment, and timelines, as discussed in **Section 2.3**, Alternatives. Total person-years employment directly supported by the project is estimated to range from 55.89 to 62.47, depending on the alternative selected. The level of anticipated labor required would be filled by current employees of the TCID, those currently unemployed, residents in the construction industry, and experts in the field from inside and outside the region.

Indirect impacts occur when related industries gain from purchases by the directly affected businesses, such as the purchase of construction equipment from local firms. For every direct job in the construction industry in Nevada, an estimated 1.8 additional indirect jobs are supported (Nevada Department of Employment, Training and Rehabilitation 2017). Based on this multiplier, an additional 100.6 to 112.45 indirect jobs would be supported by the project, depending on the alternative selected.

Note that the total person-years estimates may differ from the total number of employees; this is due to the seasonal nature of the construction. For example, one employee may work on more than one element over the construction period, or multiple employees may perform work equivalent to one person-year over the course of the project. In addition, for elements with phased approaches, the level of employees needed would vary throughout the construction period.

Based on the estimated timing for construction of different elements, the maximum total number of employees required at a given time is estimated to be 75 to 140, depending on the alternative selected. This peak employment would occur between November and February of the first winter in which the project activities occurred. It would represent less than a 1 percent increase in employment in the construction sector for the region of influence. Based on the projected number of employees, available housing and public services in the socioeconomic planning area would be sufficient to support workers required under any alternative.

Due to the scope of the project, economic impacts from project-related expenditures on supplies and employment would be temporary. They are likely to represent minor economic contributions, when viewed at the socioeconomic planning level. Locally, increased spending on supplies, increased temporary employment, and associated labor income would represent increased economic contributions; however, the specific amount would depend on the level of employment based on the alternative selected, the level of supplies purchased, and the percentage of local employees hired.

Improvements to the Canal would reduce risks of flood and associated costs for area residents and communities, compared with the No Action Alternative. As a result, the potential for direct and indirect costs to adjacent residents and area communities from flooding would be reduced, as compared with the No Action Alternative. The extent of this reduction is not known.

Indirect impacts could include changes to groundwater availability due to a change in the level of seepage from the Canal lining. The City of Fernley uses groundwater for its domestic water supply (City of Fernley 2001). Seepage from the Canal may contribute to artificial recharge of the aquifer in the Fernley area (Epstein et al. 2007). A reduction in groundwater could result in the need for new and updated water supply infrastructure improvements. The specific level of costs would depend on the level of water changes and the City's infrastructure updates.

3.13.2.4 Impacts from the No Action Alternative

Under the No Action Alternative there would be no short-term or long-term changes to the socioeconomics associated with construction of or repairs to the Canal. The number of employees needed to maintain the Canal would be similar to current conditions, as detailed in **Table 3-15**, No Action Alternative Workforce.

Table 3-15. No Action Alternative Workforce

Workforce	Administrative/Office	Operation/Maintenance	Total
Number of employees	8	34[1]	42[1]

[1]Includes seven seasonal staff persons

Direct employment can result in additional economic contributions in the region. Employing an estimated 42 people would result in approximately 76 additional jobs, based on an estimated 1.8 indirect jobs for every direct job in the construction industry (Nevada Department of Employment, Training and Rehabilitation 2017). The level of economic contributions from O&M would be variable. It would depend on the specific activities performed and the level at which materials and supplies are obtained from the socioeconomic planning area. In the absence of an increased construction workforce, no short- or long-term changes to population, demand for public services, or housing are anticipated. Dust, noise, traffic, or other construction-related impacts would not increase for local residents.

Failure to make safety improvements to the Canal could result in a Canal breach; this could affect property values for adjacent residents and costs for area communities, particularly those next to the Canal (Reclamation 2018f). Should a Canal breach occur, this could also affect current land uses. The exact timing and location are unknown; however, it is reasonable to assume the highest vulnerability to future Canal breaches would be in the high-risk areas.

3.13.2.5 Cumulative Impacts

The contributions to cumulative impacts on employment and economic contributions would be minor under the action alternatives, due to the level of anticipated employment, compared with the total construction workforce. Under the No Action Alternative,

contributions to socioeconomic impacts would be the same as current contributions to employment and economic contributions.

3.13.2.6 Summary of Impacts from the Action Alternatives

All action alternatives would temporarily increase construction employment and direct and indirect economic contributions; however, based on the planning area construction workforce and economy, impacts would be minimal. All action alternatives include lining that would reduce the risk of flooding, thereby reducing the socioeconomic impacts on adjacent property owners and the local community. These lined areas would reduce artificial groundwater recharge, with potential indirect economic impacts on shallow groundwater users as discussed in **Section 3.3**, Water Resources.

3.14 Environmental Justice

3.14.1 Affected Environment

This section describes the environmental justice issues associated with the Project Area. Census Bureau data were examined at the county level in key local communities, as well as for census tracts overlapping the region of influence in Churchill and Lyon Counties. In addition, Native American populations in the area are discussed.

3.14.1.1 Resource Study Area

The region of influence for environmental justice is the Project Area, shown in **Appendix C**, **Figure 1-1**. The data were collected from Churchill, Lyon, and Washoe Counties and the Native American communities, to best represent the area.

3.14.1.2 Issues of Environmental Concern

Executive Order 12898 requires that federal agencies identify and address any disproportionately high and adverse human health or environmental impacts of their programs, policies, and activities on minority, low-income, and Native American populations.

3.14.1.3 Characterization

Low-Income Populations

The CEQ guidance on environmental justice (CEQ 1997) defines low-income populations based on the US Census Bureau's annual statistical poverty thresholds. The 2014 poverty level is based on total income of $12,071 for an individual and $24,230 for a family of four (US Census Bureau 2014b). The CEQ guidance does not specify percentage guidelines for defining a population as low income; for this analysis, this is defined as an area where the number of individuals living below the poverty line exceeds 50 percent of the total population, or if the percentage of the low-income population is meaningfully greater than the percentage below poverty in the comparison population.

Based on best available data, Churchill and Washoe Counties, the City of Fallon, and census tracts 9601.03 and 9602.02 in Lyon County have been identified for potential environmental justice consideration. This is due to higher levels of low-income populations than Nevada, which is used as the reference population.

Minority Populations
CEQ guidance defines a minority population as one where an individual group or the aggregate population of all minority groups combined exceeds 50 percent of the total population, or if the percentage of the population comprising all minority groups is meaningfully greater than the minority population percentage in the broader region.

Nevada has a higher aggregate minority population than all region of influence counties, at 47.3 percent. Nevada's aggregate minority population was also higher than all census tracts examined in the region of influence. As a result, no racial or ethnic minority populations have been identified for further environmental justice consideration.

Native American Populations
Reclamation identified the PLPT and FPST as having religious or cultural affiliation near the region of influence. Tribal consultation is ongoing.

3.14.2 Environmental Consequences

3.14.2.1 Impact Indicators
The following indicators were used to analyze impacts on environmental justice:

- Low-income, minority, and tribal populations in the region of influence do not exceed 50 percent of the total population, as compared with the state population
- The potential for project activities to have disproportionally high and adverse effects on identified low-income, minority, or Native American populations

3.14.2.2 Environmental Protection Measures
EPMs for environmental justice include the following EPMs from **Table 3-1**:

05 All equipment would be stored, fueled, and maintained in vehicle staging areas 300 feet or the maximum feasible distance from any aquatic habitat (grassland, seasonal wetland, seep, spring, pond, lake, river, stream, or marsh). Vehicles and construction equipment would be inspected daily for fluid leaks before being driven off the staging areas.

20 Hazardous materials would not be drained onto the ground or into streams or drainage areas. All construction and maintenance waste would be removed daily. This would include trash and litter, garbage, other solid waste, petroleum products, and other regulated materials. The materials would be sent to a disposal facility authorized to accept such materials.

23 Reclamation would use measures to reduce fugitive dust generation, such as limiting vehicle speeds to reduce visible dust emissions and posting speed limit signs at construction site entrances.

26 Soil storage piles and disturbed areas would be covered or treated with appropriate dust suppressant compounds.

27 Vehicles used to transport solid bulk material on public roadways and that could cause visible emissions would be covered.

28 Wind erosion control techniques, such as windbreaks, water, silt fences, chemical dust suppressants, and vegetation, would be used where soils are disturbed in construction and access areas and on material stockpile areas.

29 Repairs and/or construction of new embankments and structures would meet Reclamation seismic design standards.

31 Local entities could implement stormwater management plans to prevent flooding.

3.14.2.3 Impacts from the Action Alternatives

Although there could be short-term impacts on all populations, including area low-income populations, they would not be disproportionately focused on these populations under any alternatives. Impacts would be concentrated in the area immediately surrounding the Canal. Low-income census tracts identified for further environmental justice consideration are not next to the Canal, further minimizing impacts on these populations. The action alternatives would reduce the potential for flooding and related impacts on all populations in the long term.

3.14.2.4 Impacts from the No Action Alternative

Under the No Action Alternative residents next to the Canal, representing all populations, would have a continued risk of flooding due to Canal breach or overflow. The exact location and timing of impacts cannot be determined.

3.14.2.5 Cumulative Impacts

No disproportionate adverse impacts are anticipated on low-income or minority populations under any alternative; therefore, there would be no contribution to cumulative impacts on environmental justice.

3.14.2.6 Summary of Impacts from the Action Alternatives

No disproportionate adverse impacts are anticipated on low-income or minority populations under any alternative. Under all action alternatives, the proposed Canal lining and other measures would reduce the potential for flooding but may increase the impacts on shallow groundwater users in all populations.

3.15 Unavoidable Adverse Impacts

Unavoidable adverse impacts are those on natural and human resources that would remain after mitigation measures have been applied. They are environmental consequences of an action that could not be avoided, either by changing the nature of the action or through mitigation. After consideration of actions, operations, and features to avoid, mitigate, or compensate for adverse effects, the action alternatives would likely result in the unavoidable direct and indirect impacts detailed below.

Artificial recharge—Under all action alternatives, the geomembrane lining would diminish, if not eliminate, artificial groundwater recharge from the Canal. The City of Fernley residents who rely on the shallow groundwater aquifer would have reduced quantities of artificial groundwater recharge from Canal diversions. Reducing seepage

from the Canal could also be beneficial to the Truckee River. Under certain circumstances, increased Canal efficiency would reduce diversions from the Truckee River into the Canal.

The cessation of artificial recharge due to reduced Canal seepage is an unavoidable consequence of the proposed action and alternatives. **Appendix F** contains correspondence between Reclamation and the City of Fernley regarding legal entitlements to artificial groundwater recharge.

Cultural and Historic Resources—All construction activities could affect the Canal and archaeological resources identified within the APE. Permanent and temporary replacement and modifications of features and historic characteristics of the Canal, a historic property, may result in an adverse effect. Ground-disturbing activities for construction, such as grading and using staging areas, creating access roads, or creating temporary water diversion structures, could damage or destroy archaeological resources by removing or displacing artifacts and features or by constructing features out of character with a historic setting. Additional surveys and revisions to the APE may be necessary in some areas, for the detention ponds, to determine if cultural resources are present.

3.16 Irreversible and Irretrievable Commitments of Resources

Irreversible and irretrievable resource commitments involve the use of nonrenewable resources and the effects of use on future generations. Irreversible effects primarily result from the use or destruction of specific resources that cannot be replaced within a reasonable time frame, such as energy and minerals. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action, such as extinction of a listed species or the disturbance of a cultural resource. The action alternatives would result in the irreversible and irretrievable commitment of the following resources during project construction and operation:

- Construction materials, including resources such as soil and rocks
- Labor
- Energy expended in the form of electricity, gasoline, diesel fuel, and oil for equipment and transportation vehicles that would be needed for project construction and O&M

Nonrenewable resources are expected to account for a minimal portion of the region's resources; the project's use of nonrenewable resources would not affect the availability of these resources for other needs within the region. Construction would not result in inefficient use of energy or natural resources. The selected construction contractors would use best available engineering techniques, construction and design practices, and equipment operating procedures.

Chapter 4
Consultation and Coordination

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4. Consultation and Coordination

4.1 Introduction

This chapter describes public outreach and participation made available by developing this XM EIS and by consulting and coordinating with tribes, government agencies, and other stakeholders. Reclamation follows the public involvement requirements documented in the CEQ regulations implementing NEPA (40 CFR 1501.7 for scoping, and 1506.6 for public involvement). NEPA and associated laws, regulations, and policies require Reclamation to seek public involvement early and throughout the planning process to develop a reasonable range of alternatives to proposed actions and to prepare environmental documents that disclose the potential impacts of proposed actions and alternatives. Reclamation involved the public and other agencies through *Federal Register* notices, news releases, public meetings, postcards, and updates on the EIS project website, https://www.usbr.gov/mp/lbao/programs/truckee-canal-eis/.

4.2 Public Collaboration and Outreach

Public involvement is a vital and legal component of the EIS process. It vests the public in the decision-making process and allows for full environmental disclosure. Guidance for implementing public involvement under NEPA is codified in 40 CFR 1506.6, which ensures that federal agencies make a diligent effort to involve the public in the NEPA process. These public involvement procedures can be found in Reclamation's NEPA Handbook (Reclamation 2012). The Truckee Canal Extraordinary Operation and Maintenance Environmental Impact Statement Scoping Summary Report, finalized in May 2016 (Reclamation 2016c), summarizes the scoping process.

Public participation will be ongoing throughout the remainder of the NEPA process. One substantial part of the process is providing an opportunity for the public to comment on this EIS during the comment period. In the Draft EIS, Reclamation will consider all substantive comments received during the 45-day comment period. Reclamation will sign the ROD 30 days after the release of the Final EIS.

4.3 Consultation and Coordination

Federal laws require Reclamation to consult with certain federal and state agencies and entities and Native American tribes during the NEPA decision-making process (40 CFR 1502.25). Reclamation is also directed to integrate NEPA requirements with other environmental review and consultation requirements to reduce paperwork and delays (40 CFR 1500.4-5).

Reclamation has implemented an extensive collaborative outreach and public involvement process. It has coordinated with tribes and cooperating agencies and is working closely with the affected tribes, the local tribal historic preservation officer, and the Nevada SHPO. Reclamation will continue to meet with interested agencies and organizations throughout the planning process and will continue coordinating closely with cooperating partners.

4.3.1 Cooperating Agencies

Reclamation is the lead federal agency under NEPA for the preparation of the Truckee Canal XM EIS. Reclamation requested federal, state, and local agencies; Native American tribes; and the TCID to participate as cooperating agencies. Cooperating agencies for the Truckee Canal XM EIS are the BIA, Churchill County, the City of Fallon, the City of Fernley, the FPST, the PLPT, the TCID, and the USFWS.

Reclamation facilitated meetings with project cooperating agencies from January 2016 through June 2018. At these meetings, they discussed and prepared the proposed federal action and purpose and need statement and participated in alternatives development and screening.

4.3.2 Native American Tribe Consultation

Consultation with Native American tribes is part of the NEPA scoping process. Government-to-government consultation began in 2015, with Reclamation sending requests for consultation letters to all area tribes. Government-to-government consultation will continue throughout the EIS development process. This is to ensure that management actions are consistent with rights retained by tribes and that the concerns of tribal groups are considered. Reclamation has consulted with the PLPT and the FPST on a government-to-government basis.

Reclamation is also consulting with the affected Native American tribes with interests or TCPs in the planning area. Consultation for cultural concerns includes local tribal historic preservation officers and the Nevada SHPO.

4.3.3 State Historic Preservation Office Consultation

The Nevada SHPO has been notified of the status of the EIS and will receive a draft EIS for review. Additional information on Nevada SHPO consultation will be added to the Final EIS. Reclamation has previously consulted with the SHPO on identification of historic properties and a finding of adverse effect on the Canal, from the project. Reclamation will resolve the adverse effects through a programmatic agreement among Reclamation, the Advisory Council on Historic Preservation, and the SHPO.

4.3.4 US Fish and Wildlife Service Consultation

To comply with Section 7(c) of the ESA, Reclamation coordinated with the USFWS early in the planning process. The USFWS provided input on planning issues, data collection and review, and alternatives development. Reclamation is coordinating with the USFWS to identify any potential ESA issues.

Appendix A
Acronyms and Glossary

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A. Acronyms and Glossary

A.1 Acronyms and Abbreviations

AF	acre-feet
AFY	acre-feet per year
APE	Area of Potential Effect
BIA	US Department of the Interior, Bureau of Indian Affairs
BLM	US Department of the Interior, Bureau of Land Management
Canal	Truckee Canal
CAS	corrective action study
CDWR	California Department of Water Resources
CEA	cumulative effects area
CEQ	council on environmental quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO_2	carbon dioxide
DOI	Department of the Interior
EES	engineering and economic study
EIS	environmental impact statement
EPA	United States Environmental Protection Agency
EPM	environmental protection measure
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FPST	Fallon Paiute-Shoshone Tribe
GHG	greenhouse gas
GIS	geographic information system
HEC-RAS	Hydrologic Engineering Center's River Analysis System
ITA	Indian trust asset
LBAO	Lahontan Basin Area Office
LCT	Lahontan cutthroat trout
MOU	memorandum of understanding
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code

NDA	Nevada Department of Agriculture
NDEP	Nevada Division of Environmental Protection
NDOM	Nevada Division of Minerals
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
Nevada SHPO	Nevada State Historic Preservation Office
NHPA	National Historic Preservation Act of 1966
NNHP	Nevada Natural Heritage Program
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O&M	operation and maintenance
OCAP	operating criteria and procedures
PLPT	Pyramid Lake Paiute Tribe
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
ppb	parts per billion
ppm	parts per million
Reclamation	United States Department of the Interior, Bureau of Reclamation
SNWR	Stillwater National Wildlife Refuge
SWReGAP	Southwest Regional Gap Analysis Project
TCID	Truckee-Carson Irrigation District
TCP	traditional cultural property
TDS	total dissolved solids
TMDL	total maximum daily load
TMWRF	Truckee Meadows Water Reclamation Facility
TROA	Truckee River Operating Agreement
TSS	total suspended solids
US	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WMA	wildlife management area
XM	extraordinary maintenance

A.2 Glossary

100-year flood (also see recurrence interval). A flood having a 100-year recurrence interval. A flood of this magnitude has a 1 percent chance of happening in any year.

Acquired land. Land acquired by the United States through donation or other monetary compensation through fee title.

Adjudicated water right. Adjudication is a legal process to determine who has a valid water right, how much water can be used, and who has priority during shortages. Adjudication provides a thorough accounting of water, which is essential to water resources use, protection, and planning, as well as the transfer of water rights. It is key to resolving and preventing water conflicts over surface water, groundwater, or both.

Air pollution. Degradation of air quality resulting from unwanted chemicals or other materials in the air.

Alluvial fan. Alluvium is a triangle-shaped deposit of gravel, sand, and even smaller pieces of sediment, such as silt. Alluvial fans are usually created as flowing water interacts with mountains, hills, or the steep walls of canyons. Streams carrying alluvium can be trickles of rainwater, a fast-moving creek, a powerful river, or even runoff from agriculture or industry.

Ambient air quality. The state of the atmosphere at ground level, as defined by the range of measured or predicted ambient concentrations of all significant pollutants for all averaging periods of interest.

Appropriation date. The date when a specified portion of previously unappropriated waters of the state can be put to beneficial use, in accordance with the procedures prescribed by law.

Archaeological site. A location that contains material remains of past human activities, generally defined as over 50 years old.

Artifact. A human-modified object, often appearing on an archaeological site, that typically dates to over 45 years in age.

Asset. A capitalized facility, building, structure, authorized project feature, power production equipment, recreation facility, or quarters, as well as capitalized and noncapitalized heavy equipment, motor vehicles, and other installed equipment that is used to achieve the mission of Reclamation to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Attainment area. A geographic area in which levels of a criteria air pollutant meet the health-based National Ambient Air Quality Standard for that specific pollutant.

Base flow. Sustained low flows in a stream, often composed largely of groundwater.

Biodiversity. The range of organisms present in a given ecological community or system. It can be measured by the numbers and types of different species or the genetic variations within and between species.

Canal prism. This refers to the shape of the canal as seen in a cross section, typically trapezoidal in shape.

Carbon dioxide (CO_2). A naturally occurring gas and also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal human-caused greenhouse gas that affects the earth's radiative balance. It is the reference gas against which other greenhouse gases are measured.

Carbon dioxide equivalent (CO_2e). A measure that accounts for the global warming potential of the different greenhouse gases.

Check dam. A small dam designed to retard the flow of water and sediment in a channel, used especially to control soil erosion. It is a small barrier constructed in a gully or other small watercourse to decrease flow velocity, minimize channel scour, and promote deposition of sediment.

Check structure. A structure used to regulate the upstream water surface and control the downstream flow in a canal.

Climate. The generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years.

Climate change. Any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for decades or longer. Climate change may result from any of the following:

- Natural factors, such as changes in the sun's intensity or slow changes in the earth's orbit around the sun
- Natural processes in the climate system, such as changes in ocean circulation
- Human activities that change the atmosphere's composition, such as driving automobiles, and the land surface, for example by deforestation, reforestation, urbanization, and desertification

Criteria pollutant. The EPA uses six criteria pollutants as indicators of air quality. It has established for each of them a maximum concentration above which adverse impacts on human health may occur. These threshold concentrations are called National Ambient Air Quality Standards. The criteria pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead.

Cofferdam. A watertight enclosure pumped dry to permit construction work below the waterline.

Comprehensive plan. A plan developed by a municipality to dictate goals, objectives, and priorities for its future management.

Consumptive use. The amount of water used up by applying it to beneficial use. Examples are water for drinking and water taken up by growing crops.

Cooperating agency. A federal, state, tribal, or local agency having special expertise with respect to an environmental issue or jurisdiction by law. During the NEPA process, a cooperating agency assists the lead agency by participating at the earliest possible time; by participating in the scoping process; by participating in developing information and preparing environmental analyses, including portions of the environmental impact statement, where it has special expertise; and by participating in making available staff support at the lead agency's request to enhance its interdisciplinary capabilities.

Critical habitat. Specific geographic areas, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species and that have been formally described in the *Federal Register*.

Cubic feet per second (cfs). An Imperial unit/US customary unit volumetric flow rate, which is equivalent to a volume of 1 cubic foot flowing every second. The amount of cubic feet of water that passes a specific point on the river in 1 second.

Cultural resources. The present expressions of human culture and the physical remains of past activities, such as historic buildings, structures, objects, districts, landscapes, and archaeological sites. These resources can be significant in the context of national, regional, or local history, architecture, archaeology, engineering, or culture. They may also include sacred sites and natural features of landscapes that are significant to living communities.

Cultural resources investigation. A walking survey of an area, typically for a proposed undertaking, to identify and evaluate cultural resources that may be affected by the undertaking. No ground is disturbed.

Deferred maintenance and repairs. Maintenance and repairs that were not performed when they should have been, or were scheduled to be performed but were delayed.

Desert Terminus Lake. A terminal lake that is formed at the end point of an enclosed watershed basin. These lakes have no outlets and are affected by variations in water flows caused by upstream activities, such as diversions of surface water, groundwater pumping, and changes in the hydrologic cycle.

Dispersion. The act or process of spreading or being distributed.

Easement. Conveys a possessory interest (control of property without ownership) in real property.

Emergent wetland. Wetland type that contains emergent plants (erect, rooted, herbaceous, and water loving) that are the tallest life form, with at least 30 percent coverage.

Extraordinary maintenance. Major, nonrecurring maintenance to Reclamation owned or operated facilities, or facility components, that is intended to ensure the continued safe,

dependable, and reliable delivery of authorized project benefits. It is greater than 10 percent of the contractor's or the transferred works operating entity's annual O&M budget for the facility, and greater than $100,000.

Federal action. An action by a federal agency. This may include supplying funding for a project, authorizing or permitting a project, or undertaking or sponsoring a project.

Federal project. A project conducted by or funded by the federal government.

Flashboards. Temporary barriers, consisting of either timber, concrete, or steel, anchored to the crest of a spillway as a means of increasing reservoir storage.

Floodplain. Any area that can be inundated with water. In this EIS, a floodplain can refer to either an area having unique vegetation or channel characteristics caused by flooding or a regulatory area, generally the 1 percent annual chance of (100-year) flood.

Fugitive dust. Significant atmospheric dust arising from the mechanical disturbance of granular material exposed to the air. Dust generated from these open sources is termed fugitive because it is not discharged to the atmosphere in a confined flow stream. Common sources of fugitive dust are unpaved roads, agricultural tilling operations, aggregate storage piles, and heavy construction operations.

Greenhouse gas. Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include carbon dioxide, methane, nitrous oxide, ozone, chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Groundwater. Water found under the surface of the ground in porous rock strata and soils.

Hazardous waste. EPA-defined waste that is dangerous or potentially harmful to health or the environment. Hazardous wastes can be liquids, solids, gases, or sludges. They can be discarded commercial products, like cleaning fluids or pesticides, or the by-products of manufacturing.

Hibernaculum. A place in which a creature seeks refuge, such as a bear using a cave to overwinter.

Historic built environment. Buildings, structures, objects, districts, and linear features, such as roads, trails, and acequias (irrigation ditches), that are at least 50 years old.

Historic property. Cultural resources, such as historic buildings, structures, objects, districts, or archaeological sites, that are listed on, or eligible for listing on, the National Register of Historic Places.

Hydric soils. Soils in which anaerobic (lacking oxygen) conditions have developed.

Hydrograph. A graph of flow past a point in a river over time.

Hydrophytes. Plants adapted to living in saturated conditions at least some of the time.

Impaired water. A water body that repeatedly exceeds regulatory water quality limits in one or more types of contamination or conditions.

Indian trust assets (ITAs). Legal interests in property held in trust by the United States for federally recognized Indian tribes or individual Indians.

Infiltration. Flow of a liquid into a substance through pores or small openings. The gradual flow or movement of water into and through the pores of a soil. See seepage.

Intermittent. A stream or drainage that flows periodically during the year. It may flow during certain seasons or storms, but it does not flow year-round. Groundwater may or may not supply intermittent streams.

Interval. See recurrence interval.

Isolated occurrence. Cultural manifestations that are at least 50 years old and that do not meet the definition of an archaeological site; typically, these are locations with fewer than 10 artifacts or with an isolated feature that lacks integrity.

Junior water right. A water right that was obtained more recently and therefore is lower in priority than older or more senior water rights.

Loss. Loss of water that results from such factors as system loss and evaporation.

M&I. Municipal and industrial water rights or water uses.

Methane (CH_4). A hydrocarbon that is a greenhouse gas, with a global warming potential most recently estimated at 25 times that of carbon dioxide. Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.

Metric ton. Common measurement for the quantity of greenhouse gas emissions. A unit of weight equal to 1,000 kilograms (2,205 pounds).

Mission critical asset. A facility or structure that sustains essential functions of a Reclamation project for which an alternative facility or structure capable of continuously sustaining those functions is unavailable.

Mitigation measure. A measure taken to offset the adverse impacts of an action or activity.

Moisture regime. The amount of moisture typically in the soil in a given area, for example wetlands, which are in depressions or other areas where surface water or groundwater is abundant in the soil.

National Ambient Air Quality Standards (NAAQS). The specified average concentration of an air pollutant in ambient air during a specified period, at or above which level the public health may be at risk. NAAQS have been set for the following criteria pollutants: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, and two categories of particulate matter (particulate matter with an aerodynamic diameter of 10 microns or less [PM_{10}] and particulate matter with an aerodynamic diameter of 2.5 microns or less [$PM_{2.5}$]).

National Pollution Discharge Elimination System (NPDES). A program created by the Clean Water Act of 1972 that regulates discharge of pollutants into public waters.

National Priorities List (NPL). List of sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation.

National Register of Historic Places. A listing of resources that are considered significant at the national, state, or local level and that have been found to meet specific criteria of historic significance, integrity, and age.

Nitrogen dioxide (NO_2). A molecule of one nitrogen and two oxygen atoms, which results usually from further oxidation of nitric oxide (NO) in the atmosphere. Ozone accelerates the conversion.

Nitrous oxide (N_2O). A greenhouse gas with a global warming potential of 298 times that of carbon dioxide (CO_2). Major sources of nitrous oxide are soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.

Operating criteria and procedures (OCAP). A federal rule that lays out how Reclamation's Newlands Project is operated. The Lahontan Basin Area Office of the Bureau of Reclamation administers the OCAP, in consultation with the TCID, Pyramid Lake Paiute Tribe, Fallon Paiute-Shoshone Tribe, US Fish and Wildlife Service, Bureau of Indian Affairs, and Federal Water Master.

Paleontological resources. Any fossilized remains or traces of organisms that are preserved in, or on, the earth's crust; that are of scientific interest; and that provide information about the history of life.

Palustrine emergent wetland. A wetland dominated by trees, shrubs, and herbaceous vegetation. It may include wet meadows, swamps, bogs, and fens.

Particulate matter. One of the six criteria pollutants for which the EPA established National Ambient Air Quality Standards. Particulate matter is defined as two categories: fine particulates with an aerodynamic diameter of 10 micrometers or less (PM_{10}), and fine particulates with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$).

Parts per billion (ppb). A measure of the amount of one substance found in another, which is the carrier.

Parts per million (ppm). A measure of the amount of one substance found in another, which is the carrier.

Perennial stream. A stream that flows continuously throughout the year.

Pool. An aquatic habitat in a stream with a low gradient that is normally deeper and wider than aquatic habitats immediately above and below it.

Prior appropriation. The water law doctrine that confers priority to use water from natural streams, based on when the water rights were acquired. Water rights in Nevada, California, and other western states are confirmed by court decree; holders of senior rights have the first claim to withdraw water over holders who have filed later claims (see junior water rights).

Priority of water right. The ranking of a water right against all other water rights drawing on the stream system.

Protocol survey. A wildlife survey of threatened and endangered species that is designed to provide clear guidelines to surveyors in order to standardize methods and produce uniform reporting of results.

Qualitative assessment. Analyzes the impacts in a descriptive manner, such as low, moderate, or high.

Quantitative assessment. Analyzes the impacts using numerical metrics, such as acres or cubic feet per second.

Rainfall hyetograph. A graphical representation of the relationship between the rainfall intensity and time.

Recurrence interval. The average number of years between floods of a certain size. The actual number of years between floods of any given size varies because of the variability associated with local, regional, and global climate patterns.

Reserved works. Reclamation-owned facilities for which Reclamation manages and performs O&M, either through Reclamation employees or a maintenance contract.

Return flow. Water that returns to streams and rivers after it has been applied to beneficial use. Return flows may return as surface flow or as an inflow of tributary groundwater.

Return interval. See recurrence interval.

Riparian. Areas along creeks or streams and between the aquatic and terrestrial environment; these areas are influenced by rivers.

Routine maintenance. Routine O&M includes the recurring activities required for the continuing safe operation of Reclamation facilities in the manner necessary to provide authorized project benefits. The definition includes tasks, activities, practices,

management, and programs that are recurring based on a finite time period, condition analysis, or another metric. Facility inspections and minor maintenance are also included within this category.

Section 404 permit. An authorization granted by the US Army Corps of Engineers under Section 404 of the Clean Water Act to place dredge or fill material in Waters of the United States (see Waters of the United States).

Sedimentation. The transport of sediment into a water body.

Seepage. The slow movement or percolation of water through soil or rock or movement of water through soil without definite channels forming. The movement of water into and through the soil from unlined canals, ditches, and water storage facilities. The slow movement or percolation of water through small cracks, pores, and interstices from an embankment, abutment, or foundation.

Senior water right. Under the prior appropriation doctrine, water rights are allocated on a "first in time, first in right" basis; that is, the first person in time to put water to a beneficial use is granted the earliest priority water right. The early appropriations are referred to as senior water rights. A senior water right has an early appropriation date and priority relative to other water rights (see junior water right).

Special status species. A state or federal threatened or endangered species, as well as a proposed or candidate species for threatened or endangered status.

Species of concern. Federally listed threatened and endangered species.

Spillway. A structure that passes normal and/or flood flows in a manner that protects the structural integrity of the dam. Overflow channel of a dam or impoundment structure. A structure over or through which flow is discharged from a reservoir. Any passageway, channel, or structure designed to discharge surplus water from a reservoir. If the rate of flow is controlled by mechanical means such as gates, it is considered a controlled spillway. If the geometry of the spillway is the only control, it is considered an uncontrolled spillway.

Stage. The height of water within the Canal.

Stage restriction. The height of water in the Canal that cannot be exceeded and complies with short-term risk reduction measures.

Surface water. Water that flows on the surface, either in streams or as surface runoff across the ground.

Take (as defined by the Endangered Species Act). To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct; may include significant habitat modification or degradation if it kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Traditional cultural property (TCP). Ethnographic resources, such as sacred sites, that are associated with the cultural practices of a living community and that meet the criteria for listing on the National Register of Historic Places.

Transfer. The sale or purchase of a water right.

Transferred works. Reclamation-owned facilities for which the responsibility to manage and perform O&M has been transferred by contract or agreement to a nonfederal operating entity.

Truckee-Carson Irrigation District (TCID). Formed in 1918 as a political subdivision of the State of Nevada, it represents water right holders within the boundaries of the Newlands Project. Since 1927, the TCID has been responsible for the operation and maintenance of the Newlands Project, including the Canal. The TCID receives funding from landowners in the Newlands Project who own water rights appurtenant to their lands. The Newlands Project boundary covers approximately 120,000 acres in Churchill and Lyon Counties, Nevada.

Trust land. Land held in trust by the United States for federally recognized Indian tribes or individual Indians.

Turbidity. The cloudiness of water due to the presence of suspended particles.

Upland. Hills, plains, mesas, or other areas not in riparian areas or wetlands, where the vegetation is not supplied with water from a stream or drainage.

Wastewater. Excess flow beyond the capacity of the service canal or spillway.

Wasteway. A channel or open ditch that allows for the passage of wastewater (see wastewater).

Water right. A right to use, in accordance with its priority, a portion of the waters of the state by reason of the appropriation of the same (see senior water right and junior water right).

Waters of the United States. A rule that is largely a technical document, defining which rivers, streams, lakes, and marshes fall under the jurisdiction of the Environmental Protection Agency and the US Army Corps of Engineers.

Wetland. An area near the margin between water and land (such as swamps and marshes) that is wet enough to support plant growth typically found in saturated soil conditions.

Whitewash. White stains from bird excrements that are usually found where birds perch or nest.

Withdrawn land. Land approved by the US Secretary of the Interior that is withdrawn from public entry because it may be required for any irrigation works and appurtenant features.

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Appendix B
References

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B. References

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Appendix C
Figures

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C. Figures

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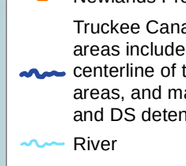
RECLAMATION
Managing Water in the West

Figure 1-1
Truckee Canal XM EIS Project Area

- Truckee-Carson Irrigation District/ Newlands Project
- Truckee Canal XM project area: areas includes a 100-foot buffer from the centerline of the 31-mile Canal, staging areas, and may include the TC-11, Mason, and DS detention ponds
- River
- Lake, reservoir, or intermittent surface water
- Sink
- Dam
- Pour point
- Detention pond
- Check structure
- USGS gaging station
- Tribal Reservation
- U.S. Navy
- National Wildlife Refuge



Source: NHD GIS 2016,
Reclamation GIS 2016, BLM GIS 2014
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
November 06, 2018
Truckee_Intro_V06.pdf
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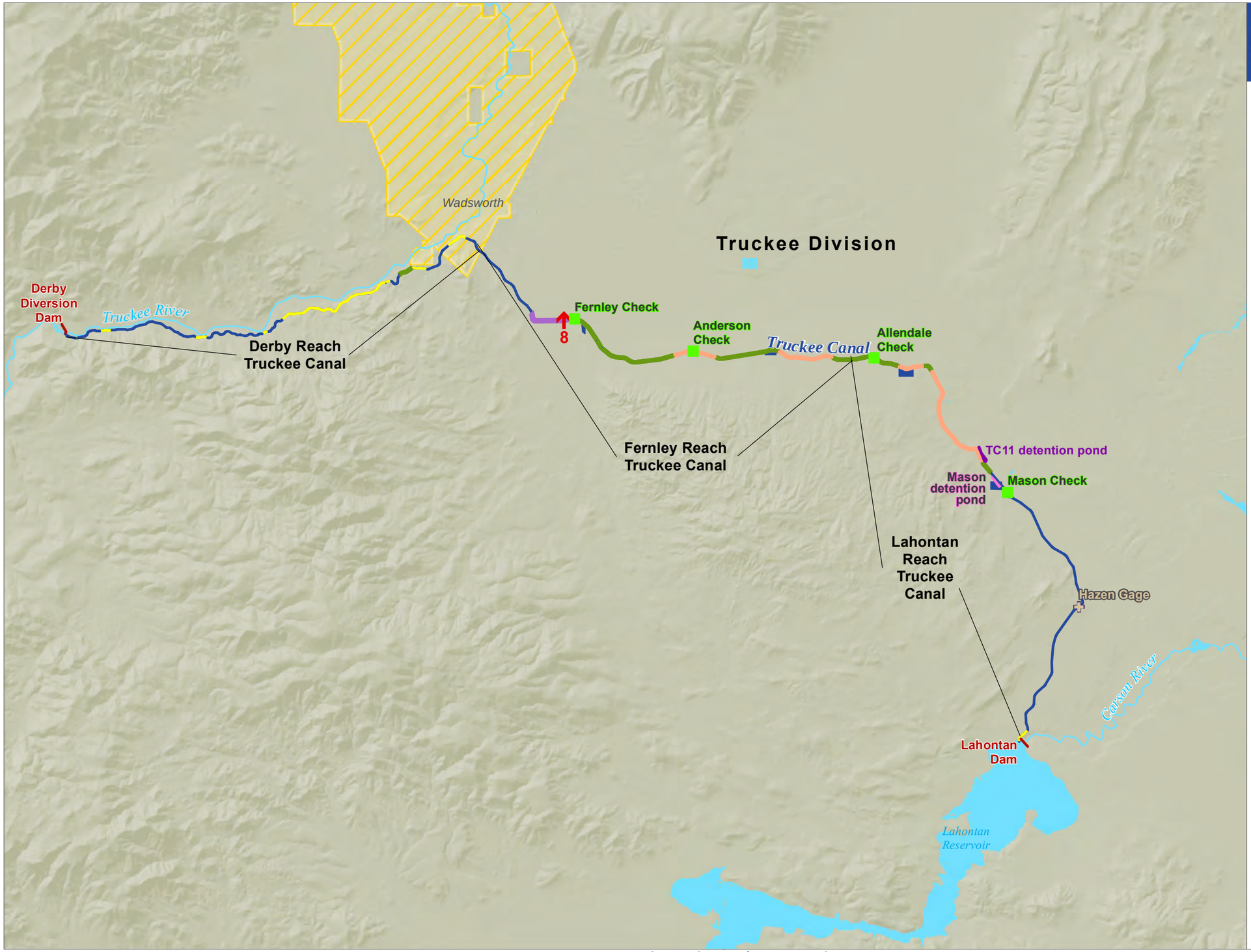

RECLAMATION
Managing Water in the West

Figure 2-1
Alternative 1

Element 1 (Embankment)
- Line the canal—full prism—geomembrane/ concrete (5.99 miles)

Element 2 (Structure)
- Replace check structure
- Remove and replace gage with long-throated flume

Element 3 (Hydrologic Actions [HA])
- Armor Pour Point 8—geomembrane/ concrete full prism (2,700 ft) at 3 inflow points and geomembrane/soil (3,000 ft)
- TC11 detention pond (322 AF)
- Mason detention pond (101 AF)
- Line the canal—geomembrane concrete full prism (5.71 miles)
- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Pour point
- Existing lining (4.2 miles)
- River
- Lake, reservoir, or intermittent surface water
- Dam
- Tribal Reservation

Source:
Reclamation GIS 2017
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
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Truckee_alts_Alt1.pdf
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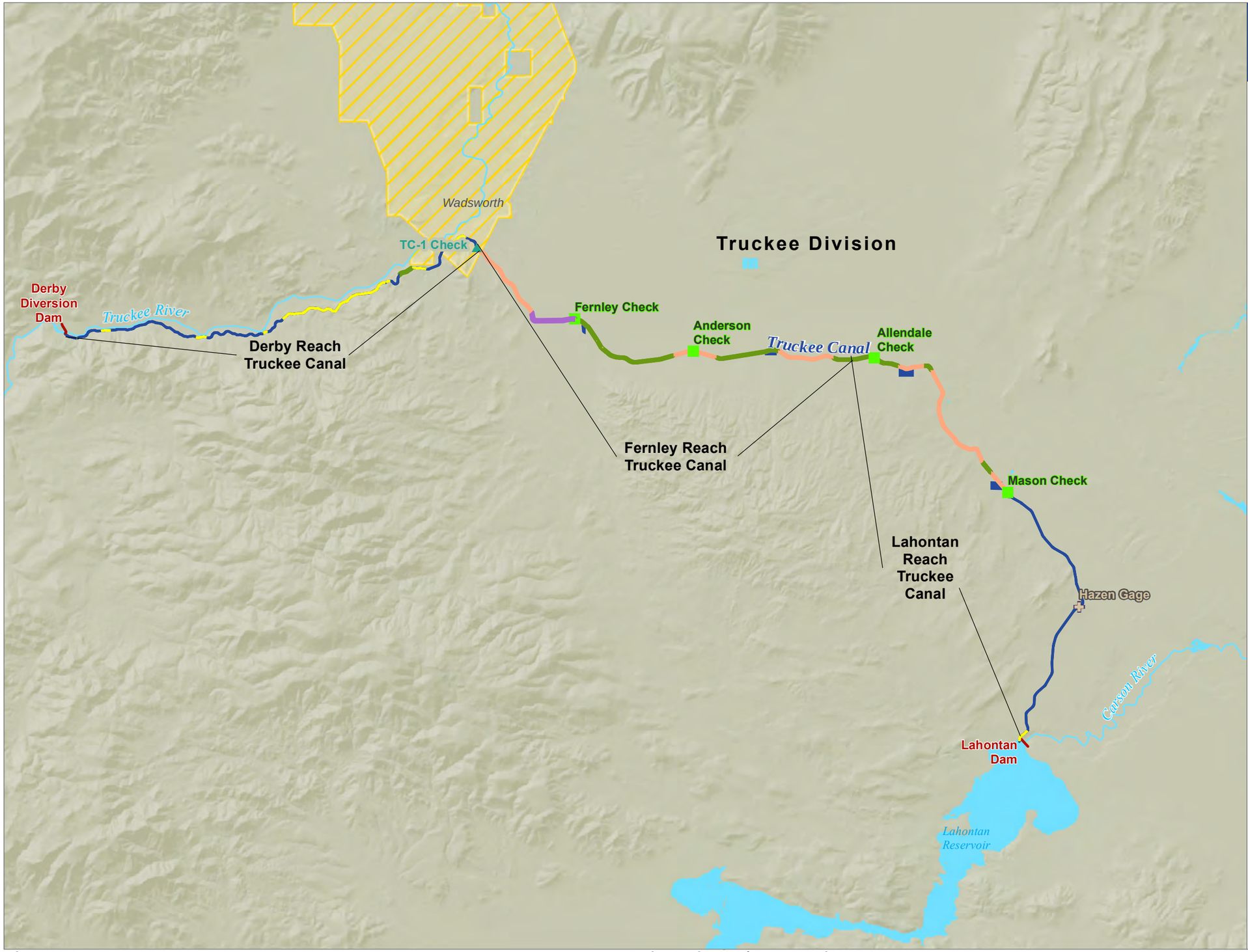

RECLAMATION
Managing Water in the West

Figure 2-2
Alternative 2

Element 1 (Embankment)
- Line the canal—full prism—geomembrane/soil (5.99 miles)
- TC-1 Check

Element 2 (Structure)
- Replace check structure
- Remove and replace gage with long-throated flume

Element 3 (Hydrologic Actions [HA])
- Armor Pour Point 8—geomembrane/concrete full prism (2,700 ft) at 3 inflow points and geomembrane/soil (3,000 ft)
- Line the canal—geomembrane concrete full prism (8.01 miles)

- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Pour point
- Existing lining (4.2 miles)
- River
- Lake, reservoir, or intermittent surface water
- Dam
- Tribal Reservation

Source:
Reclamation GIS 2017
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
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Figure 2-3
Alternative 3

Element 1 (Embankment)
- Line the canal—full prism—geomembrane/concrete (27.0 miles)

Element 2 (Structure)
- Replace check structure
- Remove and replace gage with long-throated flume

Element 3 (Hydrologic Actions [HA])
- Not applicable

- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Existing lining (4.2 miles)
- River
- Lake, reservoir, or intermittent surface water
- Dam
- Tribal Reservation

Source:
Reclamation GIS 2017
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
October 08, 2019
Truckee_alts_Alt3.pdf
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Managing Water in the West

Figure 2-4
Alternative 4

Wadsworth

Truckee Division

Derby Diversion Dam

Truckee River

Derby Reach Truckee Canal

8

Fernley Check

Fernley Reach Truckee Canal

Anderson Check

Truckee Canal

Allendale Check

TC11 detention pond

Mason detention pond

Mason Check

Lahontan Reach Truckee Canal

Downstream detention pond

Hazen Gage

Carson River

Lahontan Dam

Lahontan Reservoir

Element 1 (Embankment)
- Line the canal—geomembrane/ concrete full prism (1,600 ft)
- Geomembrane/½ concrete (1,000 ft)
- Geomembrane/soil (5.5 miles)

Element 2 (Structure)
- Replace check structure
- Remove and replace gage with a long-throated flume

Element 3 (Hydrologic Actions [HA])
- Armor Pour Point 8—geomembrane/ concrete full prism (2,700 ft) at 3 inflow points and geomembrane/soil (3,000 ft)
- TC 11 detention pond (322 AF)
- Mason detention pond (180 AF)
- Downstream detention pond (17 AF)

- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Pour point
- Existing lining (4.2 miles)
- River
- Lake, reservoir, or intermittent surface water
- Dam
- Tribal Reservation

Source:
Reclamation GIS 2017
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
October 08, 2019
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RECLAMATION
Managing Water in the West

Figure 2-5
Alternative 5

Element 1 (Embankment)
- Line the canal—geomembrane concrete full prism/ concrete (5.99 miles)

Element 2 (Structure)
- Replace check structure
- Remove and replace gage with a long-throated flume
- Modify the gates of check structure

Element 3 (Hydrologic Actions [HA])
- Armor Pour Point 8 full prism—geomembrane/concrete (5,800 ft)

Element 3
- Line the canal—geomembrane concrete full prism (6.69 miles)

- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Pour point
- Existing lining (4.2 miles)
- River
- Lake, reservoir, or intermittent surface water
- Dam
- Tribal Reservation

Source:
Reclamation GIS 2017
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
October 08, 2019
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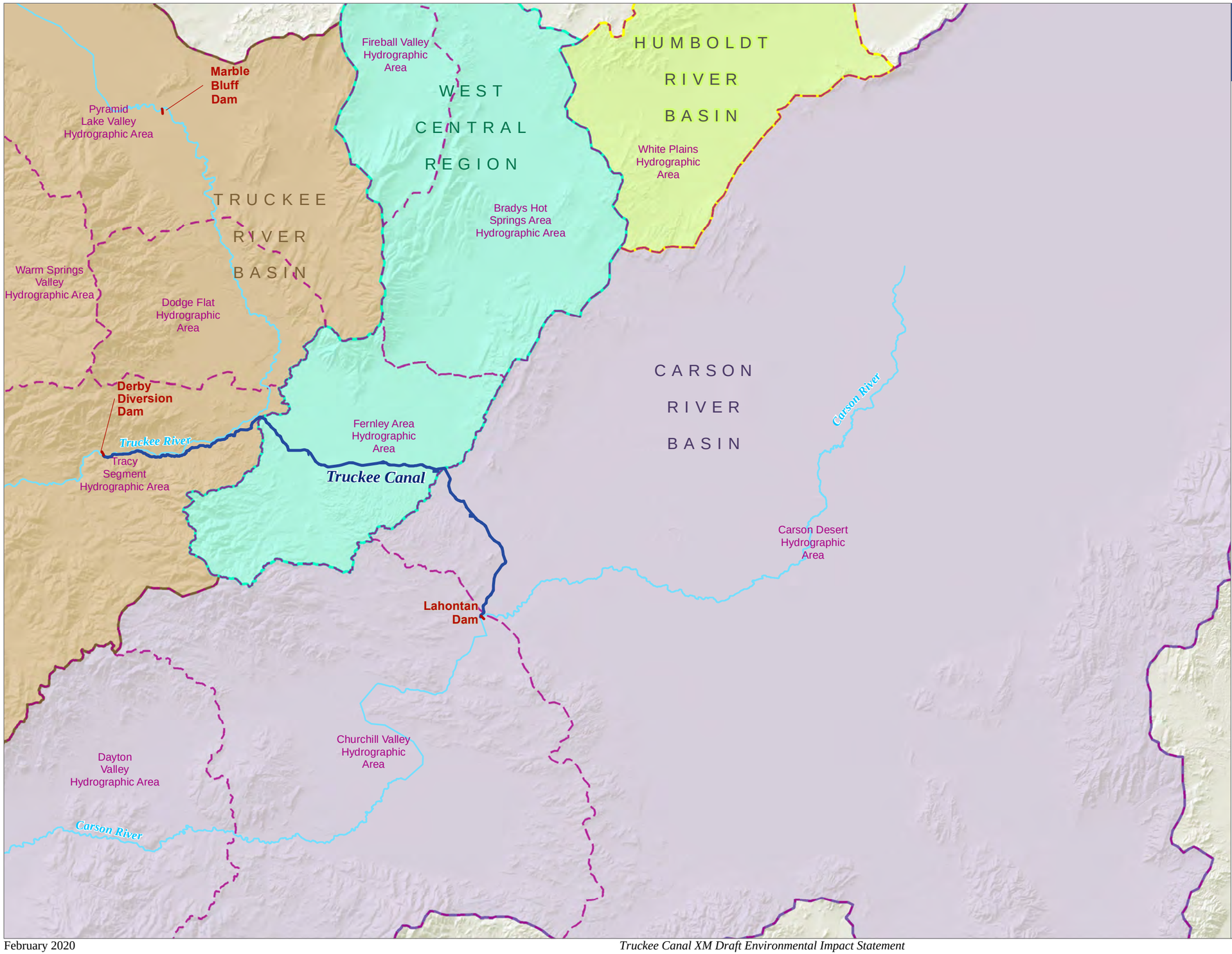
RECLAMATION
Managing Water in the West

Figure 3-1
Hydrographic Basins



- Carson River Basin
- Humboldt River Basin
- Truckee River Basin
- West Central Region
- Hydrographic Area/Sub-Area
- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- River
- Dam

Source: NVSE GIS 2018,
Reclamation GIS 2016, BLM GIS 2014
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
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Truckee_AE_WaterHydroBasins_V05.pdf
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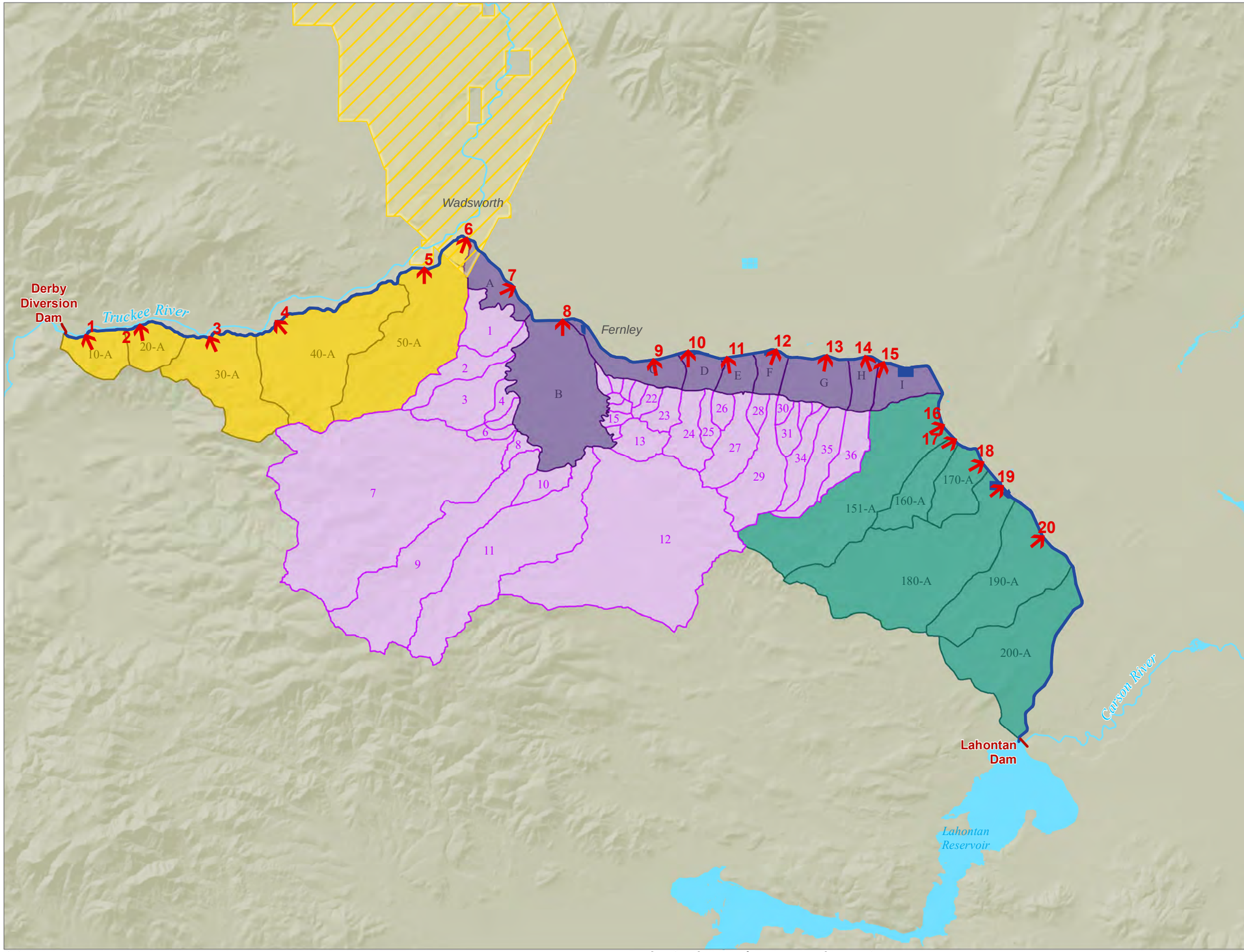
Figure 3-2
Alluvial Fan Basins and Tributary Areas



- Pour point: the point at which runoff from the watersheds is mostly likely to enter the canal
- Truckee Canal Basin, including watersheds upslope of the Truckee Canal
- Alluvial watershed contributing to the Fernley Reach
- Watershed contributing to the Fernley Reach
- Watershed contributing to the Lahontan Reach
- Watershed contributing to the Derby Reach
- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- River
- Lake, reservoir, or intermittent surface water
- Dam
- Tribal Reservation

Source:
Reclamation GIS 2016
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
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Truckee_AE_AlluvialFans_V05.pdf
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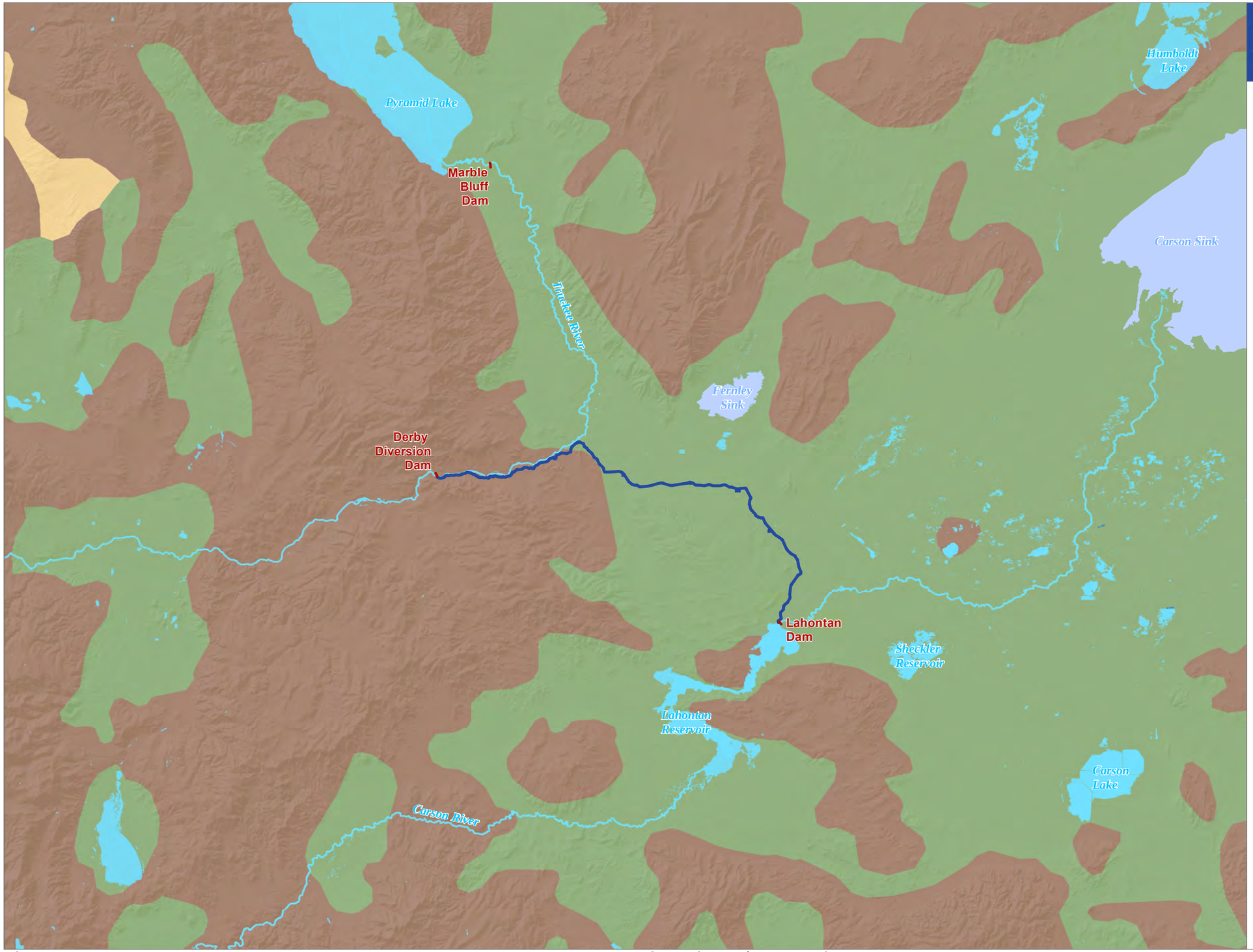
RECLAMATION
Managing Water in the West

Figure 3-3
Regional Aquifer Systems



- Basin and Range basin-fill aquifer
- Pacific Northwest basin-fill aquifer
- Other aquifer
- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- River
- Lake, reservoir, or intermittent surface water
- Sink
- Dam

Source: NHD GIS 2016, Reclamation GIS 2016, USGS GIS 2003
U.S. Department of the Interior
Bureau of Reclamation, Lahontan Basin Area Office
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Truckee_AE_Aquifers_V05.pdf
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RECLAMATION
Managing Water in the West

Figure 3-4
Area of Potential Effect for Cultural Resources

- Cultural resources area of potential effect (direct effects APE)
- Indirect effects APE
- Derby Reach
- Fernley Reach
- Lahontan Reach
- USGS 24k topographic quadrangle

Olinghouse
Wadsworth
Two Tips
Eagle Rock
Derby Dam
Fernley West
Fernley East
Hazen
Soda Lake West
Martin Canyon
Stockton Well
Silver Springs North
Lahontan Dam
Sheckler Reservoir

Truckee Canal

Source: Reclamation GIS 2016
U.S. Department of the Interior
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Truckee_AE_CulturalAPE_V05.pdf
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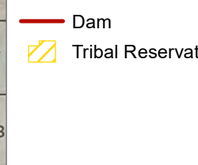
RECLAMATION
Managing Water in the West

Figure Overview

- Appendix C figure locator—grid extents
- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Dam
- Tribal Reservation



Source: Reclamation GIS 2016
U.S. Department of the Interior
Bureau of Reclamation
Lahontan Basin Area Office
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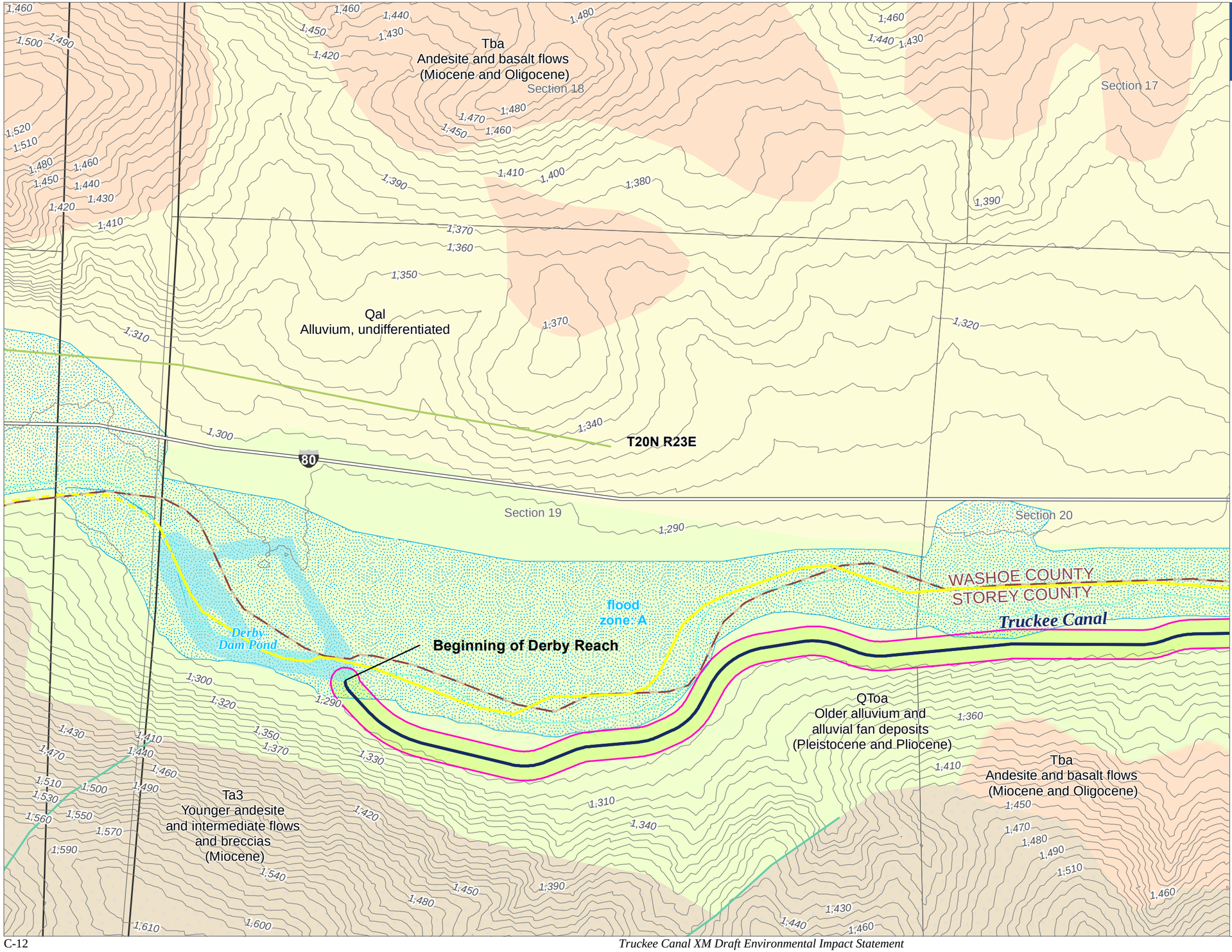


RECLAMATION
Managing Water in the West

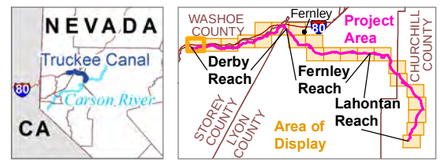
Figure C-01
Geology and Hydrology

- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal

Hydrology
- Other
- 303(d) listed stream
- Waterbody

Flood Hazard
- Zone A: An area inundated by 1% annual chance flooding, for which no base flood elevations (BFEs) have been determined

Geology
- QToa
- Qal
- Ta3
- Tba
- Concealed fault
- Known fault



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RECLAMATION
Managing Water in the West

Figure C-02
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Hydrology

Other

303(d) listed stream

Flood Hazard

Zone A: An area inundated by 1% annual chance flooding, for which no base flood elevations (BFEs) have been determined

Geology

QToa

Qal

Qpl

Ta3

Tba

Tba
Andesite and basalt flows
(Miocene and Oligocene)

Qal
Alluvium, undifferentiated

T20N R23E

Section 17

Section 16

Section 20

Section 21

WASHOE COUNTY
STOREY COUNTY

80

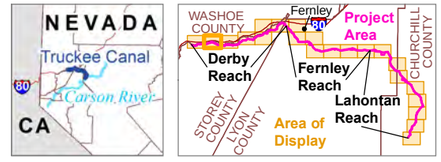
Truckee Canal

flood zone: A

QToa
Older alluvium and alluvial fan deposits
(Pleistocene and Pliocene)

Qpl
Playa, lake bed, and flood plain deposits

Tba
Andesite and basalt flows
(Miocene and Oligocene)



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
U.S. Department of the Interior,
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RECLAMATION
Managing Water in the West

Figure C-03
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Hydrology

Other

303(d) listed stream

Flood Hazard

Zone A: An area inundated by 1% annual chance flooding, for which no base flood elevations (BFEs) have been determined

Geology

QTg

QToa

Qal

Qpl

Ta3

Tba

Concealed fault

Section 16

Section 15

Section 14

Section 21

Section 22

Section 23

Tba
Andesite and basalt flows
(Miocene and Oligocene)

Ta3
Younger andesite
and intermediate flows
and breccias
(Miocene)

Qal
Alluvium, undifferentiated

T20N R23E

WASHOE COUNTY
STOREY COUNTY

QToa
Older alluvium and
alluvial fan deposits
(Pleistocene and Pliocene)

flood
zone: A

Truckee Canal

Qpl
Playa, lake bed, and
flood plain deposits

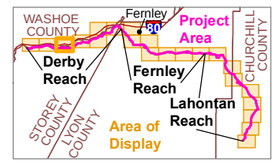
Tba
Andesite and basalt flows
(Miocene and Oligocene)

Ta3

1,400 1,390 1,380 1,370 1,360 1,350 1,340 1,330 1,320 1,310 1,300 1,290 1,280 1,270 1,410

80

421



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
U.S. Department of the Interior,
Bureau of Reclamation
Lahontan Basin Area Office
August 22, 2018
Truckee_AppGeoBio_geologyhydro_V01.pdf
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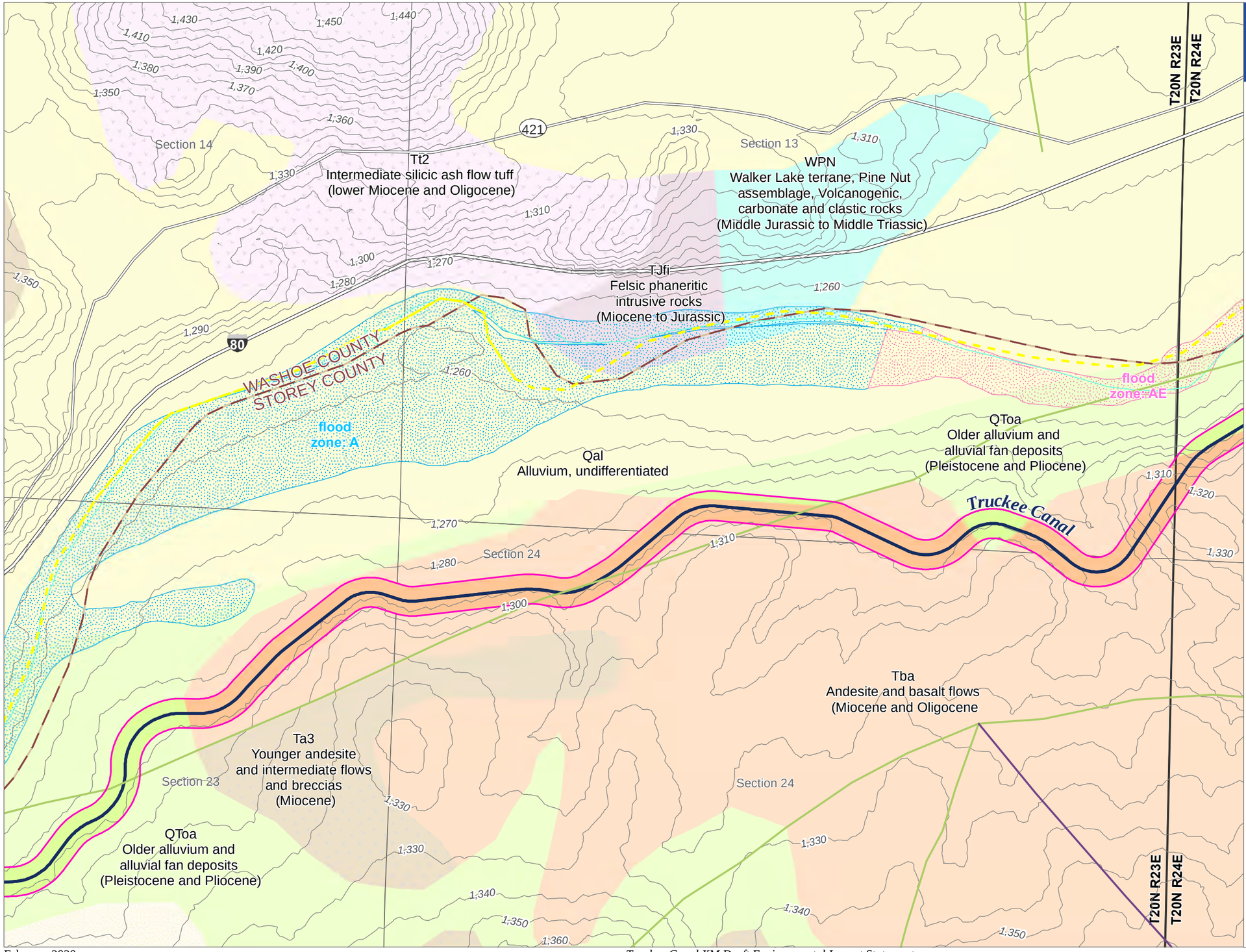
Feet



RECLAMATION
Managing Water in the West

Figure C-04
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Hydrology

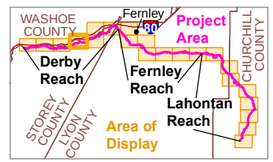
- Other
- 303(d) listed stream

Flood Hazard

- Zone A: An area inundated by 1% annual chance flooding, for which no base flood elevations (BFEs) have been determined
- Zone AE: An area inundated by 1% annual chance flooding, for which BFEs have been determined

Geology

- QToa
- Qal
- Qpl
- TJfi
- Ta3
- Tba
- Tt2
- WPN
- Concealed fault
- Inferred fault



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
U.S. Department of the Interior,
Bureau of Reclamation
Lahontan Basin Area Office
August 22, 2018
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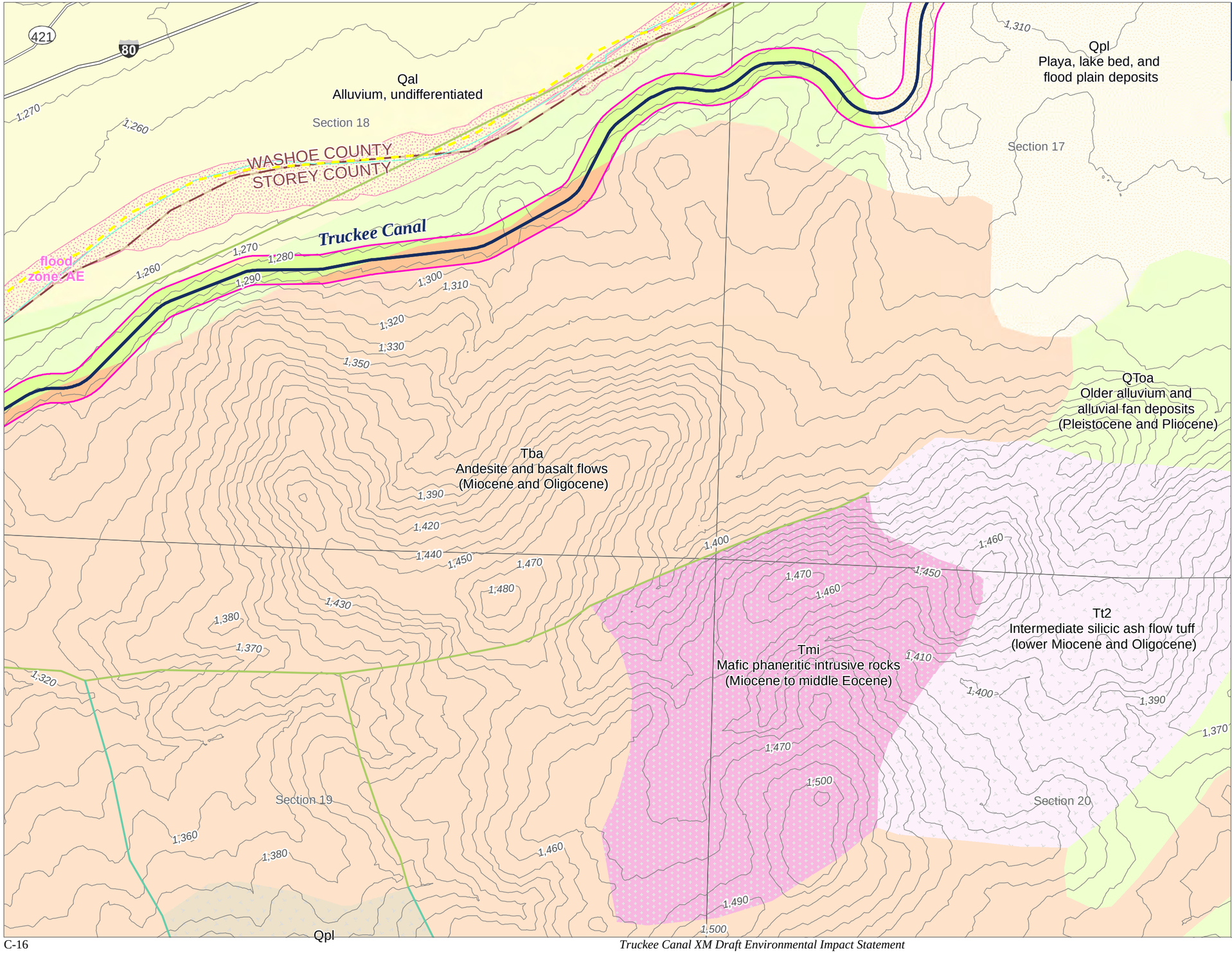
N

0 450
Feet



RECLAMATION
Managing Water in the West

Figure C-05
Geology and Hydrology

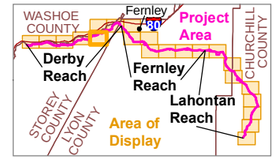
- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal

Hydrology
- Other
- 303(d) listed stream

Flood Hazard
- Zone AE: An area inundated by 1% annual chance flooding, for which BFEs have been determined

Geology
- QToa
- Qal
- Qpl
- Ta3
- Tba
- Tmi
- Tt2

Concealed fault
Known fault



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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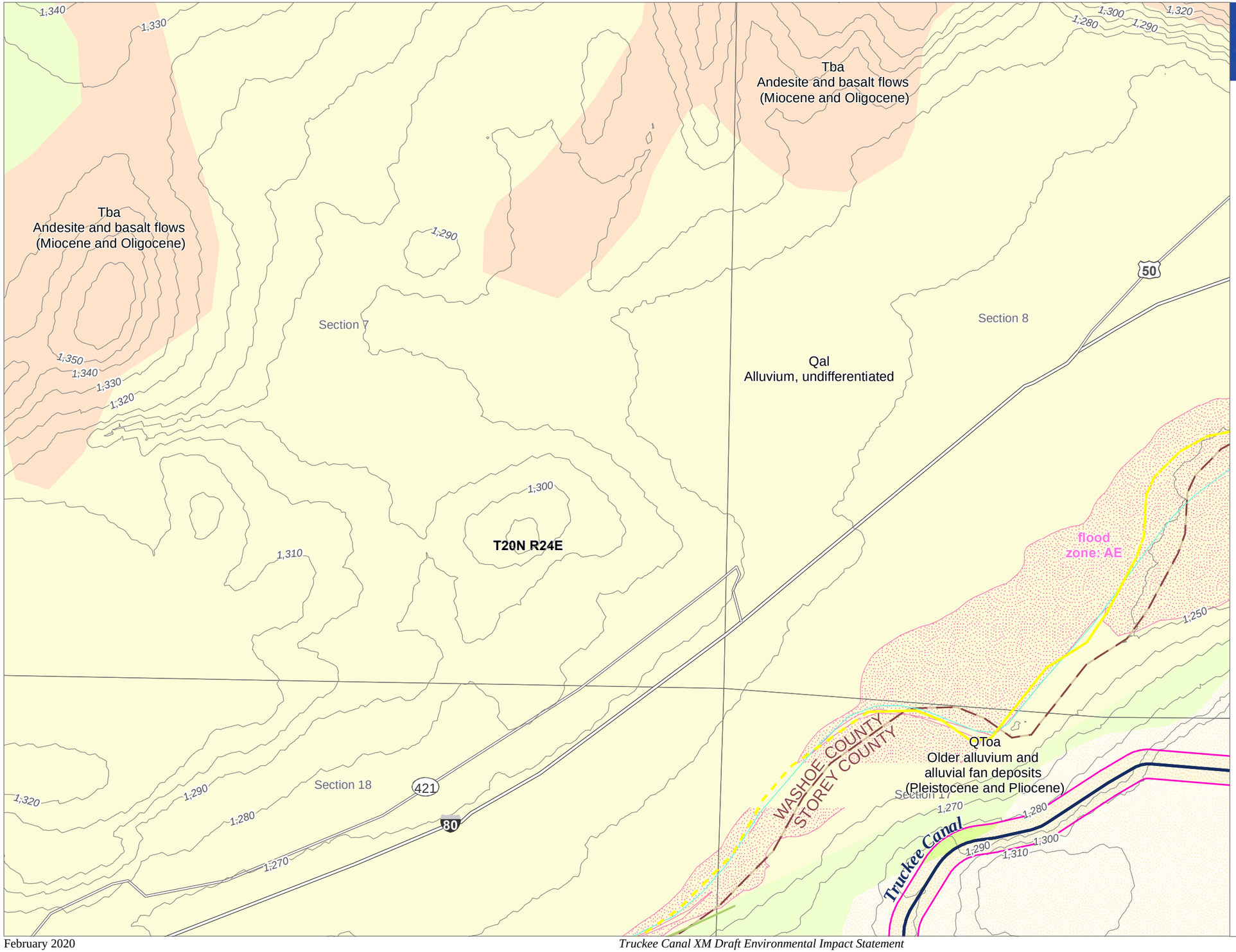
Feet



RECLAMATION
Managing Water in the West

Figure C-06
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Hydrology

Other

303(d) listed stream

Flood Hazard

Zone AE: An area inundated by 1% annual chance flooding, for which BFEs have been determined

Geology

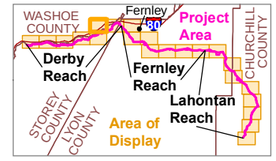
QToa

Qal

Qpl

Tba

Concealed fault



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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N

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Feet

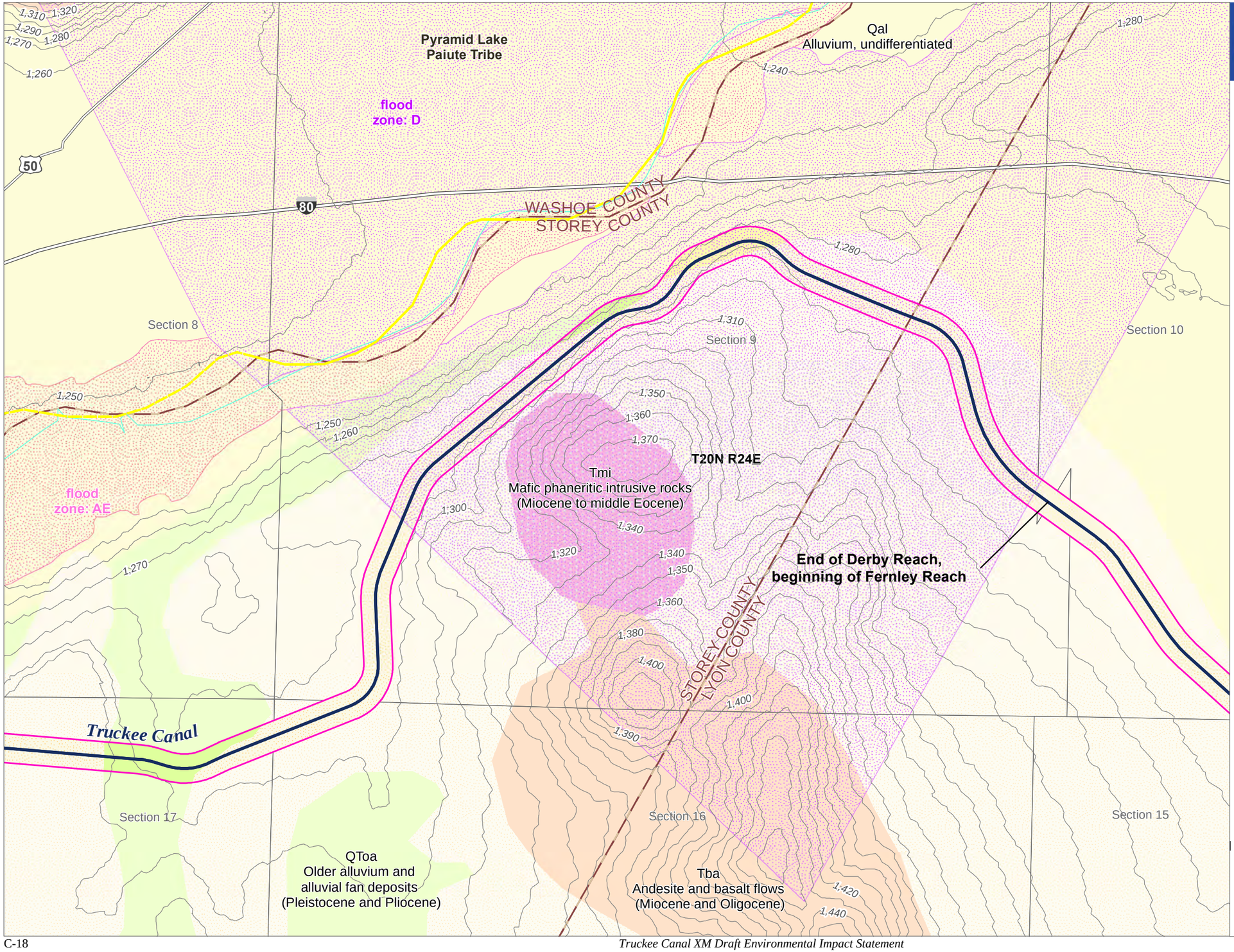

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Figure C-07
Geology and Hydrology

Truckee Canal XM project area:
areas within a 100-foot buffer from the
31-mile Canal and staging areas

Truckee Canal

Hydrology

Other

303(d) listed stream

Flood Hazard

Zone AE: An area inundated by 1% annual chance flooding, for which BFEs have been determined

Zone D: An area of undetermined but possible flood hazards

Geology

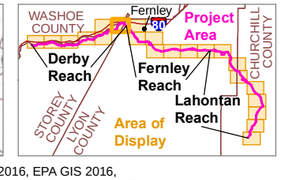
QToa

Qal

Qpl

Tba

Tmi



Source: Reclamation GIS 2016, EPA GIS 2016,
FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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N

0 450
Feet

flood zone: D

LYON COUNTY

427

80

1,270

Section 10

1,280

Section 11

flood zone: A

T20N R24E

Qal
Alluvium, undifferentiated

95

50

Qpl
Playa, lake bed, and flood plain deposits

Truckee Canal

Section 15

flood zone: AE

Section 14

1,300

1,310

RECLAMATION
Managing Water in the West

Figure C-08
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Flood Hazard

Zone A: An area inundated by 1% annual chance flooding, for which no base flood elevations (BFEs) have been determined

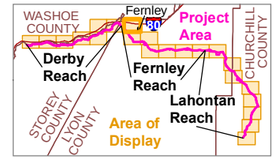
Zone AE: An area inundated by 1% annual chance flooding, for which BFEs have been determined

Zone D: An area of undetermined but possible flood hazards

Geology

Qal

Qpl



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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Lahontan Basin Area Office
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N

0 450

Feet

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Figure C-09
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Flood Hazard

Zone A: An area inundated by 1% annual chance flooding, for which no base flood elevations (BFEs) have been determined

Zone AE: An area inundated by 1% annual chance flooding, for which BFEs have been determined

Geology

Qal

Qpl

Tba

Qpl
Playa, lake bed, and flood plain deposits

LYON COUNTY

Section 15

Qal
Alluvium, undifferentiated

Section 14

1,310

1,280

1,300

T20N R24E

50

flood zone: AE

Section 14

Truckee Canal

Tba
Andesite and basalt flows (Miocene and Oligocene)

Section 22

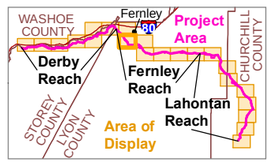
1,310

1,320

1,330

1,350

Section 23 flood zone: A



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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N

0 450
Feet

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Figure C-10
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Check structure

Flood Hazard

Zone A: An area inundated by 1% annual chance flooding, for which no base flood elevations (BFEs) have been determined

Geology

Qal

LYON COUNTY

I-270

Section 14

Section 13

Section 18

T20N R24E

T20N R25E

50

828

1,260

Fernley

1,280

Truckee Canal

Qal
Alluvium, undifferentiated

Section 23

1,290

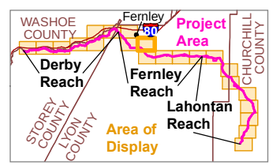
Staging area

1,300

Section 24

Section 19

flood zone: A



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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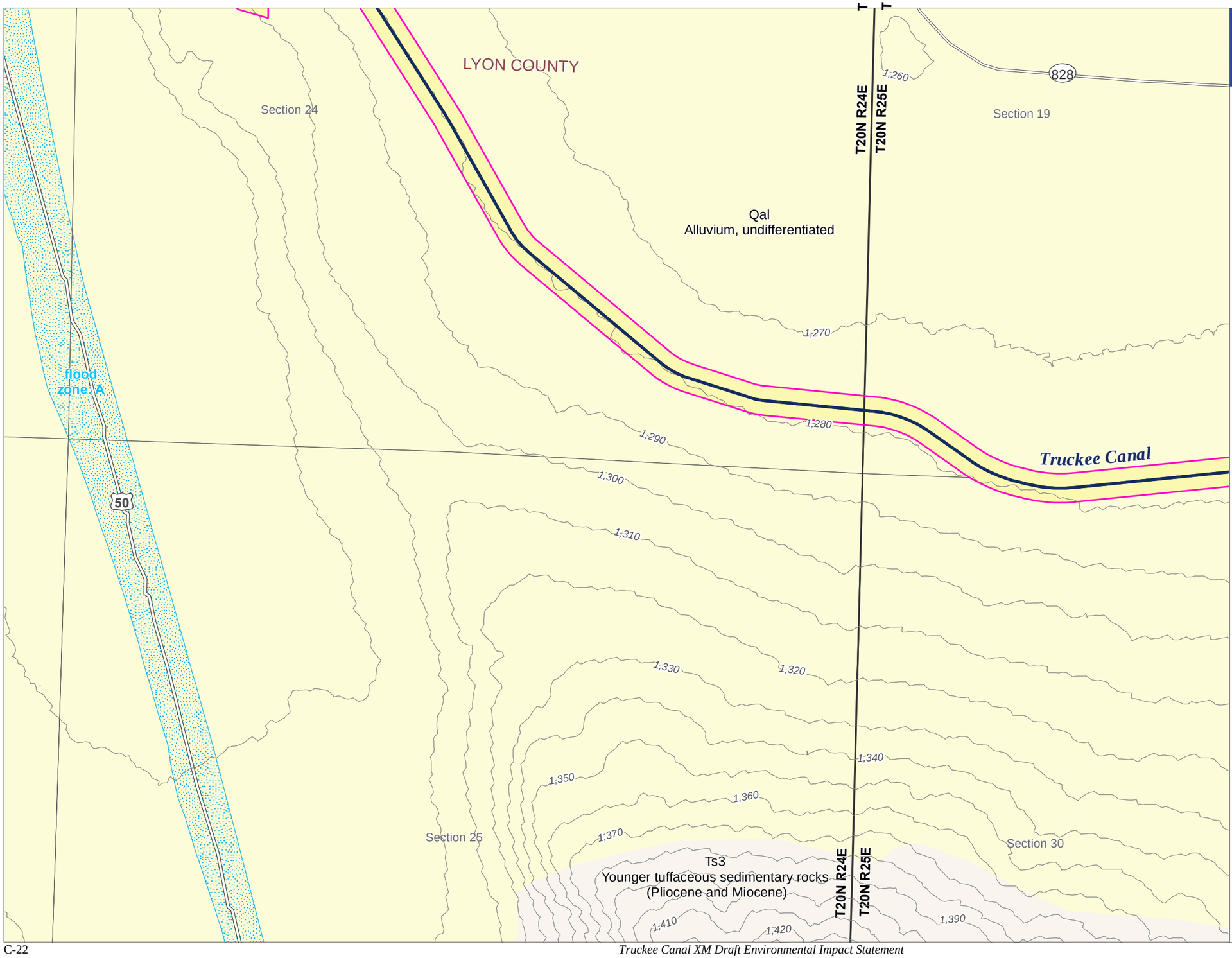
Feet



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Managing Water in the West

Figure C-11
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

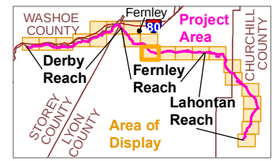
Flood Hazard

Zone A: An area inundated by 1% annual chance flooding, for which no base flood elevations (BFEs) have been determined

Geology

Qal

Ts3



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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N

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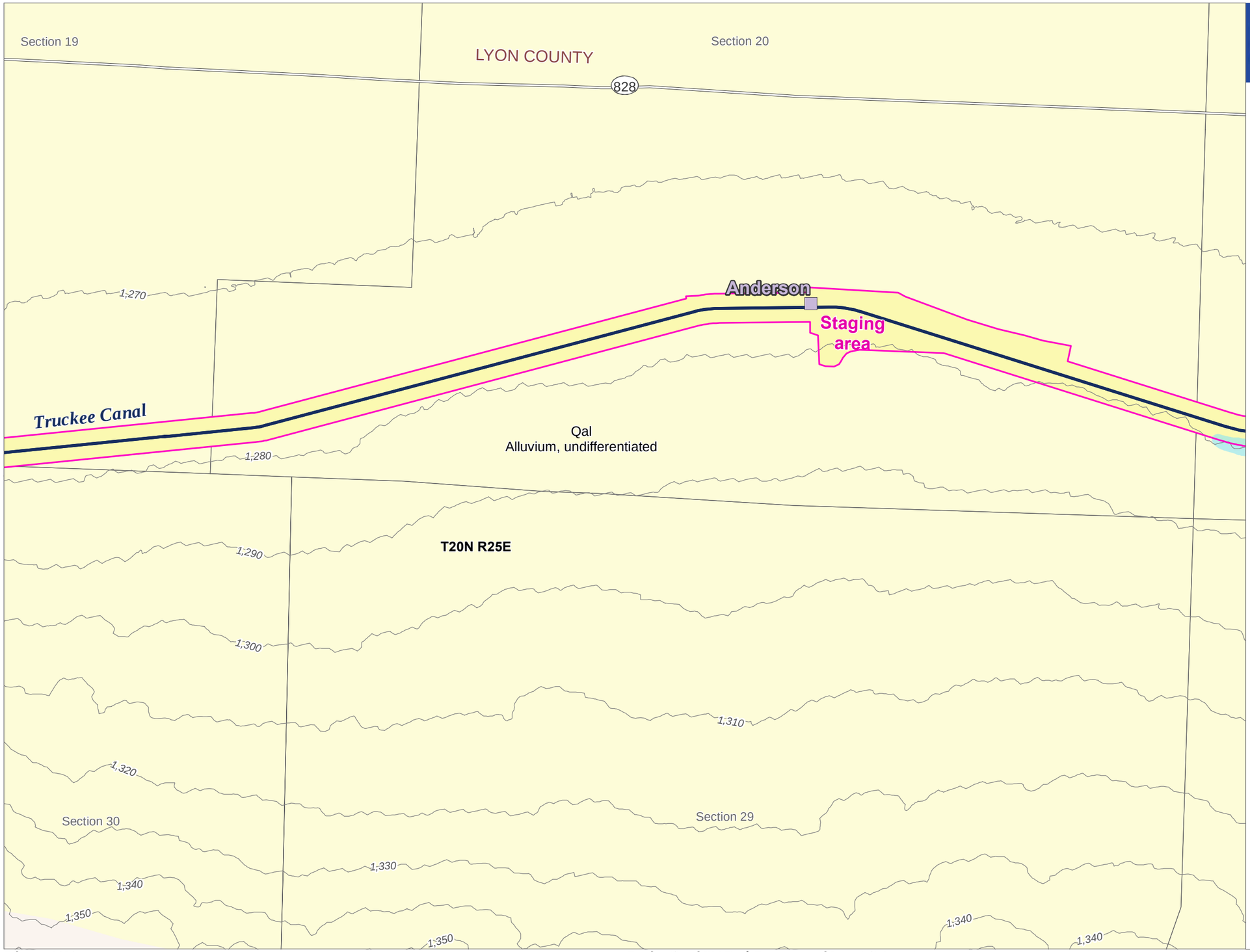
Feet



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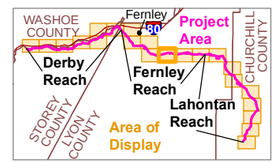
Managing Water in the West

Figure C-12
Geology and Hydrology

- Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Check structure
- Waterbody

Geology
- Qal
- Ts3



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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N

0 450
Feet

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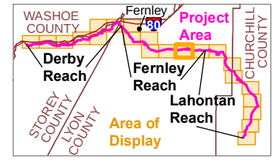
Figure C-13
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
Truckee Canal
Waterbody
Geology
Qal

LYON COUNTY
Section 21
Section 22
828
1,270
Truckee Canal
Staging area
1,280
Section 21
Qal
Alluvium, undifferentiated
Section 22
1,290
T20N R25E
1,300
1,310
1,320
Section 28
Section 27
1,330



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
U.S. Department of the Interior,
Bureau of Reclamation
Lahontan Basin Area Office
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Feet

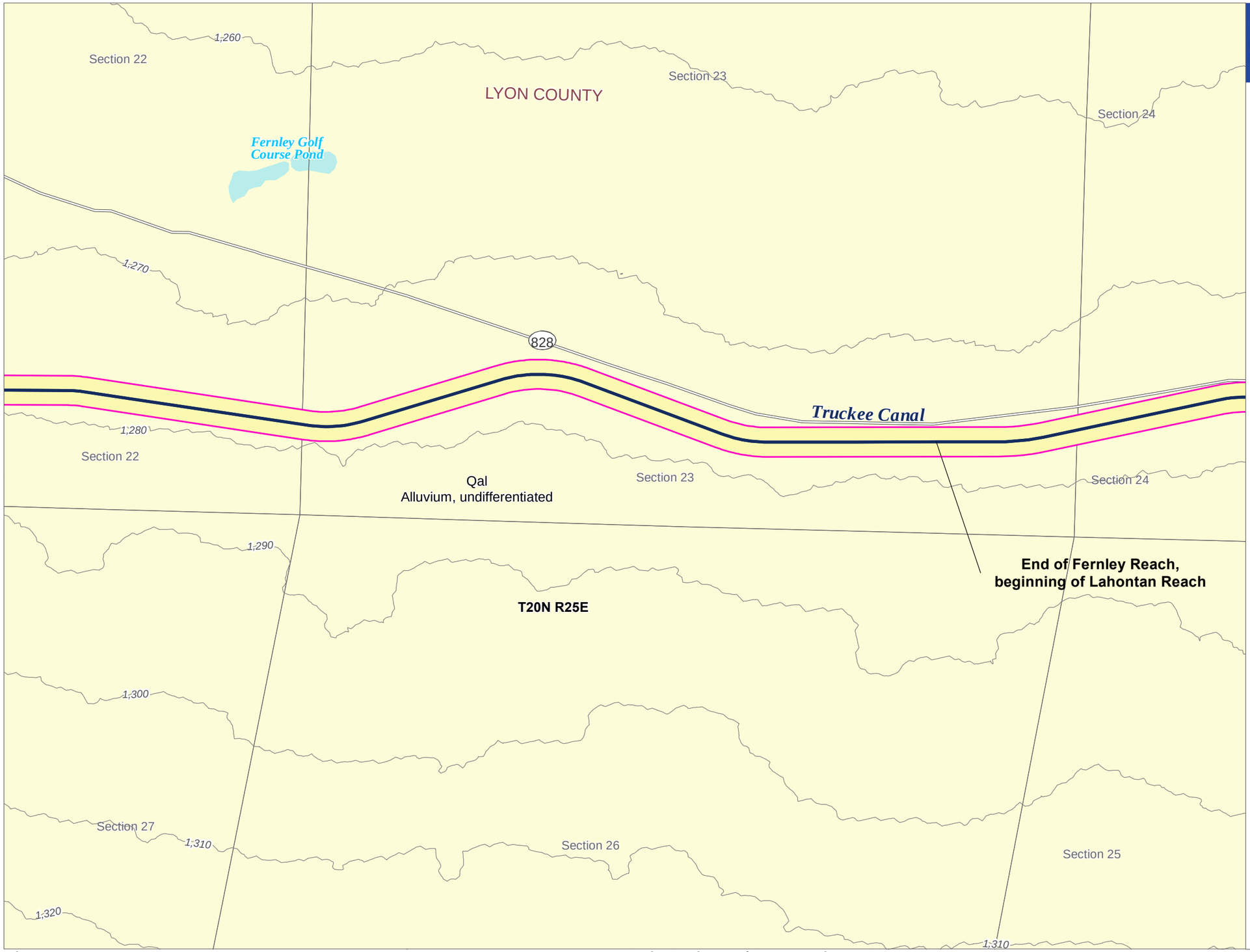

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Figure C-14
Geology and Hydrology

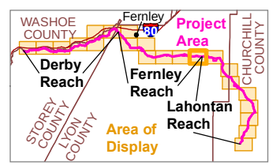
Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Waterbody

Geology

Qal



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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Feet

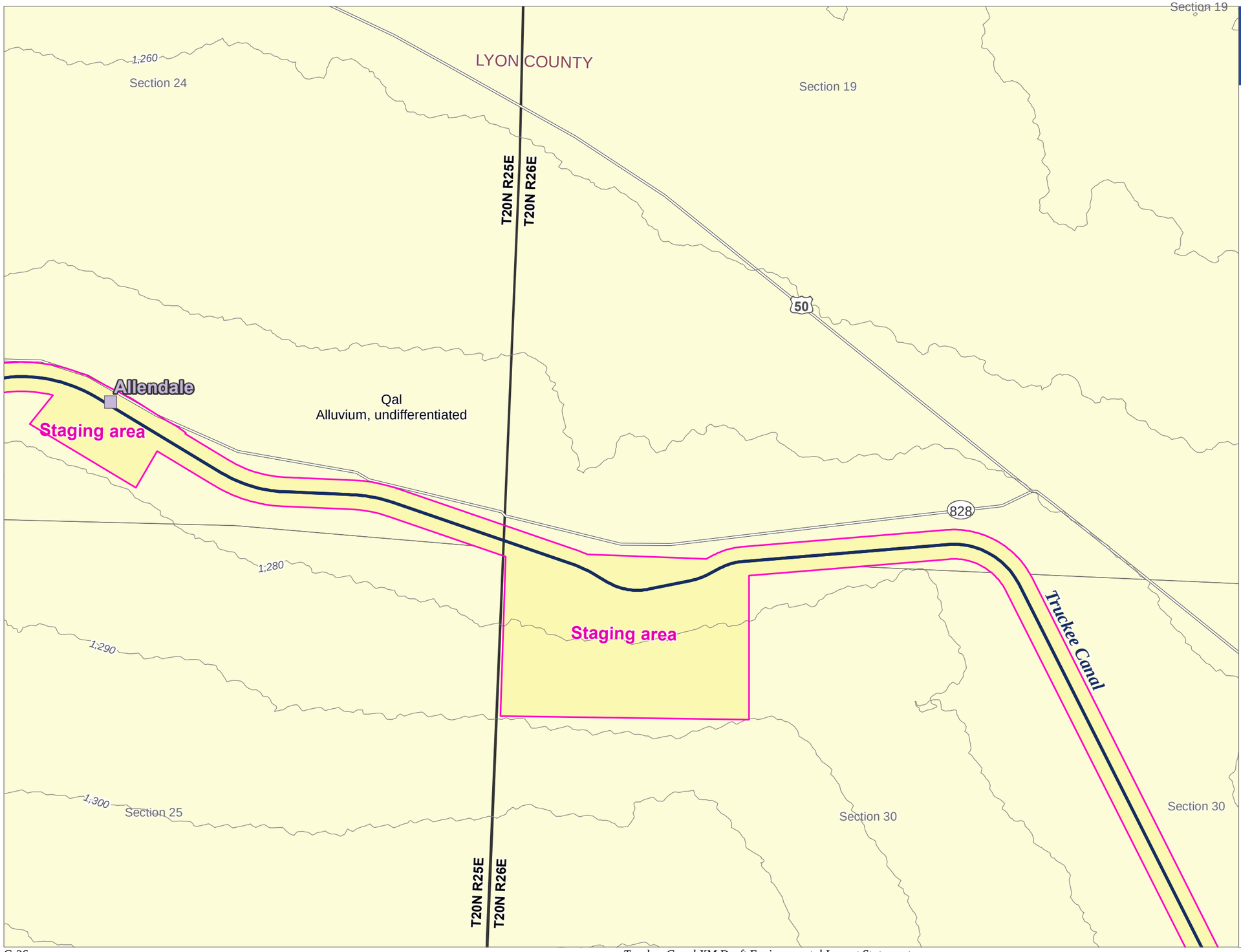

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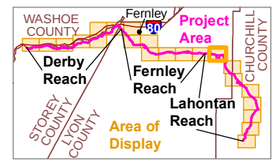
Figure C-15
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
Truckee Canal
Check structure

Geology
Qal



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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0 450
Feet

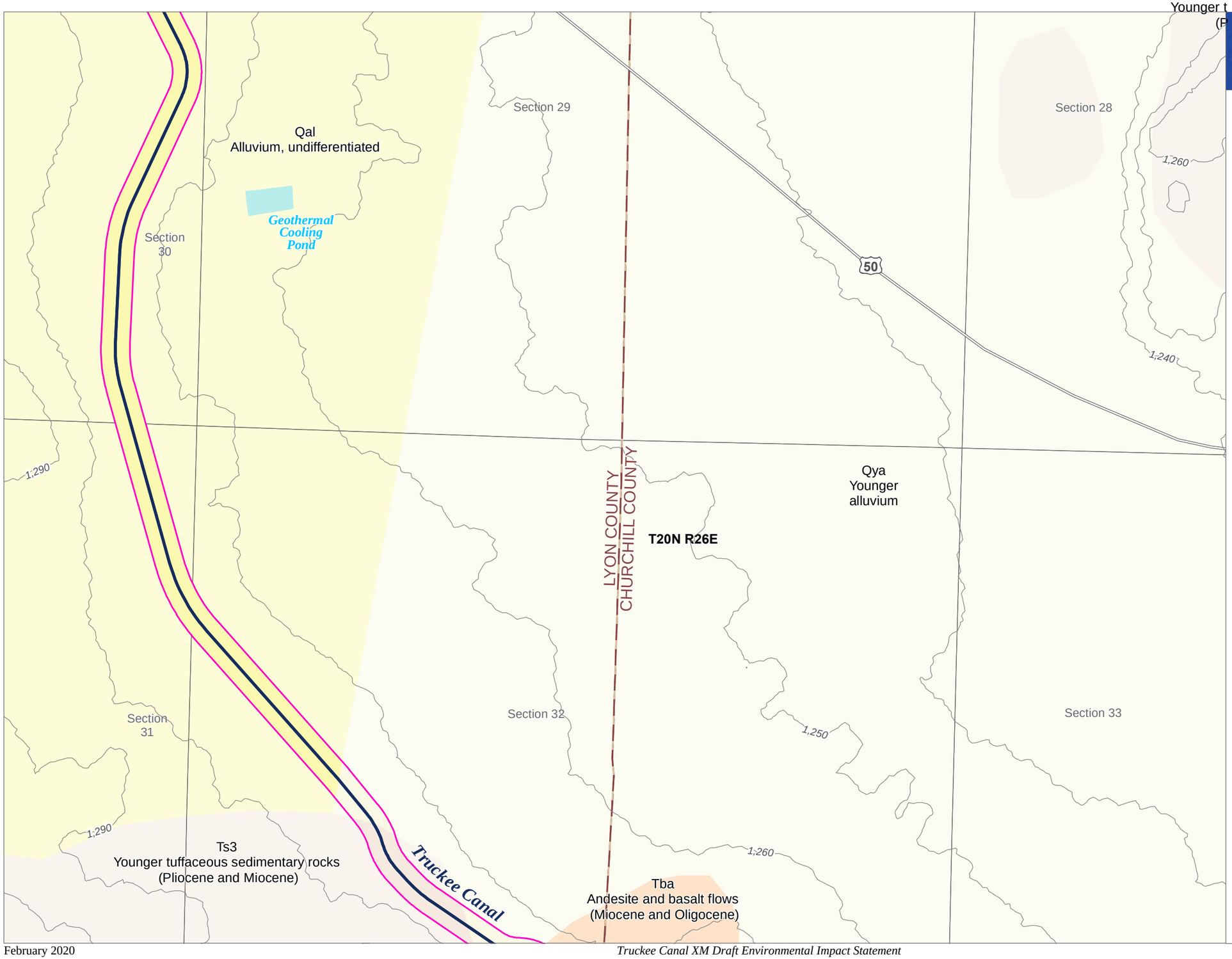

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Figure C-16
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Waterbody

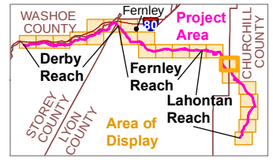
Geology

Qal

Qya

Tba

Ts3



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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N

0 450

Feet

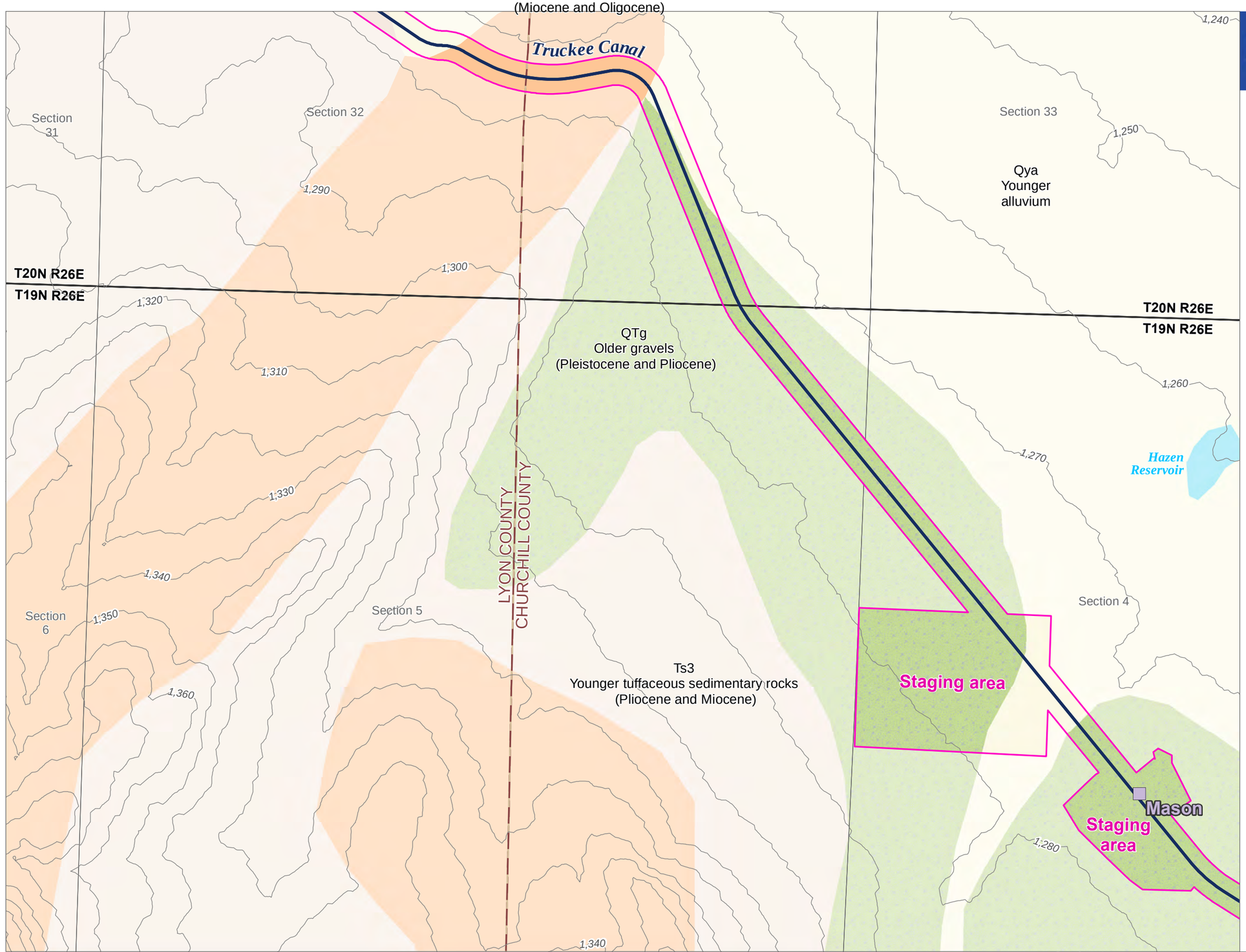

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Figure C-17
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Check structure

Waterbody

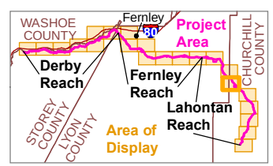
Geology

QTg

Qya

Tba

Ts3



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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N

0 450
Feet

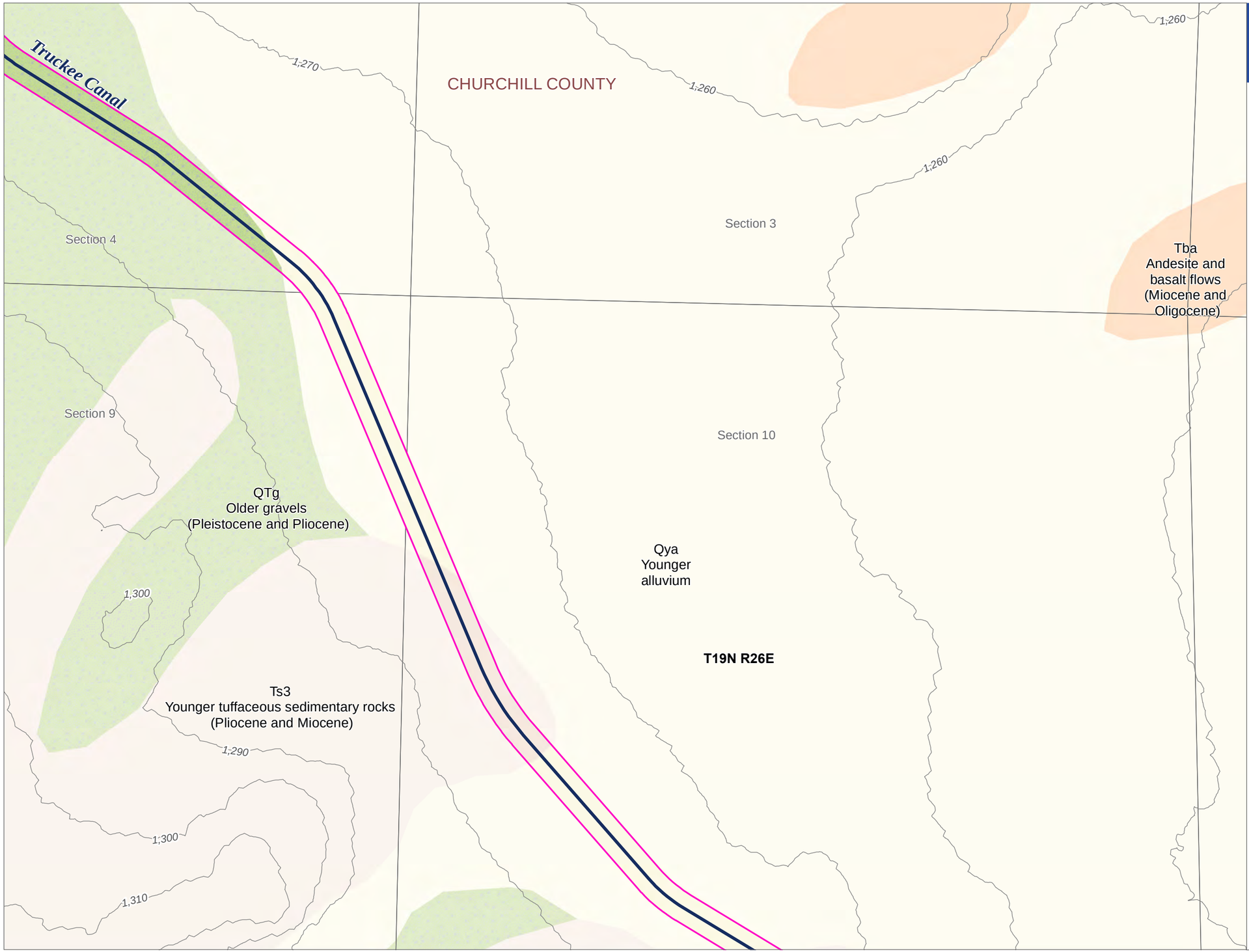

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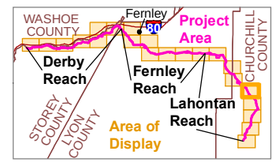
Figure C-18
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Geology

- QTg
- Qya
- Tba
- Ts3



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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Bureau of Reclamation
Lahontan Basin Area Office
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N

0 450
Feet

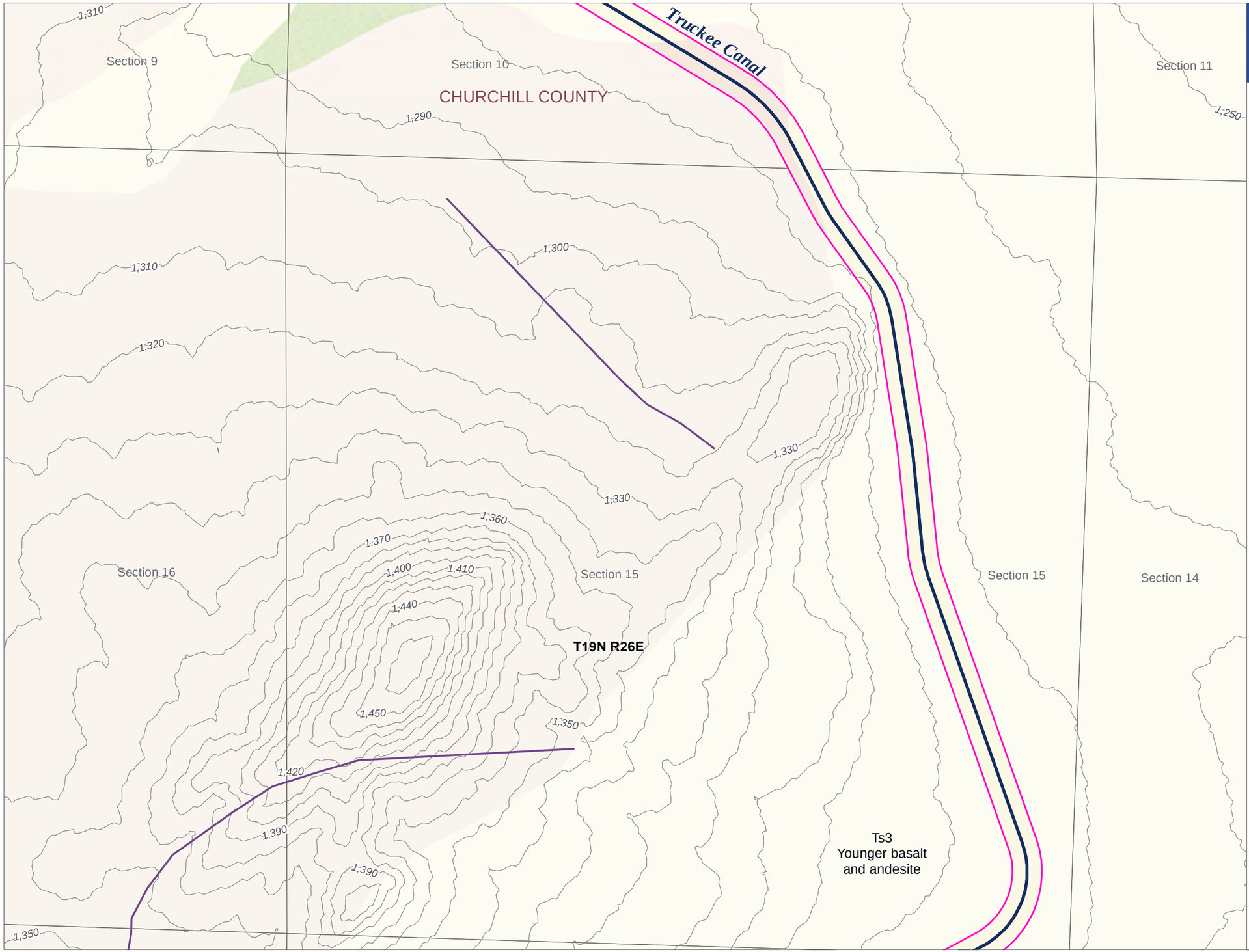

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Figure C-19
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

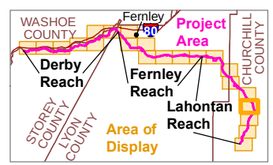
Geology

QTg

Qya

Ts3

Inferred fault



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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N

0 450

Feet

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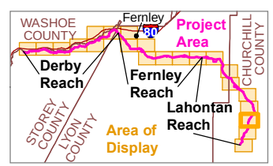
Figure C-20
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
Truckee Canal
Check structure

Geology
QTg
Qya
Tba
Ts3
Inferred fault

Section 21
Section 22
Section 23
Section 26
Section 27
Section 28
T19N R26E
CHURCHILL COUNTY
Bango
Truckee Canal
1,360
1,360
1,380
1,370
1,350
1,340
1,330
1,310
1,300
1,290
1,280
1,320
1,330
1,340
Ts3
Younger tuffaceous sedimentary rocks
(Pliocene and Miocene)
Tba
Andesite and basalt flows
(Miocene and Oligocene)
Qya
Younger
alluvium



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
U.S. Department of the Interior,
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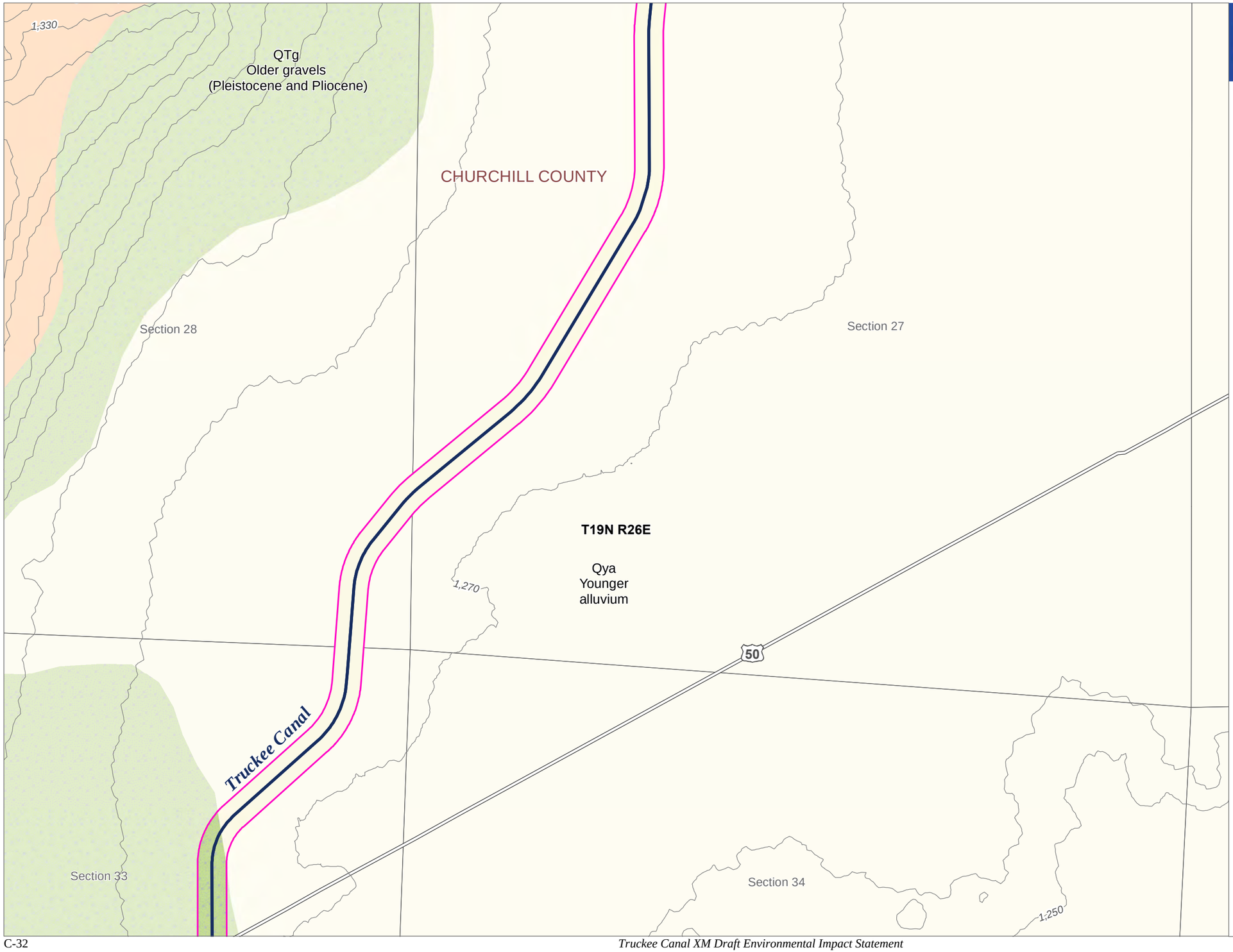

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Figure C-21
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

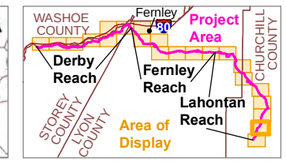
Truckee Canal

Geology

QTg

Qya

Tba



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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QTg
Older gravels
(Pleistocene and Pliocene)

Ts3
Younger tuffaceous sedimentary rocks
(Pliocene and Miocene)

CHURCHILL COUNTY

50

1,280

Section 33

Truckee Canal

1,250

Section 34

Carson River

1,240

End of Lahontan Reach

1,270

1,260

T19N R26E
T18N R26E

T19N R26E
T18N R26E

Lahontan
Reservior

flood
zone A

Qya
Younger
alluvium

1,270

Section 4

Section 3

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Figure C-22
Geology and Hydrology

Truckee Canal XM project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas

Truckee Canal

Hydrology

Perrenial stream or river

303(d) listed stream

303(d) listed waterbody

Waterbody

Flood Hazard

Zone A: An area inundated by 1% annual chance flooding, for which no base flood elevations (BFEs) have been determined

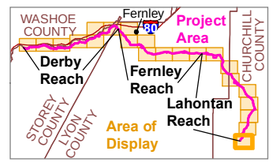
Geology

QTg

Qya

Ts3

Tt2



Source: Reclamation GIS 2016, EPA GIS 2016, FEMA GIS 2016, NHD GIS 2016, NBMG GIS 1997
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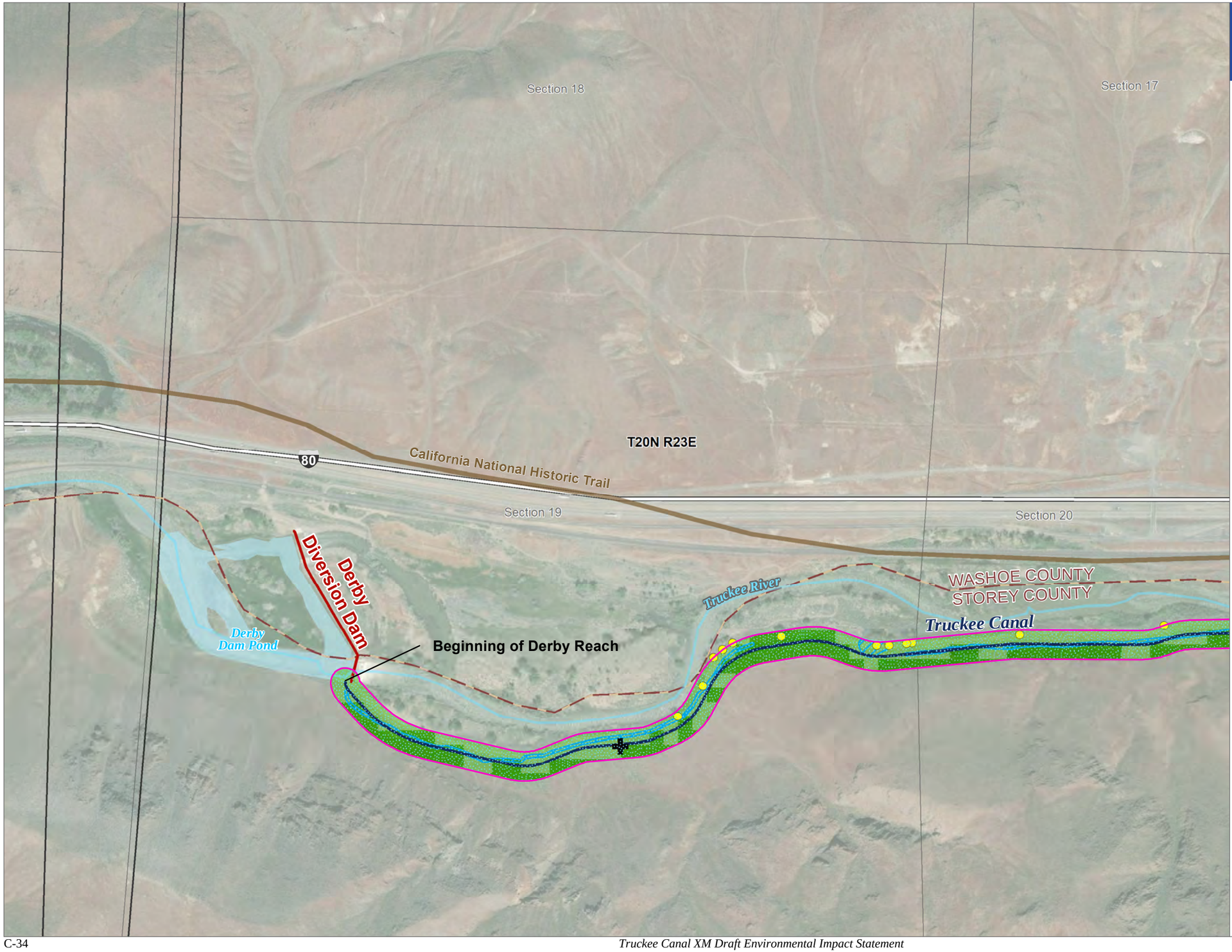

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Figure B-01
Biologic and Human Resources

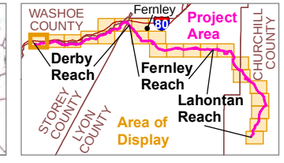
- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- River
- Waterbody
- Dam
- Gaging station
- National Historic Trail

Greater Sage-Grouse Habitat
- General habitat

Riparian Trees
- Cottonwood

Noxious Weeds
- Tall whitetop

Dominant Vegetative Cover
- Intermountain Basins Big Sagebrush Shrubland
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland



Source: Reclamation GIS 2016,
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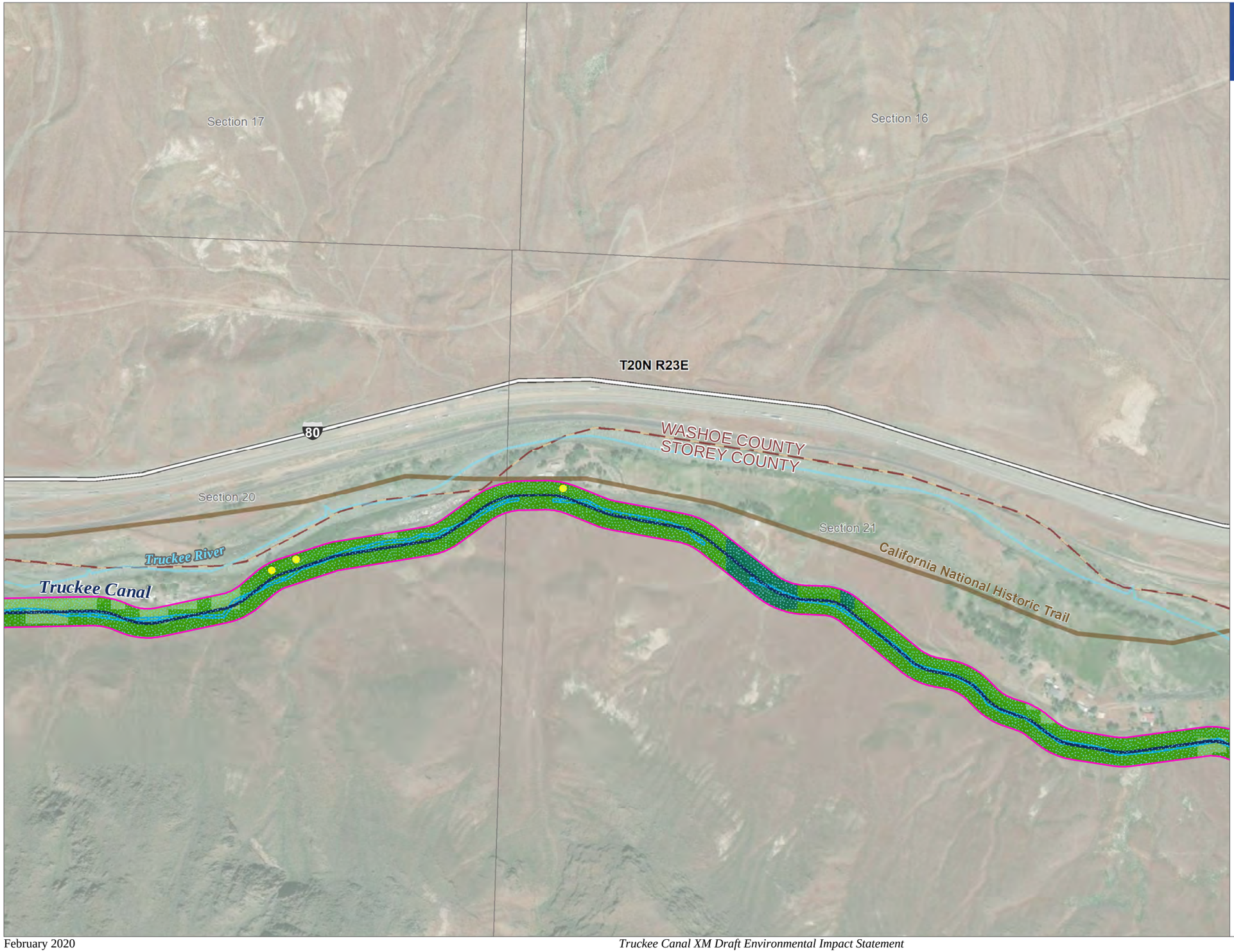

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Figure B-02
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- River
- National Historic Trail

Greater Sage-Grouse Habitat

- General habitat

Riparian Trees

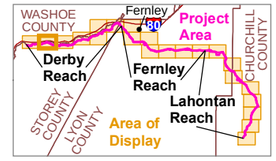
- Cottonwood

Noxious Weeds

- Tall whitetop

Dominant Vegetative Cover

- Intermountain Basins Mixed Salt Desert Scrub
- Intermountain Basins Big Sagebrush Shrubland
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland



Source: Reclamation GIS 2016,
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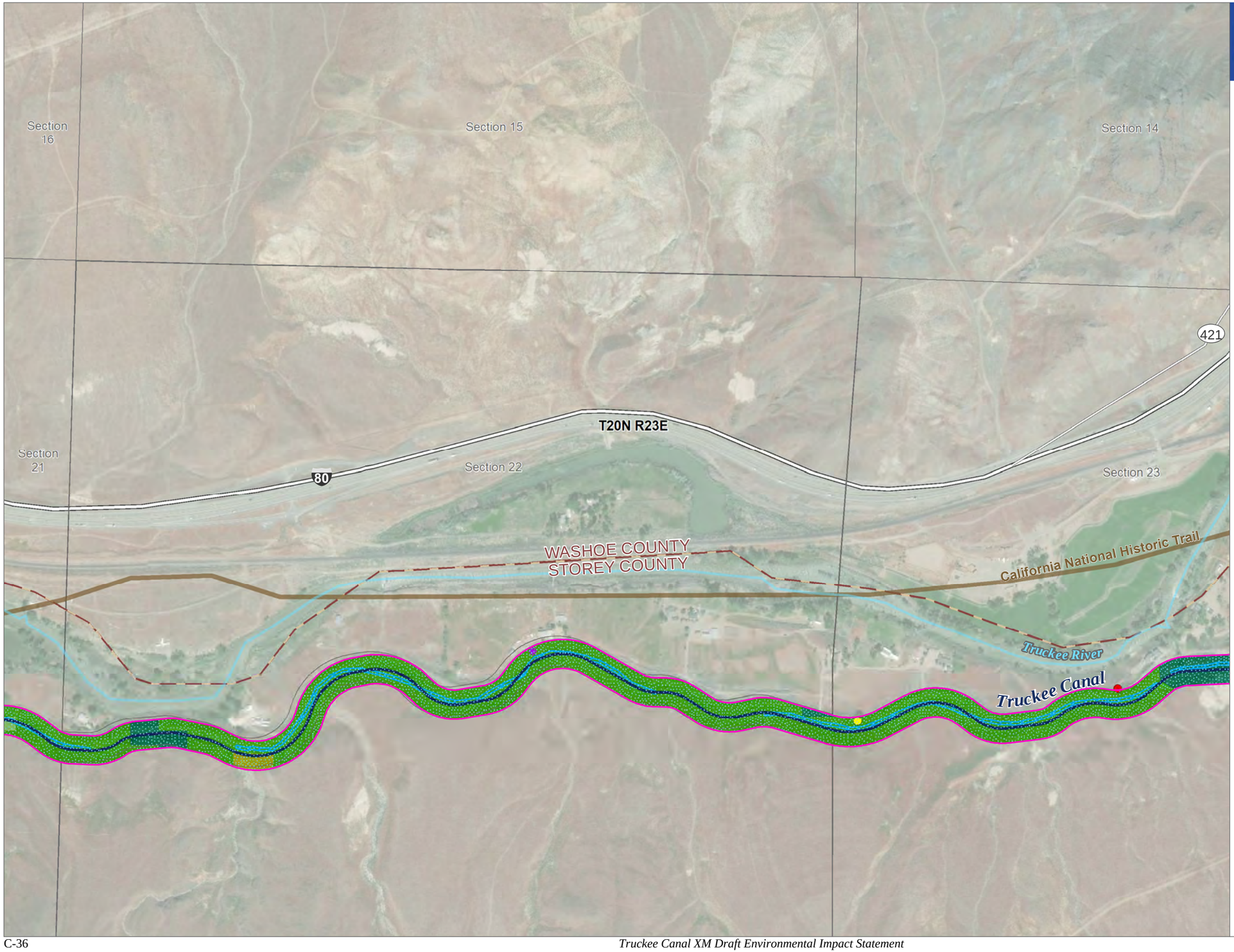

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Figure B-03
Biologic and Human Resources

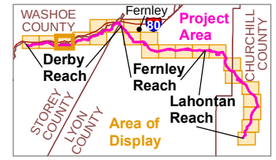
- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- River
- National Historic Trail

Greater Sage-Grouse Habitat
- General habitat

Riparian Trees
- Cottonwood
- Russian olive (invasive ornamental plant)

Noxious Weeds
- Musk thistle
- Tall whitetop

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Intermountain Basins Big Sagebrush Shrubland
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland
- Intermountain Basins Greasewood Flat
- Other



Source: Reclamation GIS 2016,
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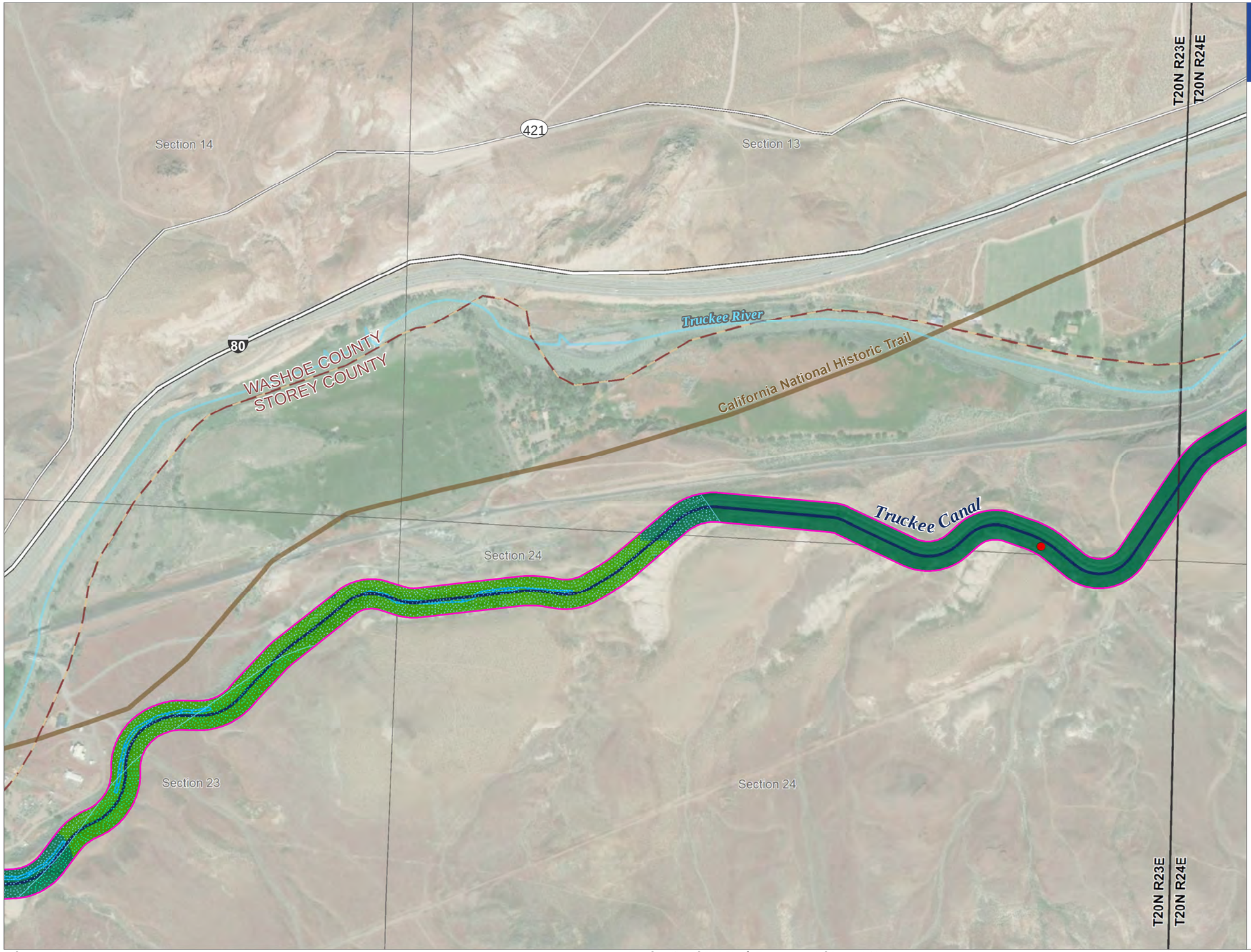

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Figure B-04
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- River
- National Historic Trail

Greater Sage-Grouse Habitat
- Priority habiat
- General habitat

Riparian Trees
- Russian olive (invasive ornamental plant)

Noxious Weeds
- Tall whitetop

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Intermountain Basins Big Sagebrush Shrubland

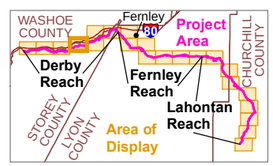

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Figure B-05
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- River
- National Historic Trail

Riparian Trees
- Cottonwood

Noxious Weeds
- Tall whitetop

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub

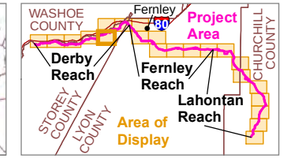

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Figure B-06
Biologic and Human Resources

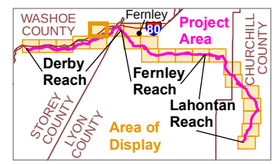
- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- River
- National Historic Trail

Noxious Weeds

- Tall whitetop

Dominant Vegetative Cover

- Intermountain Basins Mixed Salt Desert Scrub



Source: Reclamation GIS 2016,
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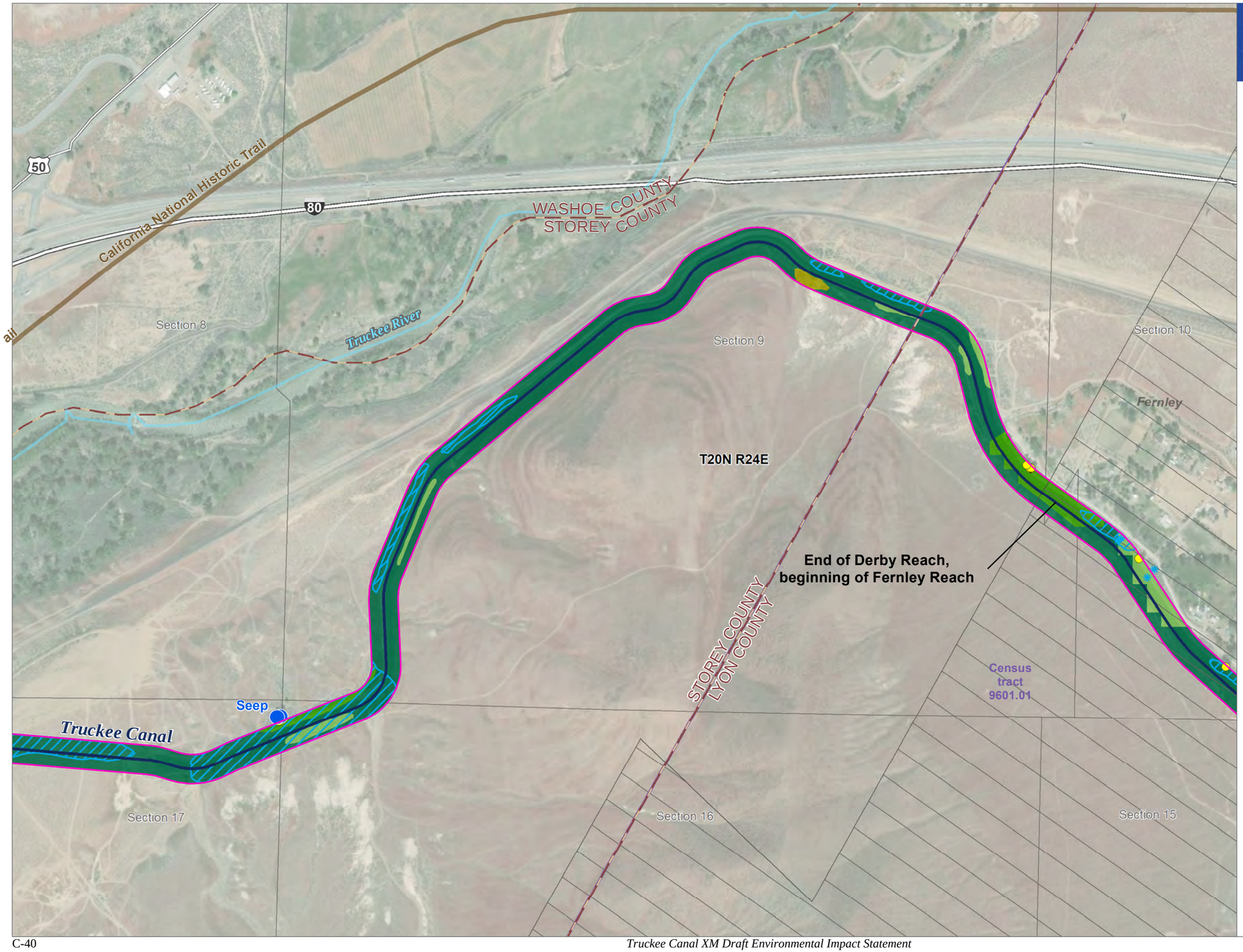

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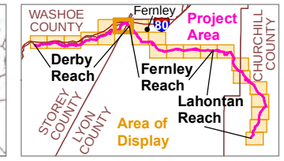
Figure B-07
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- River
- Census tract
- National Historic Trail
- City
- Seep

Riparian Trees
- Cottonwood

Noxious Weeds
- Tall whitetop
- Tall whitetop

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Intermountain Basins Big Sagebrush Shrubland
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland
- Intermountain Basins Greasewood Flat



Source: Reclamation GIS 2016,
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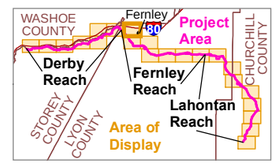
Figure B-08
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Census tract
- City

Riparian Trees
- Cottonwood

Noxious Weeds
- Tamarisk
- Tall whitetop
- Tamarisk

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland



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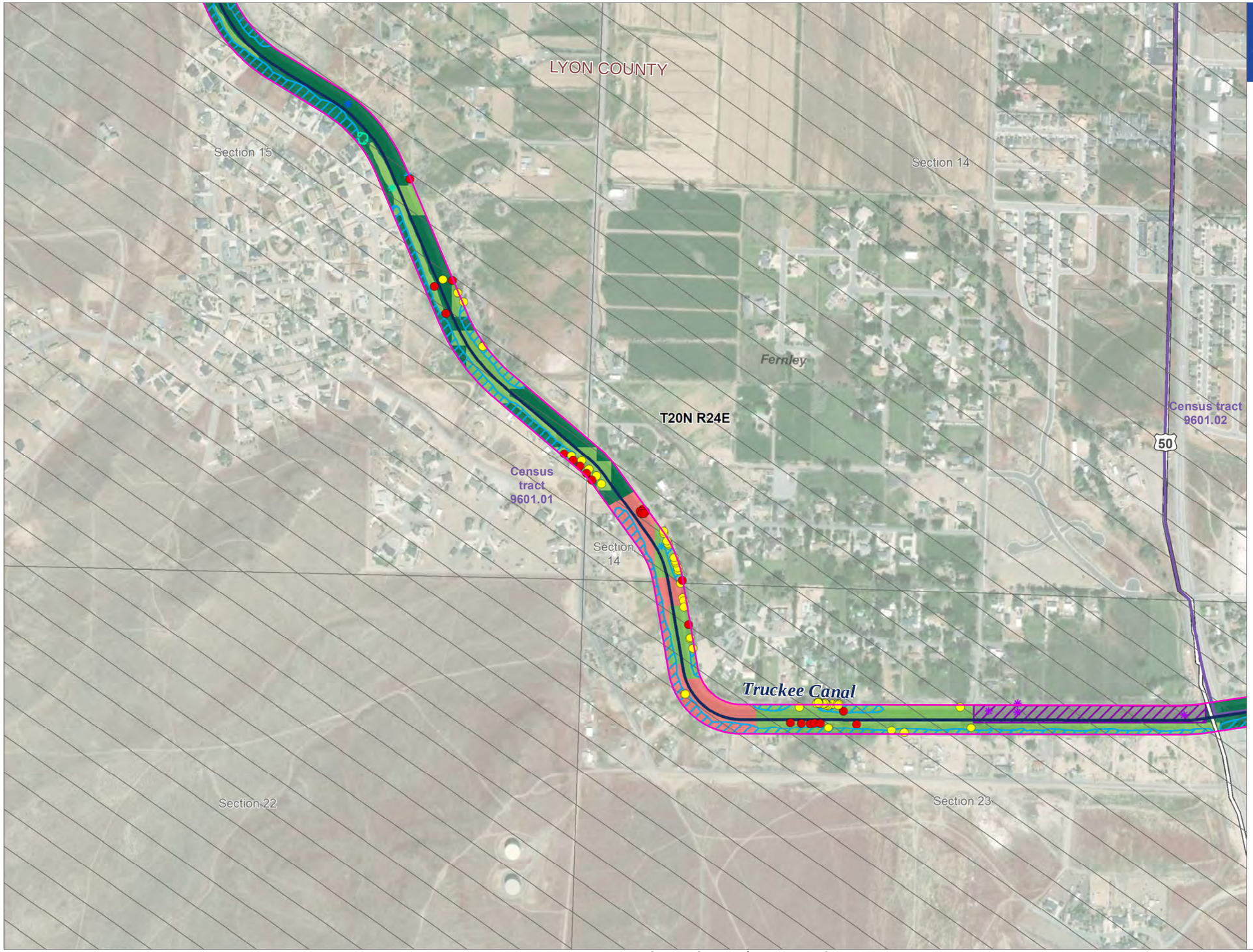

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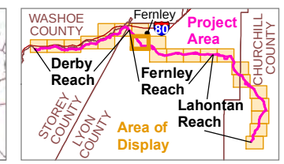
Figure B-09
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Census tract
- City

Riparian Trees
- Cottonwood
- Russian olive (invasive ornamental plant)

Noxious Weeds
- Tall whitetop
- Russian knapweed
- Musk thistle
- Tamarisk
- Tall whitetop
- Musk thistle
- Tamarisk

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland
- Intermountain Basins Greasewood Flat
- Developed open space
- Other
- Other



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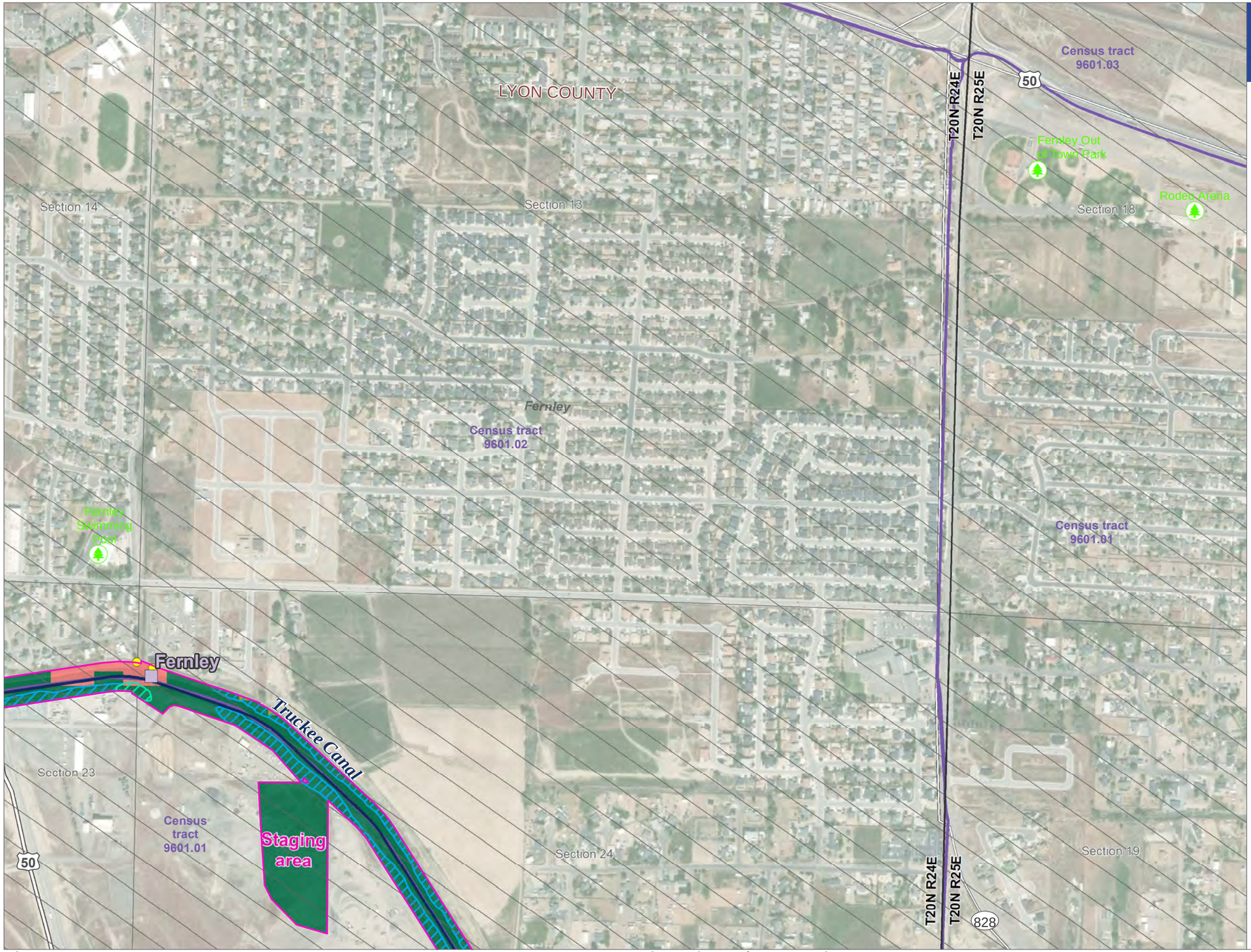

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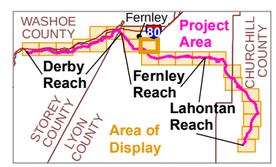
Figure B-10
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Check structure
- Census tract
- City
- Park

Riparian Trees
- Cottonwood

Noxious Weeds
- Tall whitetop
- Tamarisk

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Intermountain Basins Greasewood Flat
- Developed open space
- Other



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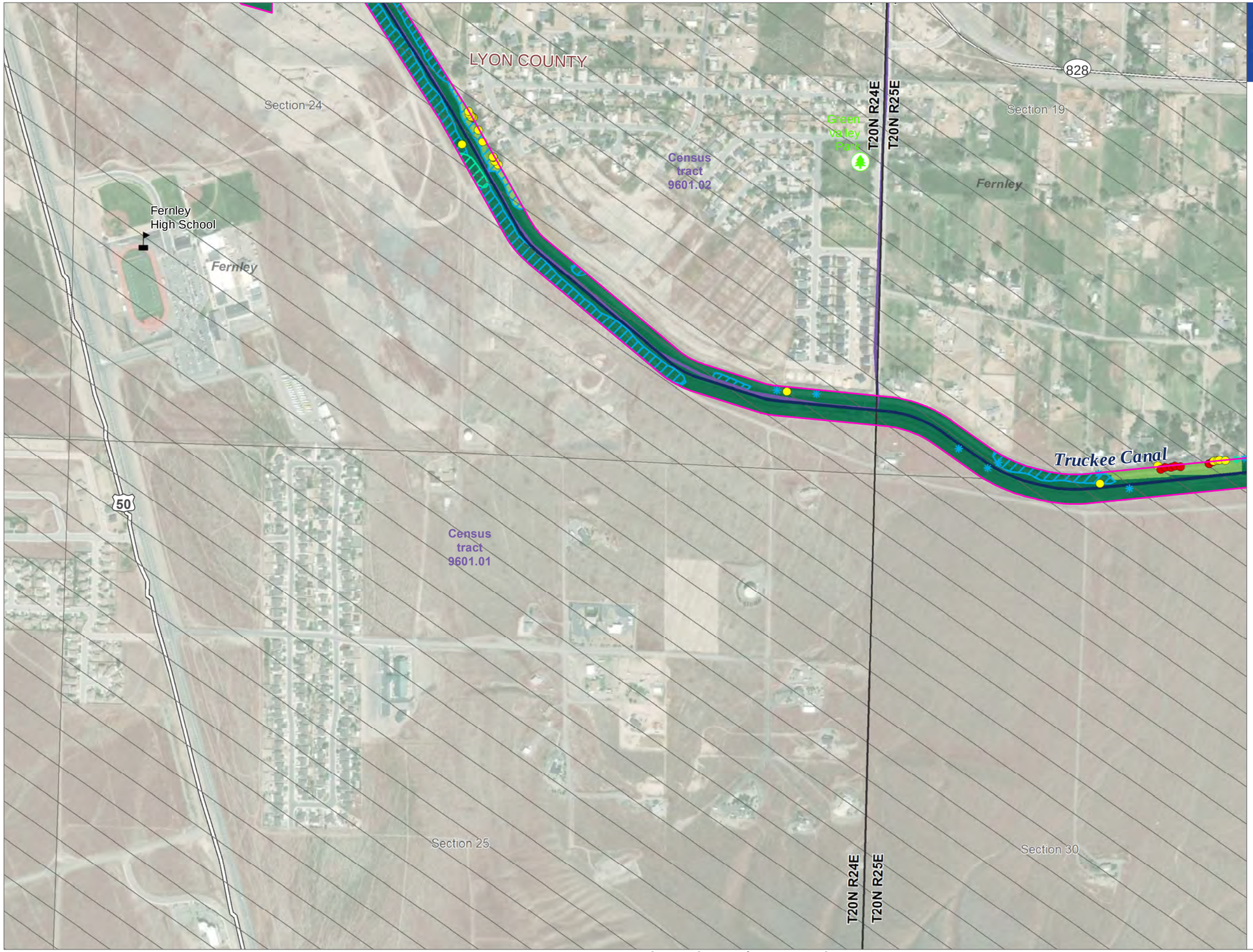

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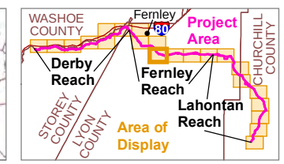
Figure B-11
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Census tract
- City
- School
- Park

Riparian Trees
- Cottonwood
- Russian olive (invasive ornamental plant)

Noxious Weeds
- Tall whitetop
- Tamarisk
- Tall whitetop
- Tamarisk

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland



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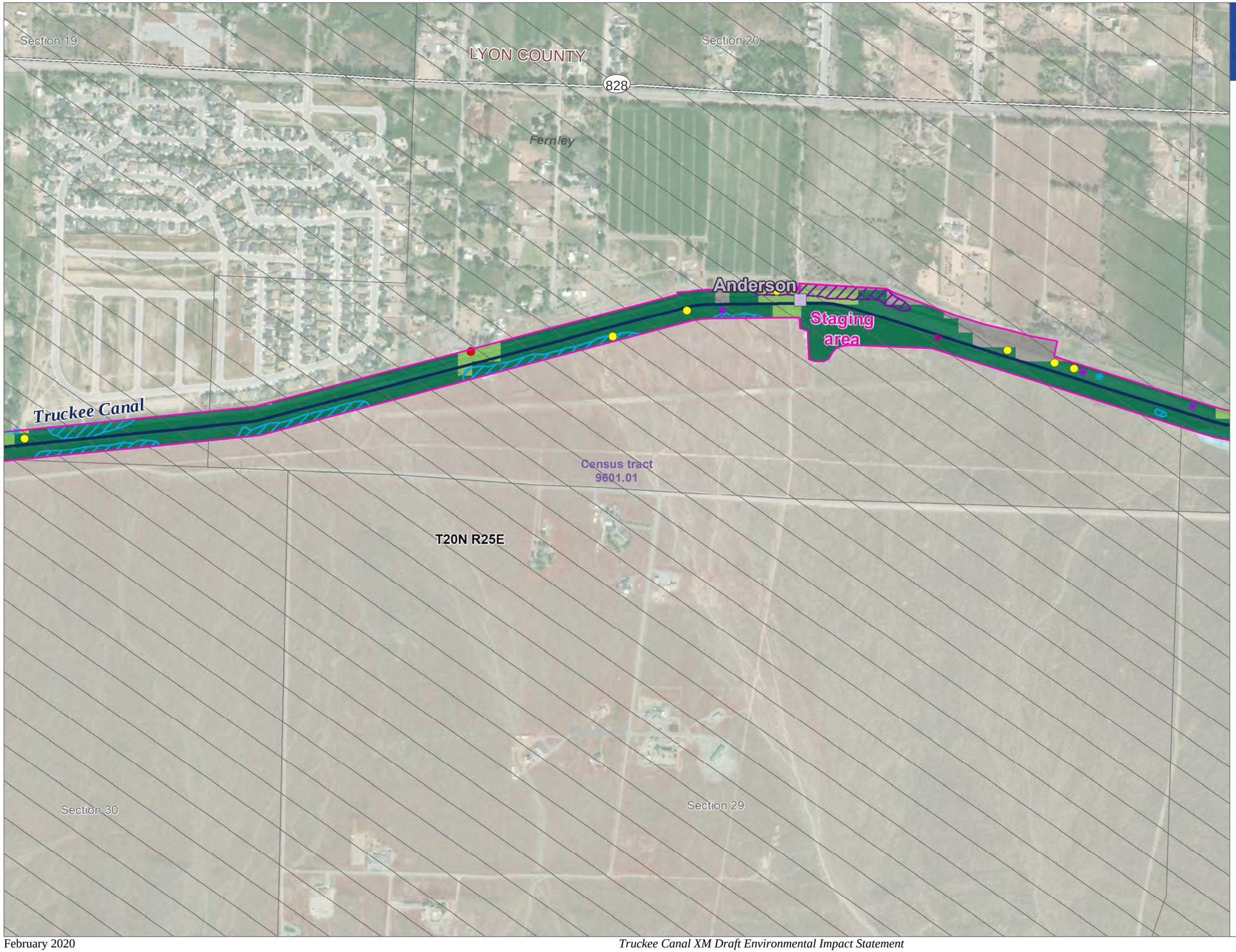

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Figure B-12
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Waterbody
- Check structure
- Census tract
- City

Riparian Trees
- Cottonwood
- Russian olive (invasive ornamental plant)

Noxious Weeds
- Tall whitetop
- Musk thistle
- Tamarisk
- Hoary cress
- Tall whitetop
- Musk thistle

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland
- Other

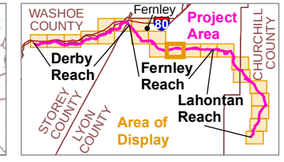

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Figure B-13
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Waterbody
- Census tract
- City
- Park

Riparian Trees

- Cottonwood
- Russian olive (invasive ornamental plant)

Noxious Weeds

- Tall whitetop
- Musk thistle
- Tamarisk
- Tall whitetop

Dominant Vegetative Cover

- Intermountain Basins Mixed Salt Desert Scrub
- Intermountain Basins Big Sagebrush Shrubland
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland
- Other

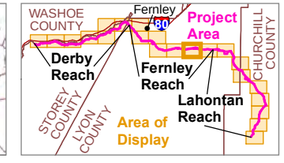

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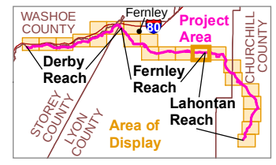
Figure B-14
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Waterbody
- Census tract
- City
- School
- Park

Riparian Trees
- Cottonwood

Noxious Weeds
- Tall whitetop
- Musk thistle
- Tall whitetop

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub



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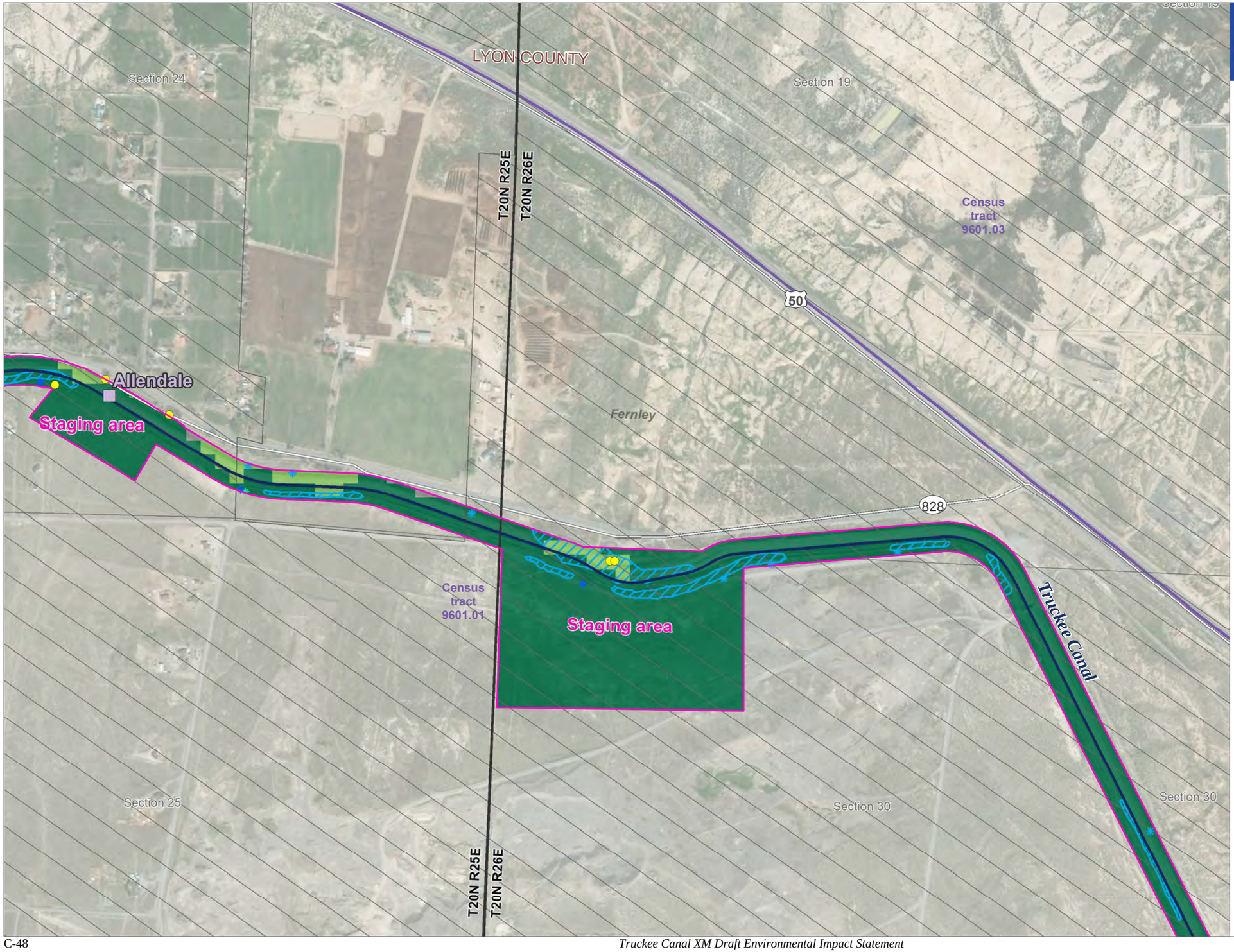

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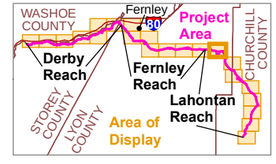
Figure B-15
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Check structure
- Census tract
- City

Riparian Trees
- Cottonwood

Noxious Weeds
- Tall whitetop
- Russian knapweed
- Tamarisk
- Tall whitetop

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland
- Other



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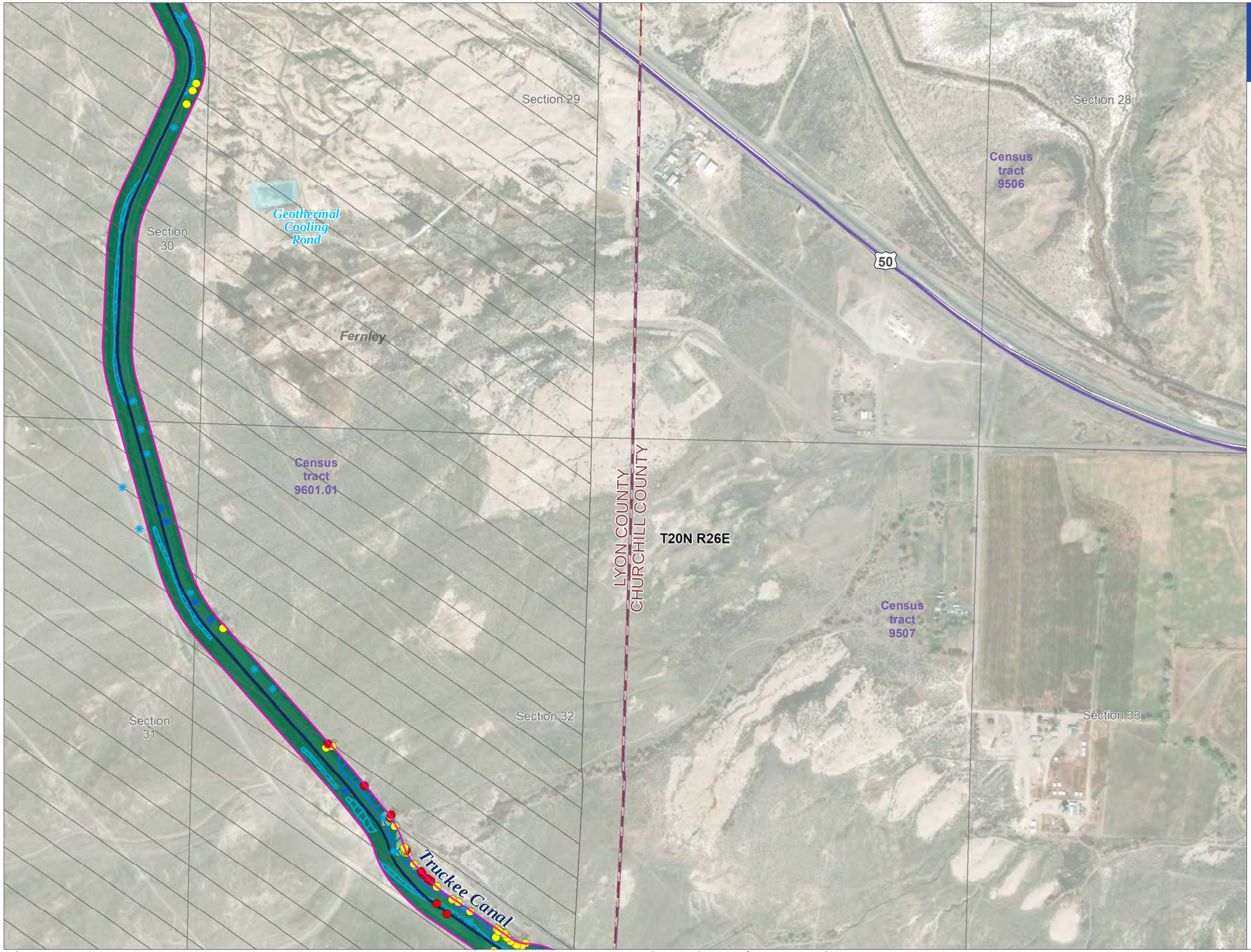

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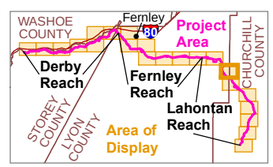
Figure B-16
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Waterbody
- Census tract
- City

Riparian Trees
- Cottonwood
- Russian olive (invasive ornamental plant)

Noxious Weeds
- Tall whitetop
- Russian knapweed
- Tall whitetop
- Russian knapweed

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland



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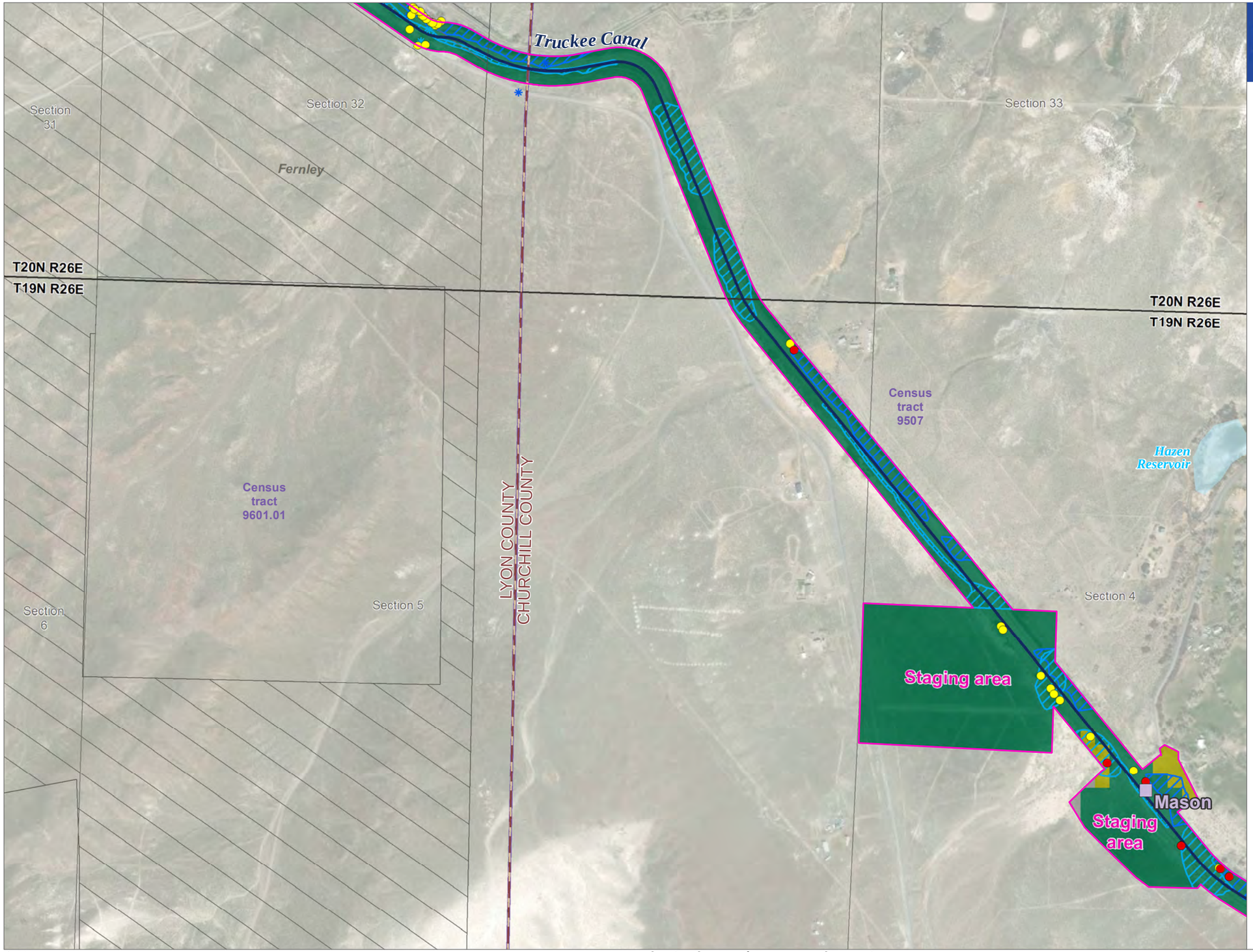

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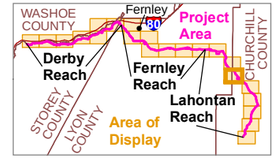
Figure B-17
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Waterbody
- Check structure
- Census tract
- City

Riparian Trees
- Cottonwood
- Russian olive (invasive ornamental plant)

Noxious Weeds
- Tall whitetop
- Russian knapweed
- Tall whitetop
- Russian knapweed

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Intermountain Basins Greasewood Flat
- Other



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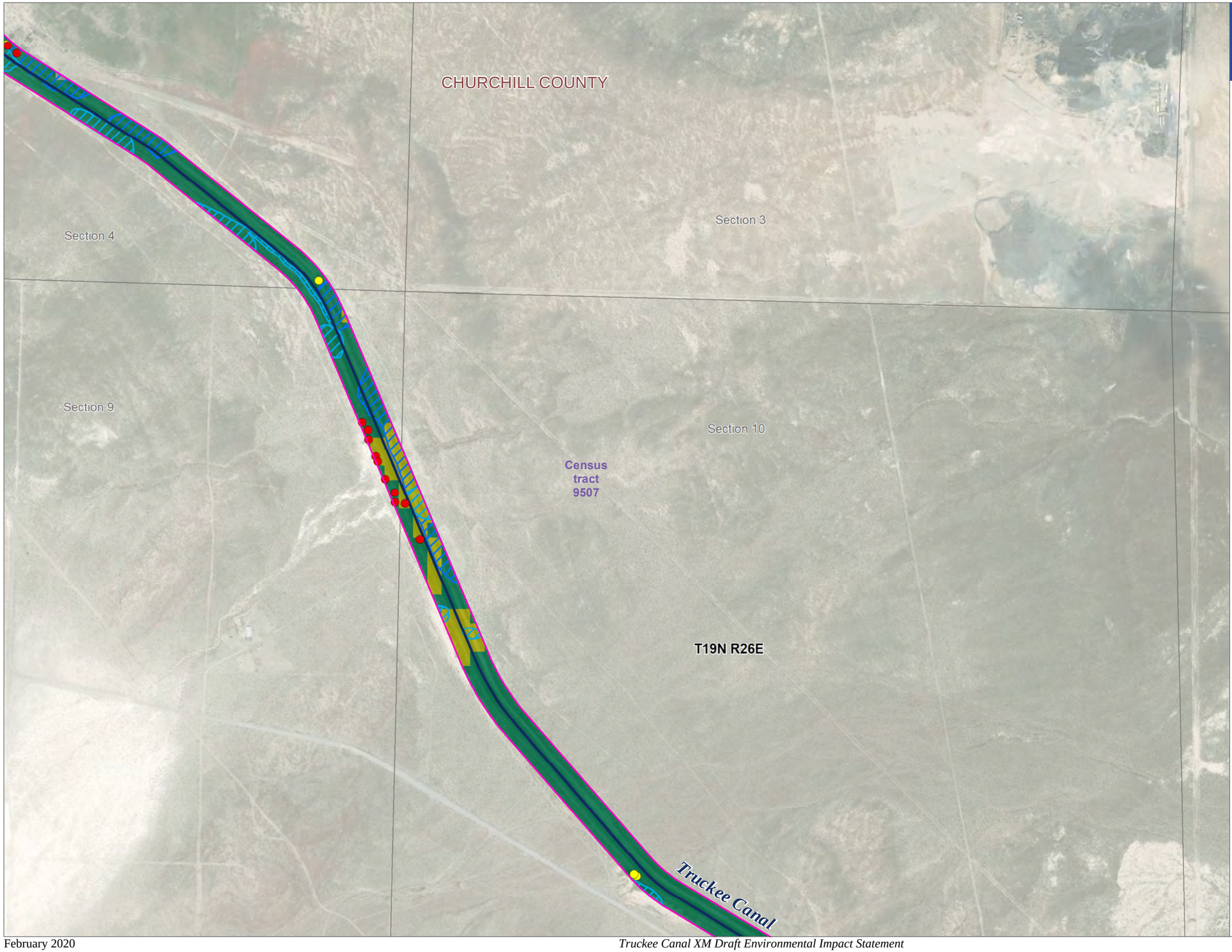

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Figure B-18
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Census tract

Riparian Trees
- Cottonwood
- Russian olive (invasive ornamental plant)

Noxious Weeds
- Tall whitetop
- Russian knapweed

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Intermountain Basins Greasewood Flat
- Other

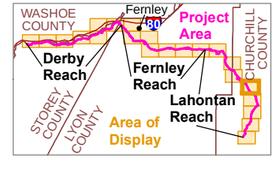

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Figure B-19
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Census tract

Noxious Weeds

- Tamarisk
- Tall whitetop

Dominant Vegetative Cover

- Intermountain Basins Mixed Salt Desert Scrub

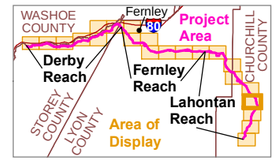

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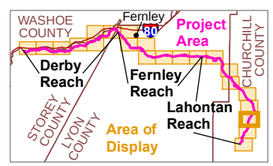
Figure B-20
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Check structure
- Census tract

Riparian Trees
- Cottonwood

Noxious Weeds
- Tamarisk
- Tall whitetop

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Intermountain Basins Greasewood Flat



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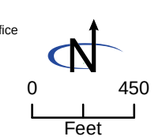

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Managing Water in the West

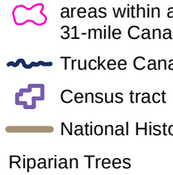
Figure B-21
Biologic and Human Resources

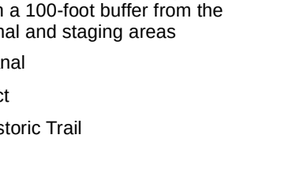
- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- Census tract
- National Historic Trail

Riparian Trees
- Cottonwood
- Russian olive (invasive ornamental plant)

Noxious Weeds
- Tall whitetop
- Russian knapweed
- Tamarisk
- Tall whitetop
- Russian knapweed

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Intermountain Basins Greasewood Flat
- Intermountain Basins Playa





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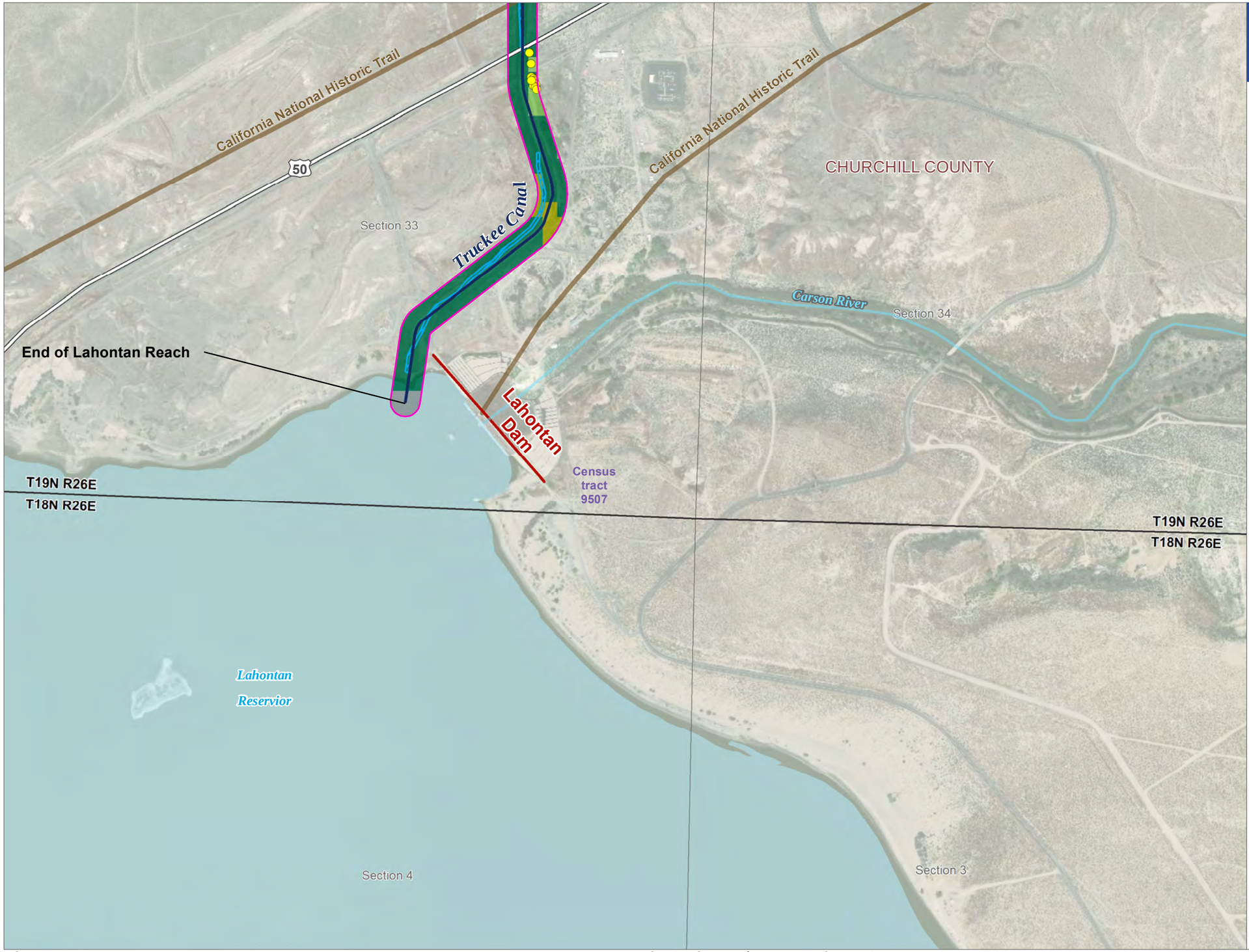

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Managing Water in the West

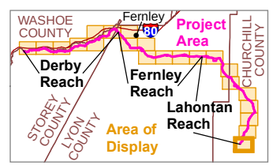
Figure B-22
Biologic and Human Resources

- Truckee Canal extraordinary project area: areas within a 100-foot buffer from the 31-mile Canal and staging areas
- Truckee Canal
- River
- Waterbody
- Dam
- Census tract
- National Historic Trail

Riparian Trees
- Cottonwood

Noxious Weeds
- Tall whitetop

Dominant Vegetative Cover
- Intermountain Basins Mixed Salt Desert Scrub
- Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland
- Intermountain Basins Greasewood Flat
- Other



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Appendix D
List of Preparers

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D. List of Preparers

Name	Role/Responsibility
Bureau of Reclamation Interdisciplinary Team	
Laurie Nicholas, PE, PMP	Project Manager (from spring 2019 to present)
Roberta Tassey	Project Manager (from 2015 through spring 2019)
Terri Edwards	LBAO Area Manager, Project Management Team Chairperson
Jack Worsley	Deputy Area Manager, Project Management Team
Amy Aufdemberge	Solicitor, Project Management Team
Rena Ballew	Resource Division Manager, Project Management Team
Rob Martinez, PE	Civil Engineer, Newlands Coordination Office, Project Management Team
Lee Berget, PE	Civil Engineer, Newlands Coordination Office
Tim Brown, PE	Technical Service Center, Group Manager
Brandee Bruce	Architectural Historian
Katherine Clancy	Civil Engineer (Hydrologic)
Kevin Clancy	Project Manager, Native American Program
Chris Ellis, PE	Technical Service Center, Geotechnical Engineer
Scott Fennema	Hydrologist
Nadira Kabir, PE	Civil Engineer (Water Resources)
Tyler Kaebisch	GIS Specialist
Doug Kleinsmith	NEPA Coordination
Dan Lahde	Special Studies Division Branch Chief
Jo Moore	GIS Specialist
Laureen Perry	Cultural Resources Branch Chief, Archaeologist
James Polsinelli, PhD	Civil Engineer (Hydrologic)
Loredana Potter	Public Affairs Specialist
Selena Werdon	Natural Resources Specialist
Scott Williams	Archaeologist
Federal, State, and Local Agencies	
City of Fallon	Cooperating agency
City of Fernley	Cooperating agency
Churchill County	Cooperating agency
Nevada SHPO	Consultation
Bureau of Indian Affairs	Cooperating agency
Department of Justice	Consultation
USFWS	Cooperating agency/consultation
Tribes	
Fallon Paiute-Shoshone Tribe	Cooperating agency/government-to-government consultation
Pyramid Lake Paiute Tribe	Cooperating agency/government-to-government consultation
Others	
TCID	Cooperating agency

Name	Role/Responsibility
Environmental Management and Planning Solutions, Inc.	
David Batts	Project Manager
Jennifer Thies	Deputy Project Manager
Amy Cordle	Air Quality and Climate
Sean Cottle	Project Assistant, Comment Analysis, Administrative Record
Kevin Doyle	Cultural Resources and Indian Trust Assets
Zoe Ghali	Socioeconomics and Environmental Justice
Peter Gower	Public Affairs, Health and Safety
Derek Holmgren	Geology and Soils
Laura Patten	Project Assistant, Water Resources
Holly Prohaska	Senior NEPA Specialist, Quality Assurance/Quality Control
Marcia Rickey	GIS
Morgan Trieger	Wildlife, Aquatic Resources and Endangered Species, Vegetation
Tom Whitehead	Water Resources

Appendix E

Regulatory Framework and Methods of Analysis

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E. Regulatory Framework and Methods of Analysis

This appendix summarizes the regulatory framework, methods of analysis, and analysis assumptions for each resource analyzed in **Chapter 3**, Affected Environment and Environmental Consequences. Impact indicators for each resource are listed in **Chapter 3**.

E.1 Water Resources

The water resources analysis focuses on surface water, groundwater, and water quality within the region of influence as defined in **Chapter 3**. Water resources were evaluated by reviewing existing studies and analyses, discussing specific information with agencies or study authors, and evaluating scientific data and modeling applicable to the project area.

E.1.1 Regulatory Framework

Activities affecting water resources would fall under the Clean Water Act (33 USC 1251 et seq.) and implementing regulations (33 CFR 320–330 and 335–338; 40 CFR 104–140, 230–233, and 401–471); the Clean Water Act Section 404 permitting requirements (31 USC 1344); the Federal Water Pollution Control Act (33 USC 1323); the Federal Safe Drinking Water Act (42 USC 201); the NAC (445A.121); and the Flood Control Act of 1944 (16 USC 460[d] et seq.; 33 USC 701 et seq.).

E.1.2 Methods of Analysis

Methods of analysis are as outlined in **Chapter 3**. Assumptions are outlined below.

E.1.3 Assumptions

Action alternatives would reduce Canal seepage and affect the artificial recharge of groundwater.

E.2 Cultural and Historic Resources

Section 106 of the NHPA describes the process for identifying and evaluating historic properties, for assessing the impacts of federal actions on historic properties, and for consulting to avoid, reduce, or minimize adverse impacts. The term historic properties refers to cultural resources that meet specific criteria for eligibility for listing on the NRHP. This process does not require historic properties to be preserved or even nominated for listing; however, it does ensure that the decisions made by federal agencies concerning the treatment of these places result from meaningful consideration of cultural and historic values and the options available to protect the properties.

E.2.1 Regulatory Framework

Cultural and historic resources were evaluated within the region of influence. Activities affecting cultural and historic resources would fall under the Antiquities Act of 1906; PL 59-209; 34 Stat. 225; 16 USC 432 and 433; the NHPA, as amended (16 USC 470 et seq.) and implementing regulations (36 CFR 800); the American Indian Religious Freedom Act of 1978 (42 USC 1996); and the Archaeological Resources Protection Act of 1979 (16 USC 470aa, as amended) and implementing regulations (43 CFR 7).

E.2.2 Methods of Analysis

Reclamation is developing information on the presence of cultural resources and their eligibility through a literature review, archaeological field survey, historic built environment survey, and ongoing consultation with Native American tribes. Consistent with Section 106 regulations, Reclamation defined the APE to guide the identification and evaluation of cultural resources that may be affected by this undertaking.

The APE is the geographic area or areas in which an undertaking may directly or indirectly change the character or use of historic properties, if any such properties exist. It includes both the direct and indirect effects APE. The direct effects APE is the Project Area and additional staging areas; the indirect effects APE is the direct effects APE plus a quarter-mile buffer, where temporary visual or other impacts may occur. The indirect effects APE covers approximately 10,990 acres; this delineated boundary was used to conduct a Class I cultural survey near the indirect effects APE. The APE constitutes the region of influence for cultural and historic resources and is referenced as such in the following discussion.

Cultural resource protection and mitigation measures apply to all proposed federal or federally assisted undertakings. The measures would be applied at the project design and implementation phases.

The criteria of adverse effect is defined in the implementing regulations of the NHPA, 36 CFR 800.5a: “An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the NRHP in a manner that would diminish the integrity of the property’s location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative.”

E.2.3 Assumptions

As stated above, the criteria of adverse effect, found at 36 CFR 800.5, provide a general framework for identifying and determining the context and intensity of potential impacts on historic properties from the proposed alternatives. Direct and/or indirect impacts may result in changes in the setting, use, or access to cultural resources that are incompatible with maintaining traditional uses.

Reclamation has previously consulted with the SHPO on historic properties identification and a finding of adverse effect on the Truckee Canal, from the Truckee Canal XM Project. Reclamation will resolve the adverse effects through a programmatic agreement among Reclamation, the Advisory Council on Historic Preservation, and the SHPO.

E.3 Indian Trust Assets

Tribal trust responsibilities considered in this analysis are based on economic rights established by treaty and the unique trust relationship between tribes and the federal government. The federal trust responsibility includes the obligation to protect tribal lands, trust assets, and treaty-based rights. An assessment of effects on ITAs is required in all Reclamation NEPA documents.

There are no applicable treaty rights associated with this NEPA analysis. ITAs were primarily identified by consulting with the appropriate tribes that may have aboriginal claims or interests. Reclamation initiated tribal consultation in 2015 on a government-to-government basis.

E.3.1 Regulatory Framework

Activities affecting ITAs would fall under Executive Order 13175, Consultation and Coordination with Indian Tribal Governments; Government-to-Government Relations with Native American Tribal Governments (memorandum signed by President Clinton on April 29, 1994); Secretarial Order 3175, Departmental Responsibilities for Indian Trust Resources; Secretarial Order 3206, American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act; Secretarial Order 3215, Principles for the Discharge of the Secretary's Trust Responsibility; Secretarial Order 3335, Reaffirmation of the Federal Trust Responsibility to Federally Recognized Indian Tribes and Individual Indian Beneficiaries; Presidential Memorandum November 5, 2009; Secretarial Order 3317 Department of Interior's Policy on Consultation with Indian Tribes; Departmental Manual 512 Chapter 2, Departmental Responsibilities for Indian Trust Resources; the Indian Policy of the Bureau of Reclamation; Bureau of Reclamation Protocol Guidelines; and the Bureau of Reclamation Indian Trust Asset Policy and Guidance 1993.

E.3.2 Methods of Analysis

The region of influence for ITAs is the Project Area and the reach of the Truckee River from Derby Diversion Dam to Pyramid Lake.

ITAs are primarily identified by consulting with the appropriate tribes that may have aboriginal claims or interests. Reclamation initiated tribal consultation in 2015 on a government-to-government basis. Reclamation sent letters to the FPST, PLPT, Reno-Sparks Indian Colony, and Washoe Tribe of Nevada and California. Reclamation identified the PLPT and the FPST as having cultural affiliation and potential trust issues that may be affected by the proposed action and, as such, invited them to be cooperating agencies.

Reclamation also received comments during scoping that were relevant to concerns about trust assets. Discussions are ongoing on a variety of topics and issues, including the identification of ITAs. Additionally, research has been conducted to determine if there are applicable treaties, statutes, executive orders, or findings of the Indian Claims Commission. Reclamation will consult with the BIA and Western Nevada Agency for other records and information that may be pertinent.

The ITA impact assessment is based on changes in asset values attributable to the project alternatives. The value of ITAs to the tribe is largely based on their quantity and quality; any change in quality or quantity without fair market compensation represents a potential change in value to the tribe. Value is also based on the ability to access the ITAs. Impacts would be determined if their implementation would result in the loss, damage, depletion, or waste of ITAs. Obligations of water delivery under the OCAP will be met that support tribal fisheries, wildlife issues, irrigation, or trust income.

E.3.3 Assumptions

No ITA assumptions were noted during the evaluation.

E.4 Biological Resources

Biological resources focuses on plant and animal species and habitats within the region of influence.

E.4.1 Regulatory Framework

Activities affecting biological resources would fall under the Fish and Wildlife Coordination Act of 1934; Executive Order 11990, Protection of Wetlands (42 *Federal Register* 26961); the Federal Water Project Recreation Act of 1965 (PL 89-72); the Endangered Species Act (Endangered Species Act of 1973 [16 USC 1531–1544] and implementing regulations [50 CFR 17]); the Bald and Golden Eagle Protection Act (16 USC 668–668d); the Migratory Bird Treaty Act of 1918 and Amendments (16 USC 703–712); Executive Order 13443, Facilitation of Hunting Heritage and Wildlife Conservation (72 *Federal Register* 46537); BLM Manual 6840, Special Status Species Management; the Federal Noxious Weed Act of 1974; Executive Order 13112, Invasive Species (64 *Federal Register* 6183); and Nevada Revised Statutes 555, Control of Insects, Pests, and Noxious Weeds.

E.4.2 Methods of Analysis

Vegetation

The region of influence for vegetation is the Project Area, which includes the entire 31 miles of the Canal, from the Derby Dam to Lahontan Reservoir, including a 100-foot buffer from the centerline of the Canal on each side and four staging areas. The region of influence also includes a portion of the Truckee River near Derby Diversion Dam. The region of influence for vegetation is consistent with the Project Area, as described in the Biological Survey Report (Reclamation 2016d). Truckee Canal XM EIS **Appendix C**, **Figures B-01 to B-22** depicts the habitat, vegetation, and sensitive species discussed in the Truckee Canal XM EIS, **Sections 3.6**, Vegetation, through **3.9**, Listed Species.

General Vegetation

The vegetation in the Project Area was mapped using GIS land cover data from the SWReGAP. The SWReGAP data were used to compare areas of various vegetation communities that would be disturbed by each of the alternatives. Vegetation impacts were assessed by determining areas where proposed facilities would directly intersect with vegetation communities.

Wetland and Riparian Vegetation
Wetland and riparian vegetation impacts were assessed by determining areas where proposed facilities would directly intersect with potential wetlands and/or riparian vegetation.

Special Status Plant Species
Special status plant impacts were assessed by determining areas where proposed facilities would directly intersect either:

1. Known special status plant locations, or
2. Suitable habitats that may support special status plants (see the Truckee Canal XM EIS, **Section 3.6**, Vegetation)

Noxious Weeds and Nonnative, Invasive Plants
Ground disturbance can encourage noxious weed and nonnative, invasive plant (hereinafter referred to collectively as "weeds" unless otherwise noted) establishment and spread; therefore, impacts were assessed by calculating the acres of surface disturbance under each alternative.

Wildlife
The region of influence for terrestrial wildlife is the Project Area, which includes the entire 31 miles of the Canal, from the Derby Dam to Lahontan Reservoir, including a 100-foot buffer from the centerline of the Canal on each side and four staging areas, unless specifically noted otherwise (**Appendix C**, **Figure 1-1**). Additionally, selected wildlife species with nearby foraging and habitat areas are included in the region of influence and are discussed in the Truckee Canal XM EIS, **Section 3.7**, Wildlife.

The analysis of impacts on wildlife (including general wildlife, migratory birds, Birds of Conservation Concern, greater sage-grouse, golden eagle and other raptors, BLM sensitive wildlife species, and game species) includes an assessment of whether each alternative would result in the possible destruction, degradation, or modification of habitat as well as disturbance to wildlife populations or individuals. The degree of the impact attributed to any one of the alternatives is influenced by the project timing and existing habitat conditions. Impact quantification is difficult due to the lack of long-term monitoring or demographic data for most wildlife species in the region of influence. In the absence of quantifiable data, best professional judgment was used to determine the impacts resulting from each alternative.

Aquatic Resources
The analysis includes an assessment of whether each alternative would result in the possible destruction, degradation, or modification of habitat as well as disturbance to populations or individuals.

Listed Species
The analysis of impacts on listed species includes an assessment of whether each alternative would result in the possible destruction, degradation, or modification of habitat, including proposed critical habitat, as well as disturbance to populations or individuals.

E.4.3 Assumptions

Vegetation

General Vegetation
No general vegetation assumptions are noted.

Wetland and Riparian Vegetation
The following assumptions were used in analyzing impacts:

- Areas of emergent and submergent wetland vegetation growing within the Canal prism are regularly disturbed by ongoing, periodic maintenance activities.
- There would be no direct impacts on wetlands or riparian vegetation in the Truckee River. This is because no work associated with any of the alternative elements is located within the Truckee River corridor (i.e., no work, and therefore no surface disturbance, is proposed at the Derby Diversion Dam).

Special Status Plant Species
The following assumptions were used in analyzing impacts on special status plant species:

- Prior to construction, focused surveys for special status plant species would be conducted in discrete areas proposed for disturbance.
- Measures would be developed, as appropriate, to protect known special status plant species occurring in the Project Area during project activities. Potential measures are described in the analysis under each alternative.

Noxious Weeds and Nonnative, Invasive Plants
The following assumptions were used in analyzing impacts:

- Mitigation measures would be implemented to reduce the establishment and spread of weeds during project activities. Measures are described in detail in the analysis of impacts under each alternative.
- Weeds would continue to be introduced and spread from existing weed populations as a result of propagules[1] being distributed by ongoing water flows, wind, vehicle traffic, recreation, and wildlife movements.
- Weeds often exploit disturbed areas and outcompete many native species.
- Most actions that disturb soils or vegetation would increase the potential for weed establishment and spread.

[1] Any plant material used for the purpose of plant propagation; propagules include seeds and fragments of roots or stems that can resprout.

- Weed infestations often follow transportation routes, making canals and associated access roads prime habitat for weeds, and making vehicles prime vectors for the spread of weeds.

Wildlife

The assumptions used to analyze impacts on wildlife are as follows:

- Reclamation would develop avoidance measures as necessary and at a minimum, measures would include:
  - If work is conducted during the avian breeding season, Reclamation would conduct preconstruction avian surveys and implement appropriate avoidance buffers if active nests are observed.
  - If construction activities occur in NDOW-mapped greater sage-grouse habitat, Reclamation would adhere to greater sage-grouse (*Centrocercus urophasianus*) RDFs[2] outlined in the Nevada and Northeastern California Greater Sage-Grouse Approved Resource Management Plan Amendment (BLM 2015).
- There would be no direct impacts on wildlife species or habitat in the Truckee River corridor. This is because no construction is proposed within the Truckee River corridor (i.e., no work, and therefore no surface disturbance, is proposed at the Derby Diversion Dam).

Aquatic Resources

The assumptions used to analyze impacts on aquatic resources are as follows:

- The region of influence includes a small portion of the Truckee River near the Derby Diversion Dam and a small portion of Lahontan Reservoir where the Canal discharges into the reservoir (see Truckee Canal XM EIS, **Appendix C**, **Figures B-01 to B-22**). No construction activities are proposed at the Derby Diversion Dam or in the Truckee River at this location. Similarly, no construction activities are proposed in Lahontan Reservoir; therefore, no direct impacts on aquatic resources in the Truckee River from construction activities at this location or Lahontan Reservoir would occur.
- No potential barriers to fish migration or passage are proposed under any alternative.
- Regardless of the alternative element, all construction within the Canal prism would occur when the Canal is not in use.
- The degree of impact attributed to the alternatives would be influenced by multiple factors, including the species affected; flow volume and rate; turbidity; chemical constituents; type, seasonal timing, and degree of

[2] RDFs establish the minimum specifications for certain activities to help mitigate adverse impacts. They are required for certain activities in greater sage-grouse habitat.

disturbance; and yearly climatic variability, including temperature and precipitation.

Listed Species

The assumptions used to analyze the impacts on listed species are as follows:

- The region of influence includes a small portion of the Truckee River near the Derby Diversion Dam (see Truckee Canal XM EIS, **Appendix C**, **Figures B-01 to B-22**); however, no construction activities are proposed at the Derby Diversion Dam or in the Truckee River at this location. Therefore, no direct impacts on listed species in the Truckee River would occur from construction activities at this location.
- No potential barriers to fish migration or changes in fish passage are proposed under any alternative.
- Regardless of the alternative element, all construction work in the Canal prism would occur when the Canal is not in use (i.e., when it is dry).
- The USFWS issued a biological opinion to Reclamation (November 6, 1997; File No. 1-5-86-F-81R.AMD) on the 1997 Adjusted Operating Criteria and Procedures for the endangered cui-ui (*Chasmistes cujus*) and threatened Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) in the Truckee River Basin, in accordance with Section 7 of the ESA (16 USC 1531 et seq.). That document concluded that implementation of the 1997 Adjusted OCAP would not jeopardize threatened and endangered species in the lower Truckee River.
- One federally listed endangered wildlife species, the cui-ui, was identified and occurs only in Pyramid Lake and the lower Truckee River, downstream of Derby Dam (USFWS 1992). Two federally listed threatened wildlife species, Lahontan cutthroat trout and the yellow-billed cuckoo, were identified and occur in the lower Truckee River and near the Carson River in Lyon County. There is no proposed or designated critical habitat along the Canal. As described in the biological resources section of the Truckee Canal XM EIS, the action alternatives would not affect these listed species.

E.5 Air Quality and Climate Change (Greenhouse Gases)

The air quality and climate change (greenhouse gases) region of influence is defined in **Chapter 3**.

E.5.1 Regulatory Framework

Air quality and climate change focus on air emissions data from Churchill, Lyon, and Storey Counties. Activities affecting air quality and climate change would fall under the Clean Air Act (42 USC 7401 et seq.).

E.5.2 Methods of Analysis

Air Quality

Air quality was evaluated by reviewing the federal NAAQS and conformity guidelines, emission information from cities and counties in the Project Area, and existing studies and analyses, and by evaluating scientific data and modeling applicable to the Project Area.

Potential effects on air quality were evaluated by analyzing the type of construction associated with each alternative and air pollutant emissions that would be associated with these activities. The analysis includes a qualitative discussion of fugitive dust emissions from surface disturbance and a quantitative estimate of on-road and off-road vehicle and equipment emissions.

Climate Change (Greenhouse Gases)

The analysis in the Truckee XM EIS addresses the potential impacts on climate change from actions associated with each alternative. It discloses the GHG emissions that would be emitted during construction under the various alternatives. Because the purpose of and need for the project is solely to make repairs to the Canal, this section does not analyze climate scenarios and the effects of these scenarios on future water supplies in the Canal. The effects of climate change on Canal operations are discussed as a cumulative effect under the respective resource sections.

Potential effects on climate change were evaluated by analyzing the type of construction associated with each alternative and greenhouse gas emissions that would be associated with these activities.

E.5.3 Assumptions

Air Quality

Air pollutant emissions provided for each alternative allow for a comparison between the action alternatives. Actual emissions may differ, based on final detailed construction plans.

Most air pollutant emissions would be associated with construction; these emissions would be temporary, intermittent, and short term and would have no long-term impacts on air quality. Emissions associated with maintenance would be a continuation of similar types of activities that occur now as part of the TCID O&M of the Canal and associated infrastructure. Construction contracts would include a list of EPMs as part of the terms and conditions. The EPMs specific to air quality are listed in Chapter 3.

Climate Change (Greenhouse Gases)

Emissions provided for each alternative allow for a comparison between the action alternatives. Actual emissions may differ, based on final detailed construction plans.

While there is a correlation between global concentrations of GHGs and climate change, it is not currently possible to link projected GHG emissions associated with any particular activity to specific environmental impacts at a specific site or location.

E.6 Geology and Soil

The geology and soils analysis focuses on geologic and soil constraints and hazards due to geologic faults, subsidence, landslides, seismic and related hazards (liquefaction), and erosion.

E.6.1 Regulatory Framework

No regulatory framework was identified for geology and soils.

E.6.2 Methods of Analysis

Geology and soils were evaluated by reviewing existing literature and Nevada geologic maps and NRCS soil maps that were within the region of influence. Report preparers reviewed the Newlands Project Planning Study Special Report (Reclamation 2013a) and the Canal Updated Risk Analysis (Reclamation 2015a). The Risk Analysis evaluated geologic and seismic activity as a Canal potential failure mode and identified areas along the Canal that may be susceptible to breach.

The region of influence for geology and soils is the Project Area. Baseline conditions for geology and soils were based on existing Reclamation data. In addition, previous studies and reports covering the Project Area were also reviewed for pertinent information as discussed above.

Areas associated with construction activities (such as the Canal, staging areas, and the TC 11 downstream detention pond, Mason upstream detention pond, and Down Stream pond) are used to indicate where there would be direct impacts on geology and soils. The staging areas and the detention ponds are the only proposed project areas outside the actual Canal that the action alternatives would affect. The staging areas are areas where equipment and supplies would be temporarily stored during construction.

E.6.3 Assumptions

The analysis includes the following assumptions:

- As the number of acres of disturbance from construction increases, the amount of impacts on soils would also increase.
- Areas of temporary disturbance, such as in staging areas, would be reclaimed to the pre-disturbance condition.
- Areas of permanent disturbance, such as in detention ponds, would not be reclaimed to the pre-disturbance condition.

E.7 Health and Safety

Health and safety focuses on workplace hazards, such as equipment failure, exposure to hazardous chemicals and petroleum products, spills or mishandling of hazardous materials, and risk of flooding from a Canal breach.

E.7.1 Regulatory Framework

Activities affecting air quality emissions would fall under the Clean Air Act (42 USC 7401 et seq.). Activities affecting water quality would fall under the Clean Water Act (33 USC 1251 et seq.). Activities affecting hazardous materials management would fall under the Resource Conservation and Recovery Act (42 USC 6901 et seq.); the Comprehensive Environmental Response, Compensation, and Liability Act (42 USC 9601 et seq.); the Federal Hazardous Materials Transportation Law and Hazardous Materials regulations (49 USC 5101 et seq.); the Toxic Substances Control Act (15 USC 2601 et seq.); Nevada Revised Statute 459.400, Disposal of Hazardous Waste; and NAC 477.323. Activities affecting worker safety would fall under the Occupational and Safety Health Act (29 USC 651 et seq.).

E.7.2 Methods of Analysis

The region of influence for health and safety is the Project Area. Report preparers evaluated construction and maintenance activities to determine potential safety and health issues. Air emissions from equipment movement and idling, hazardous material spills or equipment leaks, and flooding from a Canal breach were analyzed. Environmental protection measures were developed to eliminate or minimize the impacts.

E.7.3 Assumptions

The analysis includes the following assumptions:

- Areas of highest risk to public health and safety from a Canal breach are those where human activity and infrastructure next to the Project Area are greatest.
- The Canal repairs and hydrologic actions would be designed, constructed, and operated to meet or exceed the requirements of the US Department of Labor, the Occupational Safety and Health Administration, and local and state requirements for safety and protection of residents and workers. Compliance with safety requirements would guide chemical use, transportation, and storage associated with any construction and operation.
- In staging areas, construction yards, refueling areas, and other sites, workers would comply with local, state, and federal regulations.
- This analysis assumes there would be fewer O&M activities in the future if the Canal were repaired under an action alternative.

E.8 Socioeconomics

Socioeconomics focuses on impacts including displacement of existing residents, disruption of existing businesses and agriculture, reduction of property values, effects on income and employment, new growth, and demands for goods.

E.8.1 Regulatory Framework

There is no regulatory framework noted for socioeconomics.

E.8.2 Methods of Analysis

Report preparers evaluated data on housing, employment, and income. The region of influence for socioeconomic resources was Lyon, Churchill, and Washoe Counties. Local and regional demographic characteristics and economies may be affected by proposed project construction and by changes to existing uses in the socioeconomic study area. Impact analyses and conclusions are based on the existing and projected population, employment, income, housing, land uses, and social values, as described in Truckee Canal XM EIS, **Chapter 3.**

Demographic data were collected from publicly available data sources, including the US Department of Commerce, Census Bureau; US Bureau of Labor Statistics; and the US Department of Economic Analysis. Economic profiles were also created using Headwater Economics' economic profiles system tool.

E.8.3 Assumptions

The following assumptions were made for the purpose of this analysis:

- The location of and demand for future development would follow current land use patterns and zoning. There would be no changes to the level or areas of future development by alternative.
- Construction would be limited to a temporary workforce. None of the alternatives would result in long-term changes in population or in the demand for housing, schools, or public facilities and services.
- Employment is discussed in terms of total full-time equivalents. To calculate person years employment, data are calculated by the following formula:

  person year = number of employees required x (approximate months of employment/12)

- The level of anticipated labor required would be filled by current employees of the TCID, those currently unemployed, residents in the construction industry, and experts in the field from inside and outside the region.

E.9 Environmental Justice

Environmental justice focuses on low-income and minority populations and areas within the region of influence.

E.9.1 Regulatory Framework

Activities affecting environmental justice would fall under Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.

E.9.2 Methods of Analysis

Based on best available data for baseline income and ethnicity/race, Churchill and Washoe Counties, the City of Fallon, and census tracts 9601.03 and 9602.02 in Lyon County have been identified for potential environmental justice consideration. This is due

to higher levels of low-income populations than the Nevada reference population. See Truckee Canal XM EIS, **Section 3.14**, Environmental Justice, for methods used to identify populations for further consideration. No ethnic or minority populations have been identified in the socioeconomic region of influence; however, there is a potential for impacts on the PLPT and FPST, which have been identified as having religious or cultural affiliation near the region of influence. These impacts are assessed in Truckee Canal XM EIS, **Section 3.4**, Cultural and Historic Resources, and **Section 3.5**, Indian Trust Assets.

The level of impacts on these populations is compared with the anticipated impacts on the population at large for each alternative. In addition, census tracts identified for further environmental justice consideration are not adjacent to the Canal, minimizing impacts on these populations. Under all alternatives, the actions would be unlikely to disproportionately affect low-income and minority groups, since the actions would not target specific environmental justice populations.

E.9.3 Assumptions

No assumptions for environmental justice were identified.

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Appendix F

Groundwater Recharge – Legal Correspondence

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CITY OF FERNLEY
Mayor's Office

Mayor & City Council
Legislative
Public Policy

12/6/12

94-42020

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October 18, 2012

Michael L. Connor
Commissioner
Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

Dear Commissioner Conner:

The City of Fernley, Nevada ("Fernley") would like to express to you the importance of the Truckee Canal ("Canal") to our community. Recent developments have led to concern on the part of the citizens of Fernley about the future of the Canal. As you are aware, since the 2008 breach of the Canal, flows have been severely restricted, often leaving water users with inadequate supplies. Now, the Bureau of Reclamation ("Reclamation") is conducting a study regarding the future of this important resource. Fernley supports efforts by Reclamation to assure the safety of the Canal for our residents, and urges Reclamation to give equal consideration to the water rights that exist because of the Canal, and particularly Fernley's municipal groundwater supply.

Fernley's sole municipal water supply comes from groundwater. That groundwater is recharged from the Truckee Canal into the local Fernley groundwater aquifer. Without the recharge from the Canal, hydrologic studies clearly indicate Fernley's municipal water supply would disappear. Nearly 20,000 citizens of Fernley rely on this water, and, in response to a federal regulatory mandate, Fernley expended over 74 million dollars in a treatment system for that drinking water supply.

Since its inception in 1902, Reclamation's mission has been to aid in the development of local communities and economies. Reclamation's mission statement states that it exists to "manage, develop, and protect water and related resources...in the interest of the American public." This mission is further clarified by Reclamation's "Vision Statement," which states that Reclamation "will seek to protect local economies and preserve natural resources...through the effective use of water."

The Department of the Interior's ("Interior") 2016 "Strategic Plan" echoes these priorities. It states that "[a] new approach and creative efforts are required to sustain the economy, environment, and culture of the American West." In 2010, Interior Secretary Ken Salazar initiated the WaterSMART program, directing Reclamation to work with local governments to provide sustainable strategies for water development. As you will see, continued Canal operations are crucial to the economy of Fernley, and Reclamation decisions regarding the Canal should be made with an eye toward protecting Fernley's

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www.cityoffernley.org

economy. Not only do Reclamation and Interior policies mandate this approach, but the very future of our community depends on it.

The Newlands Project, one of the first projects undertaken by Reclamation, was conceived and developed in order to encourage settlement in Nevada's high desert. Without the Canal, there would not have been any development, and subsequently, no Fernley. To the citizens of Fernley, it does not seem logical to build a canal to encourage the growth of a city only to remove the canal once a city has grown around it.

Fernley relies heavily on the Canal for many facets of our existence. Our farmers use its water to irrigate, our citizens use it for many forms of recreation, and our municipal water supply depends on recharge to the local aquifer from Canal seepage. Fernley's citizens have been reliant on the Canal for over a century and the Canal is now considered a permanent waterway. Businesses create jobs and manufacture products based on Canal recharge. Regional economic activity at Fernley's industrial park depends on the use of groundwater recharge from the Canal. Reclamation's removal of the Canal from Fernley would be like removing a river from a waterfront town. The very existence of the City would be in danger.

The legislation and court decrees which govern the Truckee River, and subsequently the Canal, recognize that the Canal is used to deliver water to cities and towns along its banks. The 1944 *Orr Ditch* Decree states that the water decreed for use in the Canal is to be used, among other uses, "for supplying the inhabitants of cities and towns on the project and for domestic and other purposes." That decreed water is being used to supply our city, just as the *Orr Ditch* Decree directed. Water is delivered by the Canal into our local aquifer and is pumped into our water treatment facility for delivery to our citizens.

In 1990, Congress passed the Truckee-Carson-Pyramid Lake Water Settlement Act, Public Law 101-618. P.L. 101-618 reiterates the directive of the *Orr Ditch* Court, stating that the Canal is to be operated to provide "municipal and industrial water supply" to Lyon County. Fernley is the only municipality in Lyon County that receives water from the Truckee Canal, so this provision was clearly included specifically to recognize Fernley's reliance on the Canal for municipal and industrial water. P.L. 101-618 mandates that the Canal be operated to provide Fernley's municipal and industrial water, both from surface and groundwater sources.

Fernley's municipal water supply, and the treatment and delivery system, is designed to deliver drinking water to approximately 20,000 citizens, and is completely reliant on groundwater. Although our municipal water treatment facility, a state-of-the-art facility, was designed to accommodate an eventual expansion to treat surface water, this expansion has not taken place. In today's economic climate, expansion is cost-prohibitive and simply out of the question. For the foreseeable future, Fernley will rely on groundwater to serve its citizens.

Fernley designed our water system in its current form because we hold adequate state-permitted groundwater rights to serve our current and projected population. Fernley recently spent over $74 million dollars to construct our treatment facility, hoping to provide a reliable, safe water supply for our citizens into the future. The facility was specifically designed to meet federal requirements for arsenic content in drinking water. Throughout the planning, development, and construction of our water treatment facility, Reclamation never once objected to Fernley's reliance on groundwater, nor did Reclamation inform us that groundwater supplies could be severely curtailed in the future.

Fernley's reliance on groundwater was developed in conjunction with Reclamation through grants and other sponsorship of Fernley groundwater projects. Reclamation did not just sit silently while Fernley grew to rely exclusively on groundwater; it actively encouraged this reliance through grants and joint planning projects. Now it has come to our attention that Reclamation may consider lining the Canal or eliminating the Canal altogether. To Fernley, this reflects a complete reversal of Reclamation's long-standing policies.

Nevada water law will provide some insight into the importance of the Canal to our groundwater supply. In Nevada, all groundwater rights must be permitted by the Office of the State Engineer. The State Engineer bases the number of permits issued in a particular basin on the perennial yield of the basin, or the amount of water that can be removed from the aquifer without substantially lowering the water table. Natural recharge to the Fernley area basin is only 500 acre-feet per year, yet the State Engineer has issued permits for over 10,000 acre-feet of groundwater rights. The State Engineer issued these rights because there is adequate recharge in the basin due to seepage from the Canal. The State Engineer, just like Fernley, believed that this recharge could be relied upon permanently, and that Reclamation would not consider any course of action to curtail it.

Many studies in the basin have been conducted to truly understand the quantity of groundwater recharge that is provided by the Canal. The most recent study was actually completed under the auspices of a Reclamation grant, and it is the Canal seepage study conducted by Fernley. While still in its draft stages, the seepage study initially estimates that groundwater recharge from the Canal in the Fernley area alone is between 8,000 and 12,000 acre feet per year. Other studies conducted by the United States Geological Survey and others have estimated recharge along the entire length of the Canal to be as much as 55,000 acre-feet per year. Clearly, the Canal does not provide merely surface water to northern Nevada; it provides large amounts of groundwater as well.

Fernley is concerned that the current Reclamation Newlands Project Planning Study ("Reclamation Study") will not adequately recognize groundwater delivery to Fernley as a critical use of the Canal in the future. While the Reclamation Study states that it is not intended to result in a binding Reclamation policy for the future of the Canal, we believe that its importance cannot be overstated. We understand that Reclamation intends to rely on the study for any future NEPA scoping related to Canal actions, including identification of the preferred alternative for the future of the Canal. Clearly, the Reclamation Study is more than informational for Reclamation's purposes.

The Reclamation Study should recognize that the Canal delivers surface and groundwater to Fernley. The Reclamation Study should examine multiple options for the Canal going forward, and should calculate efficiencies for Canal operations under each option. Each option should include the delivery of groundwater to Fernley. The Canal's purpose is certainly more than the delivery of surface water. Courts acknowledge this fact, and so does Congress. Reclamation must acknowledge it as well. The Canal has been delivering groundwater to the local aquifer and, subsequently, cities and towns along it, for over one hundred years.

Also, any decision to leave the Canal dry for a portion of the year will impact Fernley. First, there are multiple citizens in Fernley who hold stock watering rights under the *Orr Ditch* Decree. These rights are as valid as any other Claim 3 right, and must be recognized. Second, irrigation rights come with an ancillary domestic right. While Canal water may no longer be fit for human consumption, it is still used by our citizens for other purposes under their domestic right. Finally, any period in which the canal is dry will have an impact on the local aquifer by limiting the recharge it gets from the Canal.

Fernley urges Reclamation to assure the safety of the Canal, and to recognize the importance of the Canal to the citizens of Fernley. We have been relying on the Canal and its recharge of the local aquifer for over a century, and must continue to do so in order to live here. We cannot stress enough that the Canal must remain operational, it must not be lined, and water must be maintained in it on a year-round basis. Any consideration of different Canal operation will jeopardize the future of our City.

Sincerely,

Leroy Goodman
Mayor

Cc: Senator Dean Heller
Senator Harry Reid
Congressman Mark Amodei
Pyramid Lake Paiute Tribe, Honorable Chairman Wayne Burke
Ernest Shank, TCID Board of Commissioners
Donald R. Glaser, Regional Director, Mid-Pacific Regional Director
Kenneth Parr, Mid-Pacific Region Lahontan Basin Manager
State Engineer Jason King, P.E.
Churchill County Commissioner, Norman Frey
Lyon County Commissioner, Joe Mortensen
Governor, Brian Sandoval

United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

IN REPLY REFER TO:

MP-100
~~ADM-1.00~~ PRT-15.00

DEC 07 2012

Honorable Leroy Goodman
Mayor of Fernley
595 Silver Lace Boulevard
Fernley, NV 89408

Dear Mayor Goodman:

On behalf of Bureau of Reclamation Commissioner Michael L. Connor, I am responding to your letter of October 18, 2012, regarding the importance of the Truckee Canal (Canal) to the City of Fernley (City). Commissioner Connor has requested that I provide a response to the concerns you raise in your letter regarding the future of the Canal.

As background, the Canal is an earthen structure constructed in the early 1900s as part of the Newlands Project. It is a Federal facility, operated by the Truckee-Carson Irrigation District (TCID) under contract with Reclamation. The Canal has long been the subject of litigation between the Pyramid Lake Paiute Tribe, the United States, and Newlands Project (Project) irrigators in which the efficiency of the Newlands Project has been a central theme. In 2008, the Canal breached during a January storm event and properties in the City were flooded. Since the breach, Reclamation has restricted Canal usage and maximum flows for public safety. The breach has resulted in new litigation and other concerns over the future of the Canal. It is under these circumstances that Reclamation has initiated a Newlands Project Planning Study (Planning Study).

The City is concerned that the Planning Study will not adequately address the importance of Canal seepage to the City and stresses that the Canal "must remain operational, it must not be lined, and water must be maintained in it on a year-round basis." As part of the Planning Study, Reclamation will consider the City's historic use of Canal seepage water as we deliberate on our options for the future of the Canal. The City will have an opportunity to submit comments on a draft of the Planning Study, which we anticipate issuing for public comment in January 2013. In addition, we are hopeful that the City can resolve its water supply issues and that we can assist in this endeavor under our existing authorities. However, the City should be aware that Reclamation cannot recognize or enforce purported claims of rights to seepage water which are not valid under Nevada law, nor can Reclamation view the City's use of Canal seepage water as valid Project water delivery under the current circumstances.

Under Section 8 of the Reclamation Act of 1902, 43 U.S.C. § 383, nothing in the Reclamation Act "shall be construed as affecting or intended to affect or to in any way interfere with the laws of any

State or Territory relating to the control, appropriation, use, or distribution of water used in irrigation ...." Since at least 1945, the Supreme Court of Nevada has held that a landowner cannot obtain a valid appropriation right simply by diverting surplus or waste water from an artificial ditch of a neighboring irrigator (In re Rights of Claimants, 62 Nev. 456, 466 [Nev. 1945]). Instead, valid water rights in Nevada are obtained only from natural sources.

This principle was reaffirmed in 2007 by the Nevada State Engineer in Ruling 5760. The relevant portion of this ruling was in response to similar concerns and claims raised by the City of Fallon against an application to change the place and manner of use of Newlands Project water under Claim 3 of the Orr Ditch Decree. The application sought to alter the historical use of those water rights from irrigation use on Project lands to wildlife use in the Truckee River, thereby foregoing the diversion of water associated with those rights into the Canal. The City of Fallon protested the application on various grounds including that such a change would decrease the amount of irrigation water ultimately seeping below Project lands and recharging groundwater. The City of Fallon argued that such a change would harm its valid rights to appropriate groundwater in the area.

The State Engineer rejected the City of Fallon's arguments with respect to groundwater recharge and approved the application. As stated in Ruling 5760, pp. 14-15 (footnotes omitted) (2007):

> The State Engineer has previously found that he cannot force a farmer to continue to irrigate lands with a surface-water source in order to provide continued ground-water recharge or to protect the water quantity or quality of a junior ground-water user or any ground-water user. The City of Fallon argues that it does not assert that the water rights must continue to be used at their existing places of use, but rather NRS § 533.370 precludes the transfer if it conflicts with the City's existing water rights, whether surface or ground water, junior or senior or threatens to prove detrimental to the public interest.
>
> If a person merely ceased to irrigate and let the water right lapse, the effect would be the same, but it is the change application process through which the Protestants are trying to express their dissatisfaction with P.L. 101-618 and other changes taking place within the Newlands Project. In effect, the Protestants are arguing, that as junior ground-water right holders who have come to rely on the unnatural recharge the Project created, that any change from that artificial recharge will impact its existing rights and threaten to prove detrimental to the public interest.
>
> The State Engineer, in Order No. 1116, recognized the fact that the recharge experienced from surface-water irrigation was declining in the Carson Desert Hydrographic Basin and thereby restricted further ground-water development in the area. Ground-water development was restricted based on the fact that application of surface water for irrigation was disappearing, but the order did not nor could it order the use of surface water for irrigation to continue. Since the turn of the 20th century and creation of the Newlands Reclamation Project, it is true that surface-water irrigation in the Newlands Project has changed the depth to water over large areas of the valley floor and has increased the amount of water that recharges the ground-water aquifers from that which occurs naturally. The water brought into the

> Newlands Project from the Truckee River is not native to the Carson Desert Hydrographic Basin. The water under consideration in this application is water that the Applicants are requesting to be changed back for use in its river of origin.
>
> The State Engineer recognizes that the effect of changes in water use on local ground-water supplies is not known and is a major public concern. The State Engineer finds he cannot force a person to continue to irrigate with surface water and he will not restrict a change in use of a senior surface-water right in order to provide ground-water recharge. A farmer is not required to continue farming because someone else drilled a ground-water well which depends on the farmer applying water to his land. The State Engineer recognizes that ground-water recharge experienced from surface-water irrigation is declining in the Carson Desert Hydrographic Basin and that ground-water development has been restricted in the area due to the fact that the application of surface water is disappearing, but the surface water users are not going to be restricted in what they can do because others hold ground-water rights that were granted in times when there was much greater surface water irrigation that recharged the ground-water basin. It is the ground-water users that need to be planning for the acquisition of additional water rights to recharge the ground-water basin if they believe such is required.

Contrary to the assertions in your letter, the Nevada State Engineer does not appear to believe that recharge from Newlands Project facilities could be relied upon "permanently."

Reclamation is also prohibited from viewing the City's use of Canal seepage as a valid delivery of Project water. In order to obtain rights to use Project water, the City, or the City's predecessor in interest, would have had to obtain such rights by entering into a contract with either the United States or TCID. We are not aware of any such contract. The terms of any such contract would have provided for the City's proportional share of the repayment of the capital and operation and maintenance costs of Project facilities and provided for the City to proportionally share shortages to Project water supplies with other Project water users. [1]

The contract would also have reserved to the United States, or TCID, the right to collect and use Project seepage water as against any individual Project water user. The United States, or TCID, can use that water in support of authorized Project purposes unless and until such water is abandoned. The United States has not abandoned and does not intend to abandon Project water that seeps from the Canal. The right to reserve and claim seepage water from Reclamation project facilities for use of overall project supplies and purposes was upheld by the United States Supreme Court in Ide v. United States, 263 U.S. 497 (U.S. 1924). Central to the Court's holding on that point was the

---

[1] The City is aware of the key provisions of Project water contracts because the City has acquired several such contractual rights for approximately 10,000 acre-feet of Project water and has applied to the State Engineer for a change in the use of those rights from irrigation to municipal use. Reclamation protested the City's change applications, and Reclamation and the City have entered into a settlement agreement which provides a mechanism to ensure that the City's use of the water for municipal purposes will maintain project efficiencies and otherwise comply with Federal law.

benefit of conserving water diverted from natural sources by a Reclamation project and encouraging use or re-use of project waste water to decrease Reclamation project diversions. While the Canal seepage has occurred in the past, the City cannot force Canal seepage to continue, and such Canal seepage can be used for authorized Project purposes in the future, including to further Project use efficiencies, even if such use results in a reduction or discontinuation of Canal seepage.

In the case of the Newlands Project, conserving Project water, decreasing diversions from the Truckee River, and increasing Project facility efficiencies are mandates set forth under Tribe v. Morton, 354 F. Supp. 252 (D.D.C. 1972), as well as codified by the Newlands Project Operating Criteria and Procedures (OCAP) 43 C.F.R. § 418.1 et seq. The Newlands OCAP set forth criteria for determining the maximum allowable diversions and enforcing Project efficiency standards. In addition, the OCAP mandates that:

> Project water must be managed to make maximum use of Carson River water and to minimize diversions of Truckee River water through the Truckee Canal. This will make available as much Truckee River water as possible for use in the lower Truckee River and Pyramid Lake.

Your letter states that municipal use is a valid use of Project water, as evidenced by P.L. 101-618. Reclamation agrees that municipal use is an authorized use of Project water as provided in P.L. 101-618; however, we do not agree that such authorization provides grounds for Reclamation to maintain seepage from the Canal at historical levels to support the City's municipal use. In fact, P.L. 101-618 states that, "[a]dditional uses of the Newlands Project made pursuant to this section shall have valid water rights ..." (P.L. 101-618, Section 209(a)(2)). Therefore, the authorization to use Project water for municipal purposes does not result in recognition of the City's use of seepage water, as that use is not recognized as a valid water right under the laws of the State of Nevada concerning the appropriation of water.

In addition, in order to use Project water for municipal purposes, such use will need to comply with the efficiency mandates of Tribe v. Morton and the Newlands Project OCAP. Currently, the OCAP does not expressly address efficiency standards for municipal use. This is one reason why Reclamation and the City entered into a settlement agreement over the Truckee Division surface water rights acquired by the City. The settlement agreement provides a process to ensure that future municipal use by the City of those surface water rights achieves substantially the same efficiencies as Project irrigation uses. Otherwise, such use may conflict with P.L. 101-618's mandate to not "increase diversions of Truckee River water to the Newlands Project over those allowed under applicable operating criteria and procedures" (P.L. 101-618, Section 209(b)(1)).

Reclamation remains concerned about the City's water supply and hopes to work with the City on solutions as a way forward; however, your October 18, 2012, letter requests that Reclamation keep the Canal operational, not line the Canal, and keep water in the Canal on a year-round basis, all in recognition of claimed rights to seepage water which are not valid under Nevada law and which are not supported by Federal law. As part of Reclamation's Planning Study, all options must remain on the table as Reclamation considers future plans for this Federal facility. Reclamation commits to considering the City's historical use of Canal seepage water in our Planning Study and intends to assist the City, consistent with our authority.

Please direct any questions to Mr. Kenneth Parr, Lahontan Basin Area Office Area Manager, at kparr@usbr.gov or 775-882-3436.

Sincerely,

ACTING FOR

Donald R. Glaser
Regional Director

cc: Honorable Harry Reid
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Honorable Dean Heller
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Honorable Mark Amodei
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Truckee-Carson Irrigation District
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bc: 91-10000, 92-30000, 96-00000, 96-42020
MP-106, MP-140
LO-100 (Parr), LO-101 (T. Edwards), LO-130 (Berget), LO-131 (H. Edwards)

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Ms. Devon McCune, U.S. Department of Justice, Environment & Natural Resources Division, 999 18th St. South Terrace Suite 370, Denver, CO 80202

Mr. Rod Smith, Office of the Solicitor, Division of Land & Water Resources, 125 South State Street, Suite 6201, Salt Lake City, UT 84138

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Priority/ LBAO

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PAUL G. TAGGART
SONIA E. TAGGART

ADAM O. SPEAR
GREGORY H. MORRISON

April 1, 2013

Michael L. Connor
Commissioner
United States Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825-1898

Due May 21, 2013

Dear Commissioner Conner:

In October, 2012, the City of Fernley ("Fernley") delivered a letter to the Bureau of Reclamation ("Reclamation") asserting its right to continued groundwater recharge from the Truckee Canal ("Canal"). Fernley received a response to that letter on December 7, 2012, which outlined Reclamation's position on continued recharge. Fernley appreciates Reclamation's willingness to communicate in this matter, and sincerely hopes that the door to communication remains open so that it can be resolved to both parties' benefit and satisfaction.

In the December 7 letter, Reclamation's representative, Mr. Glaser, indicated that there is no legal basis upon which Fernley can rely to compel continued recharge to the groundwater aquifer from Canal seepage. While Mr. Glaser's position is appreciated, Fernley believes that more than one of its underlying premises is faulty. Therefore, Fernley believes that its legal position is significantly stronger than Reclamation currently recognizes.

Reclamation's letter states that valid appropriations of water may only come from natural waterways, and not the works of other water appropriators. It is true that, generally, an appropriator of water from the works of another cannot rely on continued water deliveries. However, an exception to that rule exists for waters diverted into artificial watercourses which result in quasi-dedications. *See* 1 Wiel, Water Rights in the Western States § 60, at 59–60 (3d ed. 1911) (*cited favorably by Ryan v. Gallio*, 52 Nev. 330, 286 P. 963 (1930)). *Weil* describes quasi-dedication in the following terms:

There is…an established principle that by lapse of time an artificial watercourse may come to be regarded as equivalent to a natural one…Where the creator of the artificial condition intended it to be *permanent*, and a community of landowners or water users has been allowed to adjust itself to the presence and existence of the artificial watercourse or other artificial condition, acting upon the supposition of its continuance, and this has proceeded for a long time beyond the prescriptive period, the new condition will be regarded as though it were a natural one, its artificial origin being disregarded by the law as it has been by the community. The creator of the artificial watercourse will be held to have dedicated it to the use of the community that has by long time become adjusted to it….

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When Reclamation constructed the Canal over one hundred years ago, it intended the Canal to be permanent. Based upon that, the community of Fernley was allowed to grow around the recharge supplied by the Canal, eventually constructing a water treatment plant in reliance on continued recharge. The Canal is now equated to a permanent, natural condition, and deemed to have been dedicated to the community.

Fernley's groundwater rights have also been permitted by the Nevada State Engineer. Importantly, throughout the application, notice, and protest period required by Nevada law, Reclamation at no time protested the appropriations of groundwater by Fernley. Additionally, Reclamation, in full knowledge of the City's investment in a water treatment facility which can treat only groundwater, never informed Fernley that it reserved the right to line or close the Canal, thus severely curtailing the amount of groundwater available to serve Fernley's 20,000 residents. Reclamation is estopped from now denying the permanence of the Canal.

Reclamation cites to State Engineer's Ruling No. 5760 to support its claim that the State Engineer did not intend Fernley's groundwater source to be permanent. Ruling 5760 involved a groundwater appropriator's claim that an application to change an irrigation right to a downstream environmental use would harm its existing rights. The State Engineer ruled that he could not compel an irrigator to continue irrigating, regardless of the potential harm to the appropriator's rights. The Canal is vastly different than an individual irrigator, or even a system of appropriators. Noted above, the Canal is now deemed to be a permanent water condition. Beyond that, Reclamation is neither the appropriator nor the beneficial user of the water in the Canal. The U.S. Supreme Court has held that Newlands Project water users are the beneficial owners, and therefore the appropriators of Project water. Reclamation is merely the owner of the means of delivery of that water. *Nevada v. United States*, 463 U.S. 110 (1983). Therefore, requiring continued delivery of a valid appropriation is vastly different from compelling an irrigator to continue to irrigate. Ruling 5760 simply does not apply to the current situation.

Reclamation's position that the aquifer recharge from the Canal is "waste water" does not comport with the Nevada Supreme Court's definition of wastewater. It is defined as "such water as escapes from the works or appliances of appropriators without being used...." *Ryan v. Gallio*, 52 Nev. at 334, 286 P. at 967 (citing *Kinney on Irrigation (2d Ed)* § 661). As noted above, Reclamation is neither the appropriator nor the beneficial owner of Project water. Thus, the aquifer recharge is not escaping from the Canal unused, and it is not waste water.

Based on the parties' disparate positions, Fernley requests the opportunity to negotiate with Reclamation in the coming months. Fernley believes that open negotiations will lead to a greater understanding of the parties' relative legal positions, as well as a potential agreement that will take both parties' needs into account. I hope that Reclamation recognizes the potential for beneficial discussions and agrees to meet with Fernley.

Please contact my office at your earliest convenience so that we can schedule what I'm certain will be informative and productive discussions as soon as possible.

Sincerely,

Paul G. Taggart

PGT/sos

cc: Mayor Leroy Goodman
Senator Dean Heller
Senator Harry Reid
Congressman Mark Amodei
Pyramid Lake Paiute Tribe, Hon. Chairman Elwood Lowry
David Murillo, Regional Director, Mid-Pacific Regional Director
Kenneth Parr, Mid-Pacific Region Lahontan Basin Manager
State Engineer Jason King, P.E.
Churchill County Commissioner, Carl Erquiaga, Chairman
Lyon County Commissioner, Joe Mortensen, Chairman
Governor, Brian Sandoval
Fernley City Manager, Chris Good
Fernley City Engineer, Shari Whalen, P.E.

United States Department of the Interior
BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

IN REPLY REFER TO:

MP-100
ADM-1.00

MAY 24 2013

Mr. Paul G. Taggart, Esq.
Taggart & Taggart, Ltd.
108 No. Minnesota Street
Carson City, NV 89703

Dear Mr. Taggart:

On behalf of Bureau of Reclamation Commissioner Michael L. Connor, I am responding to your letter of April 1, 2013, regarding the City of Fernley's (City) position that the City is legally entitled to a permanent supply of seepage water from the Truckee Canal. Your letter was in response to Reclamation's December 7, 2012, letter to the City setting forth Reclamation's analysis that the City has no legal claim to the continued existence of seepage water under Nevada law, and, therefore, Reclamation is without authority or right to recognize such a claim. Your letter responds that the City's legal claim to the continued existence of seepage water from the Truckee Canal is based upon a "quasi-dedication" of an artificial water course to the public.

Reclamation is not persuaded that the City's "quasi-dedication" theory is recognized law of Nevada, nor that this theory is applicable to the City's claim to a perpetual right to appropriate Truckee Canal seepage water under Nevada law; therefore, Reclamation continues to hold our position that we are without authority or right to recognize a valid water right in the City based on a "quasi-dedication" theory, and we cannot negotiate a solution based upon such a claim. As we set forth in our December 7, 2012, letter, however, Reclamation is willing to assist the City with supply issues, consistent with our authorities.

The "quasi-dedication" theory you cite comes from a 1911 legal treatise entitled "Water Rights in the Western States" by Samuel Charles Wiel. Chapter 4 of this treatise, entitled "The Law Confined to Natural Resources," discusses the general and widely recognized rule that water rights, especially appropriation rights in the West, can only be obtained from natural, not artificial, sources. As stated by Wiel:

> Only owners of rights in the natural streams have "natural rights" or rights in a natural water body; all others derive a right only through some stream-owner, a derivative and not a natural right. This gives great value to the owners of natural water resources, and is a disadvantage to water users owning no rights in the stream itself and building up improvements at a distance from streams in reliance upon water coming from works or land of stream appropriators or riparian owners; but that is simply an inevitable disadvantage inherent in natural situation away from streams, or where streams have been all taken up by prior rights where the law permits their appropriation. *1 Wiel, Water Rights in the Western States,* § 53, p. 47 (3d ed. 1911)

This is consistent with Reclamation's position that the City, or its predecessor in interest, would have had to obtain a contract right, or other derivative right, from Reclamation or the Truckee-Carson Irrigation District to obtain legal rights to water diverted from the Truckee River under Claim 3 of the Orr Ditch Decree. As we stated in our December 7, 2012, letter, we are aware of no such contract. Wiel further discusses the general rule and states that:

> [w]hile artificial flow claimants may thus have priorities between themselves, they can have no right *of continuance* against the owner of the natural supply (the appropriator on the natural stream … . Yet unless they have a contract with the stream-owner, they must generally rely upon continued receipt from him of such water at their peril. In such case the creator of this artificial flow may cease to allow it to escape. *Wiel, supra,* § 56, pp. 50-51 *(emphasis in original)*

This is consistent with Reclamation's position that the City has no legal claim to the continued existence of seepage water from the Truckee Canal and consistent with Nevada State Engineer's Ruling 5760 that, "It is the ground-water users that need to be planning for the acquisition of additional water rights to recharge the ground-water basin if they believe such is required." We find no authoritative Nevada law which evidences that Nevada follows any other than this widely accepted general rule regarding artificial water sources.

The Wiel treatise continues that no length of time or expense by artificial flow claimants results in an appropriation, prescriptive right, or estoppel. *Wiel, supra,* § 57 pp. 52-56. To illustrate the application of this general rule, the Wiel treatise discusses a seminal Nevada case, *Cardelli v. Comstock T. Co.*, 26 Nev. 284 (1901). Wiel states:

> A modern illustration, entirely to the same effect, arose out of the waters flowing from the Sutro tunnel, below Virginia City, Nevada. Plaintiffs used waste water that was being pumped from the Comstock mines, and discharged in large volume through the Sutro tunnel, which had been built to drain those mines. This discharge, the court held, was an artificial stream, and not subject to appropriation by plaintiff so as to give any right against the tunnel company. The court put this case: "One further illustration: A, by artificial means, fills a tank or reservoir on his own land today, and permits the waters to flow down to B's land and irrigate B's land. Probably A's conduct gives to B the right to that water – that individual tank or reservoir full. But suppose A fills the same tank or reservoir to-morrow, but chooses to use this water – this tank or reservoir full—to irrigate his own land; what right has B to this last water? We think none, and it makes no material difference if such a state of things were kept up for a long number of years. In such case, time would raise no presumption of grant, and A could at any time stop the production of such artificial and temporary stream; and he could also, at any time, if he continued the production of such stream, put the waters thereof to his own use." *Wiel, supra,* § 58, pp. 57-58

The court in *Cardelli* states, "we think waters situated as those above stated are not appropriable; that is, not subject to appropriation. Such waters are not like waters running in streams on the public domain of the United States. They are produced by the capital, labor and enterprise of those developing them, and by such developing they become the property of those engaged in the enterprise." *Cardelli, supra*, at 295.

The Wiel section upon which you rely is § 60, which discusses narrow exceptions to the general rule that water rights are obtained only from natural sources. The exceptions Wiel notes are grant, condemnation, and dedication. It is under the "dedication" exception that Wiel discusses circumstances under which an artificial watercourse can be deemed a natural condition. No Nevada cases are cited by Wiel for this proposition. In addition, the cases from the early 1900s discussing this theory have applied the "dedication" theory only in terms of riparian water rights, not appropriation rights. Nevada has not recognized rights to water based on the common law riparian doctrine since at least 1889. *Reno Smelting, Milling & Reduction Works v. Stevenson*, 20 Nev. 269 (Nev. 1889).

All of the cases cited by Wiel in which this theory was deemed to affect water rights were in states that recognized, at least at that time, the right of riparian landowners to continued flow across their adjacent lands. In these cases, riparian interests could obtain a water right based upon the waters across their property, irrespective of whether the stream's course had been artificially altered. These cases involved the artificial alteration of watercourses in which most, if not all, of the entire flow of a natural stream's course was altered. They did not involve diversion works constructed to appropriate, under claim of right, a portion of a natural river, such as the Truckee Canal. We have found no case in which this theory was used by a plaintiff, individually or as a community, to obtain a validly recognized right of appropriation, or some derivative right thereof, as against other appropriators of the natural stream or for the continued existence of waste, drain, or seepage water from any constructed diversion works. Instead, this circumstance follows the general rule, as expressed by the Nevada Supreme Court in *Cardelli v. Comstock T. Co.*, *supra,* that an appropriator of an artificial source has no right to the continued existence of that source.

We do not read the Nevada case in which you cite, *Ryan v. Gallio*, 52 Nev. 330 (1930) as favorable to the "quasi-dedication" theory. Rather, this case considers the doctrine simply for the case of argument and then dismisses it as inapplicable to a plaintiff claiming a valid right to agricultural waste water. In that case, the plaintiff had constructed drains to capture waste water flowing from an appropriator's agricultural lands and then complained when the appropriator changed the place of use of that water. The majority opinion held that "no valid or legal appropriation was made by plaintiff." The court did not adopt Wiel's "quasi-dedication" theory. The concurring opinion in that case put it succinctly: "In my opinion the facts of this case do not bring it within the principles laid down by Mr. Wiel or any of the cases cited in support of the contention pertaining to a situation growing out of the diversion of the entire flow of water from a natural stream." *Ryan v. Gallio,* 52 Nev. 330 at 348.

Under these circumstances, we are not persuaded that the Nevada law grants to the City any right to the continued existence of seepage water from the Truckee Canal. We additionally find unpersuasive your arguments regarding title to water in the Truckee Canal. Specifically, you state that Reclamation is not the appropriator of the water rights for the Truckee Canal. That is incorrect. The United States originally appropriated the water for the Newlands Project (Project) and the Truckee Canal pursuant to both federal Reclamation law and Nevada law. The United States holds legal title to the water rights for the Project, while the individual Project water users hold the beneficial interest in that water right (in any event, the City's claim to a permanent seepage supply would invalidly take water from whomever holds valid rights to divert or use the natural flow of the Truckee River under Claim 3 of the Orr Ditch Decree). Nor do we find it persuasive, or relevant,

that you are seeking the continued existence of delivery of water through the Canal, instead of the continuation of irrigation practices, as in State Engineer Ruling 5760. Delivery of water through the Truckee Canal has no bearing on whether the condition of seepage (i.e., leaks) from the Canal continues to exist.

You also mention that Reclamation did not protest the City's applications to appropriate groundwater in the Fernley area. Because the City has no right to the continued appropriation and use of Truckee Canal seepage waters, such applications are not adverse to the interests of the United States. Our review of the applications shows that the City named "groundwater" as its source (not the Truckee Canal), and that the State Engineer granted such applications only to the extent that water was available. The City's groundwater applications, therefore, have no direct bearing on the condition of the Canal, or seepage waters from the Canal.

We reiterate that Reclamation remains available to discuss the City's water supply issues consistent with its authorities; however, Reclamation declines, at this time, to enter negotiations on the premise that the City has a legal entitlement to the continued existence of Truckee Canal seepage water.

For additional information or to schedule a meeting, please contact Mr. Kenneth L. Parr, Area Manager, Lahontan Basin Area Office, at 775-884-8356 or kparr@usbr.gov.

Sincerely,

David G. Murillo

David G. Murillo
Regional Director

cc: Honorable LeRoy Goodman
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595 Silver Lace Boulevard
Fernley, NV 89408

Honorable Brian Sandoval
Governor of Nevada
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Carson City, NV 89701

Honorable Harry Reid
United States Senator
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cc: Continued from previous page.

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MP-106, MP-140, MP-400, MP-460
LO-100, LO-101, LO-900

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Appendix G

List of Concurrent Projects

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G. List of Concurrent Projects

Table G-1. Factors Associated with Past, Present, and Reasonably Foreseeable Future Actions

Cumulative Action	Summary Information	Probability of Contributing to Canal Impacts
Water		
City of Fernley Water Master Plan (2008)	The 2008 Water Master Plan is intended to facilitate water resource management and capital improvement planning necessary to accommodate Fernley's expected growth.	Low
City of Fernley Sewer Master Plan Update (2009)	The 2009 Sewer Master Plan Update is intended to identify the sewer system facilities necessary to accommodate the land uses envisioned in the City of Fernley's (City's) 2005 Comprehensive Plan. The 2009 Sewer Master Plan Update identifies the facilities needed to accommodate the build-out of the 2005 Comprehensive Plan and uses projected growth rates taken from the comprehensive plan's land use element.	Low
Surface water delivery structure to Fernley Water Treatment Plant	This is a proposed delivery structure to convey surface water from the Canal to the Fernley Water Treatment Plant. Conveyance would be within Fernley's existing permitted water rights.	Medium
Derby Dam Fish Screen	The Derby Dam Fish Screen Environmental Assessment and Finding of No Significant Impacts were completed in 2001. Construction is expected to begin in the fall of 2019.	Medium
Land Use and Strategic Plans		
Churchill County Master Plan	The master plan is designed to establish Churchill County's vision for the future. It provides the framework and foundation for decision-making for the Board of County Commissioners, the Planning Commission, and the community on matters relating to growth and development through 2030.	Medium

Cumulative Action	Summary Information	Probability of Contributing to Canal Impacts
City of Fernley Parks Master Plan	The 2017 Fernley Parks Master Plan reflects the vision and goals of the City and provides direction for the City's decision-making over a planning horizon of 10 years. The primary purpose of this master plan update is to ensure the City's fiscal resources are appropriately used and that parks, trails, and open spaces meet the needs of the community and enhance the quality of life for residents. This plan also provides recommendations for funding, a list of improvements for short- and long-term implementation, and a high-level review and recommendations for O&M.	Low
A strategic plan for the City of Fernley for Fiscal Years 2017 through 2021	The strategic plan provides the City and the community with a general direction in responding to potential opportunities and threats as they emerge, based on the City's and the community's current set of strengths and weaknesses. The plan is tied to an overall set of core values, mission, vision, and clearly defined objectives and goals. It will provide the City and the community with a structure to guide the development and implementation of future action plans.	Medium
City of Fernley 2017–2018 Budget	This provides the budget for City departments and services for fiscal year 2017–2018.	Medium
Natural Resources Plans		
BLM Carson City Resource Management Plan/EIS	The BLM has prepared a proposed resource management plan (RMP) and final EIS. This document provides the direction for managing public lands under the jurisdiction of the BLM Carson City District, which includes lands adjacent to the Canal and within the cumulative effects areas (CEAs). As part of the RMP, the BLM has identified some of these lands as available for disposal.	Medium
Wildlife and special status species management	Management of wildlife as special status plant and animal species has occurred in the CEAs and is expected to continue.	Medium
Invasive, nonnative species and noxious weeds	Invasive, nonnative species and noxious weeds are present in the CEAs; treatments have been conducted and are expected to continue.	Low
Transportation		
Interstate 11 corridor	This is a proposed interstate corridor that would bisect the Canal at the current US Highway 50 crossing.	Medium

Cumulative Action	Summary Information	Probability of Contributing to Canal Impacts
Energy and Utility Development		
Geothermal exploration and development	In the Brady Hot Springs area, there is a power plant on private lands and a proposed well development on a BLM-administered lease north of the Hot Springs Mountains.	Low
Community and Agricultural Development		
Agricultural development	There are agricultural activities within the CEAs that include the use of heavy equipment, pesticides, fertilizer, and livestock grazing. These activities are expected to continue.	Medium
Sage Ranch Estates Phase 2 Subdivision	This is a proposed 162-unit, single-family subdivision on 150 acres directly south of the Canal at the ends of Cable Canyon Way, Seabiscuit Drive, and Saddle Horn Way.	Medium
Green Valley Estates Subdivision	This is a proposed residential subdivision located west of Ricci Lane and the terminus of Opal Way, directly north of the Canal. The site has been mass graded, but there is no approved final subdivision map for the project.	Low
Eagle Meadows Subdivision	This is a proposed 35-lot, single-family residential subdivision located north of Curtis Place and east of Highway 95A, approximately 2,000 feet north of the Canal.	Low
Nelson Meadows Subdivision	This is an approved single-family residential subdivision located north of Farm District Road and west of Rainbow Lane, approximately 1,500 feet north of the Canal.	Low

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