UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

May 6, 2022 **Refer to NMFS No:** WCRO-2021-03380

Melissa Coppola
Acting Office Chief, Biological Sciences and Permits
California Department of Transportation, District 4
P.O. Box 23660, M/S 8E
Oakland, California 94623-0660

Re: Endangered Species Act Section 7(a)(2) Biological Opinion for the Alameda Creek Bridge Replacement Project (EA 04-16030)

Dear Ms. Coppola:

Thank you for the California Department of Transportation's (Caltrans)[1] letter of December 20, 2021, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Alameda Creek Bridge Replacement Project (EA 04-16030). This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

The enclosed biological opinion is based on our review of Caltrans' proposed project and describes NMFS' analysis of potential effects on threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) in accordance with section 7 of the ESA. In the enclosed biological opinion, NMFS concludes the project is not likely to jeopardize the continued existence of the species. However, NMFS anticipates that take of CCC steelhead may occur. An incidental take statement which applies to this project with terms and conditions is included with the enclosed biological opinion.

If you have any questions concerning this consultation, or if you require additional information please contact Andrew Trent at 707-578-8553 or via email at andrew.trent@noaa.gov.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Caitlin De La Torre, Caltrans, Oakland, CA, caitlin.delatorre@dot.ca.gov
e-file: ARN 151422WCR2022SR00013

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[1] Pursuant to 23 USC 327, and through a series of Memorandum of Understandings (MOU) beginning June 7, 2007, the Federal Highway Administration (FHWA) assigned and Caltrans assumed responsibility for compliance with Section 7 of the federal Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for the federally-funded highway projects in California. Therefore, Caltrans is considered the federal action agency for consultations with NMFS for federally funded projects involving FHWA. Caltrans proposes to administer federal funds for the implementation of the proposed project. Thus, per the aforementioned MOU, Caltrans is considered the federal action agency for this project.

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion

Alameda Creek Bridge Replacement Project

NMFS Consultation Number: WCRO-2021-03380

Action Agency: California Department of Transportation (Caltrans)

Table 1. Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Central California Coast Steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	N/A	N/A

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: May 6, 2022

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

NOAA's National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at NMFS Santa Rosa, California office.

1.2. Consultation History

By letter dated June 18, 2021, Caltrans requested initiation of formal consultation under the ESA and provided NMFS the Arroyo de la Laguna Bridge Replacement Project Biological Assessment (BA). The BA included the following: draft hydraulics report, habitat assessment, tree survey and inventory, geomorphic assessment and thalweg survey, and several project figures. Proposed Federal Action

- March 6, 2018 – A technical assistance meeting was held in the field with Joe Heublein (NMFS) to discuss the Project and the potential removal of the concrete weir upstream of the current bridge.
- September 4, 2018 – Caltrans submitted preliminary Project information, including the preliminary plans for the bridge replacement, weir removal, and creek diversion to Darren Howe (NMFS) and John Wooster (NMFS).
- October 10, 2018 – John Wooster (NMFS) requested additional information, including a longitudinal profile of the creek thalweg and a description of channel rehabilitation.
- December 18, 2018 – A technical assistance meeting was held in the field with Darren Howe (NMFS) and John Wooster (NMFS) to discuss the Project and removal of the upstream weir.
- February 14, 2019 – Caltrans submitted a BA to NMFS on February 14, 2019.
- February 21, 2019 – Caltrans and NMFS conducted a site visit.
- March 4, 2019 – Caltrans received an insufficiency letter from NMFS.
- April 15, 2019 – Caltrans responded to request for additional information. However, a conceptual channel design plan was not completed within the response window.
- May 1, 2019 – NMFS closed consultation.
- May 15, 2019 – Caltrans reinitiated consultation with NMFS. A conceptual channel design plan and basis of design memo were included.
- May 22, 2019 – NMFS sent a draft opinion project description to Caltrans.

- June 24, 2019 – John Wooster (NMFS) sent comments to Caltrans regarding the conceptual channel design plans.
- August 16, 2019 – Caltrans submitted responses to John Wooster's June 24 comments.
- September 20, 2019 – NMFS submitted an additional request for information to Caltrans.
- October 8, 2019 – Caltrans submitted responses to NMFS regarding the September 20 request for information.
- October 10, 2019 – NMFS recommended that Caltrans change the steelhead determination from "may affect and likely to adversely affect" to "may affect but not likely to adversely affect."
- November 14, 2019 – Caltrans sent a memo to NMFS stating that a "no effect" determination was being made for steelhead since they did not currently have access to the Project area. Access was expected at the end of 2021 when the BART weir fish ladder is completed.
- January 25, 2021 – Caltrans and NMFS call concerning Caltrans making "may affect, likely to adversely affect" determination for steelhead for the Project once there is passage downstream of the site. Rainbow trout were sighted in the action area, and NMFS confirmed they would be considered CCC steelhead when downstream passage at the BART Weir site was complete.
- January 27, 2021 – Caltrans and NMFS call discussing water temperature data to assess whether steelhead would be expected during summer construction season. Caltrans is leaning towards formal consultation due to rainbow trout being seen at the site in July of 2018.
- December 20, 2021 – Caltrans requested by letter formal consultation under the ESA and provided NMFS the Alameda Creek Bridge Replacement Project, Niles Canyon Biological Assessment. The BA included the following: draft hydraulics report, habitat assessment, tree survey and inventory, geomorphic assessment and thalweg survey, and several project figures. Sufficient information was provided to initiate consultation.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02).

Caltrans proposes to replace the Alameda Creek Bridge (Bridge No. 33-0036) to repair scour, and to improve the bridge's structural integrity to meet current design standards for safety. The Alameda Creek Bridge Replacement Project (Project) is located within Niles Canyon in Alameda County, approximately 4 miles northeast of downtown Fremont, Alameda County, California. The Project will take place along State Route 84 (SR 84) between post mile (PM) 13.0 and 13.6 and involves the following four main components: 1) new bridge construction; 2) realignment/widening of roadway approaches; 3) removal of the existing bridge structure, roadway approaches, and concrete weir; and 4) channel reconstruction.

1.3.1. Project Timeline

Spring 2021 - Construct eastern approach soil-nail wall (Completed)

- Complete rock cut for soil-nail wall

- Excavate for soil nails and install soil nails
- Apply shotcrete followed by nail plating, reinforcement bars and final additional shotcrete

June-October 2021 - 1st construction season in creek (Completed)

- Construct access road, temporary work platform for construction, and install water diversion
- Drill CIDH piles for foundations
- Form & pour columns and abutment
- Remove weir
- Remove all temporary ground cover in creek bed (platforms, etc.)
- Reconstruct creek channel
- Remove water diversion and restore creek bed

June-October 2022 - 2nd construction season in creek

- Construct access road, temporary work platform for construction, and install water diversion
- Place falsework, form and pour superstructure soffit & stem, and bridge deck (box-girder section)
- Form and pour viaduct and Construct ST-70 barrier (bridge railing)
- Remove all temporary ground cover in creek bed (platforms, etc.)
- Reconstruct creek channel as needed
- Remove water diversion and restore creek bed

June-October 2023 - 3rd construction season in creek

- Extend existing access road for demolition, temporary work platform for demolition, and install water diversion
- Demolition and removal of existing bridge including foundations
- Remove all temporary ground cover in creek bed (platforms, etc.)
- Reconstruct creek channel as needed
- Remove water diversion and restore creek bed
- Remove existing roadways
- Traffic safety features installation
- Install permanent stormwater treatment areas

1.3.2. <u>New Alameda Creek Bridge</u>

The new bridge will consist of one abutment, four single-column piers (Piers 2-5), and six double-column piers referred to as the viaduct section (Piers 6-11). Abutment 1 and Piers 2-11 were constructed in 2021. Abutment 1 sits on two 30-inch diameter cast-in-drilled hole (CIDH) piles. Each single pier consists of a 10-foot diameter CIDH pile inserted into an 11-foot diameter steel casing. Pier 6 begins the transition to the viaduct section and is constructed from two 66-inch diameter CIDH piles. The remaining viaduct section (Piers 7-11) each consist of two 30-inch diameter CIDH piles. The three piers located within the creek (Piers 2-4) each resulted in 0.001 acre of permanent impacts.

1.3.3. Access for Bridge Construction

The crew will stage equipment in a 0.85-acre, mostly barren roadside pullout throughout the Project. The crew will continue to access the creek from the staging area through a previously disturbed access route that will require fill in one section within and adjacent to the creek. This area within the creek received a layer of imported gravel fill and timber mats to stabilize the access route. All imported materials were removed from the creek at the end of the first construction season, and the area was graded to match adjacent creek bank conditions.

Temporary impacts to the areas northwest of the existing bridge total 0.026 acre or 84 linear feet of vegetation clearing within foothill riparian habitat. The portion of the access road positioned above the ordinary high-water mark (OHWM) (0.064 acre) will not need to be filled or graded as it is an existing access road, so restoration between seasons is not anticipated. However, the access road will be repaired if significantly disturbed by vehicle or equipment access.

1.3.4. Temporary Creek Diversion

A temporary creek diversion was installed during the first construction season to create a dry working environment within the creek bed. A creek diversion will also be used during each of the two remaining creek construction seasons (June 1-October 15) over the duration of the Project. A dry working environment for the column and foundation concrete operations prevented alkaline concrete materials from entering Alameda Creek. All work within suitable aquatic habitat for steelhead will be planned to occur between June 1 and October 15, when there is less potential for these species to enter the work area. In 2021, the in-creek work window was extended to November 7 by Caltrans and the Regional Water Quality Control Board (RWQCB) to allow the contractor to finish the creek restoration work.

The following methods, approved by CDFW, were used during the 2021 creek work window. Prior to the installation of the complete temporary upstream berm, a limited diversion system was placed to block flow to a portion of the weir in order to remove a 20-foot section, which was used as part of the diversion channel. Once this section of the weir was removed, the limited diversion was extended and ultimately consisted of a U-shaped diversion dam with a 20-foot-wide diversion channel pushed against the east bank of the creek. A temporary bridge was constructed to span the diversion channel.

The temporary dam was constructed of super sacks and gravel bags, making the dam approximately 8 feet wide at the base and approximately 6 feet tall. Prior to placement of the super sacks, sharp objects, boulders, and cobbles were removed from the dam area to create a smooth streambed and prevent channels by which water can pass beneath the dam after it is built; pre-construction removal of these objects was done by hand and by a grapple located on either side of the creek and on the temporary bridge. Similar methods and materials will be used in 2022 and 2023, except that no weir removal will be required. The contractor will submit the specific diversion plans for seasons two and three prior to each season. The plans will be submitted to NMFS for review and approval at least 30 days prior to the start of construction each season. An additional area of 12 feet upstream from the upstream base of the dam is included in the Project area to account for temporary impacts due to access for construction of the temporary dam during the creek construction windows.

Temporary impacts (impacts lasting less than 1 year) to construct and maintain the temporary creek diversion will extend 80 feet upstream of the remnants of the former bridge footings and concrete wall (weir) and 55 feet downstream from the drip line of the existing Alameda Creek Bridge. All construction equipment used for the construction of the creek diversion will use the construction access roads used for the construction and demolition of the bridge during the Project. Heavy equipment, trucks, the drill rig, and other construction equipment will use this temporary roadway/ramp while working in the creek area.

The creek diversion and all other construction materials will be removed from the creek by the end of each construction season (June 1 – October 15). Upland areas will be restored and hydroseeded at the end of each construction season, but the area below the OHWM, which is predominantly bare river rock, will not be hydroseeded or revegetated. The total area of temporary impacts to the bed of Alameda Creek as a result of the creek diversion is 0.260 acre (280 linear feet), and the total area of temporary impacts for creek diversion to freshwater wetlands within the active channel of Alameda Creek is 0.332 acre (525 linear feet). This includes vegetation clearing and tree removal within the freshwater wetlands in the channel of Alameda Creek. The creek diversion will not be an upstream barrier to steelhead during the Project because it is an open channel.

1.3.5. Removal of Existing Weir

The Project has completely removed the existing footings and weir wall (weir) of an older bridge located approximately 100 feet upstream of the existing Alameda Creek Bridge. This weir served as a low-flow fish passage barrier (Gunther et al. 2000). The weir structure also impounded water and sediment, which typically lead to increased water temperatures upstream. Removal of the weir during the first construction season allows for two years of winter flows to pass through the Project area, leaving the contractor two construction seasons (summer of 2022 and 2023) to make adjustments. Per preliminary discussion and consultation with the United States Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), CDFW, and NMFS, the removal of the weir addresses anticipated compensatory mitigation requirements for Project impacts under the FESA consultation and the following permits: 1602 Streambed Alteration Agreement and Clean Water Act (CWA) Section 404 and 401 permits. The weir removal will result in the return to a more natural creek bed throughout the Project area, including unimpeded fish passage and sediment transport.

The temporary access route and work platform described for bridge construction was used during removal of the existing weir. The work area associated with removing the weir structure was approximately 0.21 acre. Caltrans Standard best management practices (BMPs) were utilized to minimize creek impacts. Temporary impacts due to removal of the weir took place after the water diversion was in place; therefore, all impacts from the work discussed in this section already fall under the temporary impacts due to creek diversion described above. The total amount of concrete removed for the weir was 428 cubic yards (0.03 acres).

1.3.6. Foundations

The foundations and piers were installed during the first construction season. Each of the four columns for the box-girder section of the new bridge were installed using the CIDH method. Each column is 5.5 feet wide by 8 feet long, ship-shaped (flattened oval) in cross section. Each column was installed using a 10-foot diameter CIDH pile that was drilled using a rig-mounted auger into the alluvium deposits of Alameda Creek, no deeper than 15 feet. Rebar was placed in the holes, and the holes were filled with concrete. The groundwater from dewatering during the construction of the CIDH piles was placed into settling tanks before being released downstream. All dewatering adheres to Caltrans Construction Site BMP Manual. Forms were placed around the rebar extending out of the foundations and filled with concrete to construct the pier columns.

The total amount of soil displacement for creating the four columns within the jurisdictional floodplain was approximately 174.53 cubic yards. The total area of permanent impacts for the two columns within the jurisdictional valley foothill riparian habitat is 0.002 acre (20 linear feet), permanent impacts for one column within jurisdictional freshwater wetland within the active floodplain is 0.001 acre (10 linear feet), and permanent impacts for one column within grassland is 0.001 acre (10 linear feet). Total permanent impacts for constructing the four columns within the creek are 0.004 acre (40 linear feet). Temporary impacts for constructing the four columns are subsumed within the water diversion temporary impacts.

1.3.7. Temporary Falsework

Construction of the box-girder section will involve the placement of falsework within the Alameda Creek channel. With the implementation of the temporary creek diversion, a dry working environment is required to set up the temporary falsework. The contractor will determine falsework specifications, but Caltrans assumes that the falsework pads will be approximately 4 feet wide, 50 feet long, and two feet tall. While falsework size and placement may slightly differ from Caltrans' estimate, all falsework will be contained within the impact area and will not require pile driving. Materials to be used include gravel and timber. Falsework will be needed during the second construction season (June 1-October 15) to support construction of the new bridge deck. All falsework and pads will be constructed on a temporary work platform, all of which will be removed at the end of the construction season. Access to the creek bed for the construction of the temporary falsework will be via constructed access roads used for construction of the new bridge piles in the first construction season. All falsework installation and removal will be completed between June 1 and October 15.

1.3.8. Box-Girder Section

The box-girder section will be 520 feet long, 46 feet wide, and 6 feet deep. The new bridge will be supported by an abutment foundation at the west approach on a spread footing and four columns. The two eastern columns have been installed and are located on either side (outside) of the primary creek channel and the two western columns are located further outside the creek channel. The eastern approach will be supported by a sidehill viaduct section. In the second construction season, the concrete girders and the bridge deck will be placed on top of the abutment and columns. The equipment used for this operation will be operated on the dry creek bank and will also use the access road and temporary bridge as a work platform. The work platform will include up to approximately 7,205 cubic yards of temporary fill, consisting of plastic sheets, gravel, and/or timber mats. The work platform will also include a bridge over the diversion channel and will result in approximately 0.64 acre of temporary impacts as it will be constructed and removed in each of the first two construction seasons. Upland areas will be restored and hydroseeded at the end of each construction season, but area below the OHWM, which is predominantly bare river rock, will not be hydroseeded or revegetated.

1.3.9. Sidehill Viaduct Section

A 180-foot-long sidehill viaduct section will be constructed adjoining the eastern end of the box-girder section to the eastern approach. It will be comprised of seven spans, varying between 10-46 feet wide. At its widest point, the sidehill viaduct section will support the entire westbound section of the travel way; at its narrowest point, the sidehill viaduct section will support only the shoulder and barrier. The viaduct section will consist of six piers on the downslope side, each comprising two columns. The upslope side of the structure will rest directly on the slope or embankment. The roadway deck structure will be constructed of precast slabs.

Because two existing drainages cross SR 84 in this portion of the Project footprint, two new culverts will be installed to convey runoff from these drainages under the SR 84 roadway surface. Temporary work areas and access routes within jurisdictional valley foothill riparian areas adjacent to SR 84 were necessary for construction of the sidehill viaduct piers. Impacts included vegetation clearing and removal of trees within 0.079 acre (385 linear feet). Work within steelhead habitat will be conducted in the creek construction work window (June 1 – October 15).

1.3.10. Width of the New Bridge and East/West Bridge Approaches

The total width of the new bridge will be 46 feet, consisting of a 2-foot-wide median barrier, two 12-foot-wide travel lanes, two 8-foot-wide shoulders, and 2 feet on either side of the bridge for the installation of the bridge railing.

1.3.11. Access for Bridge Demolition

For bridge demolition, the access road used in the previous two seasons for bridge construction will be constructed and extended during the third construction season to reach the temporary work platform that will be constructed under the existing bridge. The portion of the access road that is above the OHWM will remain in place throughout the Project as described above in the ‘Access for Bridge Construction’ section. The areas below the OHWM will receive a temporary geotextile mat and a temporary layer of imported gravel fill. The gravel would be a 3- inch-thick virgin Caltrans Class 2 aggregate subbase or aggregate base placed on top of the geotextile mat to create a stable route. This area will be restored following removal of the work platform during the third season of work.

1.3.12. Removal of Existing Alameda Creek Bridge and Pavement Section

The existing bridge is approximately 330 feet long and 26 feet wide and consists of five piers and two abutments. Abutment 1 sits on three 4-foot by 4-foot piles which each include an 8-foot by 8-foot footing. Piers 1 and 2 each have 3-foot by 3-foot piles on 6-foot by 6-foot footings. Piers 3-5 each consist of two piles (7-foot by 7- foot) on each of two footings (11-foot by 11-foot). Abutment 2 (east side of bridge) will not be removed as it is above the hardscaped bank that will remain in place. The diaphragm walls that connect the piles will also be removed. Their respective length and width is approximately 26 feet by the width of each pile.

Demolition of the existing Alameda Creek Bridge will occur during the third construction season following the transfer of traffic to the new Alameda Creek Bridge. The existing bridge will be demolished beginning in the middle of the bridge span and working outwards. A falsework platform structure will be installed below the bridge prior to dismantling to prevent debris from falling into Alameda Creek. The existing concrete railings will be jackhammered and removed in smaller pieces. Segments of the Alameda Creek Bridge superstructure will be saw-cut into relatively large pieces and removed by a crane situated on the abandoned SR 84 road alignment. Following the removal of the bridge, construction equipment will access Alameda Creek using the abandoned SR 84 alignment and the temporary work platform in order to remove the columns. The columns will be jackhammered and cut down either 10 feet or to the top of the footing with a hoe ram (a piece of equipment similar to a jackhammer). All above-ground concrete associated with the existing bridge will be removed from the site.

The existing bridge footings will be left in place approximately 10 feet below the original grade. The scour assessment states that the long-term scour is estimated at 4 feet, so Caltrans does not anticipate that the existing concrete will be exposed during the life of the bridge.

For demolition work, a backhoe or excavator with a fitted hoe ram will be used to break up the abutments. A loader will then be used to collect the debris to be hauled away by trucks. During the demolition of the existing Alameda Creek Bridge, a temporary work platform will be constructed using plastic, gravel, and timber mats. This temporary work platform will be in place throughout the third season of construction (June-October). The temporary work platform will run the length of the existing bridge, extending approximately 20 feet past the driplines of the bridge. The impacts due to the temporary work platform total 0.54 acre and will include approximately 6,121 cubic yards of fill. These impacts are categorized as temporary as areas impacted by bridge demolition will be restored at the end of the construction season. Material will not be temporarily stockpiled in the creek; if any material falls into the creek during the demolition of the bridge, it will be removed immediately.

The final stage of the Project will be the removal of the old approach pavement on either side of the bridge. An excavator will be used to take the approaches down to the subbase. The road surface and road foundation materials from the abandoned SR 84 alignment will be removed and disposed of off-site. After clearing and removal, the old road grade will be re-contoured to match the surrounding area, restored, and planted with native vegetation.

1.3.13. Channel Reconstruction

With coordination and feedback from CDFW and NMFS, a channel reconstruction plan consisting of a rock ramp design was submitted for approval to the regulatory agencies in January 2020. Approval from CDFW and NMFS was received in February 2020. Based on observations, the change in bed elevation is expected to be up to 5 feet. The design includes removal of the large pieces of concrete in the boulder field. In the existing condition, the pieces of concrete are expected to be stabilizing the channel bed, and it is expected that removal of these pieces of concrete could allow the channel bed to degrade via headcut erosion. In order to minimize headcut erosion, the rock ramp is designed to inhibit headcut erosion during low flows but to be movable in larger events. The design of the rock ramp includes a meandering low flow channel, and an overbank shape that will focus low flows to the low-flow channel to improve fish passage. The rock ramp is composed of rock sized to be transported by flows in the range of the 15-year return period. The channel design plan was implemented at the end of the first construction season in 2021. Since the entire weir structure was removed, the Year 2 creek reconstruction plan was followed, which includes placement of rock upstream of the weir. In the second and third construction seasons, the channel design will be repaired as necessary if sections are disturbed during construction. The reconstructed channel will be approximately 100 linear feet.

1.3.14. Revegetation

In areas of temporary construction impact, appropriate replacement native vegetation will be planted in locations where it will not affect roadway safety. The old alignment will be remediated and replanted with appropriate native vegetation/trees. Hydroseeding and upland planting will occur at the end of each construction season and/or after work has been completed in each work area. On the north side of the active creek channel and within the temporary impact area of jurisdictional freshwater wetland, there is a large stand of invasive giant reed (Arundo donax). The wetland area containing the giant reed is approximately 0.034 acre, and will be removed as part of the Project.

1.3.15. Avoidance and Minimization Measures and Water Quality Control

Caltrans proposes to include several avoidance and minimization measures (AMM) that will be implemented before, during, and after construction to prevent and minimize project-related effects to CCC steelhead and surrounding habitat. These measures include working within the in-water work window of June 1 to October 15; ensuring proper handling and relocation of listed salmonids during dewatering/diverting activities; ensuring establishment of revegetation areas; preventing introduction of contaminants into waterways; ensuring complete removal and proper disposal of all construction waste; implementing erosion control measures; development of a fish handling and relocation plan, a habitat restoration and revegetation plan, a stormwater pollution prevention plan (SWPPP), and a storm water management plan (SWMP) that includes provisions to protect sensitive areas and prevent/minimize storm and non-storm water discharges. A detailed list of the AMMs and additional best management practices (BMPs) are described in Caltrans' biological assessment (2021).

Additionally, a bioswale will be created west of the Alameda Creek Bridge north of the existing alignment between Stations 102+00 and 104+60, with an outfall at 104+60. Also, a biostrip will be placed west of the bridge on the existing alignment between Stations 110+00 and 114+00. The bioswale and biostrip will be installed during the third construction season. Bioswales are effective at trapping litter, Total Suspended Solids (soil particles), and particulate metals (Caltrans 2012). Biostrips are sloped vegetated land areas located adjacent to impervious areas, over which storm water runoff flows as sheet flow. Biostrips are effective at trapping litter, Total Suspended Solids, and particulate metals (Caltrans 2012).

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "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). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designation of critical habitat for CCC steelhead uses the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision does not change the scope of our analysis, and in this opinion, we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly 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; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

Within the action area (see Section 2.3 for description of the action area) of this project, no areas of critical habitat have been designated by NMFS. However, our analysis of the proposed action does evaluate the effects of the Project on habitat for CCC steelhead, and focuses on migrating and rearing habitat conditions within the action area.

2.2. Rangewide Status of the Species

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" for the jeopardy analysis.

2.2.1. Species Description and Life History

This biological opinion analyzes the effects of the federal action on CCC steelhead. CCC steelhead are listed as threatened under the ESA (71 FR 834, January 5, 2006). The CCC steelhead distinct population segment (DPS) includes steelhead in coastal California streams from the Russian River to Aptos Creek, and drainages of Suisun Bay, San Pablo Bay, and San Francisco Bay (72 FR 5248). The ESA listing of CCC steelhead DPS only applies to the anadromous form of *O. mykiss*, and under current conditions, Alameda Creek does not support a population of anadromous *O. mykiss* due to a complete barrier (called the Bay Area Rapid Transit [BART] Weir) to upstream passage located approximately 3.75 miles downstream from the action area. However, construction has now been completed for a fish passage facility that would re-establish volitional passage over the BART Weir and other barriers nearby by fall 2022. Once fish passage between Alameda Creek and the San Francisco Bay is restored, CCC steelhead within the Alameda Creek watershed, including the action area, would become a listed species with protections afforded by the ESA. Thus, at the time of issuance of this biological opinion, *O. mykiss* within Alameda Creek are not considered anadromous and are therefore not considered part of the CCC steelhead DPS. Because the project is expected to take two construction seasons to complete (i.e., 2022-2023), anadromy between Alameda Creek and the San Francisco Bay is anticipated to be restored during project operations. Therefore, *O. mykiss* occurring in the action area once anadromy is restored to the watershed (late 2022) are considered a part of the CCC steelhead DPS. Alameda Creek, including the action area of the Project, is not designated as critical habitat for CCC steelhead.

Steelhead are the anadromous form of *O. mykiss*, spawning in freshwater and migrating to marine environments to grow and mature. Steelhead have a complex life history that requires successful transition between life stages across a range of freshwater and marine habitats (i.e., egg-to-fry emergence, juvenile rearing, smolt outmigration, ocean survival, and upstream migration and spawning). Steelhead exhibit a high degree of life history plasticity (Shapovalov and Taft 1954; Thrower et al. 2004; Satterthwaite et al. 2009; Hayes et al. 2012). The occurrence and timing of these transitions are highly variable and generally driven by environmental conditions and resource availability (Satterthwaite et al. 2009; Sogard et al. 2012).

Steelhead are generally divided into two ecotypes based on timing and state of maturity when returning to freshwater: summer-run and winter-run. Summer-run steelhead return to natal streams in spring and early summer while they are still sexually immature and spend several months maturing before spawning in January and February. Winter-run steelhead enter natal streams as mature adults with well-developed gonads. They typically immigrate between December and April and spawn shortly after reaching spawning grounds (Shapovalov and Taft 1954; Moyle et al. 2008). Winter-run steelhead are the most common ecotype and are the only ecotypes expressed in the CCC steelhead DPS.

Adult steelhead spawn in gravel substrates with low sedimentation and suitable flow velocities. Females lay eggs in redds, where they are quickly fertilized by males and covered. Egg survival depends on oxygenated water circulating through the gravel, facilitating gas exchange and waste removal. Adults usually select spawning sites in pool-riffle transition areas of streams with gravel cobble substrates between 0.6 to 10.2 centimeters (cm) in diameter and flow velocities between 40-91 cm per second (Smith 1973; Bjornn and Reiser 1991). Eggs incubate in redds for approximately 25 to 35 days depending on water temperature (Shapovalov and Taft 1954). Incubation time depends on water temperature, with warmer temperatures leading to lower incubation periods due to increased metabolic rates. Eggs hatch as alevin and remain buried in redds for an additional two to three weeks until yolk-sac absorption is complete (Shapovalov and Taft 1954). Optimal conditions for embryonic development include water temperatures between 6 and 10°C, dissolved oxygen near saturation, and fine sediments less than 5% of substrate by volume (Bjornn and Reiser 1991; USEPA 2001).

Upon emerging from redds, juvenile steelhead occupy edgewater habitats where flow velocity is lower and cover aids in predator avoidance. Rearing juveniles feed on a variety of aquatic and terrestrial invertebrates. As they grow, juveniles move into deeper pool and riffle habitats where they continue to feed on invertebrates and have been observed feeding on younger juveniles (Chapman and Bjornn 1969; Everest and Chapman 1972). Juveniles can spend up to four years rearing in freshwater before migrating to the ocean as smolts, although they typically only spend one to two years in natal streams (Shapovalov and Taft 1954; Busby et al. 1996; Moyle 2002). Successful rearing depends on stream temperatures, flow velocities, and habitat availability. Preferred water temperature ranges from 12 to 19°C and sustained temperatures above 25°C are generally considered lethal (Smith and Li 1983; Busby et al. 1996; Moyle 2002; McCarthy et al. 2009). In Central California streams, juvenile steelhead are able to survive peak daily stream temperatures above 25°C for short periods when food is abundant (Smith and Li 1983). Response to stream temperatures can vary depending on the conditions to which individuals are acclimated, however, consistent exposure to high stream temperatures results in slower growth due to elevated metabolic rates and lower survival rates overall (Hokanson et al. 1977; Busby et al. 1996; Moyle 2002; McCarthy et al. 2009).

Juveniles undergo behavioral, morphological, and physiological changes in preparation for ocean entry, collectively called smoltification. Juveniles begin smoltification in freshwater and the process continues throughout downstream migration with some smolts using estuaries for further acclimation to saltwater prior to ocean entry (Hayes et al. 2008). Juveniles typically will not smolt until reaching a minimum size of 160 mm (Burgner et al. 1992). Smoltification is cued by increasing photoperiod. Stream temperatures influence the rate of smoltification, with warmer temperatures leading to more rapid transition. Downstream migration of smolts typically occurs from April to June when temperature and stream flows increase. Preferred temperature for smoltification and outmigration is between 10 and 17°C with temperatures below 15°C considered optimal (Hokanson et al. 1977; Wurtsbaugh and Davis 1977; Zedonis and Newcomb 1997; Moyle 2002; Myrick and Cech 2005). In coastal systems with seasonal lagoons, smolts may take advantage of higher growth potential in productive lagoon habitats before ocean entry (Osterback et al. 2018).

Adult steelhead are known to be highly migratory during ocean residency but little is known of their habitat use and movements. They have been observed moving north and south along the continental shelf, presumably to areas of high productivity to feed (Barnhart 1986). Adults will typically spend one to two years in the ocean, feeding and growing in preparation for spawning (Shapovalov and Taft 1954; Busby et al. 1996). Upstream migration typically begins once winter rains commence and stream flows increase. For coastal systems with seasonal freshwater lagoons, winter storms are required to breach the sandbars and allow access to upstream spawning sites. Within the action area, steelhead migrate through large, permanently open bays; CCC steelhead migrate through San Francisco Bay and Monterey Bay, respectively. Unlike most congenerics, steelhead are iteroparous, meaning they can return to spawn multiple times. Adult steelhead may spawn up to four times in their lifetime, although spawning runs predominantly consist of first-time spawners (~59%) (Shapovalov and Taft 1954). The maximum life span of steelhead is estimated to be nine years (Moyle 2002).

2.2.2. Status of the Listed CCC Steelhead DPS

NMFS assesses four population viability[2] parameters to discern the status of the listed ESUs and DPSs and to assess each species ability to survive and recover. These population viability parameters are: abundance, population growth rate, spatial structure, and diversity (McElhany et al. 2000). While there is insufficient data to evaluate these population viability parameters quantitatively, NMFS has used existing information to determine the general condition of the populations in the CCC steelhead DPS and factors responsible for the current status of these listed species.

The population viability parameters are used as surrogates for numbers, reproduction, and distribution, as defined in the regulatory definition of jeopardy (50 CFR 402.20). For example, abundance, population growth rate, and distribution are surrogates for numbers, reproduction, and distribution, respectively. The fourth parameter, diversity, is related to all three regulatory criteria. Numbers, reproduction, and distribution are all affected when genetic or life history variability is lost or constrained, resulting in reduced population resilience to environmental variation at local or landscape-level scales.

Historically, approximately 70 populations of steelhead existed in the CCC steelhead DPS (Spence et al. 2008; Spence et al. 2012). Approximately 37 of these populations were independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts (Bjorkstedt et al. 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (McElhaney et al. 2000; Bjorkstedt et al. 2005).

Abundance data for CCC steelhead are limited; however, existing information indicates population abundances have been substantially reduced from historical levels. In the mid-1960's, a total of 94,000 adult steelhead were estimated to spawn in CCC steelhead rivers, including 50,000 fish in the Russian River, the largest population in the DPS (Busby et al. 1996). Abundance estimates for smaller coastal streams in the DPS indicate low but stable levels with recent estimates for several streams (Lagunitas, Waddell, Scott, San Vicente, Pudding, and Caspar creeks) at individual run sizes of 500 fish or less (62 FR 43937). Some loss of genetic diversity has been documented and attributed to previous among-basin transfers of stock and local hatchery production in interior populations in the Russian River (Bjorkstedt et al. 2005). In San Francisco Bay streams, reduced population sizes and habitat fragmentation has likely also led to loss of genetic diversity in these populations. For more detailed information on trends in

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[2] NMFS defines a viable salmonid population as "an independent population of any Pacific salmonid (genus *Oncorhynchus*) that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100- year time frame" (McElhany et al. 2000).

CCC steelhead abundance, see: Busby et al. 1996; Good et al. 2005; Spence et al. 2008; Williams et al. 2011; and Williams et al. 2016.

CCC steelhead have experienced serious declines in abundance and long-term population trends suggest a negative growth rate, indicating the DPS may not be viable in the long-term. DPS populations that historically provided enough steelhead immigrants to support dependent populations may no longer be able to do so, thereby putting dependent populations at increased risk of extirpation. Recent status reviews and return data indicate an ongoing potential for the DPS to become endangered in the future (Good et al. 2005). In 2006, NMFS issued a final determination that the CCC steelhead DPS is a threatened species, as previously listed (71 FR 834). A CCC steelhead viability assessment completed in 2008 concluded that populations in watersheds that drain to San Francisco Bay are highly unlikely to be viable, and that the limited information available did not indicate that any other CCC steelhead populations could be demonstrated to be viable (Spence et al. 2008).

In the Santa Cruz Mountains, the California Coastal Monitoring Program (CMP) has been recently initiated for CCC steelhead. New information from three years of the CMP indicates that population sizes there are perhaps higher than previously thought. However, the long-term downward trend in the Scott Creek population, which has the most robust estimates of abundance, is a source of concern. Although steelhead occur in the Russian River, the ratio of hatchery fish to natural origin fish remains a concern. The viability of San Francisco Bay watershed populations remains highly uncertain. Population-level estimates of adult abundance are not available for any of the seven independent populations inhabiting the watersheds of the coastal strata (Novato Creek, Corte Madera Creek, Guadalupe River, Saratoga Creek, Stevens Creek, San Francisquito Creek, and San Mateo Creek). The scarcity of information on CCC steelhead abundance continues to make it difficult to assess whether conditions have changed appreciably since the previous status review assessment of Williams et al. (2011). On May 26, 2016, NMFS chose to maintain the threatened status of the CCC steelhead (81 FR 33468).

2.2.3. Global Climate Change

Another factor affecting the range wide status of CCC steelhead is climate change. Impacts from global climate change are already occurring in California. For example, average annual air temperatures, heat extremes, and sea level have all increased in California over the last century (Kadir et al. 2013). Snowmelt from the Sierra Nevada has declined (Kadir et al. 2013). However, total annual precipitation amounts have shown no discernible change (Kadir et al. 2013). CCC steelhead may have already experienced some detrimental impacts from climate change. NMFS believes the impacts on listed salmonids to date are relatively minor but increasing (see below) because natural, and local, climate factors likely still drive most of the climatic conditions salmonids experience, and many of these factors have much less influence on salmonid abundance and distribution than human disturbance across the landscape. In addition, CCC steelhead are not dependent on snowmelt driven streams and thus not directly affected by declining snow packs.

The threat to CCC steelhead from global climate change will increase in the future. Modeling of climate change impacts in California suggests that average summer air temperatures are expected

to continue to increase (Lindley et al. 2007; Moser et al. 2012). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe et al. 2004; Moser et al. 2012; Kadir et al. 2013). Total precipitation in California may decline; critically dry years may increase (Lindley et al. 2007; Schneider 2007; Moser et al. 2012). Wildfires are expected to increase in frequency and magnitude (Westerling et al. 2011, Moser et al. 2012).
In the San Francisco Bay region, warm temperatures generally occur in July and August, but as climate change takes hold, the occurrences of these events will likely begin in June and could continue in September (Cayan et al. 2012). Climate simulation models project that the San Francisco Region will maintain its Mediterranean climate regime, but experience a higher degree of variability of annual precipitation during the next 50 years, and years that are drier than the historical annual average during the middle and end of the twenty-first century. The greatest reduction in precipitation is projected to occur in March and April, with the core winter months remaining relatively unchanged (Cayan et al. 2012).

Estuaries may also experience changes detrimental to steelhead. Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling and sediment amounts (Scavia et al. 2002, Ruggiero et al. 2010). In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Brewer and Barry 2008, Feely 2004, Osgood 2008, Turley 2008, Abdul-Aziz et al. 2011, Doney et al. 2021). The projections described above are for the mid to later 21st Century. In shorter time frames, climate conditions not caused by the human addition of carbon dioxide to the atmosphere are more likely to predominate (Cox and Stephenson 2007, Santer et al. 2011).

2.3. Action Area

“Action area” means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area encompasses the streambed and banks of Alameda Creek, the active channel where the existing bridge crosses the creek, approximately 100 feet upstream of the existing bridge where the existing footings and weir wall of an older bridge were removed, the channel to be restored, and approximately 300 linear feet downstream of the bridge that is subject to increased turbidity and sedimentation. Upland areas included in the action area consist of new and old roadway alignments and construction staging areas.

2.4. Environmental Baseline

The “environmental baseline” refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

2.4.1. Description of Alameda Creek Watershed

The Alameda Creek watershed has experienced a number of land-use practices that have resulted in major changes to watershed processes and related instream morphology. Over the past 150-years, the watershed has experienced major channel modifications for flood control purposes, urbanization, agricultural development, grazing, and the development of domestic water supply. Historically, a large marsh complex was located near the current location of Pleasanton. The marsh consisted of distributaries with no defined channels. At high floods, the northern tributaries that drained into the marsh would connect to Arroyo de la Laguna, likely facilitating steelhead passage. Over 10 miles of canals were built in the early 1900s to connect several northern tributaries (Arroyo las Positas, Arroyo Mocho, and Arroyo del Valle) to Arroyo de la Laguna (Stanford et al. 2013). Much of the historic farmland has now been urbanized; however, cattle grazing is still the predominant land use within undeveloped lands throughout the watershed, particularly in eastern Livermore Valley. Three major dams within the watershed have severely altered the natural hydrology and have significantly reduced the amount of accessible high value steelhead habitat that historically existed within the watershed. In addition to these historic and ongoing land uses, substantial portions of the watershed are designated as regional and state parklands.

The majority of the lower and northern portions of Alameda Creek watershed are divided by the urban cities of San Ramon, Dublin, Pleasanton, Livermore, Fremont, Hayward, and Union City. Water resources and operations within the Alameda Creek watershed are controlled by the Alameda County Water District (ACWD), Zone 7 Water Agency (Zone 7), the Department of Water Resources (DWR), and the San Francisco Public Utilities Commission (SFPUC). The SFPUC and DWR operate three major dams in the watershed, two operated by SFPUC and one by DWR. ACWD, SFPUC, and Zone 7 are the three local agencies responsible for water supply operations in the watershed. The SFPUC owns and manages much of the southern watershed historically occupied by steelhead. Zone 7 owns and manages about a third of the channels in the Livermore Valley portion of the watershed. The cities of Dublin, Livermore, and Pleasanton also own and manage portions of the channels for flood protection. The Alameda County Flood Control and Water Conservation District manages the lower Alameda Creek Flood Control Channel and many of the county roads and stream culverts throughout the watershed. East Bay Regional Park District manages the parklands and various water bodies within the watershed for recreational opportunities. Private landowners receive some assistance from the Natural Resource Conservation Service with managing their agricultural and cattle grazing lands. There are also many stakeholders and NGOs, including the Alameda Creek Alliance, involved in restoring steelhead to Alameda Creek that participate in the Alameda Creek Fisheries Restoration Workgroup.

The lower portion of the Alameda Creek watershed, which includes the southern two-thirds of Alameda County including Niles Canyon, drains approximately 700 square miles. Alameda Creek carries runoff from the upper Alameda Creek watershed and the watersheds of Arroyo de la Laguna, Calaveras Creek, and Arroyo Hondo. Alameda Creek has high winter and spring flows, but for most of the year the creek in the vicinity of the action area exhibits slow-tomoderate flows with several deep pools and some riffles. SFPUC regulates the flows in Alameda Creek for flood protection and water management at San Antonio Reservoir, Calaveras Reservoir, and the Upper Alameda Creek Diversion Dam. As a result, fluctuations in flow are usually moderated during rain events. One small tributary to Alameda Creek flows through the action area from uplands across SR 84 to the west. Additional tributaries in the vicinity of the action area include Arroyo de la Laguna and Sinbad Creek, which flow seasonally, and a few small intermittent streams that carry water from the north and south sides of Niles Canyon into Alameda Creek.

The action area is located within Niles Canyon at an elevation of approximately 130 feet. The Project area is surrounded by rolling hills to the north and south that rise to elevations of approximately 1,400 feet. The slopes on both sides of the action area rise steeply above the existing roadbed. SR 84 is located within Niles Canyon and runs through the center of the action area. It is a two-lane state route with no median barrier and narrow shoulders. SR 84 includes the Alameda Creek Bridge which spans Alameda Creek at approximately PM 13.5.

2.4.2. Status of Listed CCC Steelhead DPS in the Action Area

Due to construction of a barrier near the mouth of Alameda Creek (i.e. BART Weir) in 1972, steelhead no longer have volitional passage into the majority of the watershed including the action area. This complete passage barrier, located approximately 3.75 miles downstream of the action area, has depleted the Alameda Creek steelhead population. The historical steelhead population within the Alameda Creek watershed has been identified as a functionally independent population within the CCC steelhead DPS (Spence et al. 2008; Bjorkstedt et al. 2005). Based on an assessment of habitat suitability, the size of the watershed, its potential production capacity (i.e., number of adults), and geographic location the NMFS Steelhead Recovery Team selected Alameda Creek as an “essential” population for the recovery of the CCC steelhead DPS, with recovery criteria set as a spawner density target of 2,900 adults (as described in NMFS 2016). The restoration of fish passage for CCC steelhead to access the Alameda Creek watershed is identified as a high priority in the NMFS Coastal Multispecies Recovery Plan (NMFS 2016).

Empirical information regarding the historical population of steelhead in Alameda Creek is very limited. However, there are accounts which indicate the presence of steelhead at the time of construction of Calaveras Dam, completed in 1925. More recently, there are accounts of steelhead in Alameda Creek prior to completion of the Flood Control Channel in 1972. Photographic records appear to document the historical runs; however, no reliable scientific records exist of the size of steelhead spawning populations or the distribution of spawning and rearing areas that once occurred within the watershed. Historical accounts of steelhead in the Alameda Creek watershed were compiled as part of the San Francisco Estuary Institute’s (SFEI) comprehensive assessment of watershed conditions prior to significant Euro-American modification (Stanford et al. 2013):

> “The Alameda Creek watershed historically supported significant numbers of steelhead although there are no reliable quantitative estimates for the number of adult fish or spawning run size (Daily Alta California 1889b; Welch 1931; Shapovalov 1938c;

> Shapovalov 1938b; Shapovalov 1938a; CDFG 1953; Evans 1954; Fisher 1959; Smith 1998; Leidy et al. 2005; Becker et al. 2007; Alameda Creek Alliance 2012). Steelhead remains have been recovered from Native American archeological sites adjacent to Alameda Creek (Gobalet 2004). In addition to steelhead, Alameda Creek also historically supported resident rainbow trout in headwater streams inaccessible to steelhead, typically in stream reaches above physical barriers such as waterfalls and cascades (Leidy 2007). Leidy et al. (2005a) documented the historical existence of a spawning run or reproducing population of rainbow trout/steelhead in 19 streams within the Alameda Creek watershed, and a probable spawning run or reproducing population in another two streams. Prior to construction of dams and other barriers, steelhead would likely have had complete or partial spawning access to at least 16 of the 21 (76%) assessed streams (Leidy et al. 2005a)."

During the past two decades, several observations of adult steelhead have been made downstream of the BART weir, indicating that adult steelhead sporadically return to the watershed in an attempt to complete their life history. They are, however, unable to pass upstream. In 1998 and in subsequent years (i.e., 1999, 2006, 2008, 2017, and 2019), individual adult steelhead were captured below the BART weir by local government agencies and citizen groups, and released at various locations throughout the watershed (e.g. Niles Canyon and lower Alameda Creek). In 1998, steelhead were observed spawning in very poor substrate conditions downstream of the BART weir. Due to poor habitat conditions within the area, the fertilized eggs from this spawning event were collected and moved to an offsite incubation facility to ensure survival. The eggs hatched successfully and the resulting fry were released into Alameda Creek near Sunol Park (Gunther et al. 2000). In 1999, three adult steelhead were captured and released upstream of BART weir. In 2006, six adult steelhead were collected and released upstream, and one female was observed excavating a red below the BART weir. In February 2008, two adult steelhead were captured below the BART weir and released in the Niles Canyon reach of Alameda Creek. These two fish exhibited spawning behavior on March 2nd and 3rd of 2008, in Stonybrook Creek (NMFS 2013). No adult steelhead were observed at the BART Weir from 2009 through 2011. In 2012 and 2016, multiple steelhead were documented via webcam at the BART weir (pers. Comm. Jeff Miller). In 2017, nine adult steelhead were collected from the area immediately downstream of the BART weir. One fish was adipose fin-clipped, indicating that it was of hatchery-origin, and this fish was released downstream. For the remaining eight adult steelhead collected in 2017, five were tagged with radio transmitters and all eight were released in the Niles Canyon reach of Alameda Creek (NMFS 2013). In 2019, four steelhead were seen at the BART weir, and one female with an intact adipose fin was collected and was fitted with a radio transmitter. This female was later tracked into Stonybrook Creek (5 miles downstream of project area) where she was observed spawning with a native rainbow trout (Pers. Comm. Jeff Miller).

In a 2013 survey of Arroyo de la Laguna Creek (a main tributary to Alameda Creek) was completed to assess habitat conditions within the creek and determine if, and how, it may support steelhead (Entrix). Results from the survey indicated that within the creek rearing and migration habitat exist, albeit of marginal quality. The channel substrate had a strong component of gravel, with some components of sand and other fine sediments. The depth of the channel ranged from 3-10 feet, with frequent occurrences of pool and riffle habitat. The average pool depth was two feet deep, and while there was some vegetative cover, this component is likely a limiting factor of the area's ability to provide high quality rearing habitat during the summer months. Furthermore, mean weekly average temperatures were measured to be between 22-25 °C during the summer months, indicating that conditions are likely "stressful" and/or "potentially lethal" to juvenile rearing steelhead (Entrix 2013). In a more recent habitat analysis, the action area appeared to show similar conditions to those observed in 2013. Warm water temperatures coupled with sparse instream cover (i.e. large woody debris, undercut banks, etc.), both in complexity and frequency, suggested that the area still exhibits a limited ability to provide optimal conditions for summer rearing of juvenile steelhead (Caltrans 2021).

Based on the aforementioned information, NMFS expects that the action area has habitat conditions that are adequate to support small numbers of rearing and migrating steelhead year-round. Yet, with the proposed in-water work window of June 1 to October 15, only juvenile CCC steelhead are expected to be present within the action area during the proposed summer work window.

The number of steelhead that may be present during fish collection is difficult to estimate given there hasn't been a run of anadromous steelhead in the watershed since 1972, when the BART weir and flood control channel were constructed. Based on surveys conducted in nearby watersheds with similar characteristics (Leidy et al. 2005) steelhead abundance in the action area could range from 10-20 juvenile steelhead per 100 feet of stream once anadromy is restored and steelhead begin to repopulate the watershed. Due to the timing of the project and the current condition of habitat in the action area, we estimate steelhead abundance will be on the lower end of regional abundance estimates (10 fish per 100 feet) during project construction.

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered the factors set forth in 50 CFR 402.17(a) and (b).

Construction activities, both during and post-project completion, associated with the proposed project may affect CCC steelhead and habitat. The following may result from construction activities: unintentional direct injury or mortality during fish collection, relocation, and dewatering activities; loss of benthic habitat; insignificant effects to steelhead and habitat from temporary reductions in riparian vegetation; insignificant effects to steelhead and habitat from temporary increases in suspended sediment concentrations; a discountable potential for fish and habitat to be exposed to construction debris and materials; and permanent improvements to habitat and fish passage. These effects are presented in detail below.

2.5.1. Fish Collection and Relocation

To facilitate completion of the project, portions of Alameda Creek will need to be dewatered. As discussed above, a maximum amount of 280 linear feet will be dewatered in two consecutive dry seasons (e.g. 2022-2023). Caltrans proposes to collect and relocate fish in the work areas prior to, and during dewatering, to avoid fish stranding and exposure to construction activities. Before, and during, dewatering of the construction site, juvenile steelhead will be captured by a qualified biologist using one or more of the following methods: dip net, seine, thrown net, block net, minnow trap, and electrofishing. Collected steelhead will be relocated to an appropriate stream reach that will minimize impacts to captured fish, and to fish that are already residing at the release site(s). Since construction is scheduled to occur between June 1 and October 15, relocation activities will occur during the summer low-flow period after emigrating smolts have left and before adults have immigrated for spawning. Only juvenile steelhead are expected to be in the action area during the construction period. Therefore, NMFS expects capture and relocation of listed steelhead will be limited to pre-smolting and young-of-the-year juveniles.

Based on the estimated number of steelhead that may occur in the action area once anadromy is established (late 2022), we anticipate up to 28 individual steelhead may be encountered in the 2023 work season after anadromy is restored[3].

Fish collection and relocation activities pose a risk of injury or mortality to rearing juvenile salmonids. Any fish collecting gear, whether passive (Hubert 1996) or active (Hayes et al. 1996) has some associated risk to fish, including stress, disease transmission, injury, or death. The amount of unintentional injury and mortality attributable to fish capture varies widely, depending on the method used, the ambient conditions, and the expertise and experience of the field crew. Since fish relocation activities will be conducted by qualified fisheries biologists following NMFS electrofishing guidelines (NMFS 2000), injury and mortality of juvenile salmonids during capture and relocation will be minimized. Based on prior experience with current relocation techniques and protocols likely to be used to conduct the fish relocation, unintentional mortality of listed juvenile salmonids expected from capture and handling procedures is not likely to exceed 2 percent, or 1 fish per construction season[4].

Relocated fish may also have to compete with other fish, causing increased competition for available resources such as food and habitat. To reduce the potential for competition, fish relocation sites will be pre-approved by NMFS to ensure the sites have adequate habitat to allow for survival of transported fish and fish already present. Nonetheless, crowding could occur which would likely result in increased inter- and intraspecific competition at those sites.

[3] In 2022- no steelhead are expected to be present due to a complete barrier downstream. In the subsequent construction season, 2023, when anadromy will have been restored, we anticipate up to 10 juvenile steelhead per 100 linear feet will occur within the action area. Based on the size of the dewatered reach (280 linear feet), there may be up to 28 juvenile steelhead present in the dewatered reach during the construction season after anadromy is restored.

[4] The number of steelhead that may be killed during fish relocation is estimated to be 2 percent of the individuals that are captured. In years after anadromy is restored to the watershed, this would be 2 percent of 28 steelhead (0.56 steelhead, or 1). In years prior to anadromy being restored, the amount would be 2 percent of zero, or zero fish killed and captured.

Responses to crowding by salmonids include self-thinning, resulting in emigration and reduced salmonid abundance with increased individual body size within the group, and/or increased competition (Keeley 2003). Relocation sites will be selected to ensure they have similar water temperatures as the capture sites, and adequate habitat to allow for survival of transported fish and fish already present. However, some of the fish released at the relocation sites may choose not to remain in these areas and move either upstream or downstream to areas that have more vacant habitat and a lower density of fish. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. In some instances, relocated fish may endure some short-term stress from crowding at the relocation sites. Such stress is not likely to be sufficient to reduce their individual fitness or performance. NMFS cannot accurately estimate the number of fish likely to be exposed to competition, but does not expect this short-term stress to reduce the individual performance of juvenile salmonids, or cascade through the watershed population of these species. Fish that avoid capture during relocation may be exposed to risks described in the following section on dewatering (see Section 2.5.2 below).

Applying applicable AMMs to fish collection, relocation, and dewatering activities is expected to appreciably reduce the effects of project actions on juvenile steelhead. Specifically, steelhead collection and relocation activities conducted by NMFS-approved fisheries biologists will ensure proper equipment operation and application of NMFS guidelines thereby minimizing injury and mortality to juvenile steelhead. Restricting the work window to June 1 to October 15 will limit the effects to stream rearing juvenile salmonids. NMFS expects applying AMMs will effectively minimize injury and mortality to juvenile steelhead in the action area.

2.5.2. Dewatering

As described above, completion of the project will require dewatering of Alameda Creek. Cofferdams and a series of pipes will be used to temporarily divert flows around the work site during construction. Dewatering of the channel is estimated to affect up to 280 linear feet of Alameda Creek. NMFS anticipates temporary changes to instream flow within, and downstream of, the project site during installation of the diversion system, and during dewatering operations. Once installation of the diversion systems are complete, stream flow above and below the work sites should be the same as free-flowing pre-project conditions, except within the dewatered reaches where stream flow is bypassed and/or pools are dewatered. These fluctuations in flow are anticipated to be small, gradual, and short-term, but are expected to cause a temporary loss, alteration, and reduction of aquatic habitat, and in the case of areas that will be dewatered, will likely result in mortality of any steelhead that avoid capture during fish relocation activities.

Stream flow diversion and dewatering could harm any rearing steelhead individuals by concentrating or stranding them in residual wetted areas before they are relocated. Juvenile steelhead that avoid capture in the project work area will likely die during dewatering activities due to desiccation, thermal stress, or may be crushed by equipment or foot traffic if not found by biologists while water levels within the reach recede. Because the pre-dewatering fish relocation efforts at the project site will be performed by qualified biologists, NMFS expects that the number of juvenile steelhead that will be killed as a result of stranding during dewatering activities will be very small, likely no more than one percent of the steelhead within the work site prior to dewatering[5].

Dewatering operations at the work site may affect benthic (bottom dwelling) aquatic macroinvertebrates, an important food source for steelhead. Benthic aquatic macroinvertebrates at the project site may be killed or their abundance reduced when river habitat is dewatered (Cushman 1985). However, effects to aquatic macroinvertebrates resulting from stream flow diversion and dewatering activities will be temporary because construction activities will be short lived, and the dewatered reach will not exceed 280 linear feet within the Alameda Creek. Rapid recolonization (typically one to two months) of disturbed areas by macroinvertebrates is expected following rewatering (Cushman 1985, Thomas 1986, Harvey 1986). Within the action area, the effect of macroinvertebrate loss on juvenile steelhead is likely to be negligible because food from upstream sources (via drift) would be available downstream of the dewatered area since stream flow will be bypassed around the work site. Based on the foregoing, juvenile steelhead are not anticipated to be exposed to a reduction in food sources at the work site from the minor and temporary reduction in aquatic macroinvertebrates as a result of dewatering activities.

Beyond the dewatered area, the temporary stream diversion is expected to resemble typical summer low flow conditions. The diversion system at the work site could restrict movement of listed steelhead in a manner similar to the normal seasonal isolation of pools by intermittent flow conditions that typically occur during summer within a portion of some streams throughout the range of CCC steelhead. Because habitat in and around the action area is adequate to support steelhead, NMFS expects steelhead will be able to find food both up- and downstream of the action area as needed during dewatering activities.

2.5.3. Increased Sedimentation and Turbidity

The proposed project will result in disturbance of the streambed and banks for construction. Construction activities within the action area may result in disturbance of the dewatered streambed and banks for equipment access, construction activities, and placement/removal of stream diversion structures. While the cofferdam and stream diversion is in place, construction activities are not expected to degrade water quality in the action area because the work areas will be dewatered and isolated from flowing waters. This disturbed soil on the creek bank is more easily mobilized when later fall and winter storms increase streamflow levels. Thus, NMFS anticipates disturbed soils could affect water quality in the action area in the form of small, short-term increases in turbidity during rewatering (i.e. cofferdam removal), and subsequent higher flow events during the first winter storms post-construction.

Instream and near-stream construction activities have been shown to result in temporary increases in turbidity (reviewed in Furniss et al. 1991, Reeves et al. 1991, Spence et al. 1996).

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[5] The number of steelhead that may be killed during dewatering is estimated to be 1 percent of the individuals that are captured. In years after anadromy is restored to the watershed, this would be 1 percent of 28 steelhead (0.28 steelhead, or 1). In years prior to anadromy being restored, the amount would be 1 percent of zero, or zero fish killed and captured.

Sediment may affect fish by a variety of mechanisms. High concentrations of suspended sediment can disrupt normal feeding behavior and efficiency (Cordone and Kelley 1961, Bjornn et al. 1977, Berg and Northcote 1985), reduce growth rates (Crouse et al. 1981), and increase plasma cortisol levels (Servizi and Martens 1992). High turbidity concentrations can reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to disease, and can also cause fish mortality (Sigler et al. 1984, Berg and Northcote 1985, Gregory and Northcote 1993, Velagic 1995, Waters 1995). Even small pulses of turbid water will cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, decreasing chances of survival. Increased sediment deposition can fill pools and reduce the amount of cover available to fish, decreasing the survival of juveniles (Alexander and Hansen 1986).

Chronic elevated sediment and turbidity levels may affect salmonids as described above. However, sedimentation and turbidity levels associated with cofferdam removal, rewetting of the construction sites within the action area, and subsequent rainfall events are not expected to rise to the levels described in the previous paragraph because the project's proposed soil and channel stabilization measures will be implemented to avoid and/or minimize sediment mobilization. Additionally, Caltrans' proposed additional AMMs and BMPs specifically aimed at reducing erosion, scour, and sedimentation in storage and staging areas, and from dewatering (Caltrans 2021). Therefore, any resulting elevated turbidity levels would be minor, occur for a short period, and be well below levels and duration shown in the scientific literature as cause injury or harm to steelhead (Sigler et al. 1984, Newcombe and Jensen 1996). NMFS expects any sediment or turbidity generated by the project would not extend more than 100 feet downstream of the worksites, based on site conditions and methods used to control sedimentation and turbidity. Thus, NMFS does not anticipate harm, injury, or behavioral impacts to juvenile steelhead associated with exposure to minor elevated suspended sediment levels that could reduce their survival chances.

2.5.4. Removal of Riparian Vegetation, Habitat Loss, and Increased Shade

The project will result in permanent and temporary reductions in riparian vegetation, including tree removal and trimming, necessary for construction access and staging. Riparian vegetation helps maintain stream habitat conditions necessary for salmonid growth, survival, and reproduction. Riparian zones and wetland/aquatic vegetation serve important functions in stream ecosystems such as providing shade (Poole and Berman 2001), sediment storage and filtering (Cooper et al. 1987, Mitsch and Gosselink 2000), nutrient inputs (Murphy and Meehan 1991), water quality improvements (Mitsch and Gosselink 2000), channel and streambank stability (Platts 1991), source of woody debris that creates fish habitat diversity (Bryant 1983, Lisle 1986, Shirvell 1990), and both cover and shelter for fish (Bustard and Narver 1975, Wesche et al. 1987, Murphy and Meehan 1991). Riparian vegetation disturbance and removal can degrade these ecosystem functions and impair stream habitat. Removal of riparian vegetation increases stream exposure to solar radiation, leading to increases in stream temperatures (Poole and Berman 2001).

Riparian vegetation provides the limited cover and habitat complexity required by migrating and rearing steelhead throughout the action area. As a result of the project, up to 1.169 acres of riparian habitat may be temporarily impacted. However, tree and vegetation removal will be minimized to the maximum extent feasible to prevent erosion and to reduce potential impacts of riparian vegetation removal on steelhead. The removal of riparian vegetation will likely result in both permanent and temporary reductions in shade and cover for fish, will remove sources of woody debris that may contribute to habitat diversity and complexity, and may result in increased stream temperatures.

Trimmed vegetation is expected to grow back and the native vegetation disturbed during construction will be replanted on-site, following project completion. The project site will be monitored to ensure the success of revegetation efforts to restore areas impacted by removal of native riparian vegetation. Therefore, the services provided by vegetation such as shade and cover, sediment storage and filtering, nutrient inputs, sources of woody debris, and habitat complexity (i.e. cover) will remain degraded at the sites until new vegetation is replanted and becomes established. When considering complete removal of trees, we expect riparian vegetation attributes on-site will return to pre-project levels after native trees are replanted and established; possibly within 5-10 years due to Caltrans' proposed AMMs, revegetation measures, and vegetation growth rates. Because of the timing and establishment of the on-site revegetation and recruitment of new woody debris, loss of riparian vegetation may cause individual steelhead to seek alternative areas for cover and forage. Such temporary displacement of steelhead is not expected to reduce their individual performance because there are sites nearby that provide these features and can accommodate additional individuals without becoming overcrowded. However, a number of individuals could remain in the area directly adjacent to areas where vegetation is either temporarily or permanently impacted. For individuals that choose to stay in the area, the impacts of reduced shade, cover, and other vegetative services (i.e. sediment storage and filtering, nutrient input, etc.) from removal of riparian vegetation is not expected to significantly reduce their performance.

2.5.5. Fish Passage and Altered Channel Morphology

Permanent effects to the riverine habitat are anticipated through the installation of new bridge columns. Because the new pier footprint will be smaller than the existing pier walls in the stream channel, there will be a reduction of hard structure. Removal of the upstream weir has also reduced the amount of concrete structure in the creek channel and improved fish passage. Implementing the Project will result in the removal of existing bridge footings and the concrete weir from the creek channel and removal of a patch of invasive giant reed. This will allow the stream to take on a more natural morphology and remove a low-flow passage barrier to steelhead. The low-flow channel is designed to have a width of 16 feet. The overbank area on either side of the low-flow channel is designed to be inundated at higher flows. Therefore, the Project will result in improved critical habitat, and improved fish passage for adult and smolt CCC steelhead.

RSP and other cut and fill work will be used to protect the new bridge abutments and some of the right bank (looking downstream). By design, streambank stabilization projects prevent lateral channel migration, effectively forcing streams into a simplified linear configuration that, without the ability to move laterally, instead erode and deepen vertically (Leopold et al. 1968; Dunn and Leopold 1978). The resulting "incised" channel fails to create and maintain aquatic and riparian habitat through lateral migration, and can instead impair groundwater/stream flow connectivity and repress floodplain and riparian habitat function. The resulting simplified stream reach typically produces limited macroinvertebrate prey that results in poor functional habitat for rearing juvenile salmonids (Florsheim et al. 2008).

The proposed RSP for this Project is expected to maintain simplification of habitat in the future. However, The Project through the reconstruction of approximately 100 linear feet of the channel below the existing bridge would enhance the functional value of aquatic resources through the construction of a riffle-pool complex, a low flow channel, and floodplain bench. This action would increase the amount of available spawning and rearing habitat, contribute to low velocity and predator avoidance refugia, add habitat complexity and diversity, restore natural sediment transport processes, and enhance prey item densities. These Project benefits likely would increase juvenile steelhead growth, abundance, and survival. The instream habitat enhancements would also likely contribute to channel and streambank stability, increase retention of organic matter, and dissipate energy. Streambank stabilization and riparian replanting may reduce sedimentation from watershed and bank erosion, decreasing turbidity levels, and improving water quality for steelhead over the long term.

Upon completion of instream work and cofferdam removal, instream habitat may be temporarily decreased due to equipment disturbance and redistribution of gravel within the construction area. Disturbance from using heavy equipment in the streambed is expected to be minimized with winter high flow events that will redistribute gravels and restore channel form.

2.5.6. Pollution from Hazardous Materials and Contaminants

Operating equipment in and near streams has the potential to introduce hazardous materials and contaminants into streams. Potentially hazardous materials include wet and dry concrete debris, fuels, and lubricants. Spills, discharges, and leaks of these materials can enter streams directly or via runoff. If introduced into streams, these materials could impair water quality by altering the pH, reducing oxygen concentrations as the debris decomposes, or by introducing toxic chemicals such as hydrocarbons or metals into aquatic habitat. Oil and similar substances from construction equipment can contain a wide variety of polynuclear hydrocarbons (PAHs) and metals. PAHs can alter salmonid egg hatching rates and reduce egg survival as well as harm the benthic organisms that are a salmonid food source (Eisler 2000). Disturbance of streambeds by heavy equipment or construction activities can also cause the resuspension and mobilization of contaminated stream sediment with adsorbed metals.

The equipment needed to complete the project has the potential to release debris, hydrocarbons, concrete, and similar contaminants into surface waters at both work sites. These effects have the potential to harm or injure exposed fish and temporarily degrade habitat. However, AMMs proposed at both work sites will substantially reduce or eliminate the potential for construction materials and debris to enter waterways. Limiting the work window to the dry season from June 1 to October 15 will limit hazardous material exposure to juvenile salmonids, and eliminate potential for containments to adversely affect the most sensitive life stages (i.e. eggs, alevin, and fry). Equipment will be checked daily at both work sites to ensure proper operation and avoid any leaks or spills. Proper storage, treatment, and disposal of construction materials and discharge management is expected to substantially reduce or eliminate contaminants entering both waterways via runoff. A SWPPP and a SWCP will be implemented to maintain water quality during and after construction within Alameda Creek, and render the potential for the project to degrade water quality and adversely affect steelhead, improbable. Furthermore, Caltrans will also construct permanent bio retention structures and develop a maintenance program for these structures for long-term management of stormwater. Due to these measures, permanent structures, and long-term management plan, conveyance of toxic materials into active waters at the work site both during, and after, project construction is not expected to occur, and potential for the project to degrade water quality and adversely affect steelhead is improbable.

2.5.7. Post-Construction Water Quality

The new bridge will result in an increase in impervious surface area adjacent to Alameda Creek. Published work has identified stormwater from roads and streets as causing a high percentage of rapid mortality of adult coho salmon in the wild (Scholz et al. 2011) and laboratory settings (McIntyre et al. 2018). Subsequent laboratory studies showed this morality also occurred in juvenile coho salmon (Chow et al. 2019) as well as to juvenile steelhead and chinook salmon (Brinkmann et al. 2022, McIntyre and Scholz, unpublished results, 2020). Recent publications have identified a degradation product of tires (6PPD-quinone) as the causal factor in this mortality at concentrations of less than a part per billion (Tian et al. 2022, Brinkmann et al. 2022, Tian et al. 2021; Peter et al. 2018). This contaminant is widely used by multiple tire manufacturers and the tire dust and shreds that produce it have been found to be ubiquitous where both rural and urban roadways drain into waterways (Sutton et al. 2019; Feist et al. 2018).

The new bridge resulting from Project construction may expose salmonids to the degradation product of tires (6PPD-quinone) which has been identified as the causal factor in coho salmon mortality at concentrations of less than a part per billion (Tian et al. 2022, Tian et al. 2021) and to juvenile steelhead trout at concentrations of one part per billion (Brinkmann et al. 2022, J. McIntyre and N. Scholz, unpublished results, 2020). Coho adults are noted to perish "within hours" of exposure (Sholz et al. 2011) and juvenile coho perished or were completely immobile within seven hours of exposure (Chow et al. 2019). Coho juveniles did not recover even when transferred to clean water (Chow et al. 2019). Steelhead mortality can begin as soon as seven hours post exposure (Brinkmann et al. 2022). Effects appear to be related to cardiorespiratory disruption, consistent with symptoms (surface swimming and gaping followed by loss of equilibrium (Sholz et al. 2011)) and therefore sublethal effects such as disruption of behaviors needed for survival (e.g. predator avoidance) and swimming performance are expected. Additional research concerning sublethal effects is needed. Mortality can be prevented by infiltrating the road runoff through soil media containing organic matter which results in removal of this (and other) contaminant(s) (Fardel et al. 2020; Spromberg et al. 2016; McIntrye et al. 2015).

The exposure will be minimized through post-construction stormwater BMPs intended to address water quality concerns associated with road projects such as where there is an increase in impervious surfaces. These permanent treatment BMPs include biofiltration strips or swales with or without soil amendment. Additionally, hydro-modification management controls will be included, which are permanent measures used to control increases in peak runoff flow and volume from the Project's new impervious surfaces. These controls include installing infiltration trenches and bioretention systems. Therefore, we expect mortality associated with construction of the new bridge, when implemented with the proposed preventative erosion control measures, will be avoided.

2.6. Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR 402.02 and 402.17(a)]. 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.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described earlier in the discussion of environmental baseline (Section 2.4).

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

The action area includes one site located within Alameda County, California in Alameda Creek. Alameda Creek currently does not support a steelhead population due to a complete barrier to anadromy (i.e., BART weir) approximately 3.75 miles downstream of the action area. The loss of upstream fish passage at the BART Weir has prevented steelhead access to all suitable spawning and rearing habitat in the Alameda Creek watershed, including the action area, since the early 1970s. Furthermore, based on the extensive loss of historic habitat due to dams and weirs, and the degraded condition of the remaining available spawning, rearing, and migratory areas, CCC steelhead populations in the watersheds that drain to the San Francisco Bay have experienced severe declines. However, once the anticipated fish ladder associated with the BART weir becomes operational (anticipated in fall 2022) and restores anadromy to the Alameda Creek watershed, CCC steelhead are expected to be found within the action area despite the suboptimal habitat conditions described above. CCC steelhead are listed as threatened, but the action area is not designated critical habitat.

The historical steelhead population within the Alameda Creek watershed has been identified as a functionally independent population within the CCC steelhead DPS (Spence et al. 2008; Bjorkstedt et al. 2005). Based on an assessment of habitat suitability, the size of the watershed, its potential production capacity (i.e., number of adults), and geographic location the NMFS Steelhead Recovery Team selected Alameda Creek as an "essential" population for the recovery of the CCC steelhead DPS, with recovery criteria set as a spawner density target of 2,900 adults (as described in NMFS 2016). The restoration of fish passage for CCC steelhead to access the Alameda Creek watershed is identified as a high priority in the NMFS Coastal Multispecies Recovery Plan (NMFS 2016).

As described in Section 2.5 Effects of the Action, NMFS identified the following components of the project that may result in effects to CCC steelhead: fish collection and relocation, dewatering, increases in sedimentation and turbidity, pollution from hazardous materials and contaminants, removal of riparian vegetation, habitat loss, and increased shade, and fish passage and altered channel morphology. Of these, fish collections and relocation, and dewatering have the potential to result in reduced fitness, injury, and/or mortality of CCC steelhead.

The project proposes to dewater approximately 280 linear feet of the Alameda Creek for up to 5.5 months in two consecutive dry seasons. Therefore, it is anticipated that only rearing juvenile steelhead would be affected by project activities, and no adult steelhead or migrating steelhead smolts would be affected by the project activities. Furthermore, due to the suboptimal habitat conditions noted above, the small area of stream affected, and low summer streamflow, NMFS estimates that a very small number (0-55) of juvenile CCC steelhead may be present in the dewatered reach prior to construction in the summer of 2023. Individuals present will likely make up a very small proportion of the steelhead population in Alameda Creek. Anticipated mortality from relocation is expected to be two percent (or less) of the fish relocated (1 fish per construction season), and mortality expected from dewatering is expected to be one percent (or less) (1 fish per construction season) of the fish in the area prior to dewatering (combined mortality not to exceed three percent). Due to the relatively large number of juveniles produced by each spawning pair, steelhead spawning in the Alameda Creek watershed in future years are likely to produce enough juveniles to replace the few that may be lost at the project site due to relocation and dewatering. Thus, it is unlikely that the small potential loss of juvenile steelhead during the life of the project will impact future adult returns.

In addition to the adverse effects described above, we also consider the potential impacts of increased sedimentation and turbidity, pollution from hazardous materials and contaminants, removal of riparian vegetation, habitat loss, increased shading, and fish passage and channel morphological changes. The implementation of proposed AMMs is expected to render the potential for fish to be exposed to pollution from hazardous materials and contaminants during and after construction improbable. Increased sedimentation and turbidity and temporary loss and degradation of habitat in the dewatered areas will cease shortly after construction is complete and will only result in minor impacts to steelhead. Riparian vegetation removed to construct the project will take up to 10 years to return to pre-project levels. During this timeframe, individual steelhead exposed to reduced cover and forage will be able to successfully complete their life cycle in the action area or alternative nearby habitats. The new bridge and accompanying reconstructed channel will maintain or improve current geomorphic conditions such that fish passage at the bridge will not be impaired. NMFS does not expect any of the aforementioned effects to combine with other effects in any significant way.

For short-term effects, climate change is not expected to significantly worsen existing conditions over the time frame considered in this biological opinion. Considering the above, we do not expect climate change to affect CCC steelhead in the action area beyond the scope considered in this biological opinion. For the long-term effects, climate change would likely worsen conditions if total precipitation in California declines and critically dry years increase. These conditions would likely modify water quality, streamflow levels, rearing habitat and steelhead migration. The overall reduction in habitat quality caused by the project is limited to a small area of a watershed and therefore, even if climate change reduced the overall habitat quality in the future, when combined with this proposed action any amplification in habitat degradation would be very small.

We do not expect the proposed project to affect the persistence or recovery of the Alameda Creek population of steelhead in the CCC steelhead DPS. We base this conclusion on our findings above which considered the status of the species, the environmental baseline, all of the potential effects of the action, and the cumulative effects.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of CCC Steelhead. No critical habitat has been designated within the action area for this species; therefore, none was analyzed.

2.9. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the taking of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Harass" is further defined by interim guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1. **Amount or Extent of Take**

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

Take of listed juvenile CCC steelhead is likely to occur during fish relocation and dewatering of Alameda Creek between June 1 and October 15. Construction will be completed within two construction seasons; therefore, dewatering is anticipated to occur up to two times to complete the project. The number of CCC steelhead that are likely to be incidentally taken during dewatering activities is expected to be small, and limited to the pre-smolt and young-of-the-year juvenile life stage. NMFS expects that no more than two percent of the juvenile steelhead within the 280 linear foot dewatering area of Alameda Creek will be injured, harmed, or killed during fish relocation activities. NMFS also expects that no more than one percent of the fish within the same dewatered area will be injured, harmed, or killed during dewatering activities. Because no more than 28 juvenile steelhead are expected to be present within the 280 linear foot dewatered reach of Alameda Creek each construction season, NMFS does not expect more than 2 juvenile CCC steelhead will be harmed or killed by the project. When considering the proposed maximum of two dewatering events (with only the 2023 dewatering event to be completed after passage at the BART weir is resumed) is expected that might be necessary to complete the work, no more than 28 juvenile steelhead are expected to be present at the site. Thus, NMFS expects no more than 2 juvenile steelhead would be injured or killed by fish relocation/dewatering over the life of the project.

Incidental take will have been exceeded if:

- more than 28 juvenile CCC steelhead are captured in construction season 2023; or
- more than 2 juvenile CCC steelhead are harmed or killed during construction season 2023.

2.9.2. **Effect of the Take**

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species.

2.9.3. **Reasonable and Prudent Measures**

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of juvenile CCC steelhead:

1. Undertake measures to ensure that injury and mortality to steelhead resulting from fish relocation and dewatering activities is low;
2. Undertake measures to minimize harm to steelhead from construction of the project and degradation of aquatic habitat; and

3. Prepare and submit plans and reports regarding the effects of fish relocation, construction of the project, and post-construction site-performance.

2.9.4. **Terms and Conditions**

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. Caltrans or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:
   a) Caltrans or the contractor will retain qualified biologists with expertise in the area of anadromous salmonid biology, including handling, collecting, and relocating salmonids; salmonid/habitat relationships; and biological monitoring of salmonids. Caltrans or the contractor shall ensure that all fisheries biologists are qualified to conduct fish collections in a manner which minimizes all potential risks to ESA-listed salmonids. Electrofishing, if used, shall be performed by a qualified biologist and conducted according to the *NOAA Fisheries Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act, June 2000*. See: https://media.fisheries.noaa.gov/dam-migration/electro2000.pdf
   b) The biologist will monitor the construction sites during placement and removal of cofferdams and channel diversions to ensure that any adverse effects to salmonids are minimized. The biologist will be on site during all dewatering events to capture, handle, and safely relocate salmonids to an appropriate location. The biologist will notify NMFS staff at 707-578-8553 or andrew.trent@noaa.gov, one week prior to capture activities in order to provide an opportunity for NMFS staff to observe the activities. During fish relocation activities the fisheries biologist shall contact NMFS staff at the above number, if mortality of federally listed salmonids exceeds three percent of the total steelhead collected, at which time NMFS will stipulate measures to reduce the take of salmonids.
   c) Salmonids will be handled with extreme care and kept in water to the maximum extent possible during rescue activities. All captured fish will be kept in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream, and fish will not be removed from this water except when released. To avoid predation, the biologists will have at least two containers and segregate young-of-the-year from larger age classes and other potential aquatic predators. Captured salmonids will be relocated, as soon as possible, to a suitable instream location (pre-approved by NMFS) in which suitable habitat conditions are present to allow for adequate survival of transported fish and fish already present.
   d) If any steelhead or salmon are found dead or injured, the biological monitor will contact NMFS staff at 707-578-8553 or andrew.trent@noaa.gov. All salmonid

mortalities will be retained until further direction is provided by the NMFS biologist (listed above).

i) Tissue samples are to be acquired from each mortality prior to freezing the carcass per the methods identified in the NMFS Southwest Fisheries Science Center Genetic Repository protocols: Either a 1 cm square clip from the operculum or tail fin, or alternately, complete scales (20-30) should be removed and placed on a piece of dry blotter/filter paper (e.g. Whatman brand). Fold blotter paper over for temporary storage. Samples must be air dried as soon as possible (don't wait more than 8 hours). When tissue/paper is dry to the touch, place into a clean envelope labeled with Sample ID Number. Seal envelope.

ii) Include the following information with each tissue sample using the Salmonid Genetic Tissue Repository form or alternative spreadsheet: Collection Date, Collection Location (County, River, Exact Location on River), Collector Name, Collector Affiliation/Phone, Sample ID Number, Species, Tissue Type, Condition, Fork Length (mm), Sex (M, F or Unk), Adipose Fin Clip (Y or N), Tag (Y or N), Notes/Comments.

iii) Send tissue samples to: NOAA Coastal California Genetic Repository, Southwest Fisheries Science Center, 110 McAllister Way, Santa Cruz, CA 95060.

e) Non-native fish that are captured during fish relocation activities shall not be relocated to anadromous streams, or areas where they could access anadromous habitat.

2) The following terms and conditions implement reasonable and prudent measure 2:

a) To ensure that the project is built as designed and contractors adhere to construction best management practices, monitoring will be performed during construction by skilled individuals. Monitors will demonstrate prior knowledge and experience in stream channel design and restoration, fish passage design, construction minimization measures, and the needs of native fish, including steelhead. Monitoring will be performed daily. The monitor(s) will work in close coordination with project management personnel, the project design (engineering) team, and the construction crew to ensure that the project is built as designed.

b) Any pumps used to divert live stream flow will be screened and maintained throughout the construction period to comply with NMFS' Fish Screening Criteria for Anadromous Salmonids (2000).

c) Construction equipment used within the river channel will be checked each day prior to work within the river channel (top of bank to top of bank) and, if necessary, action will be taken to prevent fluid leaks. If leaks occur during work in the channel, Caltrans or their contractors will contain the spill and remove the affected soils.

d) Once construction is completed, all project-introduced material must be removed, leaving the creek as it was before construction. Excess materials will be disposed of at an appropriate disposal site.

3) The following terms and conditions implement reasonable and prudent measure 3:

a) Caltrans must provide a written report to NMFS by January 15 of the year following construction. The report must be submitted to the parties and addresses described above in 1.c. The report must contain, at minimum, the following information:
b) Project Construction and Fish Relocation Report – the report must include the following contents:
   i) **Construction Related Activities –** The report(s) must include the dates construction began, a discussion of design compliance including: vegetation installation, and post-construction longitudinal profile and cross sections; a discussion of any unanticipated effects or unanticipated levels of effects on salmonids, including a description of any and all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects had any effect on ESA-listed fish; the number of salmonids killed or injured during the project action; and photographs taken before, during, and after the activity from photo reference points.
   ii) **Fish Relocation** - The report must include a description of the location from which fish were removed and the release site including photographs; the date and time of the relocation effort; a description of the equipment and methods used to collect, hold, and transport salmonids; if an electrofisher was used for fish collection, a copy of the logbook must be included; the number of fish relocated by species; the number of fish injured or killed by species and a brief narrative of the circumstances surrounding ESA-listed fish injuries or mortalities; and a description of any problems which may have arisen during the relocation activities and a statement as to whether or not the activities had any unforeseen effects.
c) **Post-Project Monitoring Reports and Surveys –** Project reports and survey information will be sent to the address above in 1(c), and must include the following contents:
   i) **Post-Construction Vegetation Monitoring and Reporting** - Caltrans must develop and submit for NMFS' review a plan to assess the success of revegetation of the site. A draft of the revegetation monitoring plan must be submitted to NMFS (address specified in 1(c) above) for review and approval prior to the beginning of the in-stream work season, at each project location. Reports documenting post-project conditions of vegetation installed at the site will be prepared and submitted annually on January 15 for the first five years following project completion, unless the site is documented to be performing poorly, then monitoring requirements will be extended. Reports will document vegetation health and survivorship and percent cover, natural recruitment of native vegetation (if any), and any maintenance or replanting needs. Photographs must be included. If poor establishment is documented, the report must include recommendations to improve conditions.

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, "conservation recommendations" are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). NMFS has no conservation recommendations for this project.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Alameda Creek Bridge Replacement Project.

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

3. Data Quality Act Documentation and Pre-Dissemination Review

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

3.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are Caltrans and their contractors. Individual copies of this opinion were provided to Caltrans. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

3.2. Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

3.3. Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR part 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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