Mountain Counties Bridge Rails

Four bridges in Alpine County near the town of Markleeville

10-ALP-4/88/89-Various

10-1300-0009

SCH #: 2018022019

Initial Study
with Mitigated Negative Declaration

Prepared by the

State of California Department of Transportation

December 2018

Caltrans

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General Information About This Document

The California Department of Transportation (Caltrans) has prepared this Initial Study (IS), which examines the potential environmental impacts of the proposed project located in Alpine County, California. Caltrans is the lead agency under the California Environmental Quality Act (CEQA). The document tells you why the project is being proposed, how the existing environment could be affected by the project, the potential impacts of the alternatives, and the proposed avoidance, minimization, and/or mitigation measures. The Initial Study was circulated to the public for 30 days between February 6 to March 9, 2018. Comments received during this period are included in Appendix D. Elsewhere throughout this document, a vertical line in the right margin indicates a change made since the draft document circulation. Minor editorial changes and clarifications have not been so indicated. Additional copies of this document and the related technical studies are available for review at the Caltrans district office, 1976 E. Dr. Martin Luther King, Jr. Blvd., Stockton.

The document can also be accessed electronically at the following website: http://www.dot.ca.gov/d10/projects.html.

For individuals with sensory disabilities, this document is available in Braille, in large print, on audiocassette, or on computer disk. To obtain a copy in one of these alternate formats, please call or write to Caltrans, Attn: Andrew Chan, Acting Branch Chief, Northern San Joaquin Environmental Management Branch, 1976 East Dr. Martin Luther King Jr. Blvd, Stockton, CA 95205; Phone: (209) 948-7879, or use California Relay Service 1 (800) 735-2929 (TTY), 1 (800) 735-2929 (Voice), or 711.

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SCH #: 2018022019
10-ALP-4/88/89-VAR
10-1300-0009

Upgrade bridge rails to all four bridges in Alpine County on State Route 4, 88, and 89, near the town of Markleeville. In addition, shoulder widening, and scour mitigation will occur at the Markleeville Creek Bridge on SR 89.

INITIAL STUDY
with Mitigated Negative Declaration

Submitted Pursuant to: (State) Division 13, California Public Resources Code

THE STATE OF CALIFORNIA
Department of Transportation

12/28/18
Date of Approval

Andrew Chan
Acting Branch Chief
California Department of Transportation

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Mitigated Negative Declaration

Pursuant to: Division 13, Public Resources Code

Project Description

The California Department of Transportation (Caltrans) proposes to upgrade existing bridge rails on four bridges in Alpine County on State Routes 4, 88, and 89. One of those bridges, Markleeville Creek, will have additional shoulder widening and scour mitigation at one of its abutments.

Determination

The proposed project would have no effect on: aesthetics, agriculture and forest resources, air quality, cultural resources, geology and soils, hazardous waste and materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation/traffic, as well as utilities and service systems.

In addition, the proposed project would have no significantly adverse effect on biological resources because the following mitigation measures would reduce potential effects to insignificance:

- Caltrans will apply for any necessary permits from the United States Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), and the Regional Water Quality Control Board (RWQCB). Impacts will be mitigated in accordance with agency requirements to ensure no net loss of acreage or value to waters of the United States which will include restoring temporarily impacted areas to pre-project condition.

- Caltrans will mitigate for the impacts to the waters of the United States either through the National Fish and Wildlife Foundation's In-Lieu Fee Program or from USACE and/or CDFW approved mitigation bank at a minimum 1 to 1 ratio (one acre of habitat replaced for every one acre filled). Based on the preliminary project design, the project will have 0.01 acre of permanent impacts to riverine habitat (Markleeville Creek).

- Caltrans shall compensate for temporary and permanent impacts to yellow willow grove riparian (riparian) habitat. Temporary impacts to riparian habitat will be revegetated at a minimum of a 1 to 1 ratio. Permanent impacts at Markleeville Creek

will require the replacement of 0.07 acre of riparian habitat and an additional 2 to 1 ratio for creation and enhancement. The total replacement ratio for permanent impacts will be 3 to 1.

- Native riparian vegetation temporarily impacted by the project will be replaced on-site at a 1:1 ratio. Shaded riverine habitat credits will be purchased at a USACE approved conservation bank at a 2 to 1 ratio. This would meet an overall project goal of a 3 to 1 mitigation ratio for shaded riverine habitat permanently impacted by the proposed project.

12/28/18

Andrew Chan
Acting Branch Chief
California Department of Transportation

Date

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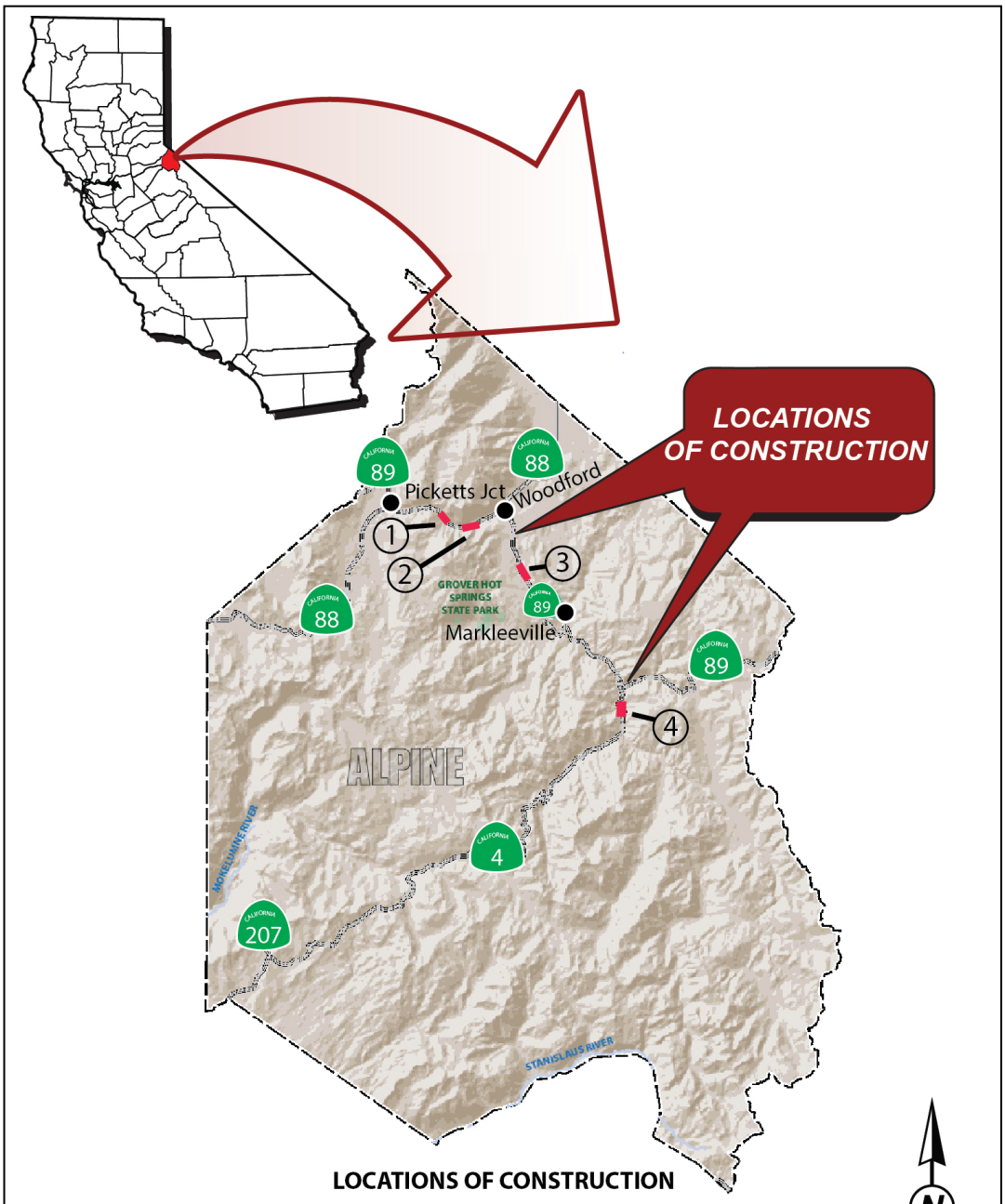
Project Description and Background

Project Title

Mountain Counties Bridge Rails

Project Location

The project is located at four different bridges in the Alpine County on State Routes 4, 88, and 89. In general, all four bridges are located within the forested area of the Sierra Nevada Mountains. Two of the bridges, both West Fork Carson River Bridges (Numbers 31-0022 and 31-0005), are located on State Route 88 between Picketts Junction and Woodfords. One bridge, Markleeville Creek Bridge (31-002), is located on State Route 89 in the town of Markleeville. The last bridge, Silver Creek Bridge (31-0001) is located between the State Route 4 and 89 junction and Ebbetts Pass on State Route 4. The exact post mile location of each bridge is listed in both the project vicinity and location maps (Figures 1 and 2).

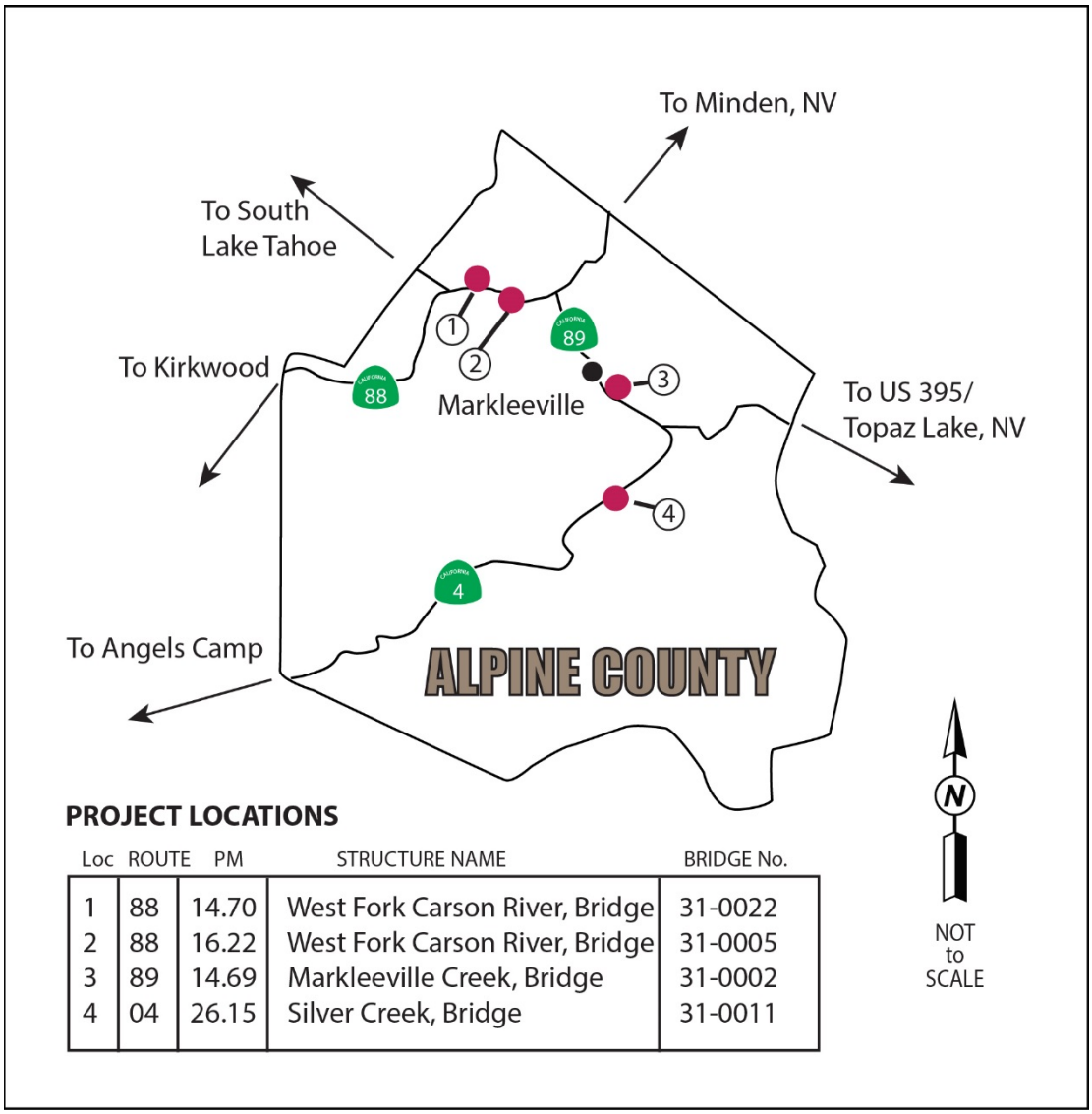


LOCATIONS OF CONSTRUCTION

Loc	ROUTE	PM	STRUCTURE NAME	BRIDGE No.
1)	88	14.70	West Fork Carson River, Bridge	31-0022
2)	88	16.22	West Fork Carson River, Bridge	31-0005
3)	89	14.69	Markleeville Creek, Bridge	31-0002
4)	04	26.15	Silver Creek, Bridge	31-0011

NOT to SCALE

Figure 1. Project Vicinity Map



PROJECT LOCATIONS

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1	88	14.70	West Fork Carson River, Bridge	31-0022
2	88	16.22	West Fork Carson River, Bridge	31-0005
3	89	14.69	Markleeville Creek, Bridge	31-0002
4	04	26.15	Silver Creek, Bridge	31-0011

Figure 2. Project Location Map

Description of Project

The California Department of Transportation (Caltrans) proposes to remove and replace the existing bridge rails at four bridges in Alpine County. In addition to the bridge rail work, the Markleeville Creek Bridge will include shoulder widening to standard eight foot shoulders and scour mitigation installed at one of its abutments. Construction is anticipated to take one construction season during the dry season between June 1 and October 15 at the West Fork Carson Bridges and Silver Creek Bridge. A second season of work during the dry season will be needed to complete the shoulder widening and scour mitigation work at the Markleeville Creek Bridge. The project is expected to be completed during the 2021 and 2022 construction seasons.

The project scope for Locations 3 and 4 were revised between draft environmental document and final environmental document. A detailed scope of work, including project scope changes, for each location is listed below:

Location 1 West Fork Carson River Bridge (31-0022)

The existing concrete bridge rail will be removed and replaced with California Type 80 barrier with Tubular Bicycle Railing. After bridge rail installation, the existing asphalt concrete will be removed from the bridge deck and a 2 inch thick polyester concrete overlay will be installed on the deck. The overlay will be placed on the deck for the entire span prior to finishing the deck to grade (tying into the highway on both ends).

Location 2 West Fork Carson River Bridge (31-0005)

The existing timber rail, timber posts, curb, and sidewalk will be removed and replaced with California Type 80 barrier with Tubular Bicycle Railing. After the bridge rail installation, the existing asphalt concrete will be removed from the bridge deck and a 2 inch thick polyester concrete overlay will be installed on the deck. The overlay will be placed on the deck for the entire span prior to finishing the deck to grade.

Location 3 Markleeville Creek (31-0002)

The bridge abutments will be replaced, with shoulder widening to meet standard eight (8) foot shoulders. In addition, scour mitigation will be placed along the northern bridge abutment in the form of riprap. There is an existing 8-inch culvert in the southeast corner of the bridge which will be removed and replaced in-kind. There is also an existing 24-inch culvert in the northwest corner of the bridge which will be relocated and replaced in kind. Portions of existing stone masonry walls that are adjacent to the bridge abutments will be required to be removed and rebuild. Both the north and south Markleeville Creek bridge abutments are within the active creek channel and therefore will require in-water work. Temporary diversion dams will be incorporated to divert water flows away from the in-water work areas during the in-water work window (June 1 to October 15). The diversion dams will be composed of washed river gravel, which may be used as potential fish spawning habitat after construction is complete. If flows within the creek are low, the diversion dam may be composed of simple berms and pipes; however, if the flows are higher the diversion dam may include concrete k-rail barriers to bolster the gravel berms. The design of the diversion dams will ensure adequate fish passage during the in-water work window.

It is assumed that staging areas and construction access to the creek during the in-water work window will occur on both sides of the creek on the upstream and downstream side of the bridge. Vegetation, including riparian habitat, within the staging areas on the upstream side of the bridge will be removed to accommodate for the two-season construction schedule.

To accommodate for the one lane traffic control during construction, one side of the bridge will be widened during the first stage, while the opposite side of the bridge will be widened during the second stage. The project's construction staging has been designed so that all

work in the stream bed will be completed during the in-water work window to minimize impacts to the creek and wildlife. The June 1 through October 15 period is due to the salmonid migration and spawning periods that occurs outside of this window.

Location 4 Silver Creek Bridge (31-0011)

The existing metal beam guard rail will be removed and replaced with California ST - 70 railing. The bridge will require in-water work in Silver Creek to accommodate five (5) foot shoulders on both sides of the bridge. The bridge will be widened three (3) feet on both sides by removing and replacing the overhangs. After the bridge rail installation, the existing asphalt concrete will be removed from the bridge deck and a 2" polyester concrete overlay will be installed on the deck. The overlay will be placed on the deck for the entire span prior to finishing the deck to grade. Construction is anticipated to take two seasons.

Carbon fiber strengthening technique will be employed at the replacement overhang and the existing concrete Tee girders. Carbon fiber strengthening work includes cleaning existing concrete surfaces, spreading a bonding agent to the existing concrete bridge superstructure beams and then applying carbon fiber strips to the bonding agent. Subsequent layers of bonding agent and carbon fiber strips are applied at right-angles to the previous layer to orient carbon fiber strands in different directions from the previous layer to maximize continuity of added strength of fibers.

The platforms and temporary support footings for the temporary falsework will require level ground and will require either a combination of grading and adding gravel within the banks of the Silver Creek. A temporary diversion dam will be placed in the bed of Silver Creek to divert water where temporary footings will be necessary to construct the temporary falsework footing. The temporary diversion dam will be constructed using a combination of multiple materials, such as: pre-washed cobbles with gravel, K-rail , precast concrete blocks, rock filled gabions, thick plastic-rubber-neoprene pool liners, added berm-erosion-control-diversion pipes 12 to 24 inches in diameter, bolted-down or free standing pre-fabricated metal or plastic berm liners to support gravel placements on edges of berms, or thick plastic-rubber-neoprene bladders filled with water to line edges of berms.

It is assumed that staging areas and construction access to the creeks during the in-water work window will occur on both sides of the creek on the up- and downstream sides of the bridges. Vegetation (including riparian habitat), within the staging areas on the upstream and downstream sides of the bridge, will be removed to accommodate for the two-season construction schedule. Upland vegetation along the upstream and downstream portion of the bridge will be a permanent impact.

Surrounding Lands Uses and Setting

All four project locations are located in the forested area of the Sierra Nevada Mountains within the State right of way. The Carson River and Silver Creek run below West Carson Fork Bridges and Silver Creek Bridge, respectively. All three bridges are directly adjacent to United States Forest Service land that consists primarily of natural habitats that are used for recreational purposes.

The Markleeville Creek Bridge is located on the southern edge downtown Markleeville and Markleeville Creek runs below it. Areas on the southern side of the Markleeville Creek Bridge are zoned as residential with suburban single family homes located along Laramie Street. Although the area is zoned as residential, Elizabeth Coyan Park is located directly southwest of the Bridge. Land use to the east and northeast of the Markleeville Creek Bridge is also zoned as residential.

The area northwest of the Markleeville Creek Bridge is zoned as institutional or public use. Currently, the Markleeville Heritage Park and Nature Area occupies this area.

Table 1. Other Public Agencies Whose Approval is Required

Agency	Permit/Approval	Status
United States Fish and Wildlife Service	Biological Opinion for Section 7 consultation for federally listed threatened and endangered species	Consultation with the United States Fish and Wildlife Service was initiated on December 05, 2017. A Biological Opinion was received on December 12, 2018.
Regional Water Quality Control Board	401 Water Quality Certification	Application for the 401 permit will be submitted during the design phase of the project.
United States Army Corps of Engineers	404 Nationwide Permit	Application for the 404 permit will be submitted during the design phase of the project.
California Department of Fish and Wildlife	Fish and Game Code Section 1602 Streambed Alteration Agreement	Application for the 1602 permit will be submitted during the design phase of the project.

CEQA Environmental Checklist

10-ALP-4/88/89	VAR	10-0X750
Dist.-Co.-Rte.	P.M/P.M.	E.A.

This checklist identifies physical, biological, social and economic factors that might be affected by the proposed project. In many cases, background studies performed in connection with the projects indicate no impacts. A NO IMPACT answer in the last column reflects this determination. Where there is a need for clarifying discussion, the discussion is included either following the applicable section of the checklist or is within the body of the environmental document itself. The words "significant" and "significance" used throughout the following checklist are related to CEQA, not NEPA, impacts. The questions in this form are intended to encourage the thoughtful assessment of impacts and do not represent thresholds of significance.

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
I. AESTHETICS: Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒
II. AGRICULTURE AND FOREST RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and the forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒
III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☒
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non- attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒
IV. BIOLOGICAL RESOURCES: Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☒	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☒	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒
V. CULTURAL RESOURCES: Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☐	☒
VI. GEOLOGY AND SOILS: Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

VII. GREENHOUSE GAS EMISSIONS: Would the project:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	Caltrans has used the best available information based to the extent possible on scientific and factual information, to describe, calculate, or estimate the amount of greenhouse gas emissions that may occur related to this project. The analysis included in the climate change section of this document provides the public and decision-makers as much information about the project as possible. It is Caltrans' determination that in the absence of statewide-adopted thresholds or GHG emissions limits, it is too speculative to make a significance determination regarding an individual project's direct and indirect impacts with respect to global climate change. Caltrans remains committed to implementing measures to reduce the potential effects of the project. These measures are outlined in the climate change section of the document.

VIII. HAZARDS AND HAZARDOUS MATERIALS: Would the project:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒
IX. HYDROLOGY AND WATER QUALITY: Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow	☐	☐	☐	☒

X. LAND USE AND PLANNING: Would the project:

a) Physically divide an established community?	☐	☐	☐	☒
b)Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

XI. MINERAL RESOURCES: Would the project:

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

XII. NOISE: Would the project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
XIII. POPULATION AND HOUSING: Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
XIV. PUBLIC SERVICES:				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XV. RECREATION:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒
XVI. TRANSPORTATION/TRAFFIC: Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☒
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Conflict with adopted policies, plans or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒
XVII. TRIBAL CULTURAL RESOURCES: Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	☒

XVIII. UTILITIES AND SERVICE SYSTEMS: Would the project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
XIX. MANDATORY FINDINGS OF SIGNIFICANCE				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☒
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	☒
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

Additional Explanations for Questions in the Impacts Checklist

This section provides additional explanations for CEQA checklist items that have a "less than significant" determination. Other environmental resources that have a "no impact" determination are not discussed in this document.

IV. Biological Resources (checklist questions a, b, c, and d)

A Natural Environment Study (NES) was completed for this project in November 2017. This technical study covers all the information discussed under the CEQA Appendix G Checklist item IV. Biological Resources.

a) & d) *Threatened, Endangered, and Special Status Species*

Caltrans initiated Section 7 consultation with the United States Fish and Wildlife Service (USFWS) on November 30, 2017, for potential effects to federally listed species. The Federal Endangered Species Act determination for the Sierra Nevada yellow-legged frog and Yosemite toad, along with their designated critical habitat is "may affect, but not likely to adversely affect". The Federal Endangered Species Act determination for the Lahontan cutthroat trout is "may affect, likely to adversely affect". Critical habitat has not been designated for the Lahontan cutthroat trout. Caltrans received an Biological Opinion from USFWS on December 12, 2018. The project would have "no effect" to all other species and their habit identified on the USFWS Federal Endangered Species Act list.

The project area is outside of National Oceanic Atmospheric Association (NOAA) Fisheries jurisdiction. Therefor there is no effect to any NOAA Fisheries Species.

Affected Environment

Lahontan cutthroat trout

The Lahontan cutthroat trout (*Oncorhynchus clarkii henskawi*) was listed as an endangered species on October 13, 1970, and reclassified as a threatened species by the USFWS on July 16, 1975. Lahontan cutthroat trout inhabit a wide range of habitats from cold, high-elevation mountain streams to highly alkaline desert lakes. They historically occurred within a vast range east of the Sierra Nevada Mountains, but have been extirpated from 95 percent of their native habitat in California. Historically, their range in California included Lake Tahoe and the Carson, Truckee and Walker rivers. Currently, within the Carson River basin, it is estimated that Lahontan cutthroat trout occupy about 9 miles of habitat in headwater streams above barriers, comprising 3 percent of the historic range in the Carson River basin.

No focused surveys were conducted for this species. There is one CNDDB (California Natural Diversity Database) occurrence (Occ. # 22) of this species within five miles of the Biological Study Area (BSA). This occurrence is located approximately 2.5 miles southwest of Silver Creek Bridge. This occurrence is located within Raymond Meadows Creek, just north of Highway 4. Individuals were identified during a single pass of a one mile section of the creek in 1995, and were likely part of an introduced population. The occurrence is

presumed extant. Silver Creek contains potential habitat for the species, however they have never been observed within the BSA.

Lahontan cutthroat trout has a low potential to occur in the BSA. It is not known to currently occupy Markleeville Creek, but is known to occur within the East Fork of the Carson River, which Markleeville Creek flows into. Since there are no barriers to fish migration between the East Fork of the Carson River and Markleeville Creek, it is presumed that Lahontan cutthroat trout could potentially be present within Markleeville Creek at Location 3.

Sierra Nevada yellow-legged frog

The Sierra Nevada yellow-legged frog (*Rana sierra*) is a federally endangered, small (approximately 1.5 to 3.25 inches) frog inhabiting high-elevation, aquatic environments including lakes, ponds, marshes, meadows, and streams ranging from 4,500-12,000 feet above sea level on the western slopes of the Sierra Nevada, north of Monarch Pass in Fresno County, as well as, the eastern slopes of the Sierra Nevada from Inyo County to areas north of Lake Tahoe. In its northern range, the species has been observed as low as 3,500 feet. The species is highly adapted for the aquatic environment and is rarely observed more than 3.3 feet from the water's edge.

Focused visual encounter surveys (VES) for amphibians were conducted for this species at Location 3. No amphibians of any kind were identified during these surveys. At the other three project locations, focused VES were not conducted, but desktop analysis was performed to determine habitat suitability for this species. There are six CNDDB occurrences of this species within five miles of the BSA. The nearest occurrence (Occ. # 244) is located approximately 2.7 miles southwest of Location 4. This occurrence is located within Silver Creek, 2 miles north of Ebbetts Pass. Individuals were collected in 1939, and the occurrence is presumed extant. The other five occurrences within five miles of the BSA are discussed below:

- Occurrence # 162 is located approximately 4.2 miles southwest of Location 4. The occurrence is from 2012 and is presumed extant.
- Occurrence # 163 is located approximately 4.7 miles southwest of Location 4. The occurrence is from 2012 and is presumed extant.
- Occurrence # 259 is located approximately 4.6 miles southwest of Location 4. The occurrence is from 2001 and is presumed extant.
- Occurrence # 333 is located approximately 4.2 miles northwest of Location 1. The occurrence is from 2013 and is presumed extant.
- Occurrence # 640 is located approximately 4.5 miles northwest of Location 1. The occurrence is from 2013 and is presumed extant.

Based on information gathered through this investigation, as well as CNDDB records, this species has a low potential to occur within the BSA. The West Fork of the Carson River, Markleeville Creek, and Silver Creek all provide marginally suitable habitat, however there are no occurrences near any of the project locations and they were not observed during any surveys. Furthermore, no in-water work will occur at three of the four bridges. At Location 3, in Markleeville, in-water work will occur, however no Sierra Nevada yellow-legged frogs were observed during the VES.

The requisite habitat parameters for the Sierra Nevada yellow-legged frog are present at all four project locations. Each site is characterized by permanent water with in-stream pools deep enough so as not to freeze to the bottom during winter; along with boulders, rip-rap, and other structures that could provide overwintering refuge. However, the rivers and creeks associated with each bridge contain CDFW (California Department of Fish and Wildlife) planted hatchery trout.

The regular planting of hatchery trout into the waterbodies associated with each project location likely preclude the presence of stable, self-sustaining populations of Sierra Nevada yellow-legged frogs. The long-term and, ongoing planting of non-native trout into lakes and streams of the Sierra Nevada is one of the primary factors that have contributed to the marked decline in the species, due to the intense predatory pressure they apply to eggs, tadpoles, and adults (Knapp 2016). The two 2009 CDFW memoranda documenting the results of visual encounter surveys conducted in the vicinity of Location 3, were issued to support recommendations to resume stocking/planting of hatchery trout on Markleeville Creek and the East Fork Carson River, suggesting CDFW planting has been ongoing in these waterbodies for several years. As a result of the presence of non-native trout and, the anticipated ongoing efforts by CDFW to plant hatchery trout in these waterbodies, Caltrans has determined that it is unlikely the Sierra Nevada yellow-legged frog would occur at any of the project locations.

Yosemite toad

The Yosemite toad (Anaxyrus canorus) is a federally threatened, long-lived (up to 15 years), medium-sized toad (approximately 1.2 to 2.8 inches) with the greatest display of sexual size dimorphism of any North American frog. The species inhabits sunny upland habitats near moist meadows and typically within 300 feet of permanent water from near Ebbetts Pass in Alpine County in the north to Fresno and southern Inyo County in the south. Access to the sunlight is important for proper thermoregulation however, the species uses cover objects for temporary refuge. Abandoned rodent burrows are used by adults for overwintering.

There is one CNDDB occurrence within five miles of the BSA. Occurrence # 80 is located approximately 4.7 miles southwest of Location 4. This occurrence is within an unnamed lake between Sherrold Lake and Upper Kinney Lake, approximately 0.8 miles northwest of Ebbetts Pass. Four adult toads were collected in 2001, and the occurrence is presumed extant.

A focused VES was conducted for this species at Location 3. The VES did not include Locations 1, 2 and 4; however a habitat assessment survey was conducted within these locations to determine habitat suitability for this species. No amphibians of any kind were identified during these surveys.

The habitat assessment revealed that the pond-wet meadow habitat complex, most commonly associated with Yosemite toad populations, was not present in the survey area; as a result, Caltrans has determined that it is unlikely this species would occur at any of the four locations.

Great grey owl

The great gray owl (*Strix nebulosa*) is listed as Endangered through the California Endangered Species Act. No focused surveys were conducted for this species. There is one CNDDB occurrence within five miles of the BSA. Occurrence # 19 is located approximately 3.2 miles

west of Location 3 within the Grover Hot Springs State Park. One owl was observed in both June and December of 1979. While this is a probable nesting area, no pairs have been observed or a nest located. The occurrence is from 1984 and is presumed extant.

Based on information gathered through this investigation, as well as CNDDB records, this species has a low potential to occur within the BSA. Ponderosa pine forest areas within each of the project locations provide potential foraging habitat for the great gray owl. It is unlikely that an owl would nest within any of the project locations due to the lack of nearby bogs and their proximity of highways. Great gray owls have not been observed within the BSA.

Northern goshawk

Northern goshawk (*Accipiter gentilis*) is listed as a CDFW Species of Special Concern. No focused surveys were conducted for this species. There are no CNDDB occurrences within five miles of the BSA. The nearest occurrence is located approximately 7.5 miles north of Location 1 within Trout Creek. A nest was originally located within a lodgepole pine, however it was abandoned due to a change in land use. The occurrence is from 1981 and is presumed extant.

Southern long-toed salamander

Southern long-toed salamanders (*Ambystoma macrodactylum sigillatum*) are listed as a CDFW Species of Special Concern. No focused surveys were conducted for this species. However, there are ten CNDDB occurrences of this species within five miles of the BSA. The nearest occurrence is located approximately 2.2 miles west of Location 1 in a pond between West Fork Carson River and Highway 88. Two larvae were found in June of 2003, and the occurrence is presumed extant.

Environmental Consequences

Lahontan cutthroat trout

In-water work within Location 3 and 4 (Markleeville Creek and Silver Creek) could lead to direct impacts to Lahontan cutthroat trout. Direct impacts include crushing injuries, entrapment in dewatered portions of the stream or fenced areas, gill abrasion and suffocation from sediment, or other direct harm from construction activities. Other direct impacts include increased turbidity and decreased water quality during construction activities due to runoff, water diversion, decreased shading, and minor ground disturbance. Chemicals, fuel, oil, and other construction materials could leak from the bridges or construction vehicles into Markleeville Creek, affecting Lahontan cutthroat trout.

In-water work at Location 3 will temporarily impact 0.34 acre of riverine habitat through construction access, cofferdam construction, and the installation of bridge abutments. The project will permanently impact 0.07 acre of riparian vegetation (yellow willow grove) at Location 3, which has potential to affect shading and primary photosynthetic production. Additional avoidance and minimization measures will ensure that no impacts to Lahontan cutthroat trout occur as a result of the proposed project.

Sierra Nevada yellow-legged frog

In-water work at Location 3 will temporarily impact 0.34 acre of riverine habitat through construction access, cofferdam construction, and the installation of bridge abutments. No permanent impacts to riverine habitat utilized by this species as potential aquatic non-breeding habitat are anticipated. Some removal of riparian vegetation will also occur, which has potential to affect shading and primary photosynthetic production. However, this vegetation removal may also provide increased basking habitat for individual Sierra Nevada yellow-legged frogs. The project will permanently impact a total of 0.07 acre of riparian habitat (yellow willow grove), 0.25 acres of ponderosa pine habitat, 0.06 acre of non-native grassland, and 0.01 acre of riverine habitat (Markleeville Creek) at Location 3.

In addition, a total of 0.68 acre of upland habitat will be temporarily impacted as a result of vegetation removal, equipment laydown, and staging at all four locations. With the exception of 0.57 acre of developed habitat, this upland habitat (0.68 acre) could provide potential upland habitat for Sierra Nevada yellow-legged frog.

Yosemite toad

In-water work associated with the bridge widening and rail replacement at Location 3 includes water diversion and widening of the bridge abutments, as well as, installation of scour mitigation within the dewatered channel. In-water work will temporarily impact 0.34 acre of riverine habitat through construction access, cofferdam construction, and the installation of bridge abutments. Some removal of riparian vegetation will also occur, which has potential to affect shading and primary photosynthetic production. However, this vegetation removal may also provide increased basking habitat for individual Yosemite toads. The project will permanently impact a total of 0.07 acre of riparian habitat (yellow willow grove) at Location 3, with a total of 0.11 acre of temporary impacts to riparian (yellow willow grove) habitat at all four locations.

Great grey owl

At Locations 1, 2, and 4, impacts to ponderosa pine forest habitat type will be temporary, consisting of foot traffic to access the bottom side of the bridge. However, there will be permanent impacts to ponderosa pine forest habitat within Location 3. Avoidance and minimization measures will ensure that no impacts to great gray owl occur as a result of the proposed project.

At this time, no compensatory mitigation is needed as no great gray owls have been found within the BSA during habitat assessments and CNDDB queries, and there are no anticipated project impacts to this species.

Northern goshawk

Based on information gathered through investigation, as well as CNDDB records, this species has a low potential to occur within the BSA. Ponderosa pine forest areas within each of the project locations provide potential foraging habitat for the northern goshawk. It is unlikely that a hawk would nest within any of the project locations due to their proximity of highways, and they have never been observed within the BSA.

Potential habitat for northern goshawk (ponderosa pine forest) is present within each of the project locations. In most of the project locations, impacts to this habitat type will be temporary and consist of foot traffic. However there will be small amounts of permanent impacts to ponderosa pine habitat within Location 3. Avoidance and minimization measures will ensure that no impacts to northern goshawk occur as a result of the proposed project.

Southern long-toed salamander

Potential habitat for southern long-toed salamander (ponderosa pine forest) is present within each of the project locations. However, because the rivers and creeks are planted with CDFW hatchery trout, this species does not occur within the BSA. Therefore, the project is not likely to impact this species.

Best Management Practices

In order to minimize impacts to the Lahontan cutthroat trout, Sierra Nevada yellow-legged frog, and Yosemite toad, Standard Construction BMPs shall be implemented throughout construction, in order to avoid and minimize adverse effects to the water quality within the BSA.

Avoidance, Minimization, and/or Mitigation Measures

Worker Environmental Awareness Training. All construction personnel will attend a mandatory, educational, environmental awareness training delivered by a qualified biologist prior to working in the BSA. The program would focus on the conservation measures that are relevant to employee's personal responsibility and would include an explanation of how to best avoid take of biological resources and sensitive habitats. Distributed materials would include a pamphlet with distinguishing photographs of sensitive species, species' habitat requirements, compliance reminders, and relevant contact information. Documentation of the training, including sign-in sheets, would be kept on file and would be available on request.

The following avoidance and minimization measures shall be implemented to reduce the potential project effects to the Lahontan cutthroat trout, Sierra Nevada yellow-legged frog, Yosemite toad, and southern long-toed salamander.

- **Fish Relocation Plan.** In order to reduce potential impacts from in-water work at Location 3 and 4, Caltrans will develop and implement a fish relocation plan to be submitted to USFWS prior to the start of construction to ensure that no fish, or amphibians become stranded within the dewatered portion of the stream and are safely relocated out of the work area. This plan shall include amphibians (in-water life cycle) in its scope.
- **Environmentally Sensitive Area (ESA) Fencing.** ESA fencing shall be installed along the edge of construction areas where construction will occur. The location of fencing shall be marked in the field. The construction specifications shall contain clear language that prohibits construction-related activities, vehicle operation, as well as, designated material and equipment staging areas. Signs shall be erected along the protective fencing at a maximum spacing of one sign per 50 feet of fencing. The signs shall state: "This area is environmentally sensitive; no construction or other

operations may occur beyond this fencing. Violators may be subject to prosecution, fines, and imprisonment." The signs shall be clearly readable at a distance of 20 feet, and shall be maintained for the duration of construction activities in the area.

- **No Use of Mono-filament Netting.** To prevent species from being entangled, trapped, or injured, erosion control materials with plastic mono-filament netting would not be used within the BSA.

The following avoidance and minimization measure shall be implemented to reduce the potential project effects to the Lahontan cutthroat trout, Sierra Nevada yellow-legged frog, and southern long-toed salamander.

- **Temporary Water Diversion.** Markleeville Creek and Silver Creek will be diverted so that in-water work can occur without impacting species within the stream. A cofferdam shall be installed at the upstream and downstream limit of project activities. The area within the cofferdams will be dewatered after fish and amphibians within the work area have been relocated. Once the area has been dewatered, work within the dewatered portion of the stream can occur. All in-water work will occur during the dry season (June 1 to October 15) to reduce impacts to Lahontan cutthroat trout and Sierra Nevada yellow-legged frog, and southern long-toed salamander.

The following avoidance and minimization efforts shall be implemented in order to reduce potential project effects to Sierra Nevada yellow-legged frog and Yosemite toad.

- **Tree Protection Zone (TPZ).** Existing riparian vegetation and other native tree species will be retained to extent feasible. A TPZ shall be established around any tree or group of trees to be avoided. The TPZ shall be defined by the radius of the dripline of the tree(s) plus one foot. The TPZ of any protected trees shall be demarcated using ESA fencing that will remain in place for the duration of construction activities.

- **Minimize Loss of Riparian Vegetation.** Caltrans shall minimize the potential for long-term loss of riparian vegetation by trimming vegetation rather than removing the entire plant. Trimming will be conducted per the direction of a biologist and/or certified arborist.

- **Preconstruction Surveys.** Prior to any ground disturbance, pre-construction surveys would be conducted by a qualified biologist. These surveys would consist of walking within the BSA to determine presence of the biological resources.

Great grey owl

- **Preconstruction Surveys.** If construction activities occur during the great gray owl nesting period (February 15 to September 1), Caltrans will retain a qualified biologist to conduct pre-construction surveys to identify active nests in accessible areas within 0.5 mile of the project BSA. The surveys will be conducted before the approval of grading and/or improvement plans (as applicable) and no more than 14 days before the beginning of construction for all project phases. If no nests are found, no further measures are required.

If active nests are found, impacts on nesting great gray owls will be avoided by establishment of a 0.25 mile buffer around the nests. No project activities will commence within the buffer area until a qualified biologist confirms that any young have fledged and the nest is no longer active. CDFW recommends implementation of 0.25-mile buffers for great gray owl, but the size of the buffer may be adjusted if a Caltrans approved biologist, in consultation with CDFW, determine that such an adjustment would not be likely to adversely affect the nest. Monitoring of the nest by a qualified biologist during and after construction activities will be required if the activities have potential to adversely affect the nest.

- **Tree Protection Zone.** Existing riparian vegetation and other native tree species will be retained to extent feasible. A TPZ shall be established around any tree or group of trees to be avoided. The TPZ shall be defined by the radius of the dripline of the tree(s) plus one foot. The TPZ of any protected trees shall be demarcated using ESA fencing that will remain in place for the duration of construction activities.

Northern goshawk

- **Preconstruction Surveys.** If construction activities occur during the Northern goshawk nesting period (February 15 to September 1), Caltrans will retain a qualified biologist to conduct pre-construction surveys to identify active nests in accessible areas within a 0.5-mile of the project BSA. The surveys will be conducted before the approval of grading and/or improvement plans (as applicable) and no more than 14 days before the beginning of construction for all project phases. If no nests are found, no further measures are required.

  If active nests are found, impacts on nesting Northern goshawks will be avoided by establishment of a 300-foot buffer around the nests. No project activities will commence within the buffer area until a qualified biologist confirms that any young have fledged and the nest is no longer active. CDFW recommends implementation of 0.25-mile buffers for great gray owl, but the size of the buffer may be adjusted if a Caltrans approved biologist, in consultation with CDFW, determine that such an adjustment would not be likely to adversely affect the nest. Monitoring of the nest by a qualified biologist during and after construction activities will be required if the activities have potential to adversely affect the nest.

b) Riparian Habitat or Natural Communities

Affected Environment

Riparian Habitat

At all four locations, a narrow riparian corridor, composed of yellow willow grove habitat is present along the West Fork of the Carson River, Markleeville Creek, and Silver Creek within the BSA. In addition, species within the ponderosa pine forest community also provide some riparian cover. Riparian habitat associated with a stream or lake is regulated by California Department of Fish and Wildlife under Section 1602 of the California Fish and Game Code (CFGC) for the purpose of protecting fish and wildlife resources, as well as, the Regional

Water Quality Control Board (RWQCB) under Section 401 of the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act.

There is approximately 2.02 acres of yellow willow grove habitat along the banks of the West Fork of the Carson River, Markleeville Creek, and Silver Creek. Willow species dominate the vegetation along the banks of the streams, with the exception of Markleeville Creek, which has numerous alders along the creek edge as well.

Ponderosa Pine Forest

The ponderosa pine forest community occurs in the BSA as both pure stands of ponderosa pine (Locations 1, 2, and 4), as well as, remnant patches of native vegetation with an urban matrix (Location 3). Ponderosa pine forest is regulated by CDFW, under Section 2800-2835 of the CFGC, for the purpose of helping declining species by conserving natural communities and by allowing complimentary land uses.

There is approximately 5.94 acres of ponderosa pine forest in four disjunct areas of the BSA. The tree canopy is mainly composed of ponderosa pine, however, other conifers, and hardwoods are present. The herbaceous layer is composed of native, and non-native grasses and forbs.

A total of 0.54 acre of upland habitat will be permanently impacted by the project at Location 4, Silver Creek Bridge. Of the 0.54 acre of upland habitat, 0.07 acre of yellow willow grove and 0.37 acre of ponderosa will be removed over two consecutive construction seasons. The project will also permanently impact 0.06 acre of developed habitat and 0.04 acre of big sagebrush habitat. In addition, the placement of access roads will temporarily impact 0.25 acre of upland habitat and the water diversion with falsework will temporarily impact 0.29 acre of aquatic habitat at Location 4.

Environmental Consequences

Riparian Habitat

The construction and widening of the Markleeville Creek Bridge over Markleeville Creek, to accommodate for the new bike lanes, and scour mitigation will result in the permanent direct impact of 0.07 acre of riparian habitat along the southern banks and may require the removal of trees. The loss of riparian vegetation can have adverse effects on aquatic habitat in Markleeville Creek.

In addition, the project will temporarily impact 0.11 acre of yellow willow grove along Locations 1, 2, and 4 for construction foot access. Construction activities may temporarily affect yellow willow grove habitat to provide pedestrian access to the underside section of the bridge during construction. Temporary vegetation removal at Locations 1, 2, and 4 will be through hand removal.

Ponderosa Pine Forest

The work at Markleeville Creek Bridge will result in the permanent direct impact of approximately 0.25 acre of ponderosa pine forest and may require the removal of trees. In addition, the project will temporarily impact 0.25 acre of ponderosa pine forest habitat along Locations 1, 2, 3, and 4 for construction foot access or staging areas. The loss of ponderosa pine habitat can have adverse effects on common terrestrial species, such as birds, and tree-dwelling mammals, as well as, diminishing a safe movement corridor for wildlife.

All downstream upland habitat (Ponderosa pine forest) of Location 3 at Markleeville Creek bridge will be removed and classified as a permanent impact. A total of 1.11 acre of upland habitat and 0.001 acre of aquatic habitat will be permanently impacted by the project. Of the 1.11 acre of upland habitat to be permanently impacted, 0.08 acre of yellow willow grove and 0.73 acre of Ponderosa pine forest provide riparian habitat. These will be permanently impacted because vegetation will be removed over two consecutive construction seasons. The project will also permanently impact 0.23 acre to developed habitat and 0.07 acre to annual grassland habitat. The widening of the bridge abutments and addition of rock slope protection for scour mitigation will permanently impact 0.001 acre of riverine habitat (Markleeville Creek). In addition, the water diversion will temporarily impact 0.37 acres of aquatic habitat at Location 3.

Best Management Practices

During construction, water quality will be protected by implementation of BMPs of the California Stormwater Quality Association. The contractor will follow Caltrans 2015 Standard Specifications under Section 13 for BMPs.

All areas that are temporarily affected during construction would be revegetated with an assemblage of native grass, shrub, and tree species to restore habitat values. Invasive, exotic plants would be controlled within the BSA to the maximum extent practicable, pursuant to Executive Order 13112.

In addition, the following avoidance and minimization measures will be implemented prior to construction of the bike lanes to avoid and minimize potential impacts on riparian habitat.

Avoidance, Minimization, and/or Mitigation Measures

The following avoidance, minimization, and/or mitigation measures will cover both riparian habitat and ponderosa pine forests.

- **Riparian Habitat Mitigation**. Caltrans will mitigate for the impacts to the Waters of the United States either through the National Fish and Wildlife Foundation's In-Lieu Fee Program or from USACE and/or CDFW approved mitigation bank at a minimum 1 to 1 ratio (one acre of habitat replaced for every one acre filled). Based on the preliminary project design, the project will have 0.01 acre of permanent impacts to riverine habitat (Markleeville Creek).

  Caltrans shall compensate for temporary and permanent impacts to yellow willow grove riparian (riparian) habitat. Temporary impacts to riparian habitat will be revegetated at a minimum of a 1 to 1 ratio. Riparian habitat temporarily impacted during construction activities will be restored by planting native riparian stock obtained from the vicinity of the project. Plant species will include riparian trees and shrubs that are native to the western slopes of the Sierra Nevada. Native riparian vegetation temporarily impacted will be replaced on-site at a 1:1 ratio.

  Permanent impacts at Markleeville Creek will require the replacement of 0.07 acre of riparian habitat and an additional 2 to 1 ratio for creation and enhancement. The total replacement ratio for permanent impacts will be 3 to 1.

- **Monitoring Plan.** Caltrans will develop a monitoring plan for riparian habitat to be restored on-site, through coordination with the U.S. Army Corps of Engineers (USACE) and CDFW. The monitoring plan will describe success criteria and duration of monitoring activities. In addition, shaded riverine habitat credits will be purchased at an approved USACE conservation bank at a 2:1 ratio to meet an overall project goal of a 3:1 mitigation ratio for shaded riverine habitat permanently removed by the proposed action. Caltrans will coordinate with the USACE to determine the appropriate method to obtain necessary shaded riverine habitat mitigation credits for the proposed action.

- **Riparian Habitat Credits.** Riparian habitat credits will be purchased at a US Army Corps of Engineers (USACE) conservation bank to meet an overall project goal of a 3:1 mitigation ratio for riparian habitat permanently removed by the project. Caltrans will coordinate with the USACE to determine the appropriate method to obtain necessary riparian habitat mitigation credits for the proposed action.

- **Tree Survey.** Prior to removal of any trees, an International Society of Arboriculture (ISA) certified arborist shall conduct a tree survey in areas that may be impacted by construction activities. This survey shall document tree resources that may be adversely impacted by implementation of the project. The survey will follow standard professional practices.

- **Tree Protection Zone.** Existing riparian vegetation and other native tree species will be retained to extent feasible. A TPZ shall be established around any tree or group of trees to be avoided. The TPZ will be delineated by an ISA certified arborist. The TPZ shall be defined by the radius of the dripline of the tree(s) plus one foot. The TPZ of

any protected trees shall be demarcated using fencing that will remain in place for the duration of construction activities.

Construction-related activities within the TPZ shall be limited to those activities that can be done by hand. No heavy equipment or machinery shall be operated within the TPZ. Grading shall be prohibited within the TPZ. No construction materials, equipment, or heavy machinery shall be stored within the TPZ.

- **Environmentally Sensitive Area Fencing.** Protective fencing shall be installed along the edge of construction areas, including temporary, and permanent access roads, where construction will occur within 200 feet of the edge of wetland, and riverine habitat (as determined by a qualified biologist). The location of fencing shall be marked in the field with stakes, and flagging, and shown on the construction drawings. The construction specifications shall contain clear language that prohibits construction-related activities, vehicle operation, as well as, designated material and equipment staging areas. Signs shall be erected along the protective fencing at a maximum spacing of one sign per 50 feet of fencing. The signs shall state: "This area is environmentally sensitive; no construction or other operations may occur beyond this fencing. Violators may be subject to prosecution, fines, and imprisonment." The signs shall be clearly readable at a distance of 20 feet and shall be maintained for the duration of construction activities in the area.
- **Replanting Plan.** Caltrans will develop a replanting plan to compensate for the temporary and permanent loss of riparian habitat affected by the project prior to the start of construction. The replanting plan should include a discussion of all plantings to be used by the project and will consist of native trees, shrubs, and herbaceous plants that are known to occur in the vicinity of the project.

c) Wetlands and Other Waters of the U.S.

Affected Environment

The West Fork of the Carson River is not listed by the USACE as a traditionally navigable water (TNW). Flows within the West Fork join the East Fork to form the Carson River near the town of Genoa, Nevada. National Wetland Inventory (NWI) maps the west Fork of the Carson River as R3UBH (upper perennial, unconsolidated bottom, permanently flooded, riverine system with a streambed). The West Fork of the Carson River was evaluated using USGS topographic maps and aerial imagery, and flows approximately 40 miles from its headwaters near Carson Pass and Lost Lakes to its confluence with the East Fork, near Genoa, Nevada. At this point it becomes the Carson River. At Location 1, the average width of the feature is 66 feet, and it travels for approximately 166 feet through the project area. At Location 2, the average width of the feature is 48 feet and it travels for approximately 152 feet through the project area. There was a clear boundary at the ordinary high water mark (OHWM) where the waters left a rack line and other obvious features, and upland vegetation began. Vegetation found above the OHWM included yellow willow (*Salix lutea)* and ponderosa pine.

Markleeville Creek is a perennial tributary to the East Fork of the Carson River. Neither are listed as a TNW. NWI maps Markleeville Creek as R3UBH (upper perennial, unconsolidated

bottom, permanently flooded, riverine system with a streambed). The headwaters of Markleeville Creek are formed by two streams (Hot Spring Creek and Pleasant Valley Creek), which originate near Markleeville Peak approximately 8 miles upstream of Markleeville Creek Bridge. Markleeville Creek flows through the town of Markleeville and about 1.6 miles downstream of the Location 3 before entering the East Fork of the Carson River to the northeast of the project location. The average width of the feature within the project area is 50 feet, and it travels for approximately 450 feet in length through the project area. There was a clear boundary at the OHWM where water staining along the rip rap and bridge piers could be observed. Vegetation found above the OHWM includes mountain alder (*Alnus incana*), and ponderosa pine.

Silver Creek is a perennial tributary to the East Fork of the Carson River. Neither are listed as a TNW. NWI maps Silver Creek as R3UBH (upper perennial, unconsolidated bottom, permanently flooded, riverine system with a streambed). Silver Creek originates from Upper Kinney Lake in the eastern Sierra Nevada Mountains to the north of Ebbetts Pass, approximately 5.75 miles upstream of the Silver Creek Bridge. Silver Creek flows generally parallel to SR 4 and joins the East Fork of the Carson River approximately 3.3 miles downstream of Location 4 near Wolf Creek Road. The average width of the feature within the project area is 51 feet, and it travels for approximately 142 feet in length through the project area. There was a clear boundary at the OHWM where water staining along the rip rap and bridge piers could be observed. Vegetation found above the OHWM include willows (Salix sp.), mountain sagebrush, quaking aspen (Populus tremuloides), ponderosa pine, and white fir (Abies concolor).

The West Fork of the Carson River, Markleeville Creek, and Silver Creek were all flowing during each of the site visits in 2017. All three of these streams are permanent and flow year-round. Snowmelt provides the primary source of flow to each of these streams, with some additional flows provided by natural springs. The beds of all three streams consist of boulder, cobble habitat, with banks ranging from cobble, and gravel, to sand. At Markleeville Creek, a rock-lined concrete wall forms the edge of the channel and contains it within this wall throughout the BSA. These waters are un-vegetated, but are lined with yellow willow groves at all four locations.

Environmental Consequences

The United States Army Corps of Engineers only considers direct impacts (temporary and permanent) to jurisdictional features, and does not define indirect impacts to jurisdictional features; therefore there is no discussion of indirect impacts to jurisdictional features in this analysis, except as they pertain to listed species. The Regional Water Quality Control Board does consider temporary and permanent impacts to jurisdictional waters.

The project will widen Markleeville Creek Bridge over Markleeville Creek. This will involve work in the creek, with a stream diversion. A total of 0.01 acre of permanent impacts will occur as a result of widening the bridge abutments by 16 feet (8 feet upstream and 8 feet downstream) and installing scour mitigation (approximately 1 foot wide by 28 feet long of rip rap) along the northern bridge abutment. In addition, a total of 0.34 acre of temporary impacts to riverine habitat (Waters of the United States) will occur as a result of placing the

stream diversion within the creek to install the scour mitigation and widen the bridge abutments.

It is expected that during construction, potential short-term impacts to water quality may be caused by localized increases in turbidity, and downstream sedimentation resulting from the placement, and removal of construction materials for the temporary diversion dam within Markleeville Creek. Sediment may also be introduced into Markleeville Creek due to runoff of sediment-laden storm water from adjacent construction areas. Increased turbidity has the potential to reduce light levels in aquatic habitats, and may result in temporary changes in water chemistry, including effects on pH, and dissolved oxygen. Reduced dissolved oxygen levels result if lowered light levels decrease the oxygen production of photosynthetic organisms, and/ or biochemical oxygen demand is increased by sedimentation. Fish and other mobile organisms are expected to avoid localized areas that are temporarily impacted by construction.

Best Management Practices

Potential impacts to surface water quality can also result from accidental leaks or spills of oil, petroleum and/or hazardous materials during refueling or maintenance of vehicles and equipment. Spills or leaks of oil, fuel, or hazardous materials have the potential to impact waters outside of the immediate construction area, if these substances are carried by surface waters, storm water runoff, or groundwater.

During construction, water quality will be protected by implementation of best management practices (BMPs) of the California Storm Water Quality Association. The contractor will follow Caltrans 2015 Standard Specifications under Section 13 for BMPs. The BMPs will be described in the SWPPP required under the NPDES permit.

Dust control measures would consist of regular truck watering of construction access areas and disturbed soil areas with the use of organic soil stabilizers to minimize airborne dust and soil particles generated from graded areas. Regular truck watering would be a requirement of the construction contract. In addition, for disturbed soil areas, an organic tackifier to control dust emissions blowing off of the right of way, or out of the construction area during construction activities would be included in the contract special provisions. Any material stockpiles would be watered, sprayed with tackifier, or covered to minimize dust production, and wind erosion.

All areas that are temporarily affected during construction would be revegetated with an assemblage of native grass, shrub, and tree species to restore habitat values. Invasive, exotic plants would be controlled within the BSA to the maximum extent practicable, pursuant to Executive Order 13112.

Worker Environmental Awareness Training. All construction personnel would attend a mandatory, environmental education program delivered by a qualified biologist prior to working in the BSA. The program would focus on the conservation measures that are relevant to employee's personal responsibility, and would include an explanation of how to best avoid take of biological resources, and sensitive habitats. Distributed materials would

include a pamphlet with distinguishing photographs of sensitive species, species' habitat requirements, compliance reminders, and relevant contact information. Documentation of the training, including sign-in sheets, would be kept on file, and would be available upon request.

Avoidance, Minimization, and/or Mitigation Measures

Compensatory mitigation is proposed for potential impacts to Waters of the United States.

- **Permit Application.** Caltrans will apply for any necessary permits from the USACE, CDFW, and the RWQCB. Impacts will be mitigated in accordance with agency requirements to ensure no net loss of acreage or value to Waters of the United States which will include restoring temporarily impacted areas to pre-project condition.

- **Impacts to Waters of the United States.** Caltrans will mitigate for the impacts to the Waters of the United States either through the National Fish and Wildlife Foundation's In-Lieu Fee Program or from USACE and/or CDFW approved mitigation bank at a minimum 1 to 1 ratio (one acre of habitat replaced for every one acre filled). Based on the preliminary project design, the project will have 0.01 acre of permanent impacts to riverine habitat (Markleeville Creek) and 0.07 acre of riparian habitat (yellow willow grove).

- **Environmentally Sensitive Area (ESA) Fencing.** ESA fencing will mark the limits of construction to prevent affecting the streams unnecessarily. Also, ESA fencing would be installed around freshwater wetland, and freshwater tidal wetlands near work areas.

- **Revegetation.** The project proposes to revegetate areas of temporary disturbance, within the project footprint, with native vegetation.

- **Work Windows**. All in-water work will occur during the dry season (June 1 through October 15).

- **Minimize Artificial Lighting**. Except when necessary for construction, driver, or pedestrian safety, artificial lighting during night time hours would be minimized to the maximum extent practicable.

- **Grindings Storage.** All grindings and asphaltic-concrete waste would be stored within previously disturbed areas absent of habitat and at a minimum of 150 feet from any aquatic habitat, culvert, or drainage feature.

- **Minimize Turbidity.** To avoid or minimize potential impacts to listed salmonids from increased turbidity and sedimentation, turbidity increases caused by project construction should not exceed the Lahontan Regional Water Quality Board water quality objectives for turbidity in the North and South Basins. Increases in turbidity will not exceed the following limits:

- Turbidity shall not be raised above 3 Nephelometric Turbidity Units (NTU) mean of monthly mean (object is approximately equal to the State of Nevada standard of 5 NTU sample mean).
- To ensure that turbidity levels do not exceed the thresholds listed above during in-water construction activities, Caltrans will retain a qualified water quality specialist to monitor turbidity levels from 150 feet upstream to 200 feet downstream of the point of in-stream construction activities. When construction activities potentially have the greatest water quality impact (e.g., during installation of temporary water diversion structure), water samples will be collected four times daily or as outlined by the agencies. In the event of a detectable plume, work will halt until the plume has dissipated to satisfactory levels.

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Appendix A Minimization and/or Mitigation Summary

Biological Resources

- **Permit Application.** Caltrans will apply for any necessary permits from the United States Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), and the Regional Water Quality Control Board (RWQCB). Impacts will be mitigated in accordance with agency requirements to ensure no net loss of acreage or value to waters of the United States which will include restoring temporarily impacted areas to pre-project condition.

- **Waters of the United States Mitigation**. Caltrans will mitigate for the impacts to the Waters of the United States either through the National Fish and Wildlife Foundation's In-Lieu Fee Program or from USACE and/or CDFW approved mitigation bank at a minimum 1 to 1 ratio (one acre of habitat replaced for every one acre filled). Based on the preliminary project design, the project will have 0.01 acre of permanent impacts to riverine habitat (Markleeville Creek).

- **Riparian Habitat Mitigation**. Caltrans shall compensate for temporary and permanent impacts to yellow willow grove riparian (riparian) habitat. Temporary impacts to riparian habitat will be revegetated at a minimum of a 1 to 1 ratio. Riparian habitat temporarily impacted during construction activities will be restored by planting native riparian stock obtained from the vicinity of the project. Plant species will include riparian trees and shrubs that are native to the western slopes of the Sierra Nevada. Native riparian vegetation temporarily impacted will be replaced on-site at a 1:1 ratio.

- Caltrans will develop a replanting plan to compensate for the temporary and permanent loss of riparian habitat affected by the project prior to the start of construction. The replanting plan should include a discussion of all plantings to be used by the project and will consist of native trees, shrubs, and herbaceous plants that are known to occur in the vicinity of the project.

- Permanent impacts at Markleeville Creek will require the replacement of 0.07 acre of riparian habitat and an additional 2 to 1 ratio for creation and enhancement. Permanent impacts at Silver Creek will require the replacement of 0.37 acre of riparian habitat and an additional 2 to 1 ratio for creation and enhancement. Riparian habitat permanently removed and purchased at the US Army Corps of Engineers. Riparian habitat credits will be purchased at a US Army Corps of Engineers (USACE) conservation bank to meet an overall project goal of a 3:1 mitigation ratio for riparian habitat permanently removed by the project. Caltrans will coordinate with the USACE to determine the appropriate method to obtain necessary riparian habitat mitigation credits for the proposed action.

- **Fish Relocation Plan.** In order to reduce potential impacts from in-water work at Location 3 and Location 4, Caltrans will develop and implement a fish relocation plan to be submitted to USFWS prior to the start of construction to ensure that no fish, or amphibians become stranded within the dewatered portion of the stream and are safely relocated out of the work area. This plan shall include amphibians (in-water life cycle) in its scope.
- **Environmentally Sensitive Area (ESA) Fencing.** ESA fencing shall be installed along the edge of construction areas where construction will occur. The location of fencing shall be marked in the field. The construction specifications shall contain clear language that prohibits construction-related activities, vehicle operation, as well as, designated material and equipment staging areas. Signs shall be erected along the protective fencing at a maximum spacing of one sign per 50 feet of fencing. The signs shall state: "This area is environmentally sensitive; no construction or other operations may occur beyond this fencing. Violators may be subject to prosecution, fines, and imprisonment." The signs shall be clearly readable at a distance of 20 feet, and shall be maintained for the duration of construction activities in the area.
- **No Use of Mono-filament Netting.** To prevent species from being entangled, trapped, or injured, erosion control materials with plastic mono-filament netting would not be used within the BSA.
- **Temporary Water Diversion.** Markleeville Creek and Silver Creek will be diverted so that in-water work can occur without impacting species within the stream. A cofferdam shall be installed at the upstream and downstream limit of project activities. The area within the cofferdams will be dewatered after fish and amphibians within the work area have been relocated. Once the area has been dewatered, work within the dewatered portion of the stream can occur. All in-water work will occur during the dry season (June 1 to October 15) to reduce impacts to Lahontan cutthroat trout, Sierra Nevada yellow-legged frog, and southern long-toed salamander. No on-site harvesting of in-situ gravels will occur for the temporary water diversion.
- **Tree Protection Zone (TPZ).** Existing riparian vegetation and other native tree species will be retained to extent feasible. A TPZ shall be established around any tree or group of trees to be avoided. The TPZ shall be defined by the radius of the dripline of the tree(s) plus one foot. The TPZ of any protected trees shall be demarcated using ESA fencing that will remain in place for the duration of construction activities.
- **Minimize Loss of Riparian Vegetation.** Caltrans shall minimize the potential for long-term loss of riparian vegetation by trimming vegetation rather than removing the entire plant. Trimming will be conducted per the direction of a biologist and/or certified arborist.
- **Preconstruction Surveys.** Prior to any ground disturbance, pre-construction surveys would be conducted by a qualified biologist. These surveys would consist of walking within the BSA to determine presence of the biological resources, specifically the Sierra Nevada yellow-legged frog and Yosemite toad.

  Preconstruction Surveys (Great Gray Owl). If construction activities occur during

the great gray owl nesting period (February 15 to September 1), Caltrans will retain a qualified biologist to conduct pre-construction surveys to identify active nests in accessible areas within 0.5 mile of the project BSA. The surveys will be conducted before the approval of grading and/or improvement plans (as applicable) and no more than 14 days before the beginning of construction for all project phases. If no nests are found, no further measures are required.

If active nests are found, impacts on nesting great gray owls will be avoided by establishment of a 0.25 mile buffer around the nests. No project activities will commence within the buffer area until a qualified biologist confirms that any young have fledged and the nest is no longer active. CDFW recommends implementation of 0.25-mile buffers for great gray owl, but the size of the buffer may be adjusted if a Caltrans approved biologist, in consultation with CDFW, determine that such an adjustment would not be likely to adversely affect the nest. Monitoring of the nest by a qualified biologist during and after construction activities will be required if the activities have potential to adversely affect the nest.

- **Preconstruction Surveys (Northern Goshawk).** If construction activities occur during the Northern goshawk nesting period (February 15 to September 1), Caltrans will retain a qualified biologist to conduct pre-construction surveys to identify active nests in accessible areas within a 0.5-mile of the project BSA. The surveys will be conducted before the approval of grading and/or improvement plans (as applicable) and no more than 14 days before the beginning of construction for all project phases. If no nests are found, no further measures are required.

  If active nests are found, impacts on nesting Northern goshawks will be avoided by establishment of a 300-foot buffer around the nests. No project activities will commence within the buffer area until a qualified biologist confirms that any young have fledged and the nest is no longer active. CDFW recommends implementation of 0.25-mile buffers for great gray owl, but the size of the buffer may be adjusted if a Caltrans approved biologist, in consultation with CDFW, determine that such an adjustment would not be likely to adversely affect the nest. Monitoring of the nest by a qualified biologist during and after construction activities will be required if the activities have potential to adversely affect the nest.

- **General Nesting Bird Surveys.** Clearing and grubbing of vegetation will occur outside of the nesting bird season (February 15 to September 1). When it is necessary to conduct construction activities during the nesting seasons, pre-construction surveys will be conducted within the action area prior to clearing and grubbing of vegetation or the start of any construction activity. The pre-construction survey should be conducted no more than 15 days before construction activities begin at any time between September 1 and February 15. If no active nests are detected, then no additional avoidance measures are required. If construction is halted or stopped for more than 2 weeks (15 days) and re-starts during the nesting bird seasons, a pre-construction nest survey shall be re-conducted to ensure new bird nests have not been constructed within the action area.

- **Non-Disturbance Buffer.** If work is to occur within 300 feet of active raptor nests and 100 feet of active passerine nests, a non-disturbance buffer will be established at a distance sufficient to minimize disturbance based on the nest location, topography, cover, the species' sensitivity to disturbance, and the intensity/type of potential disturbance.
- **Covering of Trenches and Excavated Holes.** To prevent inadvertent entrapment of wildlife during construction excavated holes or electrical trenches more than one-foot deep with walls steeper than 30 degrees will be covered by plywood or similar materials at the close of each working day. Alternatively, an additional 4-foot high vertical barrier, independent of exclusionary fences, will be used to further prevent the inadvertent entrapment of listed species. If it is not feasible to cover an excavation or provide an additional four-foot high vertical barrier, independent of exclusionary fences, one or more escape ramps constructed of earth fill or wooden planks will be installed. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals.
- **Artificial Lighting.** Except when necessary for construction, driver, or pedestrian safety, lighting of the proposed action area by artificial lighting during night time hours will be minimized to the maximum extent practicable.
- **Trash.** All food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed regularly from the work area.
- **Asphalt Waste**. All grindings and asphaltic-concrete waste will be restored within previously disturbed areas absent of habitat and at a minimum of 150 feet from any aquatic habitat, culvert, or drainage feature.
- **Tree Survey.** Prior to removal of any trees, an International Society of Arboriculture (ISA) certified arborist shall conduct a tree survey in areas that may be impacted by construction activities. This survey shall document tree resources that may be adversely impacted by implementation of the project. The survey will follow standard professional practices.
- **Worker Environmental Awareness Training.** All construction personnel will attend a mandatory, educational, environmental awareness training delivered by a qualified biologist prior to working in the BSA. The program would focus on the conservation measures that are relevant to employee's personal responsibility and would include an explanation of how to best avoid take of biological resources and sensitive habitats. Distributed materials would include a pamphlet with distinguishing photographs of sensitive species, species' habitat requirements, compliance reminders, and relevant contact information. Documentation of the training, including sign-in sheets, would be kept on file and would be available on request.
- **Revegetation.** The project proposes to revegetate areas of temporary disturbance, within the project footprint, with native vegetation.
- **Work Windows**. All in-water work will occur during the dry season (June 1 through October 15).

- **Minimize Artificial Lighting**. Except when necessary for construction, driver, or pedestrian safety, artificial lighting during night time hours would be minimized to the maximum extent practicable.

- **Grindings Storage.** All grindings and asphaltic-concrete waste would be stored within previously disturbed areas absent of habitat and at a minimum of 150 feet from any aquatic habitat, culvert, or drainage feature.

- **Invasive Species Control.** All areas that are temporarily affected during construction would be revegetated with an assemblage of native grass, shrub, and tree species to restore habitat values. Invasive, exotic plants would be controlled within the BSA to the maximum extent practicable, pursuant to Executive Order 13112.

- **Minimize Turbidity.** To avoid or minimize potential impacts to listed salmonids from increased turbidity and sedimentation, turbidity increases caused by project construction should not exceed the Lahontan Regional Water Quality Board water quality objectives for turbidity in the North and South Basins. Increases in turbidity will not exceed the following limits:
    - Turbidity shall not be raised above 3 NTUs mean of monthly mean (object is approximately equal to the State of Nevada standard of 5 NTU sample mean).

    - To ensure that turbidity levels do not exceed the thresholds listed above during in-water construction activities, Caltrans will retain a qualified water quality specialist to monitor turbidity levels from 150 feet upstream to 200 feet downstream of the point of in-stream construction activities. When construction activities potentially have the greatest water quality impact (e.g., during installation of temporary water diversion structure), water samples will be collected four times daily or as outlined by the agencies. In the event of a detectable plume, work will halt until the plume has dissipated to satisfactory levels.

Appendix B List of Technical Studies and Preparers

Natural Environment Study – November 2017, Revised July 2018 – Todd Wong, Senior Biologist.

Biological Assessment – November 2017, Revised July 2018 – Todd Wong, Senior Biologist.

Historic Property Survey Report/Archaeological Survey Report – August 2018 – Raymond Benson, Archaeologist, and Jon Brady, Architectural Historian.

Initial Site Assessment – January 2018 – Jonathan Schlee, Hazardous Waste Specialist.

Visual Impacts Memorandum – January 2017 – Robyn Fong, Landscape Architect.

Air, Noise, and Water Quality Memorandum – September 2016 – Cris Timofet, Transportation Engineer.

Paleontology Identification Report – August 2017 – Richard Stewart, Engineering Geologist.

Hydraulics/Floodplains Memorandum – March 2017 – Jeff Tudd, Hydraulic Engineer.

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Appendix C Distribution List

State Clearinghouse
Office of Planning & Research
P.O. Box 3044
Sacramento, CA 95812

Alpine County Board of Supervisors
P.O. Box 158
Markleeville, CA 96120

California Department of Fish and Wildlife – North Central (Region 2)
1701 Nimbus Road
Rancho Cordova, CA 95670

Mr. Leonard Turnbeaugh
145 Laramie Street
Markleeville, CA 96120

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Appendix D Comments and Responses

This appendix contains the comments received during the public circulation and comment period from February 6, 2018 to March 9, 2018. A Caltrans response follows each comment presented.

Comment from County of Alpine Board of Supervisors

COUNTY OF ALPINE
Board of Supervisors

March 6, 2018

Jaycee Azevedo, Branch Chief
Northern San Joaquin Management Branch California Department of Transportation
1976 E. Martin Luther King Jr. Blvd.
Stockton, CA 95205

Dear Jaycee::

The Alpine County Board of Supervisors has had an opportunity to review the Initial Study with Proposed Negative Declaration for the Mountain Counties Bridge Rails Project that includes work on four bridges within Alpine County. We do not have any specific comments on this document. The Board of Supervisors is in favor of this project moving forward.

We understand that there has been some discussion amongst Caltrans District 10 staff about allowing for the possibility in the future of water and sewer lines being attached to the Highway 89 bridge in Markleeville (#31-0002 Markleeville Creek Bridge on SR 89 at PM 14.69). Although not part of the bridge rail project, the Board of Supervisors encourages Caltrans to work with the local utility companies to allow for this possibility in the future. Allowing water and sewer lines to be attached to the bridge will enable looping of the water system in Markleeville and will eliminate an existing sewer main that crosses under Markleeville Creek downstream from the bridge.

Thank you for the opportunity to comment on this project. We look forward to Caltrans District 10 coordinating with the County as this project moves forward.

Sincerely,

Donald M. Jardine, Chair
Alpine County Board of Supervisors

P.O. Box 158 / 99 Water Street, Markleeville, CA 96120 (530) 694-2287 / Fax (530) 694-2491
Email County Clerk: ttremayne@alpinecountyca.gov

Response to Comment from County of Alpine Board of Supervisors

Thank you for reviewing and circulating the Draft Initial Study with Proposed Mitigated Negative Declaration for the Mountain County Bridge Rails Project.

Caltrans will discuss the options with our structures department to see if it is possible to add the possible utilities. Caltrans will coordinate with Alpine County to obtain more information about the utilities project as the project progresses.

Comment from California Department of Fish and Wildlife

From: Gilmore, Suzanne@Wildlife [mailto:Suzanne.Gilmore@wildlife.ca.gov]
Sent: Saturday, March 10, 2018 11:05 AM
To: Azevedo, Jaycee A@DOT <jaycee.azevedo@dot.ca.gov>
Cc: Wildlife R2 CEQA <R2CEQA@wildlife.ca.gov>
Subject: Mountain County Bridge Rails Project - State Clearinghouse No. 2018022019

The California Department of Fish and Wildlife (Department) appreciates the opportunity to comment on the Initial Study with Proposed Mitigated Negative Declaration (IS/MND) for the Mountain County Bridge Rails Project (Project) [State Clearinghouse No. 2018022019]. The Department is responding to the IS/MND as a Trustee Agency for fish and wildlife resources (California Fish and Game Code Sections 711.7 and 1802, and the California Environmental Quality Act [CEQA] Guidelines Section 15386), and as a Responsible Agency regarding any discretionary actions (CEQA Guidelines Section 15381), such as the issuance of a Lake or Streambed Alteration (LSA)Agreement (California Fish and Game Code Sections 1600 et seq.) and/or a California Endangered Species Act (CESA) Permit for Incidental Take of Endangered, Threatened, and/or Candidate species (California Fish and Game Code Sections 2080 and 2080.1). The Department has the following comments:

1. The IS / MND states that the Sierra Nevada Yellow Legged Frog (SNYLF) is Federally endangered and does not recognize this species is also a State threatened species. The mitigation measures, as written, may result in California Endangered Species Act unauthorized take of the SNYLF. If the SNYLF is not fully addressed in the IS / MND, preparation of a supplemental CEQA document may be needed if issuance of an Incidental Take Permit is necessary. The IS / MND describes dewatering activities and a fish relocation plan to be implemented. Because take of SNYLF is prohibited unless authorization pursuant to CESA is obtained, CDFW recommends that a qualified biologist assess the Project area for potential SNYLF occupancy well in advance of construction activities to evaluate potential permitting needs. Specifically, CDFW recommends that focused visual encounter surveys be conducted by a qualified biologist during appropriate survey period(s) (April – August) in areas where potential habitat exists. CDFW advises that these surveys generally follow the methodology described in pages 16–22 of "*A Standardized Protocol for Surveying Aquatic Amphibians*" (Fellers and Freel 1995), however, please note that dip-netting would constitute take as defined by Fish and Game Code § 86, so it is recommended this survey technique be avoided. In addition, CDFW advises surveyors adhere to "*The Declining Amphibian Task Force Fieldwork Code of Practice*" (DAPTF 1998).

2. If surveys find that SNYLF are occupying the Project area and cannot be avoided, CDFW may issue an Incidental Take Permit authorizing take of SNYLF, pursuant to Fish & Game Code § 2081(b). Take authorization is issued only when take is incidental to an otherwise lawful activity, the impacts of the take are minimized and fully mitigated, the applicant ensures there is adequate funding to implement any required measures, and take is not likely to jeopardize the continued existence of the species. CDFW recommends adding provisions for seeking take authorization as a

mitigation and minimization measure in the IS / MND, should SNYLF occupy the Project area.

3. The IS / MND does not recognize the Great Gray owl is a State endangered species. Therefore, if "take" or adverse impacts to species listed under CESA cannot be avoided either during Project activities or over the life of the Project, a CESA permit must be obtained (pursuant to Fish and Game Code Section 2080 et seq.). Issuance of a CESA permit is subject to CEQA documentation; therefore, the CEQA document should specify impacts, mitigation measures, and a mitigation monitoring and reporting program. If the proposed Project will impact any CESA-listed species, early consultation is encouraged, as significant modification to the Project and mitigation measures may be required in order to obtain a CESA permit. More information on the CESA permitting process and associated fees can be found here: https://www.wildlife.ca.gov/Conservation/CESA.
4. Migratory nongame native bird species are protected by international treaty under the Federal Migratory Bird Treaty Act (MBTA) (16 U.S.C., §§ 703-712). CDFW implemented the MBTA by adopting the Fish & G. Code section 3513. Fish & G. Code sections 3503, 3503.5 and 3800 provide additional protection to
5. CEQA requires that information developed in environmental impact reports and negative declarations be incorporated into a database which may be used to make subsequent or supplemental environmental determinations. (Pub. Resources Code, § 21003, subd. (e).) Accordingly, please report any special status species and natural communities detected during Project surveys to the California Natural Diversity Database (CNDDB). The CNNDB field survey form can be found at the following link: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/CNDDB_FieldSurveyForm.pdf. The completed form can be mailed electronically to CNDDB at the following email address: CNDDB@wildlife.ca.gov. The types of information reported to CNDDB can be found at the following link: http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp.
6. As discussed in the MND, CDFW will likely require a Lake and Streambed Alteration Agreement (LSAA), pursuant to Section 1600 et seq. of the Fish and Game Code, for any activity that will divert or obstruct the natural flow, or change the bed, channel, or bank of a river, stream or lake, or use material from a streambed. Issuance of an LSAA is subject to the California Environmental Quality Act (CEQA). CDFW, as a responsible agency under CEQA, will consider the MND for the project. To obtain information about the LSAA notification process, please access our website at http://www.dfg.ca.gov/habcon/1600/

If you should have any questions pertaining to these comments, please contact me at (916) 358-2950 or Suzanne.Gilmore@wildlife.ca.gov

Response to Comment from California Department of Fish and Wildlife

Thank you for reviewing and circulating the Draft Initial Study with Proposed Mitigated Negative Declaration for the Mountain County Bridge Rails Project.

Project location 4 along Silver Creek is outside the current known range for Sierra Nevada Yellow legged frog according to USFWS. Location 4 is at the low end of the elevation range for this species, at approximately 6,411 feet elevation. USFWS agrees with Caltrans' determination of may affect, not likely to adversely affect for Markleeville Creek (Location 3) because it is too low in elevation. USFWS will likely state the same reasoning for Location 4 because the location is at the low end of the elevational range, there are invasive fish present (trout) in Silver Creek, and the project is outside the known range.

If the project will remove several large trees, it is possible that raptors, including great grey owl could be affected by the project. Prior to the start of construction, raptors and/or great gray owls could move into the study area. If raptor or Migratory Bird Treaty Act (MBTA) nests are found or observed, then USFWS and/or CDFW will be notified. Avoidance and minimization measures define that bird preconstruction surveys will be conducted prior to start of construction.

Location 4 does not provide suitable habitat for sierra Nevada red fox, fisher, or California wolverine.

Comment from County of Alpine Local Resident

From: Michelle Beckwith [mailto:mbeckwith@alpinecountyca.gov]
Sent: Monday, February 5, 2018 8:49 AM
To: Azevedo, Jaycee A@DOT <jaycee.azevedo@dot.ca.gov>
Subject: Work scheduled for Hwy 88 bridges in Woodford's Canyon Dear Mr. Azevedo

District 1 Supervisor Donald Jardine pointed out the public notice to me concerning work on Hwy 88 bridges West Fork Carson River bridge post mile 14.7 and West Fork Carson River bridge post mile 16.22.

I myself drive to Markleeville from South Lake Tahoe every day and there are many commuters driving from Gardnerville to South Lake Tahoe and Kirkwood on this route.

I just want to make sure that CALTRANS will at least keep this open with one lane during the work? Do you have a timeline for this project?

Thank you for your
time.

Michelle Beckwith

Michelle Beckwith

1.1 *Administrative Assistant, CAO/Personnel and Risk Alpine County*
Ph-(530) 694-2287 Ext:161

Response to Comment from County of Alpine Local Resident

Thank you for reviewing and circulating the Draft Initial Study with Proposed Mitigated Negative Declaration for the Mountain County Bridge Rails Project.

Caltrans will plan to leave at least one lane open with traffic control during daytime construction activities.

Appendix E Biological Opionin from USFWS

Consultation with the United States Fish and Wildlife Service was initiated on December 05, 2017. A Biological Opinion was received on December 12, 2018.

United States Department of the Interior

Pacific Southwest Region
FISH AND WILDLIFE SERVICE
Reno Fish and Wildlife Office
1340 Financial Boulevard, Suite 234
Reno, Nevada 89502
Ph: (775) 861-6300 ~ Fax: (775) 861-6301

December 12, 2018
File No. 2018-F-0199

James P. Henke
Biology Branch Chief
California Department of Transportation
Northern San Joaquin Valley Environmental Biology Branch
1976 Dr. Martin Luther King Jr. Boulevard
Stockton, California 95205

Subject: Mixed Consultation for the Proposed Mountain County Bridge Rails Project, Alpine County, California

Dear Mr. Henke:

This U.S. Fish and Wildlife Service (Service) correspondence is in response to your Biological Assessment [BA; California Department of Transportation (Caltrans) 2017a] and request for informal consultation received on December 6, 2017, on the Caltrans proposed Mountain County Bridge Rails Project (project) in California. The proposed action is designed to replace the existing guard rails with tubular bicycle railing and resurface bridges at four project locations [Project Location (PL) 1, 2, 3, and 4] in Alpine County. The project proposes to remove the existing railing on each bridge and replace it with new railing designed for bicycles. After bridge rail installation, new 2-inch (in) polyester concrete overlays will be installed on the bridge decks. At two sites (PL 3 and PL 4), the bridges will also be widened. The proposed project is scheduled to require 2 years (2020-2022) for completion. On April 17, 2018, Caltrans informed the Service that the project description for construction activities at PL 4 needed to be modified (C. Lafayette, Caltrans, pers. comm. 2018a). We received the new project information (Addendum) on July 31, 2018 (Caltrans 2018). On August 30, 2018, Caltrans informed the Service that the project description for construction activities at PL 3 needed to be slightly modified (C. Lafayette, *in litt.* 2018a). We received this new project information on September 17, 2018 (C. Lafayette, *in litt.* 2018b). Caltrans has been designated as the non-Federal representative by the Federal Highway Administration (FHWA) under the Endangered Species Act of 1973, as amended (ESA; 16 USC 1531 *et seq.*) (B. Broyles, Environmental Branch Chief, Caltrans *in litt.* 2017).

The BA and Addendum (Caltrans 2017a, 2018) address the proposed project's effects to the threatened Lahontan cutthroat trout (LCT; *Oncorhynchus clarkii henshawi*), the endangered Sierra Nevada yellow-legged frog (SNYLF; *Rana sierrae*) (and its designated critical habitat), and the threatened Yosemite toad (YT; *Anaxyrus canorus*) (and its designated critical habitat) in accordance with section 7 of the ESA.

You have requested our concurrence with the "not likely to adversely affect" determination for all three listed species (and designated critical habitat for SNYLF and YT). We concur with your determination of "not likely to adversely affect" for SNYLF and YT (and their designated critical habitats) due to: (1) The unlikelihood of their presence in the action area(s) due to lack of suitable habitat (HDR Engineering, Inc. 2017 as cited in Caltrans 2017a); (2) no in-water work will occur at two of the four locations (PL 1, PL 2,); (3) long distances between the impact area and known occurrences (from all four locations); (4) the elevation within the action areas range from about 5,500 feet (ft) to 6,900 ft above sea level (Caltrans 2017a), which is considered lower than where SNYLF and YT would likely occur within Humboldt-Toiyabe National Forest (HTNF) lands (Carson District) (Service 2017); and (5) although incomplete Visual Encounter Surveys (to determine presence or absence) were conducted in 2017, no individuals of either species were observed (HDR Engineering, Inc. 2017 as cited in Caltrans 2017a). None of the four PLs is located within designated critical habitat for either SNYLF or YT (Caltrans 2017a); as a result, no critical habitat for these two species will be impacted. Therefore, unless new information reveals effects of the proposed action in a manner or to an extent not considered, or a new species is listed, no further consultation is necessary for this action for these two species. These two species will not be discussed further in this document. If analysis of site-specific projects reveals that they may adversely affect these listed species or their critical habitat, this would constitute new information that may require reinitiation of consultation.

Based on our review of the BA (Caltrans 2017a), the project description, our knowledge of LCT presence within the two action areas because of ongoing stocking efforts (Service files; California Department of Fish and Wildlife *in litt.* 2017; C. Mellison, Service, *in litt.* 2018), and the likelihood of future LCT stocking efforts in these areas during the 2-year project period, we are unable to concur with the "not likely to adversely affect" determination for LCT. On January 24, 2018, in a discussion between Caltrans and Service staff, Caltrans agreed to change the determination to, "may affect, likely to adversely affect" for LCT to address concerns for this species at PL 3. As a result, formal section 7 consultation regarding LCT was initiated by Caltrans to address impacts to the species at PL 3. Additionally, on April 17, 2018, Caltrans informed the Service that the project description for construction activities at PL 4 needed to be modified and would also involve in-water construction activities (C. Lafayette, pers. comm. 2018a); some project information was also modified for PL 3 (Caltrans 2018). The other two project locations (PL 1, PL 2) do not involve in-water work; therefore, impacts to LCT are unlikely at these locations. Therefore, only effects analyses related to LCT at PL 3 and PL 4 will be provided in this document. Critical habitat has not been designated for LCT.

In completing this biological opinion (BO), the Service utilized the following: (1) The BA, dated November 2017, for the project (Caltrans 2017a); (2) the Addendum, dated July 2018, for the project (Caltrans 2018); (3) personal communication (telephone and e-mail records) between Caltrans and Service staff; and (4) information and reference material located within the Reno Fish and Wildlife Office (FWO) files.

The following information related to Consultation History, Description of the Action Area, and Description of the Proposed Project has been taken, primarily, from Caltrans' BA and Addendum (Caltrans 2017a; 2018).

CONSULTATION HISTORY

Updated species list requests were made on October 18, 2017, for all four bridge locations (2017-SLI-0150; 2017-SLI-0151; and 2017-SLI-0152) (Caltrans 2017a) and again on December 3, 2018.

On December 6, 2017, the Service received Caltrans' request for section 7 consultation.

On April 17, 2018, Caltrans informed the Service that the project description for construction activities at PL 4 (Silver Creek) needed to be modified to include in-water work.

On July 31, 2018, the Service received the new project information (BA Addendum).

On August 30, 2018, Caltrans informed the Service that the project description for construction activities at PL 3 (Markleeville Creek) needed to be slightly modified to include two culvert replacements.

On September 17, 2018, the Service received the new project information.

On November 29, 2018, the Service emailed the draft BO for Caltrans' review and comment.

On December 4, 2018, the Service received Caltrans' comments.

BIOLOGICAL OPINION

DESCRIPTION OF THE ACTION AREAS AND PROPOSED ACTION

Description of the Action Areas

The action areas, which all occur within the Carson River Watershed, include a 50-foot buffer around PL 1 and PL 2. At PL 3 and PL 4, the action areas are defined using a 150-foot buffer around the project location due to the in-water work that will occur. With the exception of PL 3, which is located in downtown Markleeville, the other locations are located on National Forest

lands and are primarily natural habitats that are used for recreation purposes. The action areas consist mostly of paved areas and gravel parking lots. The elevation within the action areas range from approximately 5,500 ft above sea level at PL 3 to 6,900 ft above sea level at PL 1.

Throughout the region, the eastern slope of the Sierra Nevada provides topographic relief with a variety of streams and rivers flowing through the vicinity of the action areas. The PLs include the project impact area and incorporates the majority of the Caltrans right-of-way (ROW) and in some areas extends beyond the ROW to include county property (*e.g.* PL 3) that may directly or indirectly be affected by project construction.

The action areas encompass the footprint of the project and any other areas that could be impacted by construction equipment and/or personnel (*e.g.*, equipment staging areas, material storage and disposal sites, etc.). Within the Caltrans ROW, the action areas encompass all areas expected to require the placement and construction of project features, vegetation removal, and areas required for the access, operation, storage and staging of construction equipment and personnel, as well as the impacts from these activities. The total action area for all four sites is approximately 17.54 acres (ac) (15.45 ac of upland habitat; 2.1 ac of aquatic habitat).

Description of the Proposed Action

The proposed action is designed to replace the existing guard rails with tubular railing designed for bicycles and resurface bridges at four PLs in Alpine County. Specifically, work will take place on a bridge on State Route (SR) 88 at post mile (PM) 14.70 near Hope Valley (PL 1); a bridge within the Caltrans ROW adjacent to SR 88 at PM 16.22 (PL 2) east of Hope Valley; a bridge on SR 89 in the town of Markleeville at PM 14.69 (PL 3); and a bridge on SR 4 at PM 26.15 (PL 4). Equipment commonly used in these efforts includes scrapers, bulldozers, heavy trucks, backhoes, cranes, pneumatic tools, and concrete pumps.

After bridge rail installation, the existing asphalt concrete will be removed from the bridge deck and a 2-in polyester concrete overlay will be installed before the bridge deck is finished and tied into the existing highway at both ends. Slight differences in construction and design at each bridge are described below. Some vegetation removal may be necessary at each of the four locations for construction foot access. A total of 0.11 ac of riparian habitat [*Salix lutea* (yellow willow)] will be temporarily impacted at PL 1, 2, and 4; and approximately 0.08 ac of riparian habitat (*Salix lutea*) will be permanently impacted at PL 3.

PL 1 – West Fork Carson River – the existing concrete baluster rail will be removed and replaced with California Type 80 barrier with Tubular Bicycle Railing on both sides of the bridge. After the bridge rail installation, the existing asphalt concrete will be removed from the bridge deck and a 2-in polyester concrete overlay will be installed on the deck for the entire deck span prior to finishing the deck to grade (tying into the highway on both ends). Limited upland vegetation removal by hand tools may be necessary for foot access below the bridge deck within 20 ft of both sides of the bridge abutments. The majority of construction will be done from the

deck using standard construction equipment (trucks for transporting materials to and from the construction site, a crane for lifting large/heavy objects, hand tools, etc.). No in-water work is required for this site.

PL 2 – West Fork Carson River (this bridge is not on SR 88 but is within the Caltrans ROW) – the existing timber rail, timber posts, curb, and sidewalk will be removed and replaced with California Type 80 barrier with Tubular Bicycle Railing on both sides of the bridge. After the bridge rail installation, the existing asphalt concrete will be removed from the bridge deck and a 2-in polyester concrete overlay will be installed on the deck for the entire deck span prior to finishing the deck to grade (tying into the highway on both ends). Limited upland vegetation removal by hand tools may be necessary for foot access below the bridge deck within 20 ft of both sides of the bridge abutments. The majority of construction will be done from the deck using standard construction equipment (trucks for transporting materials to and from the construction site, a crane for lifting large/heavy objects, hand tools, etc.). No in-water work is required for this site.

PL 3 – Markleeville Creek – Caltrans proposes to widen the Markleeville Bridge to include standard 8-foot shoulders to accommodate bike lanes. The estimated time to complete work at this site is approximately 270 days over the 2 years (seasons). During construction the existing timber rail, timber posts, curb, and sidewalk will be removed and replaced with California Type 80 barriers with Tubular Bicycle Railing on both sides of the bridge. To accommodate for the one-lane traffic control during construction within the in-water work window, one side of the bridge will be widened during the first stage (season 1), while the opposite side of the bridge will be widened during the second stage (season 2). Limited, controlled demolition will occur on top of the bridge and contained with the use of best management practices (BMPs) to prevent material from falling from the bridge into the creek below (Caltrans 2017b; C. Lafayette and S. Pozzo, Caltrans, pers. comm. 2018). Both the north and south Markleeville Creek bridge abutments are within the active creek channel. Scour mitigation [*i.e.*, riprap; amount unknown (C. Lafayette, pers. comm. 2018b)] will be placed along the northern bridge abutment. After the bridge widening, the existing asphalt concrete will be removed from the bridge deck [and project site (C. Lafayette, pers. comm. 2018b)] and a 2-in polyester concrete overlay will be installed on the deck for the entire span prior to finishing the deck to grade.

To widen the two abutments, Caltrans proposes to install temporary diversion dams to divert water flows around the in-water work areas during June 1 to October 15. In-stream work will be completed during this in-water work window, which occurs during the low flow period. The stream diversion will consist of a diversion dam being placed approximately 150 ft upstream of and 75 ft downstream from the bridge for a total length of stream diversion of 269 ft (including the width of the bridge). The diversion is anticipated to be 15 ft in width, allowing for work on the abutments to occur on either side of the diversion (Caltrans 2017a). The entire width of the channel is likely to be impacted as the diversion will likely occur in phases, diverting water to one side of the channel, then moved to the opposite side once the work on the previous side is completed (0.37 ac aquatic habitat temporarily impacted during diversions) (Caltrans 2018).

The diversion dams will be composed of washed river gravel berms brought into the action area [and removed from the area once project is completed (Caltrans 2018; C. Lafayette, pers. comm. 2018b)]. If flows within the creek are low, the diversion dam may be composed of simple berms, pipes, and pumps (C. Lafayette, pers. comm. 2018b); however, if the flows are higher the diversion dam may include concrete k-rail barriers to bolster the gravel berms. Regardless, the design of the diversion dam(s) will ensure adequate fish passage around the diversion dam during the in-water work window. This temporary dewatering will occur during two construction seasons. The diversion dam will be removed between the two construction seasons.

Fish captures will be conducted according to a Fish Relocation Plan (summarized here) (Caltrans 2018; C. Lafayette, pers. comm. 2018b). Prior to construction site dewatering, any fish, including LCT, will be captured and relocated to avoid direct mortality and minimize take. Fish relocation activities will be conducted by qualified fisheries biologists with a current California Department of Fish and Wildlife (CDFW) collector's permit, who have experience with fish capture and handling, and are pre-approved by CDFW. The biologist(s) will stay on site during the entire dewatering process. If the site is exposed to warm air temperatures when fish relocation would occur, then capture activities will occur during the morning. The biologist(s) will periodically measure air and water temperatures and cease activities when water temperatures exceed levels allowed by CDFW. Fish will be captured using sein and dip netting. If pumping is required to reduce water depths for the removal of fish, a mesh net will be placed around the pump area so fish are not entrained into the pump. The biologist(s) will minimize handling of the fish. Captured fish will be held in a container with a lid that contains cool, shaded water and is continually aerated. Fish will not be jostled, subjected to excess noise, overcrowded, or subject to predation. Fish will be relocated to a pre-selected release site.

Once the stream is diverted, new bridge abutments and riprap will be installed (0.001 ac of aquatic habitat permanently impacted/lost). Foundations for the bridge abutments will be constructed of concrete and rebar in the dewatered channel and will be widened by approximately 10 ft. In order to construct the foundations for the new abutments, digging using backhoes will occur, and it is possible that large rocks will need to be removed using approved rock removal methods (including chemical splitting, blasting, or hydraulic rams mounted on large excavators). Some hand digging will occur around the bridge footings, and it is possible that some water blasting may occur in order to clean up the foundations.

Access to Markleeville Creek will be necessary to complete the construction. Staging areas and construction access to the creek will occur on both sides of the creek on the upstream and downstream sides of the bridge. An 8-inch culvert (southeast corner of the bridge) will be replaced in kind and a 24-inch culvert (northwest corner of bridge) will be relocated and replaced in kind (C. Lafayette, *in litt.* 2018b). Vegetation, including upland riparian habitat, within these areas will be removed by hand (approximately 0.08 ac of yellow willow will be permanently removed).

Standard construction equipment (*e.g.*, trucks for transporting materials to and from the construction site, a crane for lifting large/heavy objects, hand tools, a backhoe for digging, track-mounted excavators, etc.) will be used.

PL 4 – Silver Creek – the existing metal beam guard rail will be removed and replaced with California ST - 70 railing on both sides of the bridge. After the bridge rail installation, the existing asphalt concrete will be removed from the bridge deck and a 2-in polyester concrete overlay will be installed on the deck for the entire deck span prior to finishing the deck to grade (tying into the highway on both ends). The exterior girders may need to be strengthened.

The revised proposed action for PL 4 as described in the Addendum (Caltrans 2018) requires in-water work in Silver Creek to accommodate 5-foot shoulders on both sides of the bridge and will be widened 3 ft on both sides by removing and replacing the overhangs. A carbon fiber strengthening technique will be employed at the replacement overhang and the existing concrete Tee girders. Carbon fiber strengthening work includes cleaning existing concrete surfaces, spreading a bonding agent to the existing concrete bridge superstructure beams and then applying carbon fiber strips to the bonding agent. Subsequent layers of bonding agent and carbon fiber strips are applied at right-angles to the previous layer to orient carbon fiber strands in different directions from the previous layer to maximize continuity of added strength of fibers.

The platforms and temporary support footings for the temporary falsework will require level ground and will require grading and adding gravel within the banks of Silver Creek. A temporary diversion dam will be placed (June 1 to October 15) in the bed of Silver Creek to divert water where temporary footings will be necessary to construct the temporary falsework footing. The stream diversions will consist of cofferdams placed both upstream and downstream of the bridge. The methods of installation and operation of the cofferdam at Markleeville Creek will be the same for Silver Creek. If flows within the creek are low, the diversion dam may be composed of simple berms and pipes; however, if the flows are higher the diversion dam may include concrete k-rail barriers to bolster the gravel berms. The design of the diversion dams will ensure adequate fish passage during the in-water work window. As at PL 3, the temporary water diversion will be removed between seasons.

Staging areas and construction access to the creek during the in-water work window could occur on both sides of the creek on the upstream and downstream sides of the bridge. Vegetation, including riparian habitat, within the staging areas on the upstream and downstream sides of the bridge will be removed to accommodate for the two-season construction schedule. Upland vegetation along the upstream and downstream portion of the bridge will be a permanent impact. A total of 0.54 ac of upland habitat and will be permanently impacted by the proposed action at PL 4. Of the 0.54 ac of upland habitat, 0.07 ac of *Salix lutea* and 0.37 ac of *Pinus ponderosa* (ponderosa pine) forest will be permanently impacted because vegetation will be removed over two consecutive construction seasons. The proposed action will also permanently impact 0.06 ac to developed habitat and 0.04 ac of *Artemisia tridentata* (big sagebrush) habitat. In addition, the placement of an access road will temporarily impact 0.25 ac of upland habitat and the water diversion will temporarily impact 0.29 ac of aquatic habitat. Standard construction equipment as indicated under PL 3 will also be used at this location.

For all four sites, total temporary vegetative impacts includes 1.92 ac (1.26 ac for upland and riparian habitat and 0.66 ac for aquatic habitat); total permanent vegetative impacts for all four sites includes 1.651 ac (1.65 ac for upland and riparian habitat and 0.001 ac for aquatic habitat) (Caltrans 2017a, 2018).

Compensation

Prior to the start of construction, Caltrans will develop a replanting plan to compensate for the temporary and permanent loss of shaded riverine habitat affected by the proposed action. The replanting plan will include a list of all plantings to be used for the project and will consist of native trees, shrubs, and herbaceous plants that are known to occur in the vicinity of the proposed action.

Riparian habitat temporarily impacted during construction activities will be restored by planting native riparian stock obtained from the vicinity of the proposed action. Plant species will include riparian trees and shrubs that are native to the western slopes of the Sierra Nevada. Native riparian vegetation temporarily impacted will be replaced on-site at a 1:1 ratio. Caltrans will develop a monitoring plan for riparian habitat to be restored on-site, through coordination with the U.S. Army Corps of Engineers (Corps) and CDFW. The monitoring plan will describe success criteria and duration of monitoring activities. In addition, shaded riverine habitat credits will be purchased at a Corps approved conservation bank at a 2:1 ratio to meet an overall project goal of a 3:1 mitigation ratio for shaded riverine habitat permanently removed by the proposed action. Caltrans will coordinate with the Corps to determine the appropriate method to obtain necessary shaded riverine habitat mitigation credits for the proposed action.

General Conservation Measures

To avoid and minimize effects to biological resources within the action areas, Caltrans will implement the following general avoidance and minimization measures:

1. **Worker Environmental Training**. All construction personnel will attend a mandatory environmental education program delivered by a qualified biologist prior to working in the action area. The program would focus on the conservation measures that are relevant to employee's personal responsibility and would include an explanation of how to best avoid take of biological resources and sensitive habitats. Distributed materials would include a pamphlet with distinguishing photographs of sensitive species, species' habitat requirements, compliance reminders, and relevant contact information. Documentation of the training, including sign-in sheets, would be kept on file and would be available on request.

2. **In-Water Work Window**. All in-water work will occur during the drier season (June 1 to October 15) to reduce impacts to LCT.

3. **Pre-construction Surveys**. Prior to any ground disturbance, pre-construction surveys will be conducted by a qualified biologist. These surveys will consist of walking within the action area to determine presence of the biological resources.

4. **Environmentally Sensitive Area**. Prior to commencing construction work, wetlands within 100 ft of construction activities will be delineated with high visibility temporary environmental sensitive area fencing. Fencing will exclude construction workers, vehicles, and equipment from the environmentally sensitive areas.

5. **General Nesting Bird Surveys**. Clearing and grubbing of vegetation will occur outside of the nesting bird season (February 15 to September 1), to the degree possible. When it is necessary to conduct construction activities during the nesting season, pre-construction surveys will be conducted within the action area prior to clearing and grubbing of vegetation or the start of any construction activity. The pre-construction survey should be conducted no more than 15 days before construction activities begin at any time between September 1 and February 15. If no active nests are detected, then no additional avoidance measures are required. If construction is halted or stopped for more than 2 weeks (15 days) and re-starts during the nesting bird season (February 15 to September 1), a pre-construction nest survey shall be re-conducted to ensure new bird nests have not been constructed within the action area.

6. **Non-Disturbance Buffer**. If work is to occur within 300 ft of active raptor nests and 100 ft of active passerine nests, a non-disturbance buffer will be established at a distance sufficient to minimize disturbance based on the nest location, topography, cover, the species' sensitivity to disturbance, and the intensity/type of potential disturbance.

7. **Covering of Trenches and Excavated Holes**. To prevent inadvertent entrapment of wildlife during construction excavated holes or electrical trenches more than 1-foot deep with walls steeper than 30 degrees will be covered by plywood or similar materials at the close of each working day. Alternatively, an additional 4-foot high vertical barrier, independent of exclusionary fences, will be used to further prevent the inadvertent entrapment of listed species. If it is not feasible to cover an excavation or provide an additional 4-foot high vertical barrier, independent of exclusionary fences, one or more escape ramps constructed of earth fill or wooden planks will be installed. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals.

8. **Artificial Lighting**. Except when necessary for construction, driver, or pedestrian safety, lighting of the proposed action area by artificial lighting during night time hours will be minimized to the maximum extent practicable.

9. **Trash**. All food-related trash items such as wrappers, cans, bottles, and food scraps will be disposed of in closed containers and removed regularly from the work area.

10. **Storm Water Pollution Prevention Plan**. All revegetation and restoration measures required in the stormwater pollution prevention plan (SWPPP) will be implemented.

11. **Asphalt Waste**. All grindings and asphaltic-concrete waste will be stored within previously disturbed areas absent of habitat and at a minimum of 150 ft from any aquatic habitat, culvert, or drainage feature. [As indicated above, asphalt waste will be removed from the action areas (C. Lafayette, pers. comm. 2018b)].

12. **No Monofilament Netting**. The use of plastic, monofilament, jute, or similar erosion control matting that could entangle fish or amphibians at the project site will be prohibited.

13. **Replanting with Native Species**. All areas that are temporarily affected during construction will be revegetated with an assemblage of native grass, shrub, and tree species to restore habitat values. Invasive, exotic plants will be controlled within the action area to the maximum extent practicable, pursuant to Executive Order 13112 (Invasive Species).

Additionally, standard construction BMPs will be implemented to minimize effects to water quality. Standard construction BMPs, such as placement of straw wattles or silt fencing along the boundary in the action areas, will be implemented according to an erosion control plan that will be prepared to avoid discharge into aquatic features (Caltrans 2017a). Adverse impacts to water quality will be avoided/minimized by implementing various temporary and permanent BMPs as outlined in Section 7 of the Caltrans' Construction Site Best Management Practices (BMP) Manual (Caltrans 2017b; C. Lafayette, Caltrans, *in litt.* 2018c).

ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

Section 7(a)(2) of the ESA requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this BO considers the effects of the proposed Federal action, and any cumulative effects, on the rangewide survival and recovery of the listed species. It relies on four components: (1) The Status of the Species, which describes the rangewide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and (4) the Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the species.

STATUS OF THE SPECIES

Lahontan Cutthroat Trout (rangewide)

Lahontan cutthroat trout were listed by the Service on October 13, 1970, as endangered under the Endangered Species Protection Act of 1969 (Service 1970) and subsequently reclassified as threatened on July 16, 1975, under the ESA, to facilitate management (Service 1975). There is no designated critical habitat for LCT.

Cutthroat trout (*O. clarkii*) have the most extensive range of any inland trout species of western North America and occur in anadromous, non-anadromous, fluvial, and lacustrine populations (Behnke 1992). Differentiation of the species into approximately 14 recognized subspecies occurred during subsequent general desiccation and isolation of the Great Basin and Inter-mountain Regions since the end of the Pleistocene, and indicates presence of cutthroat trout in most of their historic range prior to the last major Pleistocene glacial advance (Loudenslager and Gall 1980, Behnke 1992).

The LCT is endemic to the Lahontan Basin of northern Nevada, eastern California, and southeastern Oregon historically occupying large freshwater and alkaline lakes, small mountain streams and lakes, small tributary streams, and major rivers including the Truckee, Carson, Walker, Susan, Humboldt, Quinn, Summit Lake/Black Rock Desert, and Coyote Lake watersheds (Service 1995). Large lakes included Lake Tahoe, Fallen Leaf Lake, and Cascade Lake in the Tahoe watershed; Donner Lake, Independence Lake, Winnemucca Lake (now dry), and Pyramid Lake in the Truckee River watershed; Walker Lake in the Walker River watershed; and Summit Lake in the Black Rock Desert watershed (Gerstung 1988). Other headwater lakes found in the Walker River watershed were also historically occupied (Gerstung 1988).

Lahontan cutthroat trout occupy approximately 587.7 miles (mi), or 8.6 percent of streams within their historical range. Lahontan cutthroat trout occupy an additional 52.7 mi of habitat outside their historical range (Out-of-Basin) for a total of 640.1 mi of occupied stream habitat. Seventy-two conservation populations were identified based on May and Albeke (2008), which represent 74.0 percent (475.0 mi) of the occupied habitat.

Lahontan cutthroat trout occupy five of their historical lakes which constitute 46.8 percent of their historical lake habitat. However, only two lakes have self-sustaining populations, which comprises less than 1.0 percent of the historical lake habitat. All other lake populations within the Western Lahontan Basin are completely maintained by Federal, State, and Tribal hatchery stocking programs. Lahontan cutthroat trout are also stocked into many other lakes outside their historical range for recreational purposes.

Additionally, LCT raised in hatcheries are used to provide LCT-based recreational fishing opportunities to the public and augment or re-establish wild populations in streams. Hatchery production of LCT also provides opportunities to research the species' biology in a controlled, captive environment. While LCT in captivity are subject to capture, handling, and transportation risks as well as potentially impacted by degraded water quality or disease if water control and disease management systems fail, the recovery benefit of providing recreational fishing opportunities, fish to augment and re-establish wild populations, and opportunities to research the species outweigh the risk of the loss of these captive individuals.

If LCT are stocked with nonnative sport fish species (particularly trout) or into streams where self-sustaining populations of nonnative species are present, LCT are subject to competition for space and food. If stocked into streams containing reproductive rainbow trout, LCT are also subject to hybridization. The competition, predation, and hybridization that results from LCT

being stocked into waters containing nonnative sport fish (from contemporaneous or historical stocking events) can impact LCT recovery efforts. Regardless, stocked hatchery LCT are afforded the same protections under the ESA as naturally-occurring LCT.

The range of LCT is divided into three Geographic Management Units (GMUs) based on geographical, ecological, behavioral, and genetic factors, and has been managed as such since 1995. These three GMUs are: (1) Western Lahontan Basin comprised of the Truckee, Carson, and Walker River watersheds; (2) Northwestern Lahontan Basin comprised of the Quinn River, Black Rock Desert, and Coyote Lake watersheds; and (3) Eastern Lahontan Basin comprised of the Humboldt River and tributaries. The proposed action is located within the Northwestern GMU.

Relevant information on the status of LCT, life history traits, population dynamics, habitat requirements, threats, and historical and more recent distribution can be found in the LCT Recovery Plan (Service 1995), Short Term Action Plans for the Truckee and Walker River Basins (Service 2003a, b), and the LCT 5-year Review (Service 2009). A brief summary of our findings in the 5-year Review is presented below.

In the LCT 5-year Review (Service 2009), the range of the species was mapped and assessed by treating each occupied LCT stream as an individual mapping segment (May and Albeke 2008). Specific information relative to stocking records, presence of nonnative fish, LCT density, habitat quality, and relative stream width were collected for each mapping segment (May and Albeke 2008). In the 5-year Review, mapping segments were aggregated into conservation populations according to specific criteria; in this BO we continue this practice of distinguishing individual occupied stream reaches (mapping units) from conservation populations.

Lahontan cutthroat trout populations have been and continue to be impacted by nonnative species interactions, habitat fragmentation and isolation, degraded habitat conditions, drought, and fire (Rhymer and Simberloff 1996, Dunham *et al.* 1997, Dunham *et al.* 2002, Fagan 2002, Dunham *et al.* 2003).

Nonnative Salmonids (Competition and Hybridization)

Nonnative fish, especially salmonid species, are currently the greatest threat to LCT rangewide, resulting in loss of available habitat and range constrictions primarily through competition and hybridization. Nonnative fish co-occur with LCT in 36.4 percent of occupied stream habitat and all occupied historical lake habitat except for Walker Lake (Service 2009). Most LCT populations which co-occur with nonnative species are decreasing and the majority of populations extirpated since the mid-1990s have been lost as a result of nonnative species. Nonnative fish also occupy habitat in nearly all unoccupied LCT historical stream and lake habitat, making repatriation of LCT to these habitats extremely difficult. The majority of LCT populations are isolated and confined to small habitats (in terms of width) and short stream lengths. These factors reduce gene flow between populations and reduce the ability of populations to recover from catastrophic events, thus threatening their long-term persistence and

viability (Frankham 2005). Pyramid and Walker Lakes are important habitat for the lacustrine form of LCT. Conditions in these lakes have deteriorated over the past 100 years and continue to decline, most dramatically in Walker Lake.

Competition from nonnative trout has been identified as one of the most detrimental threats to native inland cutthroat trout (*Oncorhynchus clarkii* spp.) (Gresswell 1988, Behnke 1992, Young 1995). Both abiotic and biotic processes can influence competitive advantages for nonnative trout over native cutthroat trout (Dunham *et al.* 2002, Peterson *et al.* 2004, Shepard 2004, de la Hoz Franco and Budy 2005, Quist and Hubert 2005, Korsu *et al.* 2007, McGrath and Lewis 2007, Budy *et al.* 2008, Seiler and Keeley 2009, Wood and Budy 2009).

Hybridization with nonnative salmonids is a common threat to all native western trout species (Behnke 1992), including LCT (Service 2009). Nonnative rainbow trout (*Oncorhynchus mykiss*) readily hybridize with native cutthroat trout and produce fertile offspring; however, fitness decreases as the proportion of rainbow trout admixture increases (Muhlfeld *et al.* 2009). Even with reduced fitness, hybridization spreads rapidly because the initial F1 (first generation) hybrids have high fitness, hybrids tend to stray more frequently, and all offspring of hybrids are hybrids (Boyer *et al.* 2008, Muhlfeld *et al.* 2009). Extensive genetic mixing of natives, nonnatives, and hybrids contributes to the loss of locally adapted genotypes and can lead to the extirpation of a population or the extinction of an entire species (Leary *et al.* 1995, Rhymer and Simberloff 1996). Isolating populations of native salmonids from nonnative salmonids has become a popular management option; however, barriers can restrict life history traits and isolate populations in small habitats, thereby reducing long-term survival and precluding recolonization if the population is extirpated (Fausch *et al.* 2009).

Population Isolation

Isolated populations are vulnerable to extirpation through demographic stochasticity (random fluctuations in birth and death rates); environmental stochasticity (random variation in environmental attributes) and catastrophes; loss of genetic heterozygosity (genetic diversity) and rare alleles (inherited forms of a genetic trait); and human disturbance (Hedrick and Kalinowski 2000, Lande 2002, Reed and Frankham 2003, Noss *et al.* 2006, Pringle 2006). Completely isolated populations are the most severe form of fragmentation because gene flow among populations does not occur, thereby inflicting inbreeding depression on the population and reducing fitness (Hedrick and Kalinowski 2000, Reed and Frankham 2003, Frankham 2005, Scribner *et al.* 2006, Pritchard *et al.* 2007, Guy et al. 2008). Across the entire range of LCT, 72.2 percent (52 populations) of all conservation populations are completely isolated and occur in short (less than 5 mi) stream reaches (Service 2009). While the populations have maintained their purity, evidence of loss of genetic diversity has been found in LCT populations (Peacock and Kirchoff 2007).

A recent study characterized the population genetic diversity and genetic structure of 40 extant LCT populations, within and among watersheds and within each of the 3 GMUs across the range of LCT (Peacock and Kirchoff 2007). Genetic diversity was greatest in the Eastern GMU, a

finding attributed to the number of occupied streams, the size of extant populations, and availability of connected habitat. In contrast, the Northwestern GMU had moderately low genetic diversity due to small isolated populations.

Habitat Availability/Population Size

Several studies have found that population viability of cutthroat trout is correlated with stream length or habitat size (Hilderbrand and Kershner 2000, Harig and Fausch 2002, Young *et al.* 2005). Stream length is important because trout move throughout stream networks searching for a variety of habitats necessary to complete their life cycle (*i.e.*, spawning, rearing, migration corridors, refugium) (Baltz *et al.* 1991, Fausch and Young 1995, Young 1996, Muhlfeld *et al.* 2001, Schmetterling 2001, Hilderbrand and Kershner 2004, Schrank and Rahel 2004, Colyer *et al.* 2005, Neville *et al.* 2006, Umek 2007). Longer stream reaches have more complexity and have a higher probability that no particular habitat type limits the population (Horan *et al.* 2000, Harig and Fausch 2002, Dunham *et al.* 2003, Huusko *et al.* 2007).

The literature suggests that to ensure long-term persistence, cutthroat populations should consist of more than 2,500 individuals, occupy at least 5 mi of habitat, and have no nonnative species present (Hilderbrand and Kershner 2000). In streams with smaller population densities (160 fish/mi), the minimum required stream length increased to 15.5 mi. Only 28.2 percent of LCT conservation populations occupy habitat greater than 5 mi in length and over 83.0 percent of occupied streams have fewer than 150 LCT/mi.

Land Use Activities

The Service's LCT 5-year Review specifically identified grazing, roads and mining as land use activities that are occurring within watersheds containing LCT conservation populations (Service 2009). These activities vary in terms of the level of threat that they pose to LCT.

Grazing

Impacts of improper livestock grazing to stream habitat and fish populations can be separated into acute and chronic effects. Acute effects are those which contribute to the immediate loss of individuals, loss of specific habitat features (undercut banks, spawning beds, etc.) or localized reductions in habitat quality (sedimentation, loss of riparian vegetation, etc.). Chronic effects are those which, over a period of time, result in loss or reduction of entire populations of fish, or widespread reduction in habitat quantity and/or quality.

According to Minshall *et al.* (1989), riparian/stream ecosystems are the most threatened ecosystems in the Great Basin. Native and domestic grazers, especially cattle, are attracted to these narrow green strips of vegetation due to the presence of water, shade, succulent vegetation, and gentle topography (Platts 1979, Marlow and Pogacnik 1986, Smith *et al.* 1992, Kie and Boroski 1996, Parsons *et al.* 2003). Livestock grazing can affect riparian areas by changing, reducing, or eliminating vegetation (Schulz and Leininger 1990, Green and Kauffman 1995), and by the actual loss of riparian areas through channel widening (Overton et al. 1994), channel

degradation, or lowering of the water table (Chaney *et al.* 1990). Effects to fish habitat include reduction of shade and cover and resultant increases in water temperature, changes in stream morphology, and the addition of sediment due to bank degradation and off-site soil erosion (Belsky *et al.* 1999).

In the LCT 5-year Review, the Service determined that some level of livestock grazing occurs in 95.0 percent of stream lengths containing LCT conservation populations (64 conservation populations; Service 2009). All conservation populations located in the Eastern and Northwest GMUs, and 72.0 percent in the Western GMU, were determined to have some level of grazing occurring. During the 5-year Review, data concerning livestock stocking rates, season of use, or utilization levels was not compiled or analyzed.

Roads

The ecological effects of roads on aquatic systems and fish are well documented (Forman and Alexander 1998, Spellerberg 1998, Trombulak and Frissell 2000, Gucinski *et al.* 2001, Forman *et al.* 2003, Wheeler *et al.* 2005). Road crossings can create barriers to fish migration (*e.g.*, culverts), effectively isolating populations in headwater reaches (Furniss *et al.* 1991, Warren and Pardew 1998). Roads can affect the hydrology, geomorphology, and disturbance regimes in stream networks (Jones *et al.* 2000). Increases in the frequency and magnitude of flood events have been attributed to roads (Jones *et al.* 2000), which reduce a stream's ability to cope with other large disturbances, and it may not be as resilient as it once was under a normal flow regime. Water, through precipitation or shallow groundwater transport, may be intercepted by roads and rerouted into the stream at road crossings (Wemple *et al.* 1996), which can add to the flood peak and increase sediment delivery to streams (Sugden and Woods 2007). Several studies have found that increasing road densities were clearly associated with declining salmonid populations (Lee *et al.* 1997, Dunham and Rieman 1999). Roads also facilitate movement of vectors for invasive species of plants (Tyser and Worley 1992, Forman *et al.* 2003) and animals (Rahel 2004). Increases in illegal fishing and illegal introductions of nonnative fish and other aquatic organisms are facilitated by public road access to different water bodies (Rahel 2004). In the LCT 5-year Review, the Service concluded that roads are associated with 65.0 percent of stream lengths containing LCT conservation populations (37 conservation populations) (Service 2009). We identified stream impacts from roads within 90.0 percent of the conservation populations found in the Northwest GMU, 67.0 percent of the Western GMU, and 51.0 percent in the Eastern GMU. It was concluded that roads are a threat to LCT and its habitat because roads occur in the majority of LCT conservation populations; however, at the present time it is uncertain as to the magnitude of this threat and its effects upon status and trends in LCT conservation populations.

Mining

The effects of mining on receiving water systems can represent a severe threat to all aquatic organisms in localized situations (Nelson *et al.* 1991). Mining can contribute toxic substances into waterways, alter stream morphology, and dewater streams completely (Nelson *et al.* 1991, Service 2008). In 2008, the Service published an assessment of trace-metal exposure to aquatic

biota from historical mine sites in the western Great Basin (Service 2008). The study looked at five different streams across the western Great Basin with various levels of mining impacts. The authors found low pH and increased concentrations of certain trace-metals in some streams which pose a significant threat to aquatic biota, increased concentrations of trace-metals in stream sediment, and bioaccumulation of trace-metals in macroinvertebrates and fish. In our 5-year Review for LCT, it was determined that mining was associated with 16.3 percent of stream lengths containing LCT conservation populations (7 conservation populations) in the Eastern and Northwest GMUs for LCT (Service 2009). We determined that mining was a low-magnitude threat to LCT on a rangewide basis; however, areas of concentrated impact do exist across the species' range.

Drought, Water Diversions, Water Management

Matthews and Marsh-Matthews (2003) reported the most common drought-related impacts to fish were decreases in numbers at the population and community level, loss of habitat, poor water quality (*i.e.*, hypoxia and temperature), decreased ability for movement, crowding, and desiccation. They also noted that studies of the effects of drought have occurred on a local scale but that large spatial studies incorporating metapopulations dynamics were lacking (Matthews and Marsh-Matthews 2003). Drought related decreases in several LCT populations have recently been documented (Sevon *et al.* 1999, Neville and DeGraaf 2006, Ray *et al.* 2007).

Small streams (width of 5 ft or less) are more susceptible than larger streams to drying, increased stream temperatures during the summer, and freezing during the winter, and stream width is an indicator of these risks (Lake 2003). Approximately 35.0 percent of occupied LCT habitats are in streams that are 5 ft or less in width. Although not all small streams have equal risk from drought, small headwater streams, especially those with an inadequate number of deep pools, are most likely to lose suitable habitat (Lake 2003). However, functioning small streams with good quality habitat (*e.g.*, deep pools) and limited anthropogenic influences can sustain salmonids during drought conditions (White and Rahel 2008). Since most LCT conservation populations are small and isolated, any reduction in population size due to drought can also reduce genetic diversity and fitness (Rutledge *et al.* 1990, Faber and White 2000).

Lahontan cutthroat trout populations have been severely reduced or even extirpated due to drought-related effects (Service 1995, Dunham 1996, Neville and DeGraaf 2006, Ray *et al.* 2007). The summer of 2015 represented the fourth year of regional drought across most of the historical range of LCT, thus generating conditions that exacerbate threats to LCT. Across the range of the species, some LCT-occupied streams ran dry or were severely curtailed due to the continued drought conditions. Since most populations are isolated, recolonization after extirpation or input of genetic material from other populations cannot occur naturally. The reduction of flow into important terminal lakes (*i.e.*, Pyramid and Walker) is decreasing water quality and affecting LCT survival. With more frequent and severe droughts likely accompanying climate change, it was concluded that drought is a threat to LCT throughout its range.

Natural low flows caused by droughts have occurred historically, but are now exacerbated by flow diversions. Where water diversions lead to lower instream flows, LCT is affected by increased water temperature, limited access to aquatic habitats, and increased opportunity for competition between fish species (Spence *et al.* 1996, Harvey *et al.* 2006). Dewatering of stream channels during the irrigation season may result in stranding of fish, exposure and desiccation of spawning redds and nursery habitat, and disruption of LCT migratory patterns (Spence *et al.* 1996).

Many diversion structures fragment watersheds and act as barriers to fish migration, limiting the ability of migrating adults, juveniles and fry to migrate to required life history habitats (Fausch *et al.* 2002, Ovidio and Philippart 2002, Compton *et al.* 2008). Certain barriers are complete obstructions to upstream immigration, while others may be partial barriers. When access is limited, fish may spawn in and utilize sub-optimal habitats. Out-migrating fry and juveniles may be injured or killed during downstream migration through entrainment into irrigation canals or passage over obstructions (Carlson and Rahel 2007, Roberts and Rahel 2008).

The combined effects of water management activities result in a loss of habitat diversity required by native aquatic species (Allan 2004, Anderson *et al.* 2006). Degradation of native riparian communities associated with altered hydrology and land use practices has added to the loss of channel diversity and habitat complexity (Nilsson and Berggren 2000, Allan 2004). Healthy, intact riparian zones provide hydraulic diversity, add structural complexity, buffer the energy of runoff events and erosive forces, moderate temperatures, and provide a source of nutrients (Naiman and Décamps 1997). Riparian zones are especially important as a source of organic matter in the form of woody debris (Naiman and Décamps 1997). Woody debris helps control the amount and quality of pool habitat and adds complexity to the habitat (Montgomery *et al.* 2003).

Water management throughout the historical range of LCT continues to negatively impact LCT through reduced water quality and quantity, fish entrainment into irrigation systems, fish barriers, and the loss of habitat diversity. In the 5-year Review, it was concluded that water management is a substantial threat to LCT throughout its range, with the most substantial impacts occurring in the Western Lahontan Basin.

Fire

Fish mortalities can occur from increases in water temperatures which exceed lethal levels, fire induced changes in pH, increased ammonium levels from smoke gases absorbed into surface waters, and increased phosphate levels leached from ash (Brown 1989, Norris *et al.* 1991, Spencer and Hauer 1991, Rinne 1996, Rieman and Clayton 1997, Gresswell 1999, Earl and Blinn 2003, Ranalli 2004, Neary *et al.* 2005). Direct mortality of fish have been observed mainly in smaller streams due to greater impacts from fire on smaller aquatic habitats (Rinne and Jacoby 2005, Howell 2006).

Most negative effects to aquatic species after wildfire are due to the immediate loss or alteration of habitat and indirect effects. Riparian vegetation is directly consumed by fire which may cause an increase in water temperature and the loss of cover for aquatic species (Dunham *et al.* 2007). Riparian plant species have adapted to disturbances such as fire which, coupled with being in a moist environment, facilitates rapid recovery of riparian habitat following fire; however, recovery rates depend on the condition of the riparian area prior to the fire, the fire severity, post-fire flooding, and post-fire management (Miller 2000, Bond and Midgley 2003, Dwire and Kauffman 2003, Pettit and Naiman 2007, Halofsky and Hibbs 2009, Jackson and Sullivan 2009).

Soil degradation can result from accelerated soil erosion, loss of vegetative cover, oxidation of soil organic matter, and impairment of other soil physical, chemical, and biological properties (Neary *et al.* 2005). Soil erosion on slopes can contribute to bank erosion in stream channels and siltation of riparian and aquatic plants leading to sediment loading in streams, which can be detrimental to aquatic species (Newcombe and MacDonald 1991, Bash *et al.* 2001, Burton 2005).

Increases in stream temperature are a common occurrence after a disturbance such as wildfire due to loss of riparian vegetation and increased solar radiation (Gresswell 1999, Moore *et al.* 2005, Dunham *et al.* 2007, Isaak *et al.* 2010, Mahlum *et al.* 2011). The magnitude and duration of these temperature increases are variable and depend on many factors which include past disturbance, elevation, groundwater inputs, aspect, percent of the watershed burned, size of watershed, riparian vegetation recovery, and post-fire channel reorganization due to flooding (Dunham *et al.* 2007).

Macroinvertebrate communities are strongly influenced by substrate instability associated with post-fire erosional processes (Arkle *et al.* 2010). Effects include changes in functional feeding groups (La Point *et al.* 1983), more annual variation (Richards and Minshall 1992), and changes in abundance, diversity, and species richness (Roby 1989, Lawrence and Minshall 1994, Minshall *et al.* 1995, Roby and Azuma 1995, Mihuc *et al.* 1996, Minshall 2003, Mellon *et al.* 2008). Species best adapted to post fire stream conditions can be characterized as those which prefer a broad range of physical habitat (Mihuc *et al.* 1996, Lepori and Hjerdt 2006). Taxa which require specialized habitat needs respond much slower to disturbances such as fire (Mihuc *et al.* 1996, Lepori and Hjerdt 2006).

Post-fire hydrologic events can severely reduce or extirpate local fish populations (Novak and White 1990, Propst *et al.* 1992, Bozek and Young 1994, Rinne 1996, Rieman and Clayton 1997, Burton 2005, Sestrich *et al.* 2011). Recolonization rates depend on the proximity and relative location of refugia, access from refugia to disturbed areas (*e.g.*, no fish barriers), and the occurrence of complex life history traits and overlapping generations (Gresswell 1999, Dunham *et al.* 2003, Howell 2006, Dunham *et al.* 2007, Neville *et al.* 2009, Sestrich *et al.* 2011). Isolated fish populations are at a much higher risk of extinction because they cannot recolonize after a large disturbance (Rinne 1996, Dunham *et al.* 2003, Burton 2005, Dunham *et al.* 2007).

Additionally, effects on small headwater streams are more severe because larger proportions of the drainage are burned at these smaller spatial scales, in contrast to larger stream orders, where relatively small proportions of the drainage burn (Romme *et al.* 2011, Sestrich *et al.* 2011).

Although LCT evolved in a fire-prone environment, increases in wildfire frequency and severity due to increased fuel loads and effects from climate change (Westerling *et al.* 2006) have increased the threats due to wildfire. Current wildfires are a larger threat to LCT because of existing habitat loss and the current fragmented and isolated state of occupied habitat.

Climate Change

The impacts to LCT from climate change are not known with certainty. Climate change is predicted to have several effects on cold water habitat including: (1) Increased water temperature; (2) decreased stream flow; (3) change in the hydrograph; (4) increased frequency and severity of extreme events such as drought and floods; and (5) changing biotic interactions between native and nonnative species (Stewart *et al.* 2005, Ficke *et al.* 2007, Bates *et al.* 2008, Webb *et al.* 2008, Kaushal *et al.* 2010, PRBO Conservation Science 2011, Wehner *et al.* 2011, Wenger *et al.* 2011). Haak *et al.* (2010) analyzed the potential cumulative impacts of increased stream temperatures, winter flooding, wildfire, and drought on the persistence of 10 native salmonids in the western United States, including LCT.

Fifty-five LCT conservation populations across the range of the species are at high risk of one or more climate risk factors; however, only nine of these conservation populations meet persistence criteria (Haak *et al.* 2010). In response to increasing temperatures, LCT will shift their distributions to northern latitudes (if possible) and/or higher elevations to find adequate stream temperatures (Keleher and Rahel 1996, Poff *et al.* 2002). This will likely increase fragmentation of populations and coupled with increases in stochastic events (*e.g.*, fire, flood, drought) will further disrupt metapopulation dynamics which increases the probability of extinction (Dunham *et al.* 1997, Fagan 2002, Opdam and Wascher 2004, Frankham 2005, Wilcox *et al.* 2006). Restoring physical connections among aquatic habitats may be the most effective and efficient step in restoring or maintaining the productivity and resilience of many aquatic populations (Bisson *et al.* 2003, Dunham *et al.* 2003, Rieman *et al.* 2003, Dunham *et al.* 2007, Rieman and Issak 2010). The focus should be to protect aquatic communities in areas where they remain robust and restore habitat structure and life history complexity of native species where aquatic ecosystems have been degraded (Gresswell 1999, Seavy *et al.* 2009, Rieman and Issak 2010).

ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem, within the action area. The environmental baseline is a snapshot of a species' health at a specific point in time. It does not include the effects of the action under review in this consultation.

Status of the Species within the Action Area

As indicated above, LCT historically occurred within the Carson River watershed. Currently, LCT are known to occur or have occurred within the action areas, or have access to Markleeville and Silver Creeks (due to stocking directly into these creeks or stocking in the East Fork of the Carson River). Lahontan cutthroat trout have been stocked in/near these areas by CDFW in the past, including the recent past of 2016, 2017, and 2018 (Service files; CDFW *in litt.* 2017; Caltrans 2017a; C. Mellison, Service, *in litt.* 2018). It is also our understanding that CDFW may conduct future LCT stocking efforts in these creeks prior to, and possibly during, the 2-year project construction window from 2020 to 2022. Assembly Bill 7, included in the California Fish and Game Code as Section 13007 addresses the management, maintenance, and capital improvement of the state's fish hatchery facilities, the Heritage and Wild Trout Program, other sport fishing activities, the enforcement of these activities, and yearly trout production. Based on stocking records available for 2016 (CDFW *in litt.* 2017), 600 and 11,250 LCT were put into Markleeville Creek (at two locations within 0.5 mile of each other near Markleeville Bridge) and the East Fork Carson River (at four locations within 6.4 miles, between Hangman's Bridge and Silver Creek Bridge), respectively. Stocked fish size was likely in the 8 to 12 in range. Lahontan cutthroat trout spawning has not been documented in these creeks nor is it expected to occur within the two action areas.

Factors Affecting the Species within the Action Area

This analysis describes factors affecting the environment of the species or designated critical habitat in the action areas in Markleeville Creek and Silver Creek. The baseline includes State, Tribal, local, and private actions already affecting the species or that will occur contemporaneously with the consultation in progress. Unrelated Federal actions affecting the same species or critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are Federal and other actions within the action areas that may benefit listed species or critical habitat.

Within the action areas, the primary threats to LCT include competition with introduced nonnative fish and other species of nonnative trout and urban development (*e.g.*, roads).

EFFECTS OF THE ACTION

Service regulations for implementing the ESA (50 CFR § 402.02) define effects of the action as the direct and indirect effects of an action on the species and/or critical habitat together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Direct effects are the immediate, often obvious impacts of the proposed action on species and habitat that occur at the same time and place as the action. Indirect effects are impacts caused by or resulting from actions of specific projects and are later in time but reasonably certain to occur. In contrast to direct effects, indirect effects are not immediately apparent and may affect listed species populations and habitat quality over an extended period of time, long after an action has been implemented.

Based on review of the proposed action, potential direct and indirect effects to LCT may occur at PL 3 and PL 4, due to the in-water work. Therefore, the effects analysis will only address potential project impacts to LCT from the proposed bridge modification activities at these two sites. As indicated in the BA (Caltrans 2017a) and Addendum (Caltrans 2018), bridge construction activities at PL 3 and PL 4 would involve widening the bridges and thus abutments up and downstream of the bridge requiring: placing riprap along the northern bridge abutment (PL 3); installing a temporary diversion dam during two seasons to divert streamflow away from the in-water work area; capturing and relocating LCT; constructing new abutment foundations with backhoes, which may require removing large rocks from the creek using approved rock removal methods (*e.g.*, chemical splitting, blasting, or hydraulic rams mounted on large excavators); hand-digging around bridge footings, and water blasting to clean up the foundations may be needed; establishing staging areas and construction access to Markleeville and Silver Creeks on and from both banks, and upstream/downstream of the bridges; and removing vegetation, including riparian habitat, within the action areas. Standard construction equipment would be used (*e.g.*, trucks, cranes, hand tools, excavators, backhoes, etc.). These activities are scheduled to occur during June 1 to October 15 over 2 years.

The proposed activities at PL 3 and PL 4 have the potential to adversely impact LCT and alter their aquatic habitat within the action areas. Due to the in-river work window of June 1 to October 15, juvenile and adult LCT are the life-stages most likely to be negatively affected by the proposed action. However, few, if any, juvenile or adult LCT are expected to be in the action areas due to project timing, their life-history characteristics, and the low-flow conditions likely during the proposed construction time period.

Those activities that have the potential to negatively impact LCT and its habitat include: (1) In-water work associated with diversion dam construction, dewatering of the work area, and installation of bridge foundations and riprap; (2) soil and vegetation disturbance/removal; (3) use of heavy equipment and noise; and (4) exposure to chemicals.

The following analysis describes the activities that could potentially occur and affect LCT in these two PLs.

Effects of In-stream Work and Fish Displacement

In-water work in Markleeville and Silver Creeks could lead to direct and indirect impacts to LCT. Direct impacts include temporary reduction in the amount of available aquatic habitat due to dewatering; capture/entrapment in the dewatered portions of the creeks; increased dust and turbidity during diversion dam installation; gill abrasion due to increased turbidity from erosion and diversion dam installation; and decreased water quality due to a loss of bank shading. Project related disturbance to LCT could also interrupt or alter movements, including excluding or causing avoidance of the action areas, which may affect their feeding or sheltering. Prior to in-water work, diversion dams will be installed and the work areas dewatered through a free flowing diversion or pipes. The free flow system, including the adequately sized pipes, will allow LCT to continue to move upstream and downstream of the work areas, not impacting their movements. The dewatering will be implemented in association with a fish capture/relocation

plan because river dewatering activities could trap or strand LCT within the diversion structures. Although water within the diversion structures will be released slowly to facilitate movement of LCT out of the areas and to mitigate the likelihood of injury or mortality, some individuals may be trapped in pools or stranded on the streambed.

To reduce the number of LCT injured or killed through dewatering, the CDFW approved biologists will salvage LCT (and other fish) by netting and moving them out of the dewatered areas. Disturbance, injury, or death of stranded LCT from dewatering activities is minimized by project timing when few juvenile and adult LCT will likely occur in the action areas, and by salvaging any LCT that do not move out of the work areas during dewatering activities. Additional minimizing measures to reduce impacts to LCT during this activity are more fully discussed in the Fish Relocation Plan.

The diversion dams will temporarily impact only 0.37 ac of aquatic habitat at PL 3, with only 0.001 ac of permanent impacts to LCT aquatic habitat anticipated. At PL 4, the diversion dams will temporarily impact only 0.29 ac of aquatic habitat, and no permanent impacts to LCT aquatic habitat are anticipated. Installation of the diversion dams has the potential to release sediment downstream, affecting LCT in the streams (discussed more fully below). Water will also be slowly released back into dewatered sections of the river, minimizing stream disturbance from the flow and reducing the amount of sediment that settles and potentially embeds downstream substrate. It is expected that high seasonal flows will wash and redistribute any deposited sediment downstream. Post-construction activities such as upland revegetation efforts and the planting of riparian plant species along the river banks should improve/restore riverine habitat quality by providing shade and streambank stability. Standard construction BMPs will be implemented to minimize affects to water quality (discussed more fully below). Thus, any water quality impacts to LCT are expected to be a short-term effect, and the work areas will be isolated from the stream in order to reduce long-term sedimentation issues.

Lahontan cutthroat trout may be displaced due to visual, noise, and vibration disturbances from a variety of mechanisms. Displacement of fish from visual, noise, and vibration disturbances could occur for some unknown distance up and downstream of the activity. Displacement from migratory habitat can result in disruption of LCT life-cycles, which can result in a variety of effects, including: reductions in survival, abundance, and reproduction, as well as the potential of long-lasting genetic effects that are difficult to discern. However, LCT passage will be maintained in half the river channels at all times. Only small, temporary reductions in food and habitat availability for LCT are anticipated to occur in the in-water work area and immediately downriver of the diversion structures. Finally, the potential negative impacts of displacing the few LCT that may be in the action areas will be short-term in nature and temporary (June 1 to October 15 over two seasons).

Effects of Sediment

Lahontan cutthroat trout could be impacted by increased sedimentation entering Markleeville and Silver Creeks during construction activities (as discussed above) as well as from streambank vegetation removal. Silt and sand may be mobilized during the installation or removal of the

diversion structures, and the dewatering and rewatering of the work areas, which will likely increase turbidity (measure of the relative clarity of water and it increases with increasing sediment loads) within the action areas. In addition, removal of trees and shrubs and recontouring of the banks to provide access to the work areas will temporarily destabilize sections of the streambank, potentially adding sediment to the creeks.

All upland and riparian vegetation removal will occur between June 1 and October 15. At PL 3, approximately 0.08 ac of permanent impacts to riparian vegetation (*Salix lutea*) will occur due to its removal. Additionally, upland vegetation (1.01 ac) will be temporarily removed, which will likely also result in increased erosion and increased sediment entering into the Markleeville Creek. At PL 4, 0.07 ac of permanent impacts to riparian vegetation (*Salix lutea*) will occur due to its removal. Additionally, upland vegetation (0.25 ac) will be temporarily removed, which will likely also result in increased erosion and increased sediment entering into Silver Creek. Loss of riparian vegetation also reduces the availability of streambank shading resulting in potential changes in water temperatures.

Suspended sediments can affect fish behavior, physiology, and habitat alteration which may result in stress and reduced survival. The severity of effects from suspended sediment increases as a function of sediment concentration and exposure time or dose (Newcombe and Jensen 1996). Effects on fish behavior include avoidance of turbid water, altered territoriality, and changes in foraging behavior (Bisson and Bilby 1982, Berg and Northcote 1985). Physiological effects associated with increased levels of suspended sediment include gill trauma, oxygen intake, and ultimately impacts to reproduction and growth (Redding *et al.* 1987, Servizi and Martens 1992). Increased sedimentation in streams can also affect fish populations through habitat alteration such as impacting foraging habitat including the benthic invertebrate community. The Service anticipates several pulses of sediment are possible, with subsequent increases in turbidity, during the installation and removal of the temporary diversion structures and the dewatering and rewatering activities. The Service also expects that runoff from disturbed upland areas may also contribute additional sediment to the action areas.

It is expected that some project-generated sediments may be transported some distance downstream of the in-water work areas, but will largely be contained due to the proposed project implementation of various standard construction BMPs that will avoid/minimize impacts to water quality. Standard construction BMPs will be implemented according to the erosion control plan to avoid discharge into aquatic features. The potential for adverse effects to water quality would be avoided/minimized by implementing various temporary and permanent BMPs as outlined in Section 7 of the Caltrans' Construction Site Best Management Practices (BMP) Manual (Caltrans 2017b, C. Lafayette, Caltrans, *in litt.* 2018c). In addition, conservation measures as described in Section 5.8.1 of the BA (Caltrans 2017a) and reiterated in this BO will be implemented to reduce the potential for impacts from these issues. Any adverse effects of turbidity likely will not occur very far downstream due to Caltrans' regulatory requirements, dewatering of the impacted area/sediment source, implementation of SWPPP and other BMPs, and the natural settling of sediment. Additionally, impacts to LCT would be reduced due to the timing of the project during low-flow conditions and that juvenile or adult LCT in the action

areas are likely to swim away from a sediment plume. Therefore, it is unlikely that sediment concentrations downstream will be intense enough or of long enough duration to cause adverse effects to LCT.

Post-project restoration of the action areas will include revegetation of disturbed areas. Areas affected during construction will be revegetated with an assemblage of native grass, shrub, and tree species to restore habitat values. Invasive, exotic plants would be controlled within the action area to the maximum extent practicable, pursuant to executive Order 13112 (Invasive Species). In the long-term, post-construction vegetation restoration activities should reduce sedimentation into the creeks improving habitat conditions for LCT.

Effects of Heavy Equipment Use

The use of heavy equipment during construction activities at PL 3 and PL 4 would result in ground vibrations, dust, exhaust, noise, and create odors associated with on-the-ground and in-water construction work. The use of heavy equipment would likely cause LCT to move out of preferred habitat in the action areas and could lead to a decrease in their ability to feed.

Lahontan cutthroat trout could be crushed or buried when heavy machinery enters the river during the installation or removal of the temporary diversion dams if individuals were present in the area. However, it is unlikely that LCT would be physically harmed by heavy equipment or other construction vehicles as work within the water will be limited (*i.e.*, heavy equipment will not be used in the live stream), equipment will not enter the channel until the stream diversion has been completed) and any salvage of LCT has occurred. The diversion dam and pipes will allow LCT to move upstream and downstream past the work area to other suitable habitat in the creeks. Thus, crushing impacts to LCT are unlikely.

Equipment and vehicles are a potential source of hazardous materials (*e.g.*, oil, fuel, asphalt, solvents), which could be inadvertently spilled into the action areas, as discussed below. Additionally, the use of vehicles and equipment could contribute to the spread or introduction of invasive species to the action areas.

Standard construction BMPs will be implemented according to the erosion control plan to avoid discharge into aquatic features. The potential for adverse effects to water quality would be minimized by implementing various temporary and permanent BMPs as outlined in Section 7 of the Caltrans' Construction Site Best Management Practices (BMP) Manual (Caltrans 2017b; C. Lafayette, *in litt.* 2018a). In addition, conservation measures as described in Section 5.8.1 of the BA (Caltrans 2017a) and reiterated in this BO will reduce the potential for impacts from these issues.

Effects of Toxic Chemicals

Lahontan cutthroat trout could be impacted by exposure to various chemicals during construction activities at Markleeville and Silver Creeks. Chemical contamination could occur from activities conducted during installation and removal of the temporary diversion structures, the subsequent

dewatering and rewatering activities, and during in-water construction. Accidental release of pollutants from heavy equipment (*e.g.*, petroleum products) could also contaminate the action areas.

Chemical or toxin contaminants can have numerous effects on aquatic animals, especially fish. In general, the effects of heavy metal or petroleum contamination are similar for all fish species due to the fact that many of their sensitive organs are in constant contact with their environment. A review of the effects of heavy metals on salmonids by Price (2013) indicates that heavy metals can have a variety of effects on individuals, from death (lethal exposure) to reductions in swimming speed, feeding rates, predation success, territoriality, egg/larval survival, growth and reproduction rates, olfaction, and impairment of development, mobility, and cellular functions over time (sublethal exposure). Similarly, a variety of effects, from lethal to sublethal, occur to fish when exposed to varying levels of petroleum contamination (Malins 1977).

Any LCT present within the action areas may be exposed to contaminants during the proposed project. To reduce this potential for chemicals to enter Markleeville and Silver Creeks, Caltrans will implement the regulatory requirements, SWPPP, and BMPs as mentioned above in the Effects of Sediment and Heavy Equipment Use sections. If exposed, LCT would likely respond by vacating the areas to avoid further exposure to any chemicals. This displacement could impact the ability of LCT to feed and shelter in the action areas. However, we expect any adverse effects to LCT due to chemical exposure to be minimal because the amount would be small, occur over a short period of time, occur in low streamflow conditions during the in-water work window, and LCT would be able to vacate the action areas.

Overall, the potential negative impacts to LCT and its habitat of the proposed project would be temporary given the commitment to the implementation of project's regulatory requirements, in addition to specific project features. The Service anticipates that the various adverse effects described above would occur in the short-term and would not result in measurable impacts to LCT or through population-level indicators. Moreover, the Service anticipates beneficial/ improved effects of the proposed action due to on-site riparian revegetation. Therefore, the overall, long-term beneficial effects are expected to outweigh the short-term adverse effects associated with implementation of the proposed project related to sediment, equipment use, and chemicals.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Recreational fishing for LCT can affect both abundance and age class distribution of the population and deplete age class structure during periods of low abundance, which may delay recovery of population levels. Introductions of nonnative fish species are also frequently attributed to use of live bait for fishing and unauthorized introductions of nonnative gamefish

species in conjunction with recreational fishing activities. Introduced species have adversely affected LCT through competition, predation, and hybridization, and may contribute to disease problems (Service 2009).

CONCLUSION

After reviewing the current status of the LCT, the environmental baseline for the action area, the effects of the proposed Federal action, and the cumulative effects, it is the Service's biological opinion that the action as proposed, is not likely to jeopardize the continued existence of LCT. No critical habitat has been designated for this species; therefore none will be affected. We base our conclusion on the following:

1. Effects to LCT will be small in scale and short in duration,

2. Environmental protection measures are proposed that will avoid or minimize effects to LCT and its habitat, and

3. The number of LCT adversely impacted will be small in relation to the number of LCT stocked in the action areas.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of sections 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are nondiscretionary and must be implemented by Caltrans so that they become binding conditions of any grant or permit issued to the Cooperator, as appropriate, for the exemption in section 7(o)(2) to apply. Caltrans has a continuing duty to regulate the activity covered by the incidental take statement. If Caltrans: (1) Fails to assume and implement the terms and conditions or (2) fails to require a contractor to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF INCIDENTAL TAKE

The actions analyzed in this BO could take individual juvenile or adult LCT through capture/handling/relocation activities at PL 3 and PL 4. Direct take is likely to occur in the form of harm due to either injury or death of LCT by exposure to capture/handling/relocation activities. If LCT spawning is documented within the two action areas prior to project completion, this would constitute new information that may require reinitiation of consultation.

We anticipate that all LCT in the immediate areas of the activity at PL 3 and PL 4 may be harmed, with take associated with capture/handling/relocation activities caused by the proposed project. However, due to project construction timing, few LCT (juveniles and adults) will likely be present in the action areas.

Based on the timing of project activities and the size of the two action areas, the Service believes that actual harm of LCT as a result of the proposed action will be low, and the conservation measures will be effective in avoiding incidental take of some, but not all, individuals who may be encountered during project activities. Based on information related to an example stocking effort (2016), we anticipate take of LCT to be an estimated 15 LCT at PL 3 (300 LCT/mile x 0.05 mile = 15 LCT within the dewatered area) and 88 LCT at PL 4 (1,758 LCT/mile x 0.05 mile = 87.9 LCT within the dewatered area) during each of the 2 years. This results in a total estimate of 206 LCT (30 at PL 3; 176 at PL 4) that may be taken during capture/handling/relocation activities. These numbers assume that stocked LCT become equally distributed throughout the stocked river sections and survive until the projects are implemented.

The reasonable and prudent measures listed below, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If the above level of anticipated take is exceeded, Caltrans should consult with the Service to determine if reinitiation is necessary.

Effect of Take

In the accompanying BO, the Service determined that this level of incidental take is not likely to result in jeopardy to LCT. No critical habitat has been designated for this species; therefore, no destruction or adverse modification of critical habitat will occur.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of LCT:

1. Minimize direct and indirect effects and incidental take of LCT and impacts to its habitat during bridge construction.

2. Monitor incidental take resulting from the proposed project and report the findings of that monitoring to the Reno FWO.

Term and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, Caltrans must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions shall be incorporated into construction contracts and subcontracts, permits, grants, and/or agreements to ensure that the work is carried out in the manner described. These terms and conditions are non-discretionary.

To implement Reasonable and Prudent Measure Number 1, Caltrans shall fully implement the following Terms and Conditions:

1. Caltrans shall ensure that all conservation and protection measures as described in the BA (Caltrans 2017a) and Addendum (Caltrans 2018) and included/clarified/corrected (C. Lafayette, *in litt.* 2018c) in the project description section of this BO, are followed.

2. Caltrans shall ensure a copy of the SWPPP is onsite during construction activities and the proper training on the implementation of the plan has occurred prior to any construction activities.

To implement Reasonable and Prudent Measure Number 2, Caltrans shall fully implement the following Term and Condition:

Caltrans shall provide a report to the Reno FWO that includes a description of construction activities and identification of the implemented conservation and protection measures to minimize adverse effects to LCT at PL 3 and PL 4. The report shall briefly summarize the following activities: (1) Implementation and effectiveness of the terms and conditions, conservation and protection measures; and (2) documentation of take of LCT through capture/ handling/relocation activities. The report shall be due to the Service on or before December 31 of each year of project activity. The address for the Service's Reno FWO is:

Field Supervisor
Reno Fish and Wildlife Office
1340 Financial Boulevard, Suite 234
Reno, Nevada 89502

REPORTING REQUIREMENTS

Upon locating dead, injured, or sick LCT during the entire length of time of the project (including monitoring), initial notification must be made to the Service's Division of Law Enforcement in Reno, Nevada at telephone number (775) 861-6360 within 3 business days. Instructions for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement. Care must be taken in handling sick or injured LCT to ensure effective treatment and care and in handling dead specimens to preserve biological material in the best possible state. In conjunction with the care of sick and injured fish or wildlife, the preservation of

biological materials from a dead specimen, Caltrans has the responsibility to ensure that information relative to the date, time, and location of the specimens, when found, and possible cause of injury or death of each is recorded and provided to the Service.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to implement recovery actions, to help implement recovery plans, to develop information, or otherwise further the purposes of the ESA.

To be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any additional conservation measures for LCT implemented by Caltrans on behalf of the FHWA related to this project.

REINITIATION NOTICE

This concludes formal consultation on the Caltrans' proposed Mountain County Bridge Rails project from 2020 to 2022. As required by 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this BO; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this BO; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Please reference File No. 2018-F-0199 in future correspondence concerning this consultation. If you have any questions regarding this consultation, please contact me or Marcy Haworth at (775) 861-6300.

Sincerely,

Carolyn Swed
Field Supervisor

cc:
Chief, Sierra/Cascades Division, Sacramento Fish and Wildlife Office, Sacramento, California

LITERATURE CITED

Allan, J.D. 2004. Landscapes and riverscapes: the influence of land use on stream ecosystems. Annual Review of Ecology, Evolution, and Systematics 35:257–284.

Anderson, K.E., A.J. Paul, E. McCauley, L.J. Jackson, J.R. Post, and R.M. Nisbet. 2006. Instream flow needs in streams and rivers: the importance of understanding ecological dynamics. Frontiers in Ecology and the Environment 4:309–318.

Arkle, R.S., D.S. Pilliod, K. Strickler. 2010. Fire, flow, and dynamic equilibrium in stream macroinvertebrate communities. Freshwater Biology 55:299–314.

Baltz, D.M., B. Vondracek, L.R. Brown, and P.B. Moyle. 1991. Seasonal changes in microhabitat selection by rainbow trout in a small stream. Transactions of the American Fisheries Society 120:166–176.

Bash, J., C. Berman, and S. Bolton. 2001. Effects of turbidity and suspended solids on salmonids. Center for Streamside Studies, University of Washington, November, 2001. 74 pp. http://depts.washington.edu/cwws/Outreach/Publications/articles.html

Bates, B.C., Z.W. Kundzewicz, S. Wu, and J.P. Palutikof (editors). 2008. Climate change and water. Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva. 210 pp.

Behnke, R.J. 1992. Native trout of Western North America. American Fisheries Society Monograph 6. 275 pp.

Belsky, A.J., A. Matzke, and S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. Journal of Soil and Water Conservation 54:419–431

Berg, L., and T.G. Northcote. 1985. Changes in territorial, gill flaring, and feeding behaviour in juvenile coho salmon (*Oncorhynchus kisutch*) following short-term pulses of suspended sediment. Canadian Journal of Fisheries and Aquatic Sciences 42:1,410-1,417.

Bisson, P.A., and R.E. Bilby. 1982. Avoidance of suspended sediment by juvenile coho salmon. North American Journal of Fisheries Management 4:371-374.

Bisson, P.A., B.E. Rieman, C. Luce, P.F. Hessburg, D.C. Lee, J.L. Kershner, G.H. Reeves, and R.E. Gresswell. 2003. Fire and aquatic ecosystems of the western USA: current knowledge and key questions. Forest Ecology and Management 178:213–229.

Bond, W.J., and J.J. Midgley. 2003. The evolutionary ecology of sprouting in woody plants. International Journal of Plant Science 164 (supplement):S103–S114.

Boyer, M.C., C.C. Muhlfeld, and F.W. Allendorf. 2008. Rainbow trout (*Oncorhynchus mykiss*) invasion and the spread of hybridization with native westslope cutthroat trout (*Oncorhynchus clarkii lewisi*). Canadian Journal of Fisheries and Aquatic Sciences 65:658–669.

Bozek, M.A., and M.K. Young. 1994. Fish mortality resulting from delayed effects of fire in the Greater Yellowstone Ecosystem. Great Basin Naturalist 54:91–95.

Brown, J.K. 1989. Effects of fire on streams. Pages 106–110 in F. Richardson, and R.H. Hamre (editors), Wild Trout IV: proceedings of the symposium. U.S. Government Printing Office, Washington, D.C.

Budy, P., G.P. Thiede, P. McHugh, E.S. Hansen, and J. Wood. 2008. Exploring the relative influence of biotic interactions and environmental conditions on the abundance and distribution of exotic brown trout (*Salmo trutta*) in a high mountain stream. Ecology of Freshwater Fish 17:554–566.

Burton, T.A. 2005. Fish and stream habitat risks from uncharacteristic wildfire: observations from 17 years of fire-related disturbances on the Boise National Forest, Idaho. Forest Ecology and Management 211:140–149.

California Department of Transportation (Caltrans). 2017a. Mountain County Bridge Rails Project Biological Assessment (State Routes 88, 89, and 4), Alpine County, California. 64 pp. plus appendices.

California Department of Transportation (Caltrans). 2017b. Construction Site Best Management Practices (BMP) Manual. CTSW-RT-17-314.18.1. Sacramento, California. 304 pp.

California Department of Transportation (Caltrans). 2018. Mountain County Bridge Rails Project Biological Assessment – Addendum (State Routes 88, 89, and 4), Alpine County, California. 12 pp. plus appendices.

Carlson, A.J., and F.J. Rahel. 2007. A basin wide perspective on entrainment of fish in irrigation canals. Transactions of the American Fisheries Society 136:1335–1343.

Chaney, E., W. Elmore, and W.S. Platts. 1990. Livestock grazing on western riparian areas. Environmental Protection Agency, Northwest Resource Information Center, Eagle, Idaho. 45 pp.

Colyer, W.T., J.L. Kershner, and R.H. Hilderbrand. 2005. Movements of fluvial Bonneville cutthroat trout in the Thomas Fork of the Bear River, Idaho-Wyoming. North American Journal of Fisheries Management 25:954–963.

Compton, R.I., W.A. Hubert, F.J. Rahel, M.C. Quist, and M.R. Bower. 2008. Influences of fragmentation on three species of native warmwater fishes in a Colorado River basin headwater stream system, Wyoming. North American Journal of Fisheries Management 28:1733–1743.

de la Hoz Franco, E.A., and P. Budy. 2005. Effects of biotic and abiotic factors on the distribution of trout and salmon along a longitudinal gradient. Environmental Biology of Fishes 72:379–391.

Dunham, J.B. 1996. The population ecology of stream-living Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*). Doctoral dissertation. University of Nevada, Reno. xv + 115 pp.

Dunham, J.B., G.L. Vinyard, and B.E. Rieman. 1997. Habitat fragmentation and extinction risk of Lahontan cutthroat trout. North American Journal of Fisheries Management 17:1126–1133.

Dunham, J.B., and B.E. Rieman. 1999. Metapopulation structure of bull trout: influences of physical, biotic, and geometrical landscape characteristics. Ecological Applications 9:642–655.

Dunham, J.B., S.B. Adams, R.E. Schroeter, and D.C. Novinger. 2002. Alien invasions in aquatic ecosystems: toward an understanding of brook trout invasions and potential impacts on inland cutthroat trout in western North America. Reviews in Fish Biology and Fisheries 12:373–391.

Dunham, J.B., M. Young, and R.E. Gresswell. 2003. Effects of fire on fish populations: landscape perspectives on persistence of native fishes and nonnative fish invasions. Forest Ecology and Management 178:183–196.

Dunham, J.B., A.E. Rosenberger, C.H. Luce, and B.E. Rieman. 2007. Influences of wildfire and channel reorganization on spatial and temporal variation in stream temperature and the distribution of fish and amphibians. Ecosystems 10:335–346.

Dwire, K.A., and J.B. Kauffman. 2003. Fire and riparian ecosystems in landscapes of the western USA. Forest Ecology and Management 178:61–74.

Earl, S.R., and D.W. Blinn. 2003. Effects of wildfire ash on water chemistry and biota in south-western U.S.A. streams. Freshwater Biology 48:1015–1030.

Faber, J.E., and M.M. White. 2000. Comparison of gene flow estimates between species of darters in different streams. Journal of Fish Biology 57:1465–1473.

Fagan, W.F. 2002. Connectivity, fragmentation, and extinction risk in dendritic metapopulations. Ecology 83:3243–3249.

Fausch, K.D., and M.K. Young. 1995. Evolutionary significant units and movement of resident stream fishes: a cautionary tale. American Fisheries Symposium 17:360–370.

Fausch, K.D., C.E. Torgersen, C.V. Baxter, and H.W. Li. 2002. Landscapes to riverscapes: bridging the gap between research and conservation of stream fishes. BioScience 52:483–498.

Fausch, K.D., B.E. Rieman, J.B. Dunham, M.K. Young, and D.P. Peterson. 2009. Invasion versus isolation: trade-offs in managing native salmonids with barriers to upstream movement. Conservation Biology 23:859–870.

Ficke, A.D., C.A. Myrick, and L.J. Hansen. 2007. Potential impacts of global climate change on freshwater fisheries. Reviews in Fish Biology and Fisheries 17:581–613.

Forman, R.T.T., and L.E. Alexander. 1998. Roads and their major ecological effects. Annual Review of Ecology and Systematics 29:207–231.

Forman, R.T.T., D. Sperling, J.A. Bissonette, A.P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R. France, C.R. Goldman, K. Heanue, J.A. Jones, F.J. Swanson, T. Turrentine, and T.C. Winter. 2003. Road ecology: science and solutions. Island Press, Washington, D.C. 481 pp.

Frankham, R. 2005. Genetics and extinction. Biological Conservation 126:131–140.

Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1991. Road construction and maintenance. American Fisheries Society Special Publication 19:297–324.

Gerstung, E.R. 1988. Status, life history, and management of the Lahontan cutthroat trout. American Fisheries Society Symposium 4:93–106.

Green, D.M. and J.B. Kauffman. 1995. Succession and livestock grazing in a northeast Oregon riparian ecosystem. Journal of Range Management 48:307–313.

Gresswell, R.E. 1988. Status and management of interior stocks of cutthroat trout. American Fisheries Society Symposium 4.

Gresswell, R.E. 1999. Fire and aquatic ecosystems in forested biomes of North America. Transactions of the American Fisheries Society 128:193–221.

Gucinski, H., M.J. Furniss, R.R. Ziemer, and M.H. Brookes. 2001. Forest roads: a synthesis of scientific information. General Technical Report PNW–GTR–509. Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 103 pp.

Guy, T.J., R.E. Gresswell, and M.A. Banks. 2008. Landscape-scale evaluation of genetic structure among barrier-isolated populations of coastal cutthroat trout, *Oncorhynchus clarkii clarkii*. Canadian Journal of Fisheries and Aquatic Sciences 65:1749–1762.

Haak, A.L., J.E. Williams, D. Isaak, A. Todd, C. Muhlfeld, J.L. Kershner, R. Gresswell, S. Hostetler, and H.M. Neville. 2010. The potential influence of changing climate on the persistence of salmonids of the inland west. U.S. Geological Survey Open File Report 2010–1236, 74 pp.

Halofsky, J.E., and D.E. Hibbs. 2009. Controls on early post-fire woody plant colonization in riparian areas. Forest Ecology and Management 258:1350–1358.

Harig, A.L., and K.D. Fausch. 2002. Minimum habitat requirements for establishing translocated cutthroat trout populations. Ecological Applications 12:535–551.

Harvey, B.C., R.J. Nakamoto, and J.L. White. 2006. Reduced streamflow lowers dry-season growth of rainbow trout in a small stream. Transactions of the American Fisheries Society 135:998–1005.

Hedrick, P.W., and S.T. Kalinowski. 2000. Inbreeding depression in conservation biology. Annual Reviews in Ecology and Systematics 31:139–162.

Hilderbrand, R.H., and J.L. Kershner. 2000. Conserving inland cutthroat trout in small streams: how much is enough? North American Journal of Fisheries Management 20:513–520.

Hilderbrand, R.H., and J.L. Kershner. 2004. Are there differences in growth and condition between mobile and resident cutthroat trout? Transactions of the American Fisheries Society 133:1042–1046.

Horan, D.L., J.L. Kershner, C.P. Hawkins, and T.A. Crowl. 2000. Effects of habitat area and complexity on Colorado River cutthroat trout density in Unita Mountain streams. Transactions of the American Fisheries Society 129:1250–1263.

Howell, P.J. 2006. Effects of wildfire and subsequent hydrologic events on fish distribution and abundance in tributaries of North Fork John Day River. North American Journal of Fisheries Management 26:983–994.

Huusko, A., L. Greenberg, M. Stickler, T. Linnansaari, M. Nykänen, T. Vehanen, S. Koljonen, P. Louhi, and K. Alfredsen. 2007. Life in the ice lane: the winter ecology of stream salmonids. River Research and Applications 23:469–491.

Isaak, J., C.H. Luce, B.E. Rieman, D.E. Nagel, E.E. Peterson, D.L. Horan, S. Parkes, and G.L. Chandler. 2010. Effects of climate change and wildfire on stream temperatures and salmonid thermal habitat in a mountain river network. Ecological Applications 20:1350–1371.

Jackson, B.K., and S.M. Sullivan. 2009. Influence of wildfire severity on riparian plant community heterogeneity in an Idaho, USA wilderness. Forest Ecology and Management 259:24–32.

Jones, J.A., F.J. Swanson, B.C. Wemple, and K.U. Snyder. 2000. Effects of roads on hydrology, geomorphology, and disturbance patches of stream networks. Conservation Biology 14:76–85.

Kaushal, S.S., G.E. Likens, N.A. Jaworski, M.L. Pace, A.M. Sides, D. Seekell, K.T. Belt, D.H. Secor, R.L. Wingate. 2010. Rising stream and river temperatures in the United States. Frontiers in Ecology and the Environment 8:461–466.

Keleher, C.J., and F.J. Rahel. 1996. Thermal limits to salmonid distributions in the Rocky Mountain region and potential habitat loss due to global warming: a geographic information system (GIS) approach. Transactions of the American Fisheries Society 125:1–13.

Kie, J.G., and B.B. Boroski. 1996. Cattle distribution, habitats, and diets in the Sierra Nevada of California. Journal of Range Management 49:482–488.

Korsu, K., A. Huusko, and T. Muotka. 2007. Niche characteristics explain the reciprocal invasion success of stream salmonids in different continents. Proceedings of the National Academy of Sciences 104:9725–9729.

La Point, T.W., M. Parker, C.A. Brewer, and M. Crossey. 1983. Impact of fire on recreation stream water quality and spawning habitat. Final Report (Cooperative Agreement 28–C2–222) of University of Wyoming, Department of Zoology and Physiology to U.S. Forest Service, Laramie, Wyoming. 64 pp.

Lake, P.S. 2003. Ecological effects of perturbation by drought in flowing waters. Freshwater Biology 48:1161–1172.

Lande, R. 2002. Incorporating stochasticity in population viability analysis. Pages 18–40 in S.R. Beissinger, and D.R. McCullough (editors), Population Viability Analysis. University of Chicago Press, Chicago, Illinois.

Lawrence, D.E., and G.W. Minshall. 1994. Short-and long-term changes in riparian zone vegetation and stream macroinvertebrate community structure. Pages 171–184 in D.G. Despain (editor), Plants and their environments: proceedings of the first biennial scientific conference on the Greater Yellowstone Ecosystem. U.S. National Park Service, Natural Resources Publication Office, Technical Report NPS/NRYELL/NRTR–93/XX, Denver, Colorado.

Leary, R.F., F.W. Allendorf, and G.K. Sage. 1995. Hybridization and introgression between introduced and native fish. American Fisheries Society Symposium 15:91–101.

Lee, D.C., J.R. Sedell, B.E. Rieman, R.F. Thurow, J.E. Williams, D. Burns, J. Clayton, L. Decker, R. Gresswell, R. House, P. Howell, K.M. Lee, K. Macdonald, J. McIntyre, S. McKinney, T. Noel, J.E. O'Connor, C.K. Overton, D. Perkinson, K. Tu, and P. Van Eimeren. 1997. Broadscale assessment of aquatic species and habitats. Pages 1057–1713 in T.M. Quigley, and S.J. Arbelbide (technical editors), An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great basins. Volume III. General Technical Report PNW–GTR–405, Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Lepori, F., and N. Hjerdt. 2006. Disturbance and aquatic biodiversity: reconciling contrasting views. BioScience 56:809–818.

Loudenslager, E.J. and G.A.E. Gall. 1980. Geographic patterns of protein variation and subspeciation in cutthroat trout, Salmo clarki. Systematic Zoology 29:27-42.

Mahlum, S.K., L.A. Eby, M.K. Young, C.G. Clancy, and M. Jokober. 2011. Effects of wildfire on stream temperatures in the Bitterroot River Basin, Montana. International Journal of Wildland Fire 20:240–247.

Malins, D.C. (ed.). 1977. Effects of Petroleum on Arctic and Subarctic Marine Environments and Organisms, Volume II: Biological Effects. Academic Press, Inc., New York, NY. 493 pp.

Marlow, C.B., and T.M. Pogacnik. 1986. Cattle feeding and resting patterns in a foothills riparian zone. Journal of Range Management 39:212–217.

Matthews, W.J., and E. Marsh-Matthews. 2003. Effects of drought on fish across axes of space, time, and ecological complexity. Freshwater Biology 28:1232–1253.

May, B.E., and S.E. Albeke. 2008. Lahontan cutthroat trout (Oncorhynchus clarkii henshawi) range-wide database update: historical range, current status, risk and population health determinations, and population restoration potential protocols. 31 pp.

McGrath, C.C., and W.M. Lewis, Jr. 2007. Competition and predation as mechanisms for displacement of Greenback cutthroat trout by brook trout. Transactions of the American Fisheries Society 136:1381–1392.

Mellon, C.D., M.S. Wipfli, and J.L. Li. 2008. Effects of forest fire on headwater stream macroinvertebrate communities in eastern Washington, U.S.A. Freshwater Biology 53:2331–2343.

Mihuc,T.B., G.W. Minshall, and C.T. Robinson. 1996. Response of benthic macroinvertebrate populations in Cache Creek, Yellowstone National Park, to the 1988 wildfires. Pages 83–94 in J. Greenlee (editor), Proceedings of the second biennial conference on the Greater Yellowstone Ecosystem: the ecological implications of fire in Greater Yellowstone. International Association of Wildland Fire, Fairfield, Washington.

Miller, M. 2000. Fire autecology. Pages 9–34 in J.K. Brown and J.K. Smith (editors). Wildland fire in ecosystems: effects of fire on flora. General Technical Report RMRS–GTR–42–volume 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Minshall, G.W. 2003. Responses of stream benthic macroinvertebrates to fire. Forest Ecology and Management 178:155–161.

Minshall, G.W., S.E. Jensen, and W.S. Platts. 1989. The ecology of stream and riparian habitats of the Great Basin Region: A community profile. U.S. Fish and Wildlife Service Biological Report 85 (7.24). 142 pp.

Minshall, G.W., C.T. Robinson, T.V. Royer, and S.R. Rushforth. 1995. Benthic community structure in two adjacent streams in Yellowstone National Park five years after the 1988 wildfires. The Great Basin Naturalist 55:193–200.

Montgomery, D.R., B.D. Collins, J.M. Buffington, and T.B. Abbe. 2003. Geomorphic effects of wood in rivers. American Fisheries Society Symposium 37:21–47.

Moore, R.D., D.L. Spittlehouse, and A. Story. 2005. Riparian microclimate and stream temperature response to forest harvesting: a review. Journal of the American Water Resources Association 41:813–834.

Muhlfeld, C.C., D.H. Bennett, and B. Marotz. 2001. Fall and winter habitat use and movement by Columbia River redband trout in small streams in Montana. North American Journal of Fisheries Management 21:170–177.

Muhlfeld, C.C., S.T. Kalinowski, T.E. McMahon, M.L. Taper, S. Painter, R.F. Leary, and F.W. Allendorf. 2009. Hybridization rapidly reduces fitness of a native trout in the wild. Biology Letters 5:328–331.

Naiman, R.J., and H. Décamps. 1997. The ecology of interfaces: riparian zones. Annual Review of Ecology and Systematics 28:621–658.

Neary, D.G., K.C. Ryan, and L.F. DeBano editors. 2005. Wildland fire in ecosystems: effects of fire on soil and water. General Technical Report RMRS–GTR–42–volume 4. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 250 pp.

Nelson, R.L., M.L. McHenry, and W.S. Platts. 1991. Mining. American Fisheries Society Special Publication 19:425–457.

Neville, H.M., and D. DeGraaf. 2006. Reconnecting fragmented Lahontan cutthroat trout habitats: Maggie and Willow Creek, 2006. Strategies for Restoring Native Trout Report. Trout Unlimited, Boise, Idaho. 21 pp.

Neville, H.M., J.B. Dunham, and M.M. Peacock. 2006. Landscape attributes and life history variability shape genetic structure of trout populations in a stream network. Landscape Ecology 21: 901–916.

Neville, H., J. Dunham, A. Rosenberger, J. Umak, and B. Nelson. 2009. Influences of wildfire, habitat size, and connectivity on trout in headwater streams revealed by patterns of genetic diversity. Transactions of the American Fisheries Society 138:1314–1327.

Newcombe, C.P., and J. Jensen. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management 16:693–727.

Newcombe, C.P., and D.D. MacDonald. 1991. Effects of suspended sediments on aquatic ecosystems. North American Journal of Fisheries Management 11:72–82.

Nilsson, C., and K. Berggren. 2000. Alterations of riparian ecosystems caused by river regulation. BioScience 50:783–792.

Norris, L.A., H.W. Lorz, and S.V. Gregory. 1991. Forest chemicals. American Fisheries Society Special Publication 19:207–296.

Noss, R., B. Csuti, and M.J. Groom. 2006. Habitat fragmentation. Pages 213–251 in M.J. Groom, G.K. Meffe, and C.R. Carroll (editors), Principles of Conservation Biology (Third Edition). Sinauer Associates, Inc. Sunderland, Massachusetts.

Novak, M.A., and R.G. White. 1990. Impact of fire and flood on the trout population of Beaver Creek, upper Missouri basin, Montana. Pages 120–127 in F. Richardson, and R.H. Hamre (editors), Wild Trout IV: proceedings of the symposium. Trout Unlimited, Arlington, Virginia.

Opdam, P., and D. Wascher. 2004. Climate change meets habitat fragmentation: linking landscape and biogeographical scale levels in research and conservation. Biological Conservation 117:285–297.

Overton, C.K., G.L. Chandler, and J.A. Pisano. 1994. Northern/Intermountain regions' fish habitat inventory: grazed, rested, and ungrazed reference stream reaches, Silver King Creek, California. General Technical Report GTR-INT-311. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 27 pp.

Ovidio, M., and J.C. Philippart. 2002. The impact of small physical obstacles on upstream movements of six species of fish. Hydrobiologia 483:55–69.

Parsons, C.T., P.A. Momont, T. Delcurto, M. McInnis, and M.L. Porath. 2003. Cattle distribution patterns and vegetation use in mountain riparian areas. Journal of Range Management 56:334–341.

Peacock, M.M., and V. Kirchoff. 2007. Analysis of genetic variation and population genetic structure in Lahontan cutthroat trout (Oncorhynchus clarkii henshawi) extant populations. Final Report submitted to the U.S. Fish and Wildlife Service, Reno, Nevada. 109 pp.

Peterson, D.P., K.D. Fausch, and G.C. White. 2004. Population ecology of an invasion: effects of brook trout on native cutthroat trout. Ecological Applications 13:754–772.

Pettit, N.E., and R.J. Naiman. 2007. Fire in the riparian zone: characteristics and ecological consequences. Ecosystems 10:673–687.

Platts, W.S. 1979. Livestock grazing and riparian/stream ecosystems - an overview. Pages 39–45 in O.B. Cope (editor), Proceedings of the Forum – Grazing and riparian/stream ecosystems; November 3–4, 1976. Denver, Colorado. Trout Unlimited, Vienna, Virginia. 94 pp.

Poff, N.L., M.M. Brinson, and J.W. Day, Jr. 2002. Aquatic ecosystems and global climate change: potential impacts on inland freshwater and coastal wetland ecosystems in the United States. Pew Center on Global Climate Change, Arlington, Virginia. 44 pp.

PRBO Conservation Science. 2011. Projected effects of climate change in California: ecoregional summaries emphasizing consequences for wildlife. Version 1.0. http://data.prbo.org/apps/bssc/climate change (accessed February 2011). 59 pp.

Price, M.H.H. 2013. Sub-lethal metal toxicity effects on salmonids: a review. Report prepared for SkeenaWild Conservation Trust. Smithers, BC. 64 pp.

Pringle, C. 2006. The fragmentation of aquatic ecosystems and the alteration of hydrologic connectivity. Pages 243–246 in M.J. Groom, G.K. Meffe, and C.R. Carroll (editors), Principles of Conservation Biology (Third Edition). Sinauer Associates, Inc. Sunderland, Massachusetts

Pritchard, V.L., K. Jones, and D.E. Cowley. 2007. Genetic diversity within fragmented cutthroat trout populations. Transactions of the American Fisheries Society 136:606–623.

Propst, D.L., J.A. Stefferud, and P.R. Turner. 1992. Conservation and status of Gila trout, *Oncorhynchus gilae*. Southwestern Naturalist 37:117–125.

Quist, M.C., and W.A. Hubert. 2005. Relative effects of biotic and abiotic processes: a test of the biotic-abiotic constraining hypothesis as applied to cutthroat trout. Transactions of the American Fisheries Society 134:676–686.

Rahel, F.J. 2004. Unauthorized fish introductions: fisheries management of the people, for the people, or by the people? American Fisheries Society Symposium 44:431–443.

Ranalli, A.J. 2004. A summary of the scientific literature on the effects of fire on the concentration of nutrients in surface waters. U.S. Department of the Interior, U.S. Geological Survey, Open-File Report 2004–1296. 23 pp.

Ray, C., M.M. Peacock, and J.B. Dunham. 2007. Demographic and population dynamics of Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) stream populations in eastern Nevada. Final Report to the U.S. Fish and Wildlife Service, Reno, Nevada. Cooperative Agreement FSW 14–48–0001–95646. 205 pp.

Redding, J.M., C.B. Schreck, and F.H. Everest. 1987. Physiological effects on coho salmon and steelhead exposure to suspended solids. Transactions of the American Fisheries Society 116:737-744.

Reed, D.H., and R. Frankham. 2003. Correlation between fitness and genetic diversity. Conservation Biology 17:230–237.

Rhymer, J.M., and D. Simberloff. 1996. Extinction by hybridization and introgression. Annual Reviews in Ecology and Systematics 27:83–109.

Richards, C., and G.W. Minshall. 1992. Spatial and temporal trends in stream macroinvertebrate communities: the influence of catchment disturbance. Hydrobiologia 241:173–184.

Rieman, B.E., and J. Clayton. 1997. Wildfire and native fish: issues of forest health and conservation of sensitive species. Fisheries 22:6–15.

Rieman, B.E., R.E Gresswell, M. Young, D. Burns, D. Lee, R. Stowell, J. Rinne, and P. Howell. 2003. Current status and conservation of native fishes and issues for integration with fire and fuels management. Forest Ecology and Management 178:197–211.

Rieman, B.E., and D.J. Isaak. 2010. Climate change, aquatic ecosystems, and fishes in the Rocky Mountain west: implications and alternatives for management. General Technical Report RMRS–GTR–250. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 46 pp.

Rinne, J.N. 1996. Short-term effects of wildfire on fishes and aquatic macroinvertebrates in the southwestern United States. North American Journal of Fisheries Management 16:653–658.

Rinne, J.N., and G.R. Jacoby. 2005. Aquatic biota. Pages 135–143 in D.G. Neary, K.C. Ryan, and L.F. DeBano (editors), Wildland fire in ecosystems: effects of fire on soil and water. General Technical Report RMRS–GTR–42–volume 4. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Roberts, J.J., and F.J. Rahel. 2008. Irrigation canals as sink habitat for trout and other fish in a Wyoming drainage. Transactions of the American Fisheries Society 137:951–961.

Roby, K.B. 1989. Watershed response and recovery from the Will Fire: ten years of observation. Pages 131–136 in N.H. Berg (editor), Proceedings of the symposium on fire and watershed management. General Technical Report PSW–109. Berkeley, California: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station.

Roby, K.B., and D.L. Azuma. 1995. Changes in a reach of a northern California stream following wildfire. Environmental Management 19:591–600.

Romme, W.H., M.S. Boyce, R. Gresswell, E.H. Merrill, G.W. Minshall, C. Whitlock, and M.G. Turner. 2011. Twenty years after the 1988 Yellowstone fires: lessons about disturbance and ecosystems. Ecosystems 14:1196–1215.

Rutledge, C.J., E.G. Zimmerman, and T.L. Beitinger. 1990. Population genetic responses of two minnow species (Cyprinidae) to seasonal intermittency. Genetica 80:209-219.

Schmetterling, D.A. 2001. Seasonal movement of fluvial westslope cutthroat trout in the Blackfoot River drainage, Montana. North American Journal of Fisheries Management 21:507–520.

Schrank, A.J., and F.J. Rahel. 2004. Movement patterns in inland cutthroat trout (*Oncorhynchus clarki utah*): management and conservation implications. Canadian Journal of Fisheries and Aquatic Sciences 61:1528–1537.

Schulz, T.T., and W.C. Leininger. 1990. Differences in riparian vegetation structure between grazed and ungrazed areas and exclosures. Journal of Range Management 43:295–299.

Scribner, K.T., G.K. Meffe, and M.J. Groon. 2006. Conservation genetics: the use and importance of genetic information. Pages 375–415 in M.J. Groom, G.K. Meffe, and C.R. Carroll (editors), Principles of Conservation Biology (Third Edition). Sinauer Associates, Inc. Sunderland, Massachusetts.

Seavy, N.E., T. Gardali, G.H. Golet, F.T. Griggs, C.A. Howell, R. Kelsey, S.L. Small, J.H. Viers, and J.F. Weigand. 2009. Why climate change makes riparian restoration more important than ever: recommendations for practice and research. Ecological Restoration 27:330–338.

Seiler, S.M., and E.R. Keeley. 2009. Competition between native and introduced salmonid fishes: cutthroat trout have lower growth rate in the presence of cutthroat-rainbow trout hybrids. Canadian Journal of Fisheries and Aquatic Sciences 66:133–141.

Servizi, J.A., and D.W. Martens. 1992. Sublethal responses of coho salmon (*Oncorhynchus kisutch*) to suspended sediments. Canadian Journal of Fisheries and Aquatic Sciences 49:1,389–1,395.

Sestrich, C.M., T.E. McMahon, and M.K. Young. 2011. Influence of fire on native and nonnative salmonid populations and habitat in a western Montana basin. Transactions of the American Fisheries Society 140:136–146.

Sevon, M., J. French, J. Curran, R. Phenix. 1999. Lahontan cutthroat trout species management plan for the Quinn River/Black Rock basins and the North Fork Little Humboldt River sub-basin. Nevada Division of Wildlife. 47 pp.

Shepard, B.B. 2004. Factors that may be influencing nonnative brook trout invasion and their displacement of native westslope cutthroat trout in three adjacent southwestern Montana streams. North American Journal of Fisheries Management 24:1,088–1,100.

Smith, M.A., J.D. Rodgers, J.L. Dodd, and Q.D. Skinner. 1992. Habitat selection by cattle along an ephemeral channel. Journal of Range Management 45:385–390.

Spellerberg, I.F. 1998. Ecological effects of roads and traffic: a literature review. Global Ecology and Biogeography Letters 7:317–333.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corporation, Corvallis, Oregon. 372 pp

Spencer, C.N., and F.R. Hauer. 1991. Phosphorus and nitrogen dynamics in streams during a wildfire. Journal of the North American Benthological Society 10:24–30.

Stewart, I.T., D.R. Cayan, and D.M. Dettinger. 2005. Changes toward earlier streamflow timing across the western North America. Journal of Climate 18:1136–1155.

Sugden, B.D., and S.W. Woods. 2007. Sediment production from forest roads in western Montana. Journal of the American Water Resources Association 43:193–206.

Trombulak, S.C., and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14:18–30.

Tyser, R.W., and C.A. Worley. 1992. Alien flora in grasslands adjacent to road and trail corridors in Glacier National Park, Montana (USA). Conservation Biology 6:253–262.

Umek, J.W. 2007. Lahontan cutthroat trout movement in a high desert watershed; inferences from a microsatellite study. Masters Thesis, University of Nevada, Reno. I–v + 34 pp.

U.S. Fish and Wildlife Service (Service). 1970. United States list of endangered native fish and wildlife. Federal Register 35:16047–16048. October 13, 1970.

U.S. Fish and Wildlife Service (Service). 1975. Threatened status for three species of trout. Federal Register 40:29863–29864. July 16, 1975.

U.S. Fish and Wildlife Service (Service). 1995. Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 147 pp.

U.S. Fish and Wildlife Service (Service). 2003a. Short-term action plan for Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) in the Truckee River basin. Nevada Fish and Wildlife Office, Reno, Nevada. August, 2003. i–iv + 71 pp.

U.S. Fish and Wildlife Service (Service). 2003b. Short-term action plan for Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) in the Walker River basin. Nevada Fish and Wildlife Office, Reno, Nevada. August, 2003. i–iii + 44 pp. + appendices.

U.S. Fish and Wildlife Service (Service). 2008. Final report: preliminary assessment of trace-metal exposures to aquatic biota from historical mine sites in the Western Great Basin. Project ID: 1130-1F41. 43 pp.

U.S. Fish and Wildlife Service (Service). 2009. 5-Year Review: Summary and Evaluation. Lahontan cutthroat trout (Oncorhynchus clarkii henshawi). Region 8, Sacramento, California. 199 pp.

U.S. Fish and Wildlife Service (Service). 2017. Concurrence and Biological Opinion for Continued Rangeland Management on the Carson and Bridgeport Ranger Districts, Alpine and Mono Counties, California (File No. 2017-F-0083, dated June 12, 2017). 81 pp. plus appendices.

Warren Jr., M.L., and M.G. Pardew. 1998. Road crossings as barriers to small-stream fish movement. Transactions of the American Fisheries Society 127:637–644.

Webb, B.W., D.M. Hannah, R.D. Moore, L.E. Brown, and F. Nobilis. 2008. Recent advances in stream and river temperature research. Hydrological Processes 22:902–918.

Wehner, M., D.R. Easterling; J.H. Lawrimore, R.R. Heim Jr., R.S. Vose, and B.D. Santer. 2011. Projections of future drought in the continental United States and Mexico. Journal of Hydrometeorology 12:1359–1377.

Wemple, B.C., J.A. Jones, and G.E. Grant. 1996. Channel network extension by logging roads in two basins, western Cascades, Oregon. Water Resources Bulletin 32:1195–1207.

Wenger, S.J., D.J. Isaak, C.H. Luce, H.M. Neville; K.D. Fausch, J.B. Dunham, D.C. Dauwalter, M.K. Young, M.M. Elsner, B.E. Rieman, A.F. Hamlet, and J.E. Williams. 2011. Flow regime, temperature, and biotic interactions drive differential declines of trout species under climate change. Proceedings of the National Academy of Sciences 108:14175–14180.

Westerling, A.L., H.G. Hidalgo, D.R. Cayan, T.W. Swetnam. 2006. Warming and earlier spring increase western U.S. forest wildfire activity. Science 313:940–943.

Wheeler, A.P., P.L. Angermeier, and A.E. Rosenberger. 2005. Impacts of new highways and subsequent urbanization on stream habitat and biota. Reviews in Fisheries Science 13:141–164.

White, S.M., and F.J. Rahel. 2008. Complementation of habitats for Bonneville cutthroat trout in watersheds influenced by beavers, livestock, and drought. Transactions of the American Fisheries Society 137:881–894.

Wilcox, C., B.J. Cairns, and H.P. Possingham. 2006. The role of habitat disturbance and recovery in metapopulation persistence. Ecology 87:855–863.

Wood, J., and P. Budy. 2009. The role of environmental factors in determining early survival and invasion success of exotic brown trout. Transactions of the American Fisheries Society 138:756–767.

Young, M.K. (Technical editor). 1995. Conservation Assessment for Inland Cutthroat Trout. USDA Forest Service General Technical Report GTR-RM-256. Ft. Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 pp.

Young, M.K. 1996. Summer movements and habitat use by Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) in small, montane streams. Canadian Journal of Fisheries and Aquatic Sciences 53:1403–1408.

Young, M.K., P.M. Guenther-Gloss, and A.D. Ficke. 2005. Predicting cutthroat trout (*Oncorhynchus clarkii*) abundance in high-elevation streams: revisiting a model of translocation success. Canadian Journal of Fisheries and Aquatic Sciences 62:2399–2408.

IN LITT. COMMUNICATION

Broyles, B. 2017. Letter from Mr. Benjamin Broyles, Environmental Branch Chief, Caltrans to Mr. Chad Mellison, Fisheries Biologist, U.S. Fish and Wildlife Service requesting initiation of informal consultation under section 7 of the Endangered Species Act for the Mountain County Bridge Rails project, California. December 5, 2017. 2 pp.

California Department of Fish and Wildlife. 2017. American River Hatchery Fish Releases List Records for 2016. 6 pp.

Lafayette, C. 2018a. Associate Biologist, California Department of Transportation, Stockton, California. Electronic mail to Marcy Haworth, Wildlife Biologist, U.S. Fish and Wildlife Service, Reno, Nevada. Subject: External OX750 Additional work. August 30, 2018. 1 p.

Lafayette, C. 2018b. Associate Biologist, California Department of Transportation, Stockton, California. Electronic mail to Marcy Haworth, Wildlife Biologist, U.S. Fish and Wildlife Service, Reno, Nevada. Subject: External OX750 Additional information. September 17, 2018. 2 pp.

Lafayette, C. 2018c. Associate Biologist, California Department of Transportation, Stockton, California. Electronic mail to Marcy Haworth, Wildlife Biologist, U.S. Fish and Wildlife Service, Reno, Nevada. Subject: External OX750 SWPPP. August 14, 2018. 2 pp.

Mellison, C. 2018. Fisheries Biologist, U.S. Fish and Wildlife Service, Reno, Nevada. Electronic mail to Marcy Haworth, Wildlife Biologist, U.S. Fish and Wildlife Service, Reno, Nevada. Subject: FW: External FW: LCT Plantings Alpine County. August 17, 2018. 3 pp.

U.S. Fish and Wildlife Service (Service). Undated. Service database of CDFW LCT stocking records at various locations and years. 3 pp.

PERSONAL COMMUNICATION

Lafayette, C. and S. Pozzo. 2018. Associate Biologist and Senior Bridge Engineer, California Department of Transportation, Stockton, California. Telephone discussion with Marcy Haworth, Wildlife Biologist, U.S. Fish and Wildlife Service, regarding bridge construction at Project Location 3. March 14, 2018.

Lafayette, C. 2018a. Associate Biologist, California Department of Transportation, Stockton, California. Telephone discussion with Marcy Haworth, Wildlife Biologist, U.S. Fish and Wildlife Service, regarding need for modifying project activities at Project Location 4. April 17, 2018.

Lafayette, C. 2018b. Associate Biologist, California Department of Transportation, Stockton, California. Telephone discussion with Marcy Haworth, Wildlife Biologist, U.S. Fish and Wildlife Service, regarding bridge construction at Project Location 3. April 16, 2018.