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

April 28, 2021 **Refer to NMFS No:** WCRO-2020-02463

Cristin Hallisy
Office of Biological Sciences and Permits
California Department of Transportation, District 4
P.O. Box 23660
Oakland, California 94623-0660

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the San Mateo State-Route 1 (SR-1) and SR-84 Structures and Scour Mitigation Project (04-2J790)

Dear Ms. Hallisy:

Thank you for the California Department of Transportation's (Caltrans)[1] letter of August 18, 2020, 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 San Mateo State-Route 1 (SR-1) and SR-84 Structures and Scour Mitigation Project. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)) for this action.

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, and Central California Coast (CCC) coho salmon, and designated critical habitat for these species 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 these species; nor is it likely to adversely modify critical habitat. However, NMFS anticipates that take of CCC

[1] Pursuant to 23 USC 327, and through a series of Memorandum of Understandings 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 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.

steelhead and CCC coho salmon may occur. An incidental take statement which applies to this project with non-discretionary terms and conditions is included with the enclosed opinion. NMFS has reviewed the proposed project for potential effects on EFH and determined that the proposed project would adversely affect EFH for Pacific Coast Salmon, which are managed under the Pacific Coast Salmon Fishery Management Plan. While the proposed action will result in adverse effects to EFH, the proposed project contains measures to minimize, mitigate, or otherwise off set the adverse effects; thus, no EFH Conservation Recommendations are included in this opinion.

If you have any questions concerning this consultation, or if you require additional information please contact Elena Meza, North Central Coast Office in Santa Rosa, California at 707-575-6068 or via email at elena.meza@noaa.gov.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Gregory Pera, Caltrans, South Counties Biology Branch Chief, gregory.pera@dot.ca.gov
Elizabeth Leyvas, Caltrans, Associate Biologist/Planner, elizabeth.leyvas@dot.ca.gov
Copy to E-File: ARN 151422WCR2020SR00184

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

San Mateo State-Route 1 (SR-1) and SR-84 Structures and Scour Mitigation Project

NMFS Consultation Number: WCRO-2020-02463

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 Coho Salmon (*Oncorhynchus kisutch*)	Endangered	Yes	No	Yes	No
Central California Coast Steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No

Table 2. Essential Fish Habitat and NMFS' Determinations:

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	No

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

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: April 28, 2021

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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.), and implementing regulations at 50 CFR 402, as amended.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

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 two weeks at the NOAA Library Institutional Repository. A complete record of this consultation is on file at the NMFS North-Central Coast Office in Santa Rosa, California.

1.2. Consultation History

By letter dated August 17, 2020, the California Department of Transportation (Caltrans) requested initiation of formal consultation under the ESA, and an EFH consultation with NMFS. In addition to a biological assessment, Caltrans also provided hydraulic modeling, fish passage assessments, and preliminary hydraulic re-evaluation memorandums for both Pilarcitos and San Gregorio creeks. We reviewed these materials and on September 4, 2020, we requested additional information via email. In our correspondence we requested the following: an effects determination with corrected language for critical habitat[2], location and quantities of trees proposed for removal at both locations, cross-section of the proposed RSP layout at Pilarcitos Creek Bridge, and, for both locations, scour and sediment transport analyses, hydraulic modeling that depicts existing and proposed conditions for shear stress with longitudinal distances, and peak flow assessments calculated at the 1.5-, 5-, 10-, and 25-year flood magnitudes. The aforementioned information was requested to ensure that NMFS had sufficient information to estimate the risk to listed species and critical habitat from the proposed action. Within this same correspondence, we also recommended that Caltrans consider a design that explored deeper vertical placement of RSP for scour protection and/or the development of flow deflecting structures away from the piers to minimize the lateral footprint of hardened RSP placed within critical habitat, provide mitigation as part of the proposed project, include language within the biological assessment stating that the proposed revegetation and dewatering/diversion plans will

[2] Caltrans' original effects determination for critical habitat, as stated on page 5-11 of their biological assessment, was that the proposed action "may affect, and is likely to adversely modify" critical habitat for CCC steelhead DPS and CCC Coho ESU. NMFS recommended an 'adversely affect' determination for critical habitat.

be sent to NMFS for review prior to construction, and to consider more recent survey data to inform fish densities at both bridge locations.

On September 24, 2020, NMFS, Caltrans, and AECOM (consultant preparing the biological assessment), participated in a meeting to discuss the aforementioned information requests and recommendations.

On October 12, 2020, Caltrans responded to our information request via email and provided us a response that included three enclosures (tree inventory results, annotated design drawings and cross sections, and hydraulic figures) and a response letter. This letter addressed the other information requests, as described above, and noted the following in regards to NMFS recommendation to consider a different design to reduce the footprint of the RSP and/or the development of flow deflecting structures away from the piers:

> *"Caltrans did consider NMFS' suggestion to limit the lateral footprint of RSP and modified the design from what was being proposed in 2019 in response to the comment. Prior to NMFS' suggestion Caltrans was considering RSP without grout. As described in Section 1.4.3 of the BA, use of partially grouted RSP (Alternative 2), the selected alternative, results in a reduced lateral extent of RSP compared to the original proposal, RSP without grout (Alternative 1). Caltrans' design team is required to adhere to FHWA design guidelines which constrain methods to address bridge scour. Although Caltrans also considered sheet pile and pressure grouting, these alternatives are not well-suited countermeasures for local scour according to FHWA's (2009) HEC-23 Volume 2, the design guidelines that Caltrans follows to protect existing bridge structures from scour."*

We reviewed these additional materials and determined that they provided sufficient information in response to our September 4, 2020 information request, and that consultation could be initiated. On November 3, 2020, we notified Caltrans via email that their ESA and EFH consultations were initiated on October 12, 2020.

On February 5, 2021, Caltrans Headquarters staff informed NMFS that the proposed project at Pilarcitos Creek would prolong the life of a partial barrier, without improving fish passage, and that this was "not allowed" under State Bill 857. They noted that Caltrans cannot cite downstream access and flow as a reason fish passage shouldn't be remediated on a State Highway System. They also noted they would allocate more funding for the project and process it as a scour mitigation project to include fish passage remediation.

On February 17, 2021, NMFS emailed the Caltrans team working on this project to clarify the email message of February 5, as it contradicted the statements made by the Caltrans project team to date (see above). Specifically, during consultation, NMFS had recommended avoidance and minimization measures to Caltrans that would have remediated the passage barrier, yet the project team stated that design alternatives were not feasible according to FHWA's 2009 HEC-23 Volume 2 guidelines that Caltrans follows to protect existing bridge structures from scour.

On February 26, 2021, Caltrans provided a presentation and an agenda to NMFS via email for the scheduled conference call on March 1, 2021. On March 1, 2021, Caltrans, NMFS, and AECOM participated in a conference call to discuss the qualitative information provided within the presentation, and to discuss next steps. Caltrans explained that their email of February 5, 2021, was about a different project on Pilarcitos Creek. Caltrans also explained that their fish

passage analysis was flawed and the post-project conditions at Pilarcitos Creek would not be as bad as they originally concluded. Their main arguments were that the model was generally inaccurate and an existing logjam was skewing the results. Caltrans explained the logjam would have to be removed for construction and included several qualitative figures depicting the revised hydraulic and fish passage conditions that would result under the proposed condition without the logjam. NMFS reiterated their concerns with the project and their earlier recommendations to improve passage conditions at the site. Caltrans noted that they cannot commit to additional design changes because they lacked the funding to do so at this stage of project development. They agreed to work with us at later development stages to insure they appropriately incorporate design related minimization measures.

On March 3, 2021, we reminded Caltrans that we are awaiting a revised hydraulic and fish passage analysis summary explaining the newly modeled proposed condition. On March 3, 2021, Caltrans provided NMFS a letter via email describing the topics discussed during the March 1, 2021 conference call, a written description of the technical analysis to date, and additional minimization measures aimed at reducing the potential for scour. NMFS reviewed this information and determined that there was insufficient information to complete the biological opinion.

On March 17, 2021, NMFS sent Caltrans a letter informing them that we had insufficient information to complete consultation. NMFS noted in the letter that the information provided during the conference call on March 1, 2021 and in Caltrans' letter of March 3, 2021 included modifications to the project that would require additional analysis by NMFS. We explained in our letter that the WCR's practice in these circumstances is to consider the consultation initiation date the date NMFS received the modified project (March 1, 2021) and that the 135-day deadline to complete the biological opinion was July 14, 2021.

On March 17, 2021, NMFS sent an email clarifying the specific information NMFS required to complete consultation: the anticipated effects of removing the logjam on critical habitat, and adult and juvenile salmonid movements, survival, and productivity, and information explaining how the post-project hydraulic and fish passage conditions (at the Pilarcitos Creek location) will affect juvenile and adult salmonid movements, survival, and productivity in (the Pilarcitos Creek portion of) the action area.

Following NMFS' March 17, 2021 request for more information, several calls and emails were exchanged to clarify the information that was requested. On April 16, 2021, Caltrans provided the following information regarding the Pilarcitos Creek portion of the action area: an informational letter describing the effects of logjam removal on critical habitat, adult and juvenile salmonid movements, survival, and productivity, and an analysis of how the post-project hydraulic and fish passage conditions will affect juvenile and adult salmonid movements, survival, and productivity in the action area. In addition, Caltrans also provided a stream inventory report, an instream wood survey summary and photographs, and updated hydraulic model images.

On April 28, 2021, Caltrans sent additional minimization measures to NMFS by email. The minimization measures were aimed at further minimizing hydraulic effects of the RSP on the San Gregorio channel.

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 (50 CFR 402.02). Under MSA, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

Caltrans proposes to repair scour at two bridges within San Mateo County, California on SR-1 at the Pilarcitos Creek Bridge[3] (Bridge No. 35-0139R/L), and SR-84 at the San Gregorio Creek Bridge[4] (Bridge No. 35-0166). At both bridge locations, partially grouted rock slope protection (RSP) will be placed along the existing bridge piers and abutments. A recent bridge inspection of the San Gregorio Bridge revealed that the bank between the left pier and left abutment (as viewed looking downstream at the bridge) has eroded and needs additional protections to prevent roadway settlement. An inspection of the Pilarcitos Creek Bridge revealed that the bridge is in scour critical condition. The purpose of the proposed action is to restore both bridges to their serviceable condition, prevent additional scour and erosion, protect the structural integrity of the bridges, and enhance highway safety.

1.3.1. Pilarcitos Creek Bridge

The existing bridge is a concrete cast-in-place structure, with three tee-beam spans supported on piers and abutments. Prior to any earthmoving work, portions of the site will be cleared and grubbed; which involves removing and disposing of all unwanted surface material (e.g., trees, brush, grass, weeds, downed trees, etc.), and removing unwanted vegetative matter from beneath the ground surface (e.g., stumps, roots, buried logs, etc.). After clearing and grubbing, existing material around piers 2 and 3, and between pier 3 and abutment 4, will be excavated to a depth of approximately 3 to 5 feet, and removed from the site. Following excavation, approximately 1,430 cubic yards of 15-inch quarry stone (RSP) will be placed on both sides of the creek covering an area of approximately 20,710 square feet (0.48 acres). The partially grouted RSP will be approximately 3 feet deep, and approximately 190 feet long along the north bank, and 155 feet long along the south bank. On the northeast and northwest bank, the RSP will extend from the piers up to the abutments.[5]

After placement of RSP, Portland concrete cement (PCC) grout would be poured by grout hose, tremie, or some other automated mechanical means, to fill one-third to one-half of the total void space. Staging areas will be situated in the median of SR-1 (both north and south of the bridge), and the existing public use trail that runs parallel to the creek underneath the north end of the bridge will be used to access the work site. An existing shoulder southeast of the existing bridge may be used as a potential stockpiling area.

During the design phase, Caltrans will evaluate alternative RSP layouts and flow-routing structures such as vanes or barbs to direct streamflow away from the bridge piers and towards the center of the channel. The goal of additional analysis, design refinements, and inclusion of flow-routing features would be to:

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[3] Lat./Long: 37.46634/-122.43358
[4] Lat./Long: 37.31356/-122.28423
[5] Per the construction plan sheets included in Appendix A of the biological assessment.

- Direct the thalweg towards the center of the stream channel before it encounters the bridge piers or proposed RSP;
- Configure the RSP in manner that minimizes scour or other adverse hydraulic effects;
- Reduce the risk of subsurface RSP being exposed by scour;
- Prevent the thalweg from carving a path adjacent to, and becoming fixed against, the RSP on the left streambank; and
- Reduce the extent of RSP required to protect the bridge piers.

To complete the work at this bridge, seventy-one native trees will either be temporarily or permanently impacted. Permanent impacts are described as tree removal, or an impact to 30 percent or more of the trees root zone or canopy. Temporary impacts are described as minor pruning of trees, and compaction of 30 percent or less of the root zone. Of the seventy-one trees, thirty-nine will be permanently impacted, and thirty-two will be temporarily impacted. All trees anticipated to be impacted are at least 4-inches-in-diameter at breast height (DBH)[6], with the largest tree measuring 17 inches at DBH.

Access to the creek bed is needed to excavate existing material, place RSP, and install grouting material, and while instream construction work will be conducted during the dry season when flows are at annual lows (June 15 to October 15) a creek diversion may be necessary. To gain access, water may be temporarily diverted around the work area using temporary cofferdams both up- and downstream of the construction area, in combination with a temporary diversion pipe and/or a narrowed channel running between them.[7] If the area is already dry, there may be a need to dewater any pools that would otherwise restrict access to the work site. A maximum of 200 linear feet of Pilarcitos Creek will be diverted/dewatered to complete the project, and the work is expected to take one construction season to complete. This project will result in 0.48 acres of permanent impacts in the project area resulting from the placement of the partially grouted RSP.

Following construction, temporarily disturbed areas will be regraded to preconstruction contours or to match the surrounding topography. Construction related materials will be removed after construction activities have been completed. Temporarily disturbed areas will be revegetated, and native tree species with a DBH greater than 4 inches that are removed will be replanted in-kind at a ratio to be determined in consultation with appropriate wildlife agencies. Permanent erosion control (e.g., hydroseeding, coir netting, non-filament mesh fiber roles, etc.) will be applied to affected areas after construction is complete, and the creek will be restored to pre-project conditions without grade control structures.

Typical equipment used to complete this project is expected to include hand tools, backhoes, excavators, front loaders, trucks, skid steers, drill rigs, concrete trucks, grout hose, pumps, water and dump trucks, and truck trailers.

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[6] DBH measurements were recorded 4.5 feet from the base of the tree.

[7] The final design of the temporary stream diversion, and materials used, will be at the discretion of the contractor. Materials may include the following: gravel, gravel-filled bags, pushed-in sheet piles, impermeable plastic sheeting, and portable water-filled dams.

1.3.2. San Gregorio Creek Bridge

The existing bridge is a concrete cast-in-place structure, with three tee-beam spans supported on piers and abutments. Prior to earthmoving work, portions of the site will be cleared and grubbed, which involves removing and disposing of all unwanted surface material (e.g., trees, brush, grass, weeds, downed trees, etc.), and removing unwanted vegetative matter from beneath the ground surface (e.g., stumps, roots, buried logs, etc.).

After clearing and grubbing, existing material between abutment 1 and pier 2 will be excavated to a depth of approximately 2.5 feet and removed from the site. Following excavation, approximately 400 cubic yards of 15-inch quarry stone (RSP) would be placed along the west bank of the creek covering an area of approximately 4,300 square feet (0.10 acres). The RSP will extend from the pier up to the abutment[8]. After placement of the RSP, PCC grout will be poured by grout hose, tremie, or some other automated mechanical means to fill one-third to one-half of the total void space. The partially grouted RSP will be approximately 2.5 feet deep, and 95 feet long on the west bank of the creek.

During the design phase, Caltrans will evaluate alternative RSP layouts and flow-routing structures such as vanes, barbs, LWD to direct streamflow away from the RSP. The goal of additional analysis, design refinements, and inclusion of flow-routing features would be to:

- Direct the thalweg towards the center of the stream channel before it encounters the bridge piers or proposed RSP;
- Configure the RSP in manner that minimizes scour or other adverse hydraulic effects;
- Reduce the risk of subsurface RSP being exposed by scour;
- Prevent the thalweg from carving a path adjacent to, and becoming fixed against, the RSP on the left streambank;
- Reduce the extent of RSP required to protect the bridge piers.

Due to the difficult access to the creek, construction will take place under one-way traffic control of SR-84 via flagging, and the closed lane/shoulder will be used for staging and storage. As necessary, equipment will be lowered via crane from the existing structure into the work area below the bridge onto a timber mat platform constructed over the creek bed.

To complete the work at this bridge, thirty-three native trees will either be temporarily or permanently impacted.[9] Of the thirty-three trees, twenty-one will be permanently impacted, and twelve will be temporarily impacted. All trees anticipated to be impacted are at least 4 inches at DBH, with the largest tree measuring 28 inches at DBH.

Access to the creek bed is needed to excavate existing material, place RSP, and install grouting material, and while instream construction work will be conducted during the dry season when flows are at annual lows (June 15 to October 15) a creek diversion will be necessary. To gain access, water will be temporarily diverted around the work area using temporary cofferdams both up- and downstream of the construction area, in combination with a temporary diversion pipe

[8] Per the construction plan sheets included in Appendix B of the biological assessment.
[9] See Section 1.3.1 above for details on permanent and temporary impacts.

and/or a narrowed channel running between them.[10] A maximum of 50 linear feet of San Gregorio Creek will be diverted to complete the project, and the work is expected to take one construction season to complete. CCC coho salmon and CCC steelhead, if present in the work area, will be collected and relocated prior to dewatering the work site. This project will result in 0.10 acres of permanent impacts within the project area resulting from the placement of the partially grouted RSP.

Following construction, temporarily disturbed areas will be regraded to preconstruction contours to match the surrounding topography. Construction related materials will be removed after construction activities have been completed. Temporarily disturbed areas will be revegetated, and native tree species with a DBH greater than 4 inches that are removed will be replanted in-kind at a ratio to be determined in consultation with appropriate wildlife agencies. Permanent erosion control (e.g., hydroseeding, coir netting, non-filament mesh fiber roles, etc.) will be applied to affected areas after construction is complete, and the creek will be restored without grade control structures.

Typical equipment used to complete this project is expected to include hand tools, backhoes, excavators, front loaders, trucks, skidsteers, drill rigs, concrete trucks, grout hoses, pumps, water and dump trucks, truck trailers, and cranes.

Caltrans proposed to include several avoidance and minimization measures (AMMs) that will be implemented before, during, and after construction to prevent and minimize project-related effects to CCC coho salmon, CCC steelhead, and their critical habitat. These measures include working within the in-water work window of June 15 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, water pollution control plan; a habitat restoration and revegetation plan; and a spill prevention and response plan. A detailed list of the AMMs and additional best management practices (BMPs) are described in Caltrans' biological assessment (2020).

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 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

[10] The final design of the temporary stream diversion, and materials used, will be at the discretion of the contractor. Materials may include the following: gravel, gravel-filled bags, pushed-in sheet piles, impermeable plastic sheeting, and portable water-filled dams.

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 non-discretionary 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 relies on the 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(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The 2016 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 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition 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 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.

To conduct the assessment, NMFS examined an extensive amount of information from a variety of sources. Detailed background information on the biology and status of listed species and critical habitat has been published in a number of documents including peer reviewed scientific journals, primary reference materials, and governmental and non-governmental reports. Additional information regarding the efforts of the project's actions on the listed species in question, their anticipated response to these actions, and the environmental consequences of the actions as a whole was formulated from the aforementioned resources, and from information acquired via email, conference calls, site visits, hydraulic analysis, fish passage assessments completed by Caltrans, and a technical assistance memo (see 1.2 Consultation History). For information that has been taken directly from published, citable documents, those citations have been references in the text and are listed at the end of this document.

Due to the nature of Caltrans' project delivery process, the information within the biological assessment provided to NMFS is based on preliminary design information. Following receipt of NMFS' biological opinion, the project will move into Caltrans' "design" phase where funding is available to move from a concept to development of an engineered design. During this phase, NMFS assumes, based on Caltrans' March 3, 2021 letter and April 28, 2021 email, that Caltrans will evaluate alternative RSP layouts and ways to direct flows toward the center of the channel away from the Pilarcitos Creek and San Gregorio Creek bridge piers. Our analysis in this biological opinion assumes Caltrans will implement such design related minimization measures (as described above in Sections 1.3.1 and 1.3.2, respectively, of the opinion.

To conduct our analysis of the proposed design as it concerns fish passage, we utilized NMFS' criteria for adult and juvenile passage as outlined in the Guidelines for Salmonid Passage at Stream Crossings document (2019). The depth and velocity criteria for adult and juvenile passage used for this project assessment were created and designed to ensure passage at hydraulic solutions, and not directly for open-channel solutions with a natural channel bed and where the provided channel width is at least the natural active channel width, such as the Pilarcitos Creek Bridge. Despite the conservative nature that may result from utilizing NMFS' 2019 depth and velocity criteria to analyze fish passage in the proposed action area, we decided utilization of the aforementioned fish passage criteria was warranted considering the following: 1) both existing and resulting conditions constrict fish passage at each portion of the action area, 2) the location of each action area within their respective watershed, 3) the presence of endangered coho salmon within the San Gregorio Creek portion of the action area, and 4) the importance of each Creek's salmonid populations to the recovery of their respective ESU or DPS.. Therefore, NMFS' analysis in the below biological opinion regarding adult and juvenile fish passage is based on NMFS' guidelines, including hydraulic depth and velocity, criteria outlined within the Guidelines for Salmonid Passage at Stream Crossings (2019).

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would 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" as described in 50 CFR 402.02. The opinion also

examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species.

2.2.1. Species Description and Life History

This biological opinion analyses the effects of the federal action on the following federally listed species (Distinct Population Segment (DPS) or Evolutionary Significant Unit (ESU)) and designated critical habitat:

> **Endangered Central California Coast (CCC) coho salmon ESU** (*Oncorhynchus kisutch*)
> Endangered (70 FR 37160; June 28, 2005)
> Critical habitat designation (64 FR 24049; May 5, 1999);
>
> **Threatened Central California Coast (CCC) steelhead DPS** (*Oncorhynchus mykiss*)
> Threatened (71 FR 834, January 5, 2006)
> Critical habitat (70 FR 52488, September 2, 2005).

The CCC steelhead DPS includes steelhead in coastal California streams from the Russian River to Aptos Creek, and the drainages of Suisun, San Pablo, and San Francisco Bays (72 FR 5248). The CCC coho salmon ESU includes coho from Punta Gorda in northern California south to, and including, Aptos Creek in central California, as well as populations in tributaries to San Francisco Bay, excluding the Sacramento-San Joaquin River System (61 FR 56138).

The action area is within designated critical habitat for CCC steelhead and CCC coho salmon. CCC steelhead critical habitat is designated from the Russian River to the San Lorenzo River to a lateral extent of ordinary high water in freshwater stream reaches, and to extreme high water in estuarine areas. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series. CCC coho salmon critical habitat is designated to include all river reaches assessable to listed coho salmon from Punta Gorda in northern California south to the San Lorenzo River in central California, including Arroyo Corte Madera Del Presidio and Corte Madera Creek, tributaries to San Francisco Bay. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches (including off-channel habitats).

2.2.1.1. General Steelhead Life History

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 (Nielson and Fountain 2006). 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 (Smith 1990; 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 breech 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).

2.2.1.2. General Coho Salmon Life History

The life history of the coho salmon in California has been well documented (Shapovalov and Taft 1954; Hassler 1987; Weitkamp et al. 1995). In contrast to the life history patterns of other anadromous salmonids, coho salmon in California generally exhibit a relatively simple three year life cycle. Adult salmon typically begin the immigration from the ocean to their natal streams after heavy late-fall or winter rains breach the sand bars at the mouths of coastal streams (Sandercock 1991). Coho salmon are typically associated with small to moderately-sized coastal streams characterized by heavily forested watersheds; perennially-flowing reaches of cool, high quality water; dense riparian canopy; deep pools with abundant overhead cover; instream cover consisting of large, stable woody debris and undercut banks; and gravel or cobble substrates (Sandercock 1991). Immigration continues into March, generally peaking in December and January, with spawning occurring shortly after arrival at the spawning ground (Shapovalov and Taft 1954).

When in freshwater, optimal habitats for successful coho include adequate quantities of: (1) deep complex pools formed by large woody debris; (2) adequate quantities of water; (3) cool water temperatures [when maximum weekly average water temperatures exceed 18°C Coho salmon are absent from otherwise suitable rearing habitat (Welsh et al. 2001); temperatures between 12-14° C are preferred; and the upper lethal limit is between 25-26°C.]; (4) unimpeded passage to spawning grounds (adults) and back to the ocean (smolts); (5) adequate quantities of clean spawning gravel; and (6) access to floodplains, side channels and low velocity habitat during high flow events. Numerous other requirements exist (*i.e.*, adequate quantities of food, dissolved oxygen, low turbidity, *etc.*), but in many respects these other needs are generally met when the six freshwater habitat requirements listed above are at a properly functioning condition.

The eggs generally hatch after four to eight weeks, depending on water temperature. Survival and development rates depend, in part, on fine sediment levels within the redd. Under optimum conditions, mortality during this period can be as low as 10 percent; under adverse conditions of high scouring flows or heavy siltation, mortality may be close to 100 percent (Baker and Reynolds 1986). McMahon (1983) found that egg and fry survival drops sharply when fines

make up 15 percent or more of the substrate. The newly-hatched fry remain in the redd from two to seven weeks before emerging from the gravel (Shapovalov and Taft 1954). Upon emergence, fry seek out shallow water, usually along stream margins. As they grow, juvenile coho salmon often occupy habitat at the heads of pools, which generally provide an optimum mix of high food availability and good cover with low swimming cost (Nielsen 1992). In the spring, as yearlings, juvenile coho salmon undergo a physiological process, or smoltification, which prepares them for living in the marine environment. Emigration timing is correlated with precipitation events and peak upwelling currents along the coast. Entry into the ocean at this time facilitates more growth and, therefore, greater marine survival (Holtby et al. 1990).

2.2.2. Status of the Listed Species

NMFS assesses four population viability[11] 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, the CCC coho salmon ESU, 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.

2.2.2.1. CCC Steelhead DPS

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

[11] 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).

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 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).

2.2.2.2. CCC Coho Salmon ESU

Historically, the CCC coho salmon ESU was comprised of approximately 76 coho salmon populations. Most of these were dependent populations that needed immigration from other nearby populations to ensure their long-term survival. Historically, there were 11 functionally independent populations and 1 potentially independent population of CCC coho salmon (Spence et al. 2008, Spence et al. 2012). Most of the populations in the CCC coho salmon ESU are currently doing poorly as a result of low abundance, range constriction, fragmentation, and loss of genetic diversity, as described below.

Brown et al. (1994) estimated that annual spawning numbers of coho salmon in California ranged between 200,000 and 500,000 fish in the 1940s, which declined to 100,000 fish by the 1960s, followed by a further decline to 31,000 fish by 1991. More recent abundance estimates vary from approximately 600 to 5,500 adults (Good et al. 2005). Recent status reviews (Williams et al. 2011) indicate that the CCC coho salmon are likely continuing to decline in number. CCC coho salmon have also experienced acute range restriction and fragmentation. Adams et al.

(1999) found that in the mid 1990's coho salmon were present in 51 percent (98 of 191) of the streams where they were historically present, and documented an additional 23 streams within the CCC coho salmon ESU in which coho salmon were found for which there were no historical records. Recent genetic research has documented reduced genetic diversity within subpopulations of the CCC coho salmon ESU (Bjorkstedt et al. 2005). The influence of hatchery fish on wild stocks has likely also contributed to the lack of diversity through outbreeding depression and disease.

Available data from the few remaining independent populations suggests population abundance continues to decline, and many independent populations that in the past supported the species overall numbers and geographic distributions have been extirpated. This suggests that populations that historically provided support to dependent populations via immigration have not been able to provide enough immigrants for many dependent populations for several decades. The near-term (10 - 20 years) viability of many of the extant independent CCC coho salmon populations is of serious concern. These populations may not have enough fish to survive additional natural and human caused environmental change.

The two conservation hatchery programs are the Don Clausen Coho Salmon Conservation Program on the Russian River in Sonoma County, California, and the smaller Kingfisher Flat Hatchery on Scott Creek, Santa Cruz County, California. While differing in size and funding, both programs were initiated in 2001 in response to severely depressed coho salmon abundances. Fish are collected from the wild, brought into the hatcheries, genetically tested, and spawned to maximize diversity and prevent inbreeding. In the hatchery, fish are raised to various ages, fed krill, tagged, and released into streams throughout the watersheds. This release strategy allows the fish to imprint on the creek with the aim that they will return to these streams as adults so they can spawn naturally. Juvenile coho salmon and coho salmon smolts have been released into several Russian River tributaries and coastal watersheds in San Mateo and Santa Cruz counties.

None of the five diversity strata defined by Bjorkstedt et al. (2005) currently support viable coho salmon populations. According to Williams et al. (2016), recent surveys suggest CCC coho abundance has improved slightly since 2011 within several independent populations (mainly north of SF bay), although all populations remain well below their high-risk dispensation thresholds identified by Spence et al. (2008). The Russian River and Lagunitas Creek populations are relative strongholds for the species compared to other CCC ESU populations, the former predominantly due to out-planting of hatchery-reared juvenile fish from the Russian River Coho Salmon Broodstock Program. The most recent status review (81 FR 33468) documents conditions for CCC coho salmon have not improved since the last status review in 2011 (Williams et al. 2011). The overall risk of CCC coho salmon extinction remains high, and the most recent status review reaffirmed the ESU's endangered status (NMFS 2016). NMFS's recovery plan (NMFS 2012) for the CCC coho salmon ESU identified the major threats to population recovery. These major threats include roads, water diversions and impoundments, and residential development.

2.2.3. Status of CCC Steelhead and CCC Coho Salmon Critical Habitat

In designating critical habitat, NMFS considers the following requirements of the species: 1) space for individual and population growth and for normal behavior; 2) food, water, air, light, minerals, or other nutritional or physiological requirements; 3) cover or shelter; 4) sites for spawning, reproduction, and rearing offspring; and, generally 5) habitats that are protected from

disturbance or are representative of the historic geographical and ecological distributions of the species (50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on Physical or Biological Features (PBF) and/or essential habitat types within the designated area that are essential to the conservation or protection (81 FR 7414).

PBFs for CCC steelhead critical habitat and their associated essential features within freshwater include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development;
2. Freshwater rearing sites with:
   a) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
   b) Water quality and forage supporting juvenile development; and
   c) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;
3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

PBFs for CCC steelhead critical habitat, and their associated essential features within estuarine areas include: areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

For CCC coho salmon critical habitat, the following essential habitat types were identified: 1) juvenile summer and winter rearing areas; 2) juvenile migration corridors; 3) areas for growth and development to adulthood; 4) adult migration corridors; and 5) spawning areas. PBFs for coho salmon include adequate (64 FR 24049): (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions (64 FR 24049).

The condition of CCC steelhead, and CCC coho salmon critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that currently depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat[12]: logging, urban and agricultural land development, mining, stream channelization, bank stabilization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation). Habitat impacts of concern include altered streambank and channel morphology, elevated water

[12] Other factors, such as over fishing and artificial propagation have also contributed to the current population status of these species. All these human induced factors have exacerbated the adverse effects of natural environmental variability from such factors as drought and poor ocean productivity.

temperature, lost spawning and rearing habitat, habitat fragmentation, impaired gravel and wood recruitment from upstream sources, degraded water quality/quantity, lost riparian vegetation, and increased sediment delivery into streams from upland erosion (Weitkamp *et al*. 1995; Busby et al. 1996; 64 FR 24049; 70 FR 37160; 70 FR 52488). Based on NMFS familiarity with the landscapes in which these critical habitats occur, these impacts continue to persist today. Widespread diverting of rivers and streams, as well as the pumping of groundwater hydraulically connected to stream flow, has dramatically altered the natural hydrologic cycle in many of the streams within the CCC steelhead DPSs, and CCC coho ESU which can delay or preclude migration and dewater aquatic habitat. Stream channelization, commonly caused by streambank hardening and stabilization, represents a very high threat to instream and floodplain habitat throughout much of the designated critical habitat for both species, as detailed within the CCC coho salmon and CCC steelhead recovery plans (NMFS 2012 and 2016, respectively). Streambank stabilization confines stream channels and precludes natural channel movement, resulting in increased streambed incision, reduced habitat volume and complexity. Overall, the current condition of critical habitat for both CCC steelhead and CCC salmon is degraded, and likely cannot provide the full extent of conservation values necessary for the recovery without continued habitat restoration efforts.

The CZU Lightening Complex started as a series of lightening fires on August 16, 2020 across western Santa Cruz and San Mateo counties (California Department of Forestry and Fire Protection and California Department of Conservation 2020). The fire was fully contained on September 22, 2020; a total of 86,509 acres burned. Portions of the burned area represented some of the highest quality habitat for salmonids south of San Francisco (NMFS 2020b). The long-term impacts on such valuable salmonid habitat are yet to be determined. However, there is heightened concern related to increased sediment run-off and erosion, decreased riparian vegetation, increased stream temperatures, and decreased water quality. There have not been detailed habitat inventories since the fires and first winter rains, but it is likely that CCC steelhead and CCC coho salmon spawning, rearing, and migratory habitat was directly and indirectly, impacted by the fire and recent rain events.

2.2.4. Additional Threats to CCC Steelhead and CCC Coho Salmon Critical Habitat

Another factor affecting the rangewide status of CCC steelhead and CCC coho salmon, and their critical habitat at large 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 and CCC coho salmon 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 and CCC coho salmon are not dependent on snowmelt driven streams and thus not directly affected by declining snow packs.

The threat to CCC steelhead and CCC coho salmon 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).

For Northern California, most models project heavier and warmer precipitation. Extreme wet and dry periods are projected, increasing the risk of both flooding and droughts (California Department of Water Resources 2013). Estimates show that snowmelt contribution to runoff in the Sacramento/San Joaquin Delta may decrease by about 20 percent per decade over the next century (Cloern et al. 2011). Many of these changes are likely to further degrade CCC coho salmon and steelhead habitat by, for example, reducing streamflows during the summer and raising summer water temperatures. Estuaries may also experience changes detrimental to salmonids. 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. 2012). The projections described above are for the mid to late 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 included in this biological opinion includes two locations in separate watersheds in San Mateo County, California. The San Gregorio Bridge is approximately 13 miles southeast of the Pilarcitos Creek Bridge. The action area includes areas that may be affected by stream diversion, fish capture and relocation, streambank hardening, staging and access, and other general construction activities; including the creekbed, banks, and the riparian corridor.

2.3.1. Pilarcitos Creek Bridge Scour Mitigation

The action area encompasses the area immediately beneath the bridge, a maximum of 200 linear feet of Pilarcitos Creek that will be dewatered for construction purposes, and approximately 300 feet upstream and 500 feet downstream to account for water quality and geomorphological impacts.

2.3.2. San Gregorio Creek Bridge Scour Mitigation

The action area encompasses the area immediately beneath the existing structure, a maximum of 50 linear feet of San Gregorio Creek that will be dewatered for construction purposes, and approximately 300 feet downstream and 500 feet upstream of the bridge to account for water quality and geomorphological impacts.

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 Pilarcitos Creek Watershed

The Pilarcitos Creek Watershed drains a 28-square-mile area in San Mateo County encompassing seven subwatersheds: Nuff Creek, Corinda Los Trancos Creek, Apanolio Creek, Albert Canyon, Madonna Creek, Mills Creek, and Arroyo Leon. Pilarcitos Creek originates on the eastern side of Montara Mountain and flows approximately 12 miles to the Pacific Ocean at Half Moon Bay. Flows in Pilarcitos Creek and its tributaries follow an annual pattern consistent with Mediterranean rainfall-dominated runoff patterns. The creek can be divided into three broad reaches: Upper Pilarcitos, above the confluence with seven tributaries; Middle Pilarcitos, primarily confined to an agricultural and residential floodplain valley; and Lower Pilarcitos, which flows through the City of Half Moon Bay (PWA 2008).

The watershed consists primarily of relatively rugged uplands vegetated with shrubs and grasslands. The San Francisco Public Utilities Commission (SFPUC) owns a majority of the lands in the Upper Pilarcitos region and has stored water in two locations since 1910: Pilarcitos Lake behind Pilarcitos Dam, and a small, sediment-filled reservoir behind Old Stone Dam (PWA 2008). Below the dams, the watershed includes a mix of public and private lands, including agricultural areas. Approximately 400 acres of the floodplain and hillslope are cultivated for agriculture within the watershed (PWA 1996). Public landowners include the Coastside County Water District, the City of Half Moon Bay, California State Parks, and the Sewer Authority Mid-Coastside. Substantial portions of the watershed are protected from urban development by the Peninsula Open Space Trust and State Parks.

The watershed is a source of drinking water for San Francisco Bay residents, and supports recreational tourism. Diversions by the City of San Francisco and others in the upper portion of the watershed, in combination with pumping of the aquifer from streamside wells, significantly reduce stream flows. Pilarcitos Creek watershed has been designated by the State Water Resources Control Board as fully appropriated during the period of June 1 to October 31, and these water management operations alter hydrology. In general, flows in Middle and Lower Pilarcitos Creek are predominantly provided by the subwatersheds of Middle Pilarcitos, Arroyo Leon and Apanolio. Diversions, dams, and domestic irrigation wells affect stream flow in the lower watershed. It is also influenced by water supply infrastructure management practices, land-use practices, and allocation of water rights. Grazing, urbanization, and recreational tourism also occur in the watershed. Overall, under current conditions, Pilarcitos Creek watershed has only modest salmonid habitat compared to other streams in San Mateo County.

2.4.2. Description of the San Gregorio Creek Watershed

The San Gregorio Creek watershed is the second largest in San Mateo County, draining an area approximately 52 square miles. The mainstem of San Gregorio Creek is formed by the confluence of La Honda and Alpine creeks, and is approximately 12 miles long. The creek flows west through steep canyons of redwood, Douglas-fir, and tan oak forests before entering the San Gregorio Creek Lagoon and the Pacific Ocean. Other important tributaries include El Corte

Madera, Bogess and Harrington Creeks (NMFS 2016). San Gregorio Creek has a coastal lagoon at its mouth, and in dry months low-energy waves deposit sand that builds up a sandbar at the beach. After the sandbar forms, water surface elevation rises as the impounded seasonal lagoon fills with freshwater stream flow. The lagoon is contained in a large, incised stream channel primarily upstream of the Highway 1 Bridge; at its largest, it is approximately 5 acres (NHI 2010).

Current land use in the watershed is a mix of agriculture, urban/residential uses, and forestland and rangeland that overlaps with designated open space. Most of the land in the watershed is zoned resource management, timberland preserve zone, planned agricultural district, community open space, with some residential (Stillwater Sciences et al., 2010). Rangeland zoned as resource management is the dominant land use in the watershed. Timber harvesting primarily occurs in the headwaters of the watershed. Agriculture also occurs in the watershed, with various crops. Urban or built-up land is focused around the communities of San Gregorio and La Honda. A significant portion of the watershed is used as parks and open space preserves. Mid-peninsula Regional Open Space District owns and manages 33 percent of the watershed and is the largest landowner (Stillwater Sciences et al., 2010).

The watershed was adjudicated in 1993 (Superior Court of San Mateo, Decree #355792), and the rights of all users to divert water within the watershed were established through the court decree. Aquatic conditions in San Gregorio Creek are adversely affected by water diversions; therefore, the watershed was designated as a Fully Appropriated Stream by the California State Water Resources Control Board (SWRCB) during the period from June 1 to October 31.

Some areas in the San Gregorio watershed have a "High" fire hazard rating according to CalFire data. A major fire, particularly if located in areas with a high erosion hazard rating, could substantially increase fine sediment input and further compromise the rate of large wood recruitment into stream channels. Furthermore, if existing riparian areas were lost to fire, higher instream temperatures, which are already above optimal condition along the mainstem, would likely result (NMFS 2012).

2.4.3. Status of Listed Species in the Action Area

San Gregorio Creek is a part of the CCC Coho Salmon ESU Santa Cruz Mountains Diversity Strata, and this population is identified as a dependent population. Within this stratum, the two identified functionally independent populations[13] appear extirpated (San Lorenzo River) or nearly so (Pescadero Creek). Dependent coho salmon populations still persist, but only the Scott Creek population, which is supported by ongoing hatchery activities, has regularly produced spawners. While coho salmon individuals are not expected to be present within Pilarcitos Creek, coho are occasionally observed in the San Gregorio Creek watershed. These fish are likely the product of strays from either Scott Creek or hatchery fish that have been planted in area streams (NMFS 2012). Despite the fact that coho salmon have not been found in either creek in recent

[13] Functionally independent populations are those that have a high likelihood of persisting for 100 or more years and whose population dynamics and extinction risk are not substantially altered by exchanges of individuals with other populations.

years, San Gregorio Creek is considered an important recovery stream, with recovery criteria set as a spawner density target of 1,363 adults (NMFS 2012).

Both Pilarcitos and San Gregorio Creek are a part of the CCC Steelhead DPS Santa Cruz Mountains Diversity Stratum. The Pilarcitos Creek CCC steelhead population is considered potentially independent[14], and the recovery criteria for the population is a spawner density target of 1,110 adults. The San Gregorio Creek population is functionally independent with recovery criteria set as a spawner density target of 1,700 adults (as described in NMFS 2016).

2.4.3.1. CCC Coho Salmon in the Action Area

The San Gregorio Creek watershed contains approximately 37 miles of historical coho salmon habitat. In the 1800s, the creek had large enough runs to support commercial harvest (Skinner 1962). Historical records document the presence of coho salmon in the Pescadero-Butano Creek, Gazos Creek, and San Gregorio Creek watersheds. Collectively, these watersheds produced a combined average annual run of approximately 1,000 spawners during 1959-1963 (CDFG 1995). As described above, coho salmon are not expected to occur within the Pilarcitos Creek portion of the action area; thus, the remainder of this biological opinion will not address coho salmon as it relates to the Pilarcitos Creek portion of the action area. Conversely, although the occurrence is occasional, the species does have a low likelihood of occurrence within the San Gregorio Creek portion of the action area. For the purposes of this analysis, we assume CCC coho salmon would be present in the San Gregorio Creek portion of the action area. With the proposed in-water work window of June 15 to October 15, only juvenile CCC coho salmon would be expected to be present within this portion of the action area during the proposed summer in-water work window. While information on the abundance of adults or smolts in the action area is unavailable and migration rate data is similarly unavailable for portions of San Gregorio Creek outside the action area, we expect that a portion of the migrating coho salmon adults and smolts in San Gregorio Creek in any given year will pass through the site during the winter-spring migration period. Considering the above, a portion of migrating coho salmon adults and smolts in San Gregorio Creek will pass through the action area during the winter-spring migration period (i.e. outside the proposed work window).

2.4.3.2. CCC Steelhead in the Action Area

CCC steelhead are present in most San Mateo County streams, although abundance has declined considerably since peak observations in the past (NMFS 2020a). Within the Santa Cruz Mountain stratum, a multi-year monitoring plan has recently been initiated. Estimates of adult abundance span only 1-3 years for populations in this stratum. Juvenile density is not available for many streams in the stratum, but there have been either consistent or incidental monitoring in some streams that provide data on these populations. Information on population estimates for the San Gregorio Creek and Pilarcitos Creek watersheds are available, and are described below.

Steelhead were once abundant in San Gregorio Creek, which forms at the confluence at La Honda Creek and Alpine Creek and flows 12 miles to the Pacific Ocean. Sampling in the lagoon,

[14] Potentially independent populations are independent populations that are too strongly influenced by immigration from other populations to exhibit independent dynamics.

downstream of the action area, has been conducted and steelhead are found yearly (NMFS 2020a). In addition, density estimates became available on Mindego Creek, a tributary to San Gregorio Creek upstream of the action area, in 2012 during construction activities where 58 to 189 steelhead juveniles were electrofished in 100 feet of stream over several days. In Alpine Creek in 2019, another tributary to San Gregorio Creek upstream of the action area, 363 steelhead were electrofished from approximately 500 feet of stream, or 73 fish per 100 feet. Given the observations of steelhead both up- and downstream of the San Gregorio portion of the action area, CCC steelhead are expected to occur in the action area year round. While this data was not obtained from within the action area, it represents the best available, most recent information on steelhead presence in the area. Moreover, NMFS will utilize this data to determine the density of fish expected to be present within the action area during project construction activities. With the proposed in-water work window of June 15 to October 15, juvenile CCC steelhead are expected to be present within the San Gregorio portion of the action area during the proposed summer work window.

There have been long term multi-year surveys for CCC steelhead in recent years in Pilarcitos Creek upstream of the action area. During 2013 through 2019, average yearly density in sampled reaches of the creek were 38 juveniles per 100 feet, ranging from 18/100ft in 2019 to 68/100ft in 2017 (A. Brinkerhoff, personal communication 2021). The action area lies within Lower Pilarcitos Creek well below the aforementioned multi-year survey sites. In 2010, a Stream Habitat Assessment Survey of Lower Pilarcitos Creek was completed by the California Department of Fish and Wildlife (2013). In addition to the habitat assessment, two 300-foot reaches were electrofished for species composition and distribution. The surveyed area encompassed a nine-mile stretch of Pilarcitos Creek, beginning at the creek's confluence with the Pacific Ocean and extending upstream to the limit of anadromy at the Old Stone Dam. As described in the report, "reach 4" includes the Pilarcitos Creek portion of the action area. A 300-foot stretch of reach 4 was electrofished in late October and 13 juvenile steelhead were observed, or 4.3 fish per 100 feet. While the exact location of the electrofished area of reach 4 cannot be ascertained, fish may not have been obtained specifically from within the action area, and the survey was completed outside of the proposed in-water work window, this data represents the best available, most recent information on steelhead presence in the area. NMFS will utilize this data to determine the density of fish expected to be present within the action area during proposed construction activities. Given the aforementioned observation, CCC steelhead are expected to occur in the action area year round. Yet, with the proposed in-water work window of June 15 to October 15, only juvenile CCC steelhead are expected to be present within the Pilarcitos Creek portion of the action area during the proposed summer work window.

Information on abundance and migration rates of steelhead adults or smolts in the action area is unavailable, and is similarly unavailable for portions of Pilarcitos and San Gregorio creeks outside the action area. Because of the location of the Pilarcitos Creek portion of the action area within the watershed, approximately one mile upstream from the Pacific Ocean, we expect that all migrating adults and smolts in Pilarcitos Creek in any given year will pass through the site during the winter-spring migration period. Also, any adult steelhead in both portions of the action area that immigrate and then return to the ocean (i.e. emigrate) in the same year will pass through the action area twice. Considering the above, all migrating adults and smolts will pass through the action area during the winter-spring migration period (i.e. outside the proposed work window).

2.4.4. Status of Critical Habitat in the Action Area

The action area is designated critical habitat for CCC steelhead and CCC coho salmon, and supports rearing, and migration of these listed species. Essential features include substrate, water quality, water quantity, water temperatures, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. The principal factors responsible for current steelhead and salmon habitat conditions in the action area are described below and are organized by the major factors responsible for current habitat conditions: water diversions, sedimentation and water quality, loss of riparian vegetation and large woody debris from streams, bank stabilization and channel modification, and climate change. These factors have likely reduced available rearing habitat for steelhead and coho salmon in the action area. Moreover, designated critical habitat within the action area is moderately degraded from a properly functioning condition.

Water diversions and resulting decreases in stream flow are a limiting factor for fisheries in the action area. Reduction of flows negatively affect salmonid habitat by loss of usable habitats due to dewatering and blockage, stranding of fish resulting from rapid flow fluctuations; migration delays, entrainment of juveniles into unscreened or poorly screened diversions, and increased lethal and sublethal effects resulting from increased water temperatures (Berggren and Filardo 1993, Chapman and Bjornn 1968). Reduced flows can also degrade or diminish fish habitats via increased deposition of fine sediments in spawning gravels, decreased recruitment of new spawning gravels, and encroachment of riparian and non-endemic vegetation into spawning and rearing areas.

As described above in Section 2.4.1, Pilarcitos Creek can be divided into three broad reaches: Upper, Middle, and Lower. Lower Pilarcitos Creek flows through the City of Half Moon Bay (PWA 2008), and the Pilarcitos Creek portion of the action area lies within this reach. Streamflow in Pilarcitos Creek is reduced by dam and water diversions, and groundwater pumping adjacent to the creek. As such, Pilarcitos Creek within the action area is classified as an intermittent stream, and in some years may not have surface flow in the late summer and early fall, although isolated pools are often present. However, since 2006, the San Francisco Public Utilities Commission (SFPUC) has implemented perennial releases from the Pilarcitos and Old Stone dams of approximately 1.5 cfs, or more. NMFS assumes that the flow releases from SFPUC have extended dry season surface flows in the mainstem compared with previous conditions and we expect some flow to occur within the action area year round. Because of the historically reduced flows and the absence of fine sand transport from the creek, some pool filling has occurred resulting in coarser substrates being buried. As a result, the creek bed within the action area is dominated by sand, with some gravel and cobbles. Losing these habitats has reduced rearing and migrating space, and degraded food production in the area. Impacts from this hydro-modification are likely greatest in the Lower Pilarcitos as a result of increasing residential development in Half Moon Bay, and local geological conditions that lead to sand as the predominant channel substrate.

Water diversions and impoundments are distributed throughout the San Gregorio watershed, including the mainstem of San Gregorio Creek. The watershed was adjudicated in 1993 (Superior Court of San Mateo, Decree #355792), and the rights of all users to divert water within the watershed were established through the court decree. Under the adjudication, all new water diversions (or activation of unexercised riparian rights) in the watershed are subject to the requirements for maintenance of minimum instream flows. However, during below-normal water

years, the available water supply is insufficient to meet all the water rights allocated in the watershed, and also provide instream flows necessary for aquatic species. The number of individual landowners in the watershed who maintain groundwater wells for residential and irrigation water supply is not known, but these diversions predominantly pull water from the eastern half of the watershed, which primarily acts as an area of groundwater recharge to the basin aquifer in the valley. These groundwater wells in combination with on stream diversions likely contribute to significant degradation of habitat for all coho and steelhead life stages in all but very wet water years. Furthermore, they likely contribute to significant degradation and reduction of juvenile rearing opportunities, and rearing habitat, during the summer period by reducing the quantity of water in the wetted stream channel and increasing diurnal temperature fluctuations. Despite the above, San Gregorio Creek is a perennial stream and is expected to have surface flows during the summer months. Channel substrates in the action area are generally cobble and sand, but with a strong component of gravel and boulders.

Aquatic habitats within the action area have also deteriorated from their historical conditions due to increased rates of sediment input into the creeks. Threats that contribute to the altered sediment transport within the San Gregorio Creek portion of the action area include agriculture, recreational trails, grazing, urbanization, logging, and most predominant, road-related erosion. Within the San Gregorio watershed, road densities are high, and are estimated at 3.0 miles of road per square mile of watershed area, and 3.2 miles per square mile of riparian area. Many of these roads are poorly situated and constructed, and improperly maintained. Even though chronic erosion decreases as the roads become vegetated, roads can deteriorate with age, becoming more susceptible to culvert plugging and subsequent stream crossing failure, stream diversion and gullying, as well as failure of both road and landing fills (Environmental Science Associates et al. 2004). Legacy roads from past logging activity have been adopted as year-round roads and recreational trails, and continue to impact the San Gregorio watershed. On many forest and ranch roads, located on both public and private lands, periodic maintenance falls short of addressing chronic, localized erosion problems. In these circumstances, grading of poorly drained roads and repair of failed fills and stream crossings can continue, and even exacerbate, the rate of fine sediment delivery to the stream channel. In addition to sedimentation, water quality is also suboptimal to support salmonids as temperature thresholds for both coho and steelhead are exceeded. As a result, temperature thresholds based on coho salmon thermal requirements were set within the watershed where both CCC coho and steelhead are found.

While elevated instream sedimentation levels are a common problem within the watershed and the action area, and Pilarcitos Creek is considered impaired by high instream sediment conditions, investigations are still needed to identify and prioritize the major sediment contributions within the watershed. In 1994, Rich documented poor salmonid spawning substrate conditions throughout the watershed. PWA (1996) reported sediment yield estimates (from other studies) for Pilarcitos Creek that ranged from 425 tons/square mile/year in one study with another study estimating sediment yield ranging between 80 and 5,570 tons/square mile/year. PWA (2008) reported information from other studies indicating the two primary sources of sediment are from Apanolio Creek and the Upper Pilarcitos Creek below Old Stone Dam. The high levels of instream fine sediment and turbidity likely impair overwinter rearing success within the action area by disrupting invertebrate (salmonid food) production, and filling of pools needed by salmonids for predators and refuge from fast moving waters (NMFS 2016).

Altered riparian areas can change tree recruitment rates and the quality of instream habitat forming features. The loss of riparian vegetation removes cover for fish over streams, can lead to increased water temperatures, and reduces the amount of wood that enters stream channels from tree death, wind-throw, and bank erosion. The result is a reduction in a stream's carrying capacity for juvenile fish, particularly coho salmon (Glova 1978). In the CCC coho salmon ESU, watersheds that have increased agricultural and/or urban development also have depressed populations of coho salmon (NMFS 2010 and 2012) in large part due to the removal or reduction of large wood elements in stream channels and floodplains. Agricultural, urban, and residential development has resulted in the loss of extensive floodplains or off-channel rearing areas. Therefore, large woody debris (LWD) is an even more critical habitat element for salmonids than in more northern streams to form pools or areas of refuge from high flows. Several LWD structures are located within the Pilarcitos Creek portion of the action area, including a logjam, located immediately upstream from the bridge, proposed for removal to complete construction of the proposed project. In general, Pilarcitos Creek has suboptimal temperature conditions to support summer rearing juveniles, but in some years, water temperature and streamflow in the action area may provide habitat suitable to support summer rearing (Caltrans 2021).

Altered riparian conditions are common throughout much of the Pilarcitos Creek watershed, arising largely from urban and agricultural encroachment into riparian corridors and the intentional and unintentional establishment of non-native vegetation in the riparian zone. Exotic plants that were introduced for landscaping dominate the valley floors, yet native species are still relatively common in riparian areas. Within the Pilarcitos Creek portion of the action area land cover consists primarily of commercial, residential, agricultural, and riparian tree cover. The health and diversity of riparian species deteriorate downstream due to the spread of invasive ornamentals; yet tree surveys conducted within the Pilarcitos Creek portion of the action area in 2020 (Caltrans 2020) indicate a healthy presence of native riparian trees. These include arroyo willows, red alders, and red willows immediately surrounding the project location, many of which will either be temporarily or permanently impacted to complete the project (see section 1.3 for more details). As described above, sand dominates the substrate composition of pools and runs, limiting pool extent and depth, and aquatic insect abundance. When streamflow is present in the action area runs, riffles, and pools exist (Caltrans 2020). In addition, several LWD structures provide varied habitat complexity within the Pilarcitos Creek portion of the action area.

When considering the San Gregorio Creek portion of the action area, land cover adjacent to and within the action area consists mainly of undeveloped forest, and scattered low-density residential housing nearby. Tree surveys conducted in 2019 indicate that a variety of native trees make up the canopy within the action area, including big leaf maples, coast redwoods, and white alders, to name a few. Similar to Pilarcitos Creek, LWD is scarce in San Gregorio Creek (CDFG 1996; Dunn and Renger 1996; Hickethier and Miles 1996; CDFG 1997a; CDFG 1997b). Low LWD abundance within San Gregorio Creek is likely the result of past logging practices that removed trees from riparian areas and stream clearance efforts. The lack of LWD likely is the major contributor to the lower shelter values estimated in the watershed (an average rating of 0 out of a possible total shelter rating of 300) (NMFS 2016). In addition, the proximity of residences to stream channels and riparian areas has led to further alteration. Many residences are prone to flooding, and efforts to minimize the impacts of flooding often include removing instream habitat features, such as large woody debris. Despite the aforementioned, the action area does have some habitat complexity in the form of riffles, pools, undercut banks, large

woody debris, and abandoned concrete remnants that create shelter and slow moving waters (Caltrans 2020). Overall, the action area likely does not retain an appropriate level of large wood to sustain various life stages of salmonids.

RSP installation can impact the physical habitat in two general ways – by changing a dynamic, unrestrained stream that constantly evolves via hydrologic and geomorphic processes into a fixed, simplified channel, and by altering the physical land/water interface (i.e. streambank) that provides shelter, food, and other ecosystem benefits to aquatic species, including juvenile salmonids. The existing Pilarcitos and San Gregorio bridges have likely impacted the physical habitat in the ways noted above.

In most low gradient streams, such as lower Pilarcitos Creek, the channel will naturally "meander", eroding laterally to dissipate its hydraulic energy while creating a sinuous longitudinal course. Stream meandering efficiently regulates the erosive forces by lengthening the channel and reducing stream gradient, thus controlling the ability of the stream to entrain and transport available sediment. Meandering streams also create and maintain both the hydraulic and physical components of instream habitat used by fish and other aquatic species. For instance, specific to salmon and steelhead, a meandering, unconstrained stream channel sorts and deposits gravel and other substrate necessary for optimal food production and spawning success, maintains a healthy and diverse riparian corridor that supplies LWD to the channel, and inundates adjacent floodplain habitat during appropriate winter/spring flows (Spence *et al.* 1996). The existing Pilarcitos and San Gregorio bridges have likely reduced the amount of stream meandering.

Bank stabilization practices, which lock the stream channel in place, are commonly used in Pilarcitos Creek to prevent the stream channel from meandering. In Pilarcitos Creek, stream bank stabilization and channelization measures have simplified instream habitat complexity and disconnected some stream channels from their floodplains. PWA (1996) documented a major shift in channel morphology in Pilarcitos Creek from 1943-1980 as evidenced by loss of channel sinuosity. Channel meanders present in 1943 were straightened for agricultural reclamation by 1956, and these locations are now experiencing bank erosion as the channel attempts to re-establish a natural meander pattern.

The long-term effects of climate change have been presented above, and include temperature and precipitation changes that may affect steelhead, coho salmon, and critical habitat by changing water quality, streamflow levels, and salmonid migration in the action area. The threat to salmonids in the action area from climate change is likely going to mirror what is expected for the rest of Central California. NMFS expects that average summer air temperatures in the action area would continue to increase, heat waves would become more extreme, and droughts and wildfire would occur more often (Lindley et al. 2007, Hayhoe et al. 2004, Moser et al. 2012; Kadir et al. 2013, Schneider 2007, Westerling et al. 2011). Many of these changes are likely to further degrade CCC steelhead and CCC coho salmon critical habitat throughout the action area by, for example, reducing streamflow during the summer and raising summer water temperatures.

As noted above, the CZU Lightening Complex burned 86,509 acres across western Santa Cruz and San Mateo counties. Both portions of the action area are north of the fire's perimeter, (California Department of Forestry and Fire Protection and California Department of Conservation 2020 [Figure 3]), and therefore did not experience direct impacts to critical habitat

(i.e. loss of soil cover, vegetation and canopy, soil heating, etc.). Furthermore, given the location of the action area, the fire's perimeter, and the surrounding topography, critical habitat within the action area is not anticipated to be indirectly impacted from post-fire debris flows; although some areas of designated critical habitat within the Santa Cruz Diversity Stratum was burned, and will likely experience post-fire debris flows.

2.4.5. Previous Section 7 Consultations and Section 10(a)(1)(A) Permits in the Action Area

Although no previous individual section 7 consultations with NMFS have occurred within the action area, NMFS has completed programmatic consultations for salmonid habitat restoration actions that include the action area of this project. These programmatic consultations include the NOAA Restoration Center's restoration program, the Corps' Regional General Permit #12 programmatic consultation, and San Mateo Counties Regional General Permit. These consultations anticipate a limited amount of take for juvenile salmonids during instream work conducted in the summer months. NMFS determined these restoration actions are likely to improve habitat conditions for listed species and that the limited amount of take anticipated is unlikely to affect future adult returns.

NMFS' Section 10(a)(1)(A) research and enhancement permits and section 4(d) limits or exceptions occur in some of the watersheds covered under this Program, including the reaches within the action area. Salmonid monitoring approved under these programs includes carcass surveys, smolt outmigration trapping, and juvenile density surveys. In general, these activities are closely monitored and require measures to minimize take during the research activities. NMFS determined these research projects are unlikely to affect future adult returns.

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. 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 50 CFR 402.17(a) and (b).

In this biological opinion, our approach to determine the effects of the action was based on institutional knowledge and a review of the ecological literature and other relevant materials. We used this information to gauge the likely effects of the proposed project using an exposure and response framework that focuses on the stressors (physical, chemical, or biological), directly or indirectly caused by the proposed action, to which CCC coho salmon and CCC steelhead are likely to be exposed. Next, we evaluate the likely response of the above listed fish to these stressors in terms of changes to survival, growth, and reproduction, and changes to the ability of PBFs to support the value of critical habitat in the action area. PBFs include sites essential to support one of more life stages of the species. These sites for migration, spawning, and rearing, in turn, contain physical and biological features that are essential to the conservation of the species. Where data to quantitatively determine the effects of the proposed action on listed fish and their critical habitat were limited or not available, our assessment of effects focused mostly on qualitative identification of likely stressors and responses. Our effects determinations are based on the expectation that Caltrans will fully incorporate design related minimization

measures (described in Sections 1.3.1 and 1.3.2 of this opinion) into the final design of the project.

Construction activities, both during and post-project completion, associated with the proposed project may affect CCC coho salmon and CCC steelhead, and their critical habitat. The following may result from construction activities: unintentional direct injury or mortality during fish collection, relocation, and dewatering activities; loss of benthic habitat; increases in suspended sediments and turbidity; reductions in riparian vegetation and cover; hazardous materials and contaminants from heavy machinery and construction materials; altered channel morphology and fish passage conditions. Project effects are described in more detail below.

2.5.1. Fish Collection and Relocation

To facilitate the completion of the project, portions of Pilarcitos and San Gregorio creeks will need to be dewatered. As discussed above, a maximum amount of 200 and 50 linear feet will be dewatered, respectively. 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 salmonids 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 salmonids 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 15 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 salmonids are expected to be in the action area during the construction period. Therefore, NMFS expects capture and relocation of listed salmonid species will be limited to pre-smolting and young-of-the-year juveniles.

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.

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. 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).

To estimate the number of juvenile steelhead that may be present in the Pilarcitos Creek portion of the action area, we used data described in section 2.4.3.2 above from surveys performed by CDFW (2013) in Lower Pilarcitos Creek where they encountered 13 steelhead in a reach of 300 linear feet. Using this data, and the proposed dewatering length of 200 linear feet, NMFS estimates that no more than 9 juvenile steelhead will be present in the dewatered area when relocation and dewatering activities occur each year.[15] Considering environmental variability such as interannual variation in temperature, variation in predator or prey abundance, habitat conditions in the action area, and other factors, NMFS assumes that as many as 25 percent more juvenile CCC steelhead may be present in the area to be dewatered. If 25 percent more than 9 juvenile steelhead are present this would result in 12 juvenile CCC steelhead present in the 200-foot-dewatered area.[16]

To estimate the number of juvenile steelhead that may be present in the San Gregorio Creek portion of the action area, we used data described in section 2.4.3.2 above from surveys performed by the San Mateo Resource Conservation District (2019) in Alpine Creek where they encountered 363 steelhead in a dewatered reach of 500 linear feet. Using this data, and the proposed dewatering length of 50 linear feet, NMFS estimates that no more than 37 juvenile steelhead will be present in the dewatered area when relocation and dewatering activities occur each year. [17] Considering environmental variability such as interannual variation in temperature, variations in predator or prey abundance, habitat conditions in the action area, and other factors, NMFS assumes that as many as 25 percent more juvenile CCC steelhead may be present in the area to be dewatered. If 25 percent more than 37 juvenile steelhead are present this would result in 47 juvenile CCC juvenile steelhead present in the 50-foot-dewatered area.[18]

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[15] 13 steelhead encountered / 300 feet of dewatered river = 0.043 steelhead per foot of river. 0.043 fish per foot*200 feet of river = 8.6 fish per 200 feet of river. Rounding this up to whole numbers yields an estimate of 9 steelhead to be in the area during dewatering.

[16] ((9 juvenile steelhead/200 linear feet*0.25)+9 juvenile steelhead) = 11.16 juvenile steelhead/200 linear feet, or 12 juvenile steelhead/200 linear feet when rounding up.

[17] 363 steelhead encountered/ 500 feet of dewatered river = 0.726 steelhead per foot of river. 0.726 fish per foot*50 feet of river = 36.3 fish per 50 feet of river. Rounding this up to whole numbers yields an estimate of 37 steelhead to be in the area during dewatering.

[18] ((37 juvenile steelhead/50 linear feet*0.25) + 37 juvenile steelhead) = 46.25 juvenile steelhead/50 linear feet, or 47 juvenile steelhead/50 linear feet when rounding up.

Within the San Gregorio portion of the action area, low numbers of juvenile CCC coho salmon juveniles may be rearing in the action area during the low-flow summer period when dewatering may occur. Based on the limited information that exists within the San Gregorio watershed, NMFS estimates that no more than five juvenile CCC coho salmon will be present in the dewatered area of the San Gregorio Creek during the in water work window.

Applying applicable AMMs to fish collection, relocation, and dewatering activities is expected to appreciably reduce the effects of project actions on juvenile salmonids. Specifically, salmonid 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 salmonids. 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 CCC steelhead and CCC coho in the action area.

2.5.2. Dewatering

As described above, completion of the project will require dewatering of Pilarcitos and San Gregorio creeks. Cofferdams and a series of pipes will be used to temporarily divert flows around each work site during construction. Dewatering of the channel is estimated to affect up to 200 linear feet of Pilarcitos Creek and 50 linear feet of San Gregorio Creek. NMFS anticipates temporary changes to instream flow within, and downstream of, each project site during installation of the diversion systems, 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 salmonids that avoid capture during fish relocation activities.

Stream flow diversion and dewatering at both project sites could harm any rearing salmonid individuals by concentrating or stranding them in residual wetted areas before they are relocated. Juvenile salmonids that avoid capture in the project work areas 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 reaches recede. Because the pre-dewatering fish relocation efforts at both project sites will be performed by qualified biologists, NMFS expects that the number of juvenile salmonids that will be killed as result of stranding during dewatering activities will be very small, likely no more than one percent of the salmonids within the work sites prior to dewatering.

Dewatering operations at both projects sites may affect benthic (bottom dwelling) aquatic macroinvertebrates, an important source for salmonids. Benthic aquatic macroinvertebrates at each 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 reaches will not exceeded 200 linear feet in Pilarcitos Creek and 50 linear feet in San Gregorio Creek. Rapid recolonization (typically one to two months) of disturbed areas by macroinvertebrates is expected following rewatering (Cushman 1985, Thomas 1985, Harvey 1986). Within action area the effect of macroinvertebrate loss on juvenile salmonids is likely to be negligible because food from upstream sources (via drift) would be

available downstream of the dewatered areas since stream flow will be bypassed around the project work sites. Based on the foregoing, juvenile salmonids are not anticipated to be exposed to a reduction in food sources at both work sites from the minor and temporary reduction in aquatic macroinvertebrates as a result of dewatering activities.

Beyond the dewatered area, the temporary stream diversion at each project site is expected to resemble typical summer low flow conditions. The diversion systems at both work sites could restrict movement of listed salmonid species 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 through the range of CCC steelhead and CCC coho salmon. Because habitat in and around the action area is adequate to support salmonids, NMFS expects salmonids will be able to find food both up- and downstream of this portion of 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 cofferdams and stream diversion systems are 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. While placing the RSP onto the streambank, heavy machinery will dig within and disrupt the dewatered streambed, likely dislodging previously armored and sequestered inter-gravel fine sediment. This disturbed soil on the creek banks 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). 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 disposition can fill polls 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 (associated with its water

pollution control plan) specifically aimed at reducing erosion, scour, and sedimentation in storage and staging areas, and from dewatering (Caltrans 2020). 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 salmonids (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 salmonids associated with exposure to minor elevated suspended sediment levels that could reduce their survival chances.

2.5.4. RSP Installation

In contrast to minor short-term turbidity effects, fish response to impacts resulting from the proposed RSP installation will be much longer in duration. The expected habitat loss will impact steelhead and coho salmon fitness and survival at both the individual and population level. Fish migrating through and rearing within the action area along the proposed stabilization sites will experience degraded aquatic habitat caused by the RSP installation. The RSP and its resulting effect on natural channel-evolution processes and instream habitat (see section 2.5.8 below for more detail), are expected to last well into the future - at least several decades. Thus, for species with typically short life-spans (3-4 years for steelhead and 3 years for coho), the RSP will not only impact individual fish but will likely manifest population-level impacts also. The long-term impacts from RSP installation likely portends decreased productivity and abundance of steelhead and coho salmon in the action area over successive generations. In effect, the proposed RSP will perpetuate the diminished carrying capacity that already exists within the action area.

Quantifying the number of individuals injured or killed by the proposed action is difficult because there are few studies or surveys within the action area, especially with regard to identifying the yearly abundance or distribution of CCC steelhead or CCC coho salmon. In addition, some rearing individual steelhead or coho salmon in the action area could move away seeking more suitable habitat. Such temporary displacement of salmonids 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 the RSP. Some proportion (likely small) of these rearing individuals would be injured or killed as a result of degraded cover and forage habitat brought about by the RSP. For example, some individuals would not be able to obtain sufficient size and would have significantly less survival probability during their first few months in the ocean.

2.5.5. Fish Passage

2.5.5.1. Pilarcitos Creek

Based on the conceptual design, without implementation of design related minimization measures (see Section 1.3.1 of the opinion) the channel thalweg would likely migrate and flow along pier 2 and the proposed RSP. However, Caltrans proposes to incorporate design elements in the final design that direct the thalweg towards the center of the stream channel before it encounters the bridge piers or proposed RSP to prevent the thalweg from carving a path adjacent to, and becoming fixed against, the RSP on the left streambank. The conceptual cross-section designs also illustrate that the proposed RSP situated around pier 2 will be installed at and above the existing channel grade. Thus, Caltrans will implement design related minimization measures

(see Section 1.3.1 of the opinion) that minimize streamflow interactions with RSP, minimizes scour or other adverse hydraulic effects, reduces the risk of subsurface RSP being exposed by scour, and reduces the extent of RSP required to protect the bridge piers. With implementation of the measures, the proposed project is not expected to result in scour.

To assess existing and post-project passage conditions, Caltrans used the CDFW "Culvert Criteria for Fish Passage" (CDFG 2002) minimum required water depths, maximum velocities, and maximum water surface elevation drops for adequate passage of adult and juvenile salmonids at culvert and bridge crossings, which are consistent with the NMFS "Guidelines for Salmonid Passage at Stream Crossings" (NMFS 2019). Upstream passage for adult salmonids under existing conditions was assessed for the range of flow rates from 3 to 222 cfs (50-1% exceedance flow). Model results for all flows less than 60 cfs indicated that areas where the flow depth meets or exceeds the adult salmonid passage 1-foot minimum depth criterion are disconnected. The results indicated that 60 cfs is the lowest flow rate at which a continuous flow path having a minimum depth of 1 foot occurs. Model results indicate that the adult salmonid passage 6 feet per second (ft/s) maximum velocity criterion is satisfied at all flows in the 3 to 222 cfs range. Although model results for a flow rate of 222 cfs indicate velocities up to 15 ft/s occur, there is a continuous flow path where velocities exceed 6 ft/s only over distances of less than 60 feet. The results indicate that under current conditions the adult salmonid fish passage 1-foot maximum water surface drop criterion is satisfied at all flows in the 60 to 222 cfs range for which the 1-foot minimum depth criterion is satisfied. The estimated passage condition is likely an underestimate of the actual passage opportunities provided by the current conditions due to the complex multithread channel with a variety of flow and depths being assessed with criteria primarily meant for hydraulic fish passage solutions. An existing wood structure is present under the bridge that Caltrans has deemed is necessary to remove in order to install the RSP. Removal of this structure is not expected to degrade adult or juvenile steelhead passage opportunities.

Through implementation of the design-related minimization measures (see Section 1.3.1 of the opinion) the project will prevent channel evolution from scour so the existing and "as built" conditions for fish passage will be the same. Caltrans estimates the project will enable adult salmonids to successfully migrate upstream at 3-222 cfs (50-1% exceedance flow) 74% of the time. So, while fish passage will be met 74% of the time, there is and will be some delay to fish passage. In dry years, the bridge has much more limited impacts on passage such that whether a fish can migrate past the site is largely or almost wholly dependent on climate conditions. In other water year types, we expect passage opportunities to be close to the modeled passage condition. However, we expect some passage for delayed fish will occur during subsequent storms. Additionally, because 60 cfs is a conservative flow, we expect adult passage will occur during flows less than 60 cfs. Some adult steelhead will experience delays in their movements while they wait for suitable passage conditions. Adults exposed to impeded passage conditions will likely suffer from reduced fitness. The precise number of individuals that will be adversely affected is unknown. Depending on the severity of the delay, which largely depends on the hydrologic and hydraulic conditions at the site, a small proportion of adult steelhead migrating through the Pilarcitos Creek site may not successfully spawn in some years due to delays in their upstream migration. Thus, NMFS concludes that the individual steelhead that do suffer from reduced performance will make up a small proportion of the Pilarcitos Creek population.

Caltrans assessed upstream passage for juvenile salmonids under existing conditions using the methodology used for adult salmonids. The existing channel is a sandy, multithread channel that

provides a variety of depths and velocities at lower flows (approximately 33 cfs and lower). Based on model results, streamflows between 20-33 cfs provide a continuous path meeting the 0.5-foot juvenile depth criterion, yet the juvenile velocity criteria is only met at flows less than 18 cfs. However, upon closer evaluation, at 10 cfs, the model indicated most of the site area that is within the hydraulic influence of the bridge maintained depths of 0.5 feet or greater. There are short (less than 10 feet) channel sections where depths are less than 0.5 feet in depth downstream and upstream of the bridge, with sections deeper than 1 foot downstream of and under the bridges. Therefore, juvenile passage is possible at flows between 10 and 18 cfs, when the depth and velocity juvenile fish passage criteria are both met. The 0.5 foot juvenile depth criterion is fairly conservative for a natural channel. Similar assessments of critical riffles have used a 0.2 foot criterion for juvenile fish passage (DWA 2018). Therefore, the estimated passage condition for juveniles is likely an underestimate of the actual passage opportunities provided by the current condition. Based on the above, the project is not expected to change the existing juvenile passage opportunities.

Post-project conditions will likely limit juvenile passage opportunities at flows above or below 10-18 cfs, approximately. Streamflow conditions in Pilarcitos Creek enable upstream juvenile movements throughout most of the year when flows typically fall within 10-18 cfs periodically. During the low flow season when flows stay below 10 cfs, juvenile steelhead tend to show high site fidelity (Sogard et al. 2009) rendering passage between sites less of a factor during this timeframe. Additionally, comparable habitat conditions exist upstream and downstream of the bridge, which suggests there may be little incentive for juvenile steelhead to move between these two reaches until they emigrate downstream as smolts. Juveniles that move downstream of the Pilarcitos Creek site either passively or actively will not be adversely affected because habitat downstream of the Pilarcitos project site is sufficient for juvenile rearing. The project is not expected to pose as a hydraulic or depth barrier for smolts since they will move downstream during winter and spring flows. Thus, NMFS does not expect post project juvenile passage conditions to have more than a negligible effect on juvenile fitness in the Pilarcitos creek portion of the action area.

2.5.5.2. San Gregorio Creek

Based on the conceptual design, without implementation of design related minimization measures (see Section 1.3.2 of the opinion) the channel thalweg would likely result in a reduced cross-sectional area and further constrict the channel beyond the existing constriction caused by the San Gregorio Bridge. As a result of this constriction, the project would result in elevated velocities and increases in bed sheer stress along the majority of the channel bed adjacent to the proposed RSP. These impacts would likely be the most pronounced at the upstream end of the proposed grouted RSP, where velocities would increase 4 to 5 feet per second (ft/s) at the upstream corner of the RSP at a 1.5-year return interval flow. At a 1.5-year return interval velocities would likely increase across the entire active channel width by at least 2 ft/s. However, Caltrans proposes to incorporate design elements in the final design that direct the thalweg towards the center of the stream channel before it encounters the bridge piers or proposed RSP to prevent the thalweg from carving a path adjacent to, and becoming fixed against, the RSP on the left streambank. The conceptual cross-section designs also illustrate that the proposed RSP situated around Pier 3 and up to abutment 4 will be installed at and above the existing channel grade. Thus, Caltrans will implement design related minimization measures (see Section 1.3.2 of the opinion) that minimize streamflow interactions with RSP, minimizes scour or other adverse

hydraulic effects, reduces the risk of subsurface RSP being exposed by scour, and reduces the extent of RSP required to protect the bridge piers. With implementation of the measures, the proposed project is not expected to result in scour.

To assess existing and post-project passage conditions at this site, Caltrans used the same methodology described above for the Pilarcitos Creek site. Upstream passage for adult salmonids under existing conditions was assessed for the range of flow rates from 3 to 229 cfs (50-1% exceedance flow). Model results for all flows less than 70 cfs indicated that areas where the flow depth meets or exceeds the adult salmonid 1-foot minimum depth criterion are disconnected. The results indicated that 70 cfs is the lowest flow rate at which a continuous flow path having a minimum depth of 1 foot occurs. Model results indicate that the adult salmonid 6 feet per second (ft/s) maximum velocity criterion is satisfied at all flows in the 3 to 229 cfs range. The results indicate that under current conditions the 1-foot maximum water surface drop criterion is satisfied at all flows in the 70 to 229 cfs range for which the 1-foot minimum depth criterion is satisfied. Model results indicate that under existing conditions all the hydraulic criteria for upstream passage of adult salmonids are satisfied at all flows in the 70 to 229 cfs range, which is 70% of the assessment flow range.

Caltrans assessed upstream passage for juvenile salmonids under existing conditions using the methodology used for adult salmonids. They assessed juvenile passage conditions for the range of flow rates from 1 to 28 cfs (95-10% exceedance flow). Model results for all flows less than 25 cfs indicate that areas where the flow depth meets or exceeds the juvenile salmonid fish passage 0.5-foot minimum depth criterion are disconnected. The results indicate that 25 cfs is the lowest flow rate at which a continuous flow path having a minimum depth of 0.5 foot occurs. The results indicate that the 0.5-foot minimum depth criterion is satisfied at flows in the 25 to 28 cfs range. Simulated velocity results were analyzed for flows in the 25 to 28 cfs range for which the minimum depth criterion is satisfied. The results indicate that flow velocities generally exceed 1 ft/s at all flows in this range and that there is no continuous flow path where the maximum velocity criterion is satisfied. Simulated flow velocities at 25 cfs, the lowest flow rate at which the 0.5-foot minimum depth criterion is satisfied. The 0.5 foot juvenile depth criterion is fairly conservative for a natural channel. Similar assessments of critical riffles have used a 0.2 foot criterion for juvenile fish passage (DWA 2018). Therefore, the estimated passage condition for juveniles is likely an underestimate of the actual passage opportunities provided by the current condition.

Through implementation of the design-related minimization measures (see Section 1.3.2 of the opinion) the project will prevent channel evolution from scour so the existing and “as built” conditions for fish passage will be the same. Caltrans estimates the project will enable adult salmonids to successfully migrate upstream at 65-229 cfs (50-1% exceedance flow) 73% of the time. So, while fish passage will be met 73% of the time, there is and will be some delay to fish passage. In dry years, the bridge has much more limited impacts on passage such that whether a fish can migrate past the site is largely or almost wholly dependent on climate conditions. In other water year types, we expect passage opportunities to be close to the modeled passage condition. Adults exposed to impeded passage conditions will likely suffer from reduced fitness. The precise number of individuals that will be adversely affected is unknown. Due to the location of the San Gregorio Creek site, only a proportion of steelhead and coho salmon adults will encounter these fish passage conditions. This is because, in general, there is equal distribution of spawning habitat upstream and downstream of the bridge roughly in proportion to

stream miles upstream and downstream of the bridge (Becker et al. 2008). Additionally, because 65 cfs is a conservative flow, we expect adult passage will occur during flows less than 65 cfs. Some adult salmonids will experience delays in their movements while they wait for suitable passage conditions. Depending on the severity of the delay, which largely depends on the hydrologic and hydraulic conditions at the site, some adults exposed to impeded passage conditions will likely suffer from reduced fitness. Yet, some adults encountering the project site may change course and spawn downstream where suitable habitat exists. Thus, NMFS concludes that the individual steelhead and coho salmon that do suffer from reduced performance will make up a small proportion of the San Gregorio Creek populations.

The project is not expected to change the existing juvenile passage opportunities. Based on model results, streamflow conditions in San Gregorio Creek do not enable upstream juvenile movements at the site. However, juvenile steelhead tend to show high site fidelity during the low flow season (Sogard et al. 2009). Comparable habitat conditions upstream and downstream of the bridge suggest there may be little incentive for juvenile steelhead and coho salmon to move between these two reaches until they emigrate downstream as smolts. Nonetheless, the project will prohibit their ability to move to upstream habitats. Juveniles that move downstream of the San Gregorio site either passively or actively that cannot move upstream of the bridge will not be adversely affected because habitat downstream of the San Gregorio project site is sufficient for juvenile rearing. The project is not expected to pose as a hydraulic or depth barrier for smolts since they will move downstream during winter and spring flows. Thus, NMFS does not expect post project juvenile steelhead and coho salmon passage conditions to have more than a negligible effect on juvenile fitness in the San Gregorio creek portion of the action area.

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 absorbed 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 15 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. Due to these measures, conveyance of toxic materials into active

waters at both work sites during project construction is not expected to occur, and potential for the project to degrade water quality and adversely affect salmonids is improbable.

2.5.7. Removal of Riparian Vegetation and Habitat Loss

The project will result in permanent and temporary reductions in riparian vegetation, including tree removal and trimming, necessary for construction access and staging, and during placement of permanent RSP. 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 cover and habitat complexity required by migrating and rearing salmonids throughout the action area. Approximately 71 native trees will be impacted because of the work at the Pilarcitos Creek site. This includes 39 trees that are proposed to be removed, and 32 trees that will be temporarily impacted (i.e. trimmed, compaction of <30% of root zone). At the San Gregorio Creek site, 21 native trees are proposed to be removed, and 12 native trees will be temporarily impacted. In addition, a logjam located within the Pilarcitos Creek portion of the action area, and other vegetation at both locations, will also be removed to gain access to the work sites and otherwise complete project work. The removal of riparian vegetation at both work sites, and the logjam at the Pilarcitos work site, 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. Both project sites 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 and the logjam, 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 at both sites 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 salmonids to seek alternative areas for cover and forage. Such temporary displacement of salmonids 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 and

the logjam are not expected to significantly reduce performance of individual salmonids within the action area.

2.5.8. Critical Habitat Effects

The action area is designated critical habitat for CCC steelhead and CCC coho salmon. Generally, PBFs or critical habitat for both steelhead and coho found within the action area, and include sites for migration and rearing (see section 2.4.4). As discussed above, construction activities and post-construction condition of the action area are expected to result in both temporary and permanent disturbance to stream channels and adjacent streambanks which could result in impacts to critical habitat by diminishing PBFs.

Mobilization of sediment during construction and post-construction activities has the potential to result in high levels of turbidity and suspended sediment if appropriate AMMs are not implemented. Caltrans, however, is proposing AMMs that will isolate work sites from live streams and prevent pulses of sediment from entering streams after construction is complete. Some minor and temporary increases in turbidity and sediment is expected to occur within the dewatered reaches and a portion of the stream downstream of the active work sites. Such increases are not expected to alter water quality, substrate conditions, or pool habitat to the extent that PBFs in the action area would be diminished.

Dewatering approximately 200 and 50 linear feet of Pilarcitos and San Gregorio Creeks, respectively, in the action area for up to four months during the dry season at each site will expose habitat in these areas to artificial and repetitive dry conditions. Salmonid forage at these sites will be reduced for up to two months following rewatering, after which, macroinvertebrate abundance is expected to return to pre-dewatering levels (Cushman 1985, Thomas 1985, Harvey 1986). Thus, forage supporting juvenile development will be diminished at each site for up to four months during the dry season. Furthermore, salmonid rearing habitat at each site will be reduced in area equal to the dewatered areas for up to four months during each construction season.

Removal of riparian vegetation and/or woody debris will impact critical habitat at both work sites. Impacts to freshwater rearing and migratory sites that provide shade, cover, sediment storage and filtering, nutrient inputs, and habitat complexity will occur as a result of removal of trees, vegetation, the logjam, and tree trimming to complete construction at both work sites. Trimmed trees are expected to grow back in a short amount of time on site. When considering complete removal of trees, we expect riparian vegetation attributes at both sites 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. During the construction and the revegetation timeframe, habitat at both sites will suffer reductions in shade, sediment storage and filtering, nutrient inputs, and habitat complexity. These reductions will diminish the quality of salmonid rearing and forage sites, as well as migration corridors at each site, during the construction and post-construction revegetation timeframe. When considering the removal of the logjam at the Pilarcitos work site, we expect permanent loss of the habitat complexity and cover provided by this structure. Yet, in NMFS judgement, other logjams within this portion of the action area nearby provide these features and can accommodate additional individuals without becoming over crowded. Thus, the permanent removal of the logjam is not expected to have adverse effects on salmonid rearing and forage sites, or migration corridors, at the Pilarcitos work site during construction and the post-construction revegetation timeframe.

Streambank habitat degradation and long-term preclusion of natural fluvial and geomorphic processes resulting from RSP installation is an adverse effect to CCC steelhead and CCC coho salmon critical habitat. Streams transport water and sediment from upland sources to the ocean and, in general, the faster the streamflow, the greater the erosive force. Natural processes constrain and moderate these erosive forces, such as when complex structure both within (e.g., boulders and/or woody debris) and adjacent (e.g., riparian vegetation) to the stream channel slows the water velocity (Knighton 1998). Where existing geology and geomorphology allow, a stream channel will also naturally meander, eroding laterally and creating a sinuous longitudinal course that dissipates its hydraulic energy and reduces stream gradient and erosive forces. A meandering stream helps control the entrainment and transport of available sediment, and also creates and maintains both the hydraulic and physical components of instream habitat used by migrating, spawning, and rearing fish and other aquatic species. For instance, specific to salmon and steelhead, a meandering, unconstrained stream channel sorts and deposits gravel and other substrate types necessary for optimal food production and spawning success. These processes contribute to the maintenance of a healthy and diverse riparian corridor for fish that supplies LWD, and allows floodplain engagement during appropriate winter flows (Spence et al. 1996).

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 and poor functional habitat for rearing juvenile salmonids (Pollock et al. 2007; Florsheim et al. 2008). Because bank stabilization utilizing RSP is typically designed to withstand high streamflow caused by large storm events, the RSP structure, and by extension the impacts to instream habitat, are long-term, harming future fish generations in perpetuity. Moreover, streambank stabilization impacts not only extend temporally but also spatially. Altered geomorphic and hydraulic processes can propagate spatially both upstream and downstream of hardened bank structures, dependent upon site- and structure-specific characteristics (Henderson 1986 and Arnaud-Fassetta et al. 2005, as cited in Florsheim et al. 2008), meaning that bank stabilization projects often result in future bank stabilization projects in the same system. Natural earthen streambanks provide complex fish habitat (e.g., undercut banks, submerged rootwads, etc.) (Fischenich and Copeland 2001), and RSP as a stabilization material is an immediate and long-term conversion of a natural streambank to a relatively simple, homogenous streambank structure less suitable for juvenile steelhead and salmon (Schmetterling et al. 2001; Fischenich 2003). By stabilizing a moderate length of streambank with RSP, the project will likely reduce the availability of migrating and rearing critical habitat PBFs by precluding natural fluvial and geomorphic processes within the action area for the foreseeable future. NMFS analyzed the extent of the effects on migration availability in section 2.5.5 above.

Habitat conditions in the action area are poor for salmonids. Habitat complexity is adequate, substrate complexity is poor, and fish passage is impaired at both project locations. The RSP at both locations under the proposed condition is likely to further degrade habitat when compared to the existing condition. By placing the grouted RSP within the action area, the project will likely compromise the value of available migrating and rearing critical habitat PBFs by reducing passage and water quality, and increasing water velocities and obstructions within the action area for the foreseeable future.

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.

Non-federal water diversions are expected to continue to affect the action area (NMFS 2012, NMFS 2016). Water diversion effects of reduced base flows within the action area are described in the Environmental Baseline section of this consultation. Diversions are not expected to change appreciably, and will continue to perpetuate into the future.

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 in the environmental baseline (Section 2.4)

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. 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 for the project includes two locations in San Mateo County, California; one located on Pilarcitos Creek and the other on San Gregorio Creek. Threatened CCC steelhead and endangered CCC coho salmon and their critical habitat occur within the San Gregorio Portion of the action area. Within the Pilarcitos Creek portion of the action area threatened CCC steelhead and critical habitat occur. San Gregorio Creek is a part of the CCC coho salmon ESU Santa Cruz Mountains Diversity Strata, and is identified as a dependent population. Despite the extremely low numbers and sporadic presence of coho salmon in the creek, San Gregorio Creek is considered an important recovery stream for the CCC coho ESU (NMFS 2012) and contains coho salmon critical habitat. When considering steelhead, both Pilarcitos and San Gregorio creeks are a part of the CCC steelhead DPS Santa Cruz Mountains Diversity Stratum. The Pilarcitos Creek CCC steelhead population is considered potentially independent, and the San Gregorio Creek population is considered functionally independent. The Pilarcitos and San Gregorio populations are essential for the recovery of CCC steelhead (NMFS 2016). Based on the extensive loss of historic habitat due to dams, forestry practices, bank stabilization, and urban and agricultural land development, and the degraded condition of remaining spawning and rearing habitats, CCC steelhead and CCC coho salmon have experienced severe declines.

As described in the CCC Coho Recovery Plan (NMFS 2012) and the Coastal Multi-Species Recovery Plan (NMFS 2016a), as discussed in Section 2.2 above, CCC steelhead and CCC coho salmon have declined to a large degree from historic numbers. CCC coho are depressed to the point that their population is highly fragmented. Within the Santa Cruz Mountains Diversity Stratum, the two identified functionally independent CCC coho populations appear extirpated. Dependent populations still persist, but only the Scott Creek population has regularly produced spawners. As noted, despite the occasional occurrences of coho within the San Gregorio watershed, San Gregorio Creek is considered an important coho recovery stream (NMFS 2012). Steelhead populations in the CCC steelhead DPS are the most poorly monitored salmonid populations in the North-Central California Coast Recovery Domain (NMFS 2016a). Sub-populations within the CCC steelhead DPS are generally healthier than CCC coho in the same watersheds; however, population trends for both species are declining. Therefore, survival and recovery of both populations will be unlikely unless habitat conditions are widely improved.

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, CCC coho, and/or habitat: reduced migration availability, fish collection and relocation, dewatering, increases in suspended sediment and other construction-related contaminants, loss of benthic habitat, streambank hardening, and reductions in riparian vegetation and cover. Of these, fish collection, relocation, dewatering, and streambank hardening/RSP placement have the potential to result in reduced fitness, injury, and/or mortality of CCC steelhead and CCC coho.

2.7.1. Listed Species

The project proposes to dewater approximately 50 and 200 linear feet of San Gregorio and Pilarcitos creeks, respectively, for up to 4 months at each location; construction is scheduled to occur during the dry season. Therefore, it is anticipated that only rearing juveniles will be present in the action area during construction, and no adult of smolt life stages of salmonids would be affected by the dewatering and fish relocation project activities. For the San Gregorio location, NMFS estimates up to 47 juvenile steelhead and 5 juvenile coho salmon may be present in the reach to be dewatered prior to construction. For the Pilarcitos location, NMFS estimates up to 12 juvenile steelhead may be present in the reach to be dewatered prior to construction.

Anticipated mortality from relocation is expected to be two percent (or less) of the fish relocated, and mortality expected from dewatering is expected to be one percent (or less) of the fish in the areas prior to dewatering (combined mortality not to exceed three percent). Therefore, NMFS expects no more than two juvenile steelhead at the San Gregorio project site would be injured or killed by fish relocation/dewatering during construction. At the Pilarcitos project site NMFS expects no more than one juvenile steelhead would be injured or killed by fish relocation/dewatering during construction. No more than five juvenile coho salmon are expected to be present at the San Gregorio project site, and NMFS does not expect any juvenile coho salmon would be injured or killed by fish relocation/dewatering at the project site.

As described in the Effects of the Action section above, long-term habitat degradation from installation of the RSP is expected to perpetuate degraded carrying capacity and habitat complexity, and reduce cover and forage habitat. Some proportion (likely small) of rearing individuals would be injured or killed as a result of degraded cover and forage habitat brought about by the RSP.

At both sites, with implementation of the design-related minimization measures (Section 1.3), the existing and post-project conditions for fish passage will be the same, resulting in some continued loss of passage under certain conditions for the foreseeable future. Nonetheless, NMFS expects most adult salmonids will be able to migrate past the sites and successfully spawn in most years. Some individual adult salmonids will experience delays in their movements while they wait for suitable passage conditions. This could result in reduced spawning success. The number of adults that will not spawn successfully is likely low, because we expect there will be passage opportunities for adults at some point throughout the migration window in most years. In San Gregorio Creek, salmonid adults encountering the project site are more likely to change course and spawn downstream where suitable habitat exists, albeit their spawning will be delayed as a consequence. The number of individuals in San Gregorio Creek that will spawn unsuccessfully is likely very low because the number of adults that may be affected by reduced passage is already low because the bridge is located approximately 10 miles upstream of the ocean and there is suitable spawning habitat available downstream of the bridge.

For juvenile salmonids, the proposed project will have some negative effects on upstream passage opportunities, but little to no effect on rearing habitat upstream or downstream of the bridges. Juvenile fish that are unable to move upstream are anticipated to be able to find suitable habitat conditions downstream of the bridges. Similarly, suitable rearing habitat exists downstream of the sites to support juveniles that move downstream either passively or actively. Smolt movements will not be impaired by the project since they will move downstream during winter and spring flows.

The cumulative impacts of non-federal future activities that are likely to occur in, or have affects in the action area were discussed in Section 2.6, and included a discussion of future effects of water diversions. Diversions in the San Gregorio and Pilarcitos watersheds are expected to perpetuate the reduced base flows in the watershed, and are identified as a threat to CCC steelhead and CCC coho salmon populations in both watersheds.

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 or CCC coho salmon 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 salmonid migration. The overall reduction in rearing and migration habitat quality caused by the bridges is either minor or limited to a small area of the watersheds, 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.

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, and removal of riparian vegetation and habitat loss. The implementation of proposed AMMs is expected to render the potential for fish to be exposed to pollution from hazardous materials and contaminants improbable. Similarly, increased sedimentation and turbidity, and removal of riparian vegetation and habitat loss are not expected to result in reductions in fitness of individual salmonids within the action area. NMFS does not expect any of the aforementioned effects to combine with other effects in any significant way. Effects from construction are limited in time and area and fish losses due to capture and relocation are minimal and only occur

to juvenile salmonids during a single construction season. Migration impacts occur at different times and are limited to only small numbers of adult migrating fish in some years, and at least some of these fish will be able to complete spawning. Therefore, we do not expect the proposed project to affect the persistence or recovery of the Pilarcitos and San Gregorio creek populations of steelhead, the San Gregorio Creek population of coho salmon, or the CCC steelhead DPS or CCC coho salmon ESU.

2.7.2. Critical Habitat

The San Gregorio and Pilarcitos project sites are critical habitat for the CCC steelhead DPS and CCC coho salmon ESU (San Gregorio site only). In our adverse modification analysis, we consider the condition of critical habitat, the potential effects of the project (completed and pending) on critical habitat, and whether or not those effects are expected to directly or indirectly diminish the value of critical habitat for the conservation of CCC steelhead or CCC coho salmon. We also consider the potential for climate change to alter conditions in the action area such that critical habitat may be affected over the duration of time we consider for this consultation. These elements (conditions of critical habitat across the DPS/ESU, in the watershed, and in the action area; effects of the project on critical habitat, and effects of climate change on critical habitat) are considered further below.

Across the CCC steelhead DPS and CCC coho salmon ESU, critical habitat has been degraded by habitat alteration and development. While conditions vary throughout, critical habitat is generally impaired by habitat alteration and fragmentation, water diversion, and groundwater extraction. These factors also affect CCC steelhead and CCC coho salmon critical habitat in San Gregorio and Pilarcitos creeks, which have been impaired by bank stabilization, urban and agricultural development, dam construction, and forestry practices. Both watershed-wide factors and action area-specific factors affect critical habitat in the action area leading to reduced habitat complexity and accessibility, poor substrate quality, increased water temperatures, and limited juvenile rearing habitat.

Regarding future climate change effects in the action area, California could be subject to higher average summer air temperatures and lower total precipitation levels. Reductions in the amount of snowfall and rainfall would reduce streamflow levels in Northern and Central Coastal Rivers. For these projects, in-water activities would occur on a short-term basis; thus, the above effects of climate change are not likely to be detected within that period. If the effects of climate change are detected over the short term, they will likely materialize as moderate changes to the current climate conditions within the action area. As discussed above, climate change could modify water quality, stream flow levels, rearing habitat, and salmonid migration over the long-term. Because the overall reduction in rearing and migration habitat quality cause by the project is minor, or limited to a small area of the watersheds, even if climate change reduced the overall habitat quality in the future, when combined with this proposed action any amplification in habitat degradation will be very small.

Effects to critical habitat from the proposed project are expected to include temporary impacts during construction activities, and altered habitat conditions post-construction from reduced riparian vegetation, removal of a logjam, and permanent habitat loss from RSP. During dewatering activities, forage supporting juvenile development will be diminished at each site for up to 5.5 months, and salmonid rearing habitat at each site will be reduced in area equal to the dewatered areas for up to 4 months. Critical habitat at the sites will also suffer reductions in

vegetation associated cover and forage during the construction and revegetation timeframe of 5-10 years. These reductions will diminish the quality of salmonid freshwater rearing and adult forage sites at each site during the 5-10 year construction and revegetation timeframe. The installation and permanent placement of RSP at both sites will maintain degraded migration critical habitat PBFs and further degrade the available rearing critical habitat PBFs at that site. The project as a whole is therefore expected to degrade migrating and rearing critical habitat PBFs in the action area by precluding natural fluvial and geomorphic processes within the action area for the foreseeable future. However, the overall degradation of migration and rearing PBFs in the action area is minor or of limited extent and suitable migration and rearing opportunities will remain. When added to the environmental baseline, cumulative effects, species status, the effects to critical habitat from the proposed action are not expected to appreciably reduce the quality and function of critical habitat at the larger CCC steelhead DPS or CCC coho salmon ESU.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is likely to jeopardize the continued existence of CCC steelhead and CCC coho salmon, and destroy or adversely modify its designated critical habitat.

2.9. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take 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). "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 and CCC coho salmon is likely to occur during fish relocation and dewatering of Pilarcitos and San Gregorio creeks between June 15 and October 15. 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 dewatered portion of Pilarcitos and San Gregorio creeks 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 47 juvenile steelhead are expected to be present within the 50 linear foot dewatered reach of San Gregorio Creek, NMFS expects no more than two juvenile CCC steelhead will be harmed or killed by the project. If more than 47 juvenile steelhead are captured or more than two juvenile steelhead are harmed or killed, incidental take will have been exceeded. Because no more than 12 juvenile steelhead are expected to be present within the 200 linear foot dewatered reach of Pilarcitos Creek, NMFS expects no more than one juvenile steelhead will be harmed or killed by the project. If more than 12 juvenile steelhead are captured or more than one juvenile steelhead are harmed or killed, incidental take will have been exceeded.

Similarly, the number of CCC coho salmon that may be incidentally taken during dewatering and fish handling activities is expected to be low, and will be limited to the pre-smolt/young-of-the-year juvenile life stage. NMFS expects no more than five juvenile coho salmon will be present within the 50 linear foot dewatered reach. NMFS does not expect that any juvenile CCC coho salmon will be harmed or killed by the project. If more than five juvenile coho salmon are captured, or any juvenile coho are harmed or killed, incidental take will have been exceeded.

Installation of RSP will also likely result in incidental take of juvenile CCC coho salmon, juvenile CCC steelhead, adult CCC coho salmon, and adult CCC steelhead. However, quantifying the number of fish harmed is difficult, given the complex and variable components at play. Individual fish behavior, and how that behavior adapts to evolving habitat conditions, will primarily influence how many fish will be impacted by the proposed action, and to what degree. In this circumstance, NMFS cannot provide an amount of take that would be caused by the proposed action. In instances such as this, NMFS designates the expected level of take in terms of the extent of take allowed. Here, the best available indicators for the extent of take is related to:

1) the area of habitat lost due to stabilizing the stream bank and arresting natural fluvial and geomorphic processes; and
2) the reductions in adult passage opportunities at the Pilarcitos and San Gregorio bridge sites as indicated by hydraulic conditions (e.g. velocity and depth).

These variables are directly proportional to the extent and nature of adverse effects attributable to this proposed action. Therefore, for harm associated with RSP installation along Pilarcitos and San Gregorio creeks, the linear length of RSP and the fish passage assessment results will serve as an effective take indicator. Specifically, the anticipated take will be exceeded if:

1) the total distance of RSP is longer than 190 feet on the north bank, 155 feet on the south bank at Pilarcitos Creek, and 95 feet at San Gregorio Creek;
2) adult fish passage opportunities at the Pilarcitos Creek site are reduced to less than 74% of the 50-1% exceedance flows, as determined by utilizing the methodology described in Sections 2.1 and 2.5.5 of this biological opinion;
3) juvenile fish passage conditions at the Pilarcitos Creek site are rendered impassable at streamflows between 10-18 cfs, as determined by utilizing the methodology described in Sections 2.1 and 2.5.5 of this biological opinion; and
4) adult fish passage opportunities at the San Gregorio Creek site are reduced to less than 73% of the 50-1% exceedance flows, as determined by utilizing the methodology described in Sections 2.1 and 2.5.5 of this biological opinion.

These take indicator operates as an effective reinitiation trigger because Caltrans has authority to conduct compliance inspections and to take actions to address non-compliance during post-construction.

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 or destruction or adverse modification of critical habitat.

2.9.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary 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 and juvenile CCC coho salmon:

1) Undertake measures to ensure that injury and mortality to salmonids resulting from fish relocation and dewatering activities is low;
2) Undertake measures to minimize harm to salmonids 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

The terms and conditions described below are non-discretionary, and Caltrans or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). Caltrans or any contractor 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 allow any NMFS employee(s), or any other person designated by NMFS, to accompany field personnel to visit the project sites during activities described in this opinion.
   b) Caltrans or the contractor will retain qualitied 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 working on this project be 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: http://www.nwr.noaa.gov/ ESA-Salmon-Regulations-Permits/4d Rules/upload/electro2000.pdf.
   c) The biologists 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 biologists 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 707-575-6068 or elena.meza@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 for each species collected at each project site, at which time NMFS will stipulate measures to reduce the take of salmonids.

d) 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-year form 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.

e) If any steelhead or salmon are found dead or injured, the biological monitor will contact NMFS staff at 707-575-6068 or elena.meza@noaa.gov. The purpose of the contact is to review the activities resulting in take, determine if additional protective measures are required, and to ensure appropriate collection and transfer of salmonid mortalities and tissue samples. All salmonid mortalities will be retained. Tissue samples are to be acquired from each mortality per the methods identified in the NMFS Southwest Fisheries Science Center Genetic Repository protocols (contact the above NMFS office at the phone number provided) and sent to: NOAA Coastal California Genetic Repository, Southwest Fisheries Science Center, 110 McAllister Way, Santa Cruz, California 95060.

f) 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) Caltrans shall provide 30, 60, 90, and 100% design plans of the channel design to NMFS for review and comment. At a minimum, Caltrans shall provide to NMFS: plan, profile, cross-sections, hydraulic modeling results, findings from project analyses, methods of construction, and all relevant construction detail drawings of the channel design. Caltrans shall provide a minimum of 45 calendar days to review and develop comments regarding the draft design plans. Draft design plans should be sent to Elena Meza at elena.meza@noaa.gov.

b) 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 and coho salmon. 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.

c) 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).

d) 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 removed the affected soils.
e) Once construction is completed, all project-introduced material must be removed, leaving the river as it was before construction. Excess materials will be disposed of at an appropriate disposal site.
f) Implement habitat-forming features into RSP and other hardscape that minimizes habitat-altering effects. Specific examples include:
    i) Keep large trees that must be removed intact with their root wads to improve their function as LWD;
    ii) Use large trees removed onsite for habitat restoration, and/or make them available for a separate habitat restoration project(s) as a source of instream LWD; and
g) The final design at the Pilarcitos Creek site shall:
    i) Reduce the proposed footprint of RSP at the upstream corners of both piers 2 and 3, including both rounding the corners of the RSP and retracting and configuring the RSP to more closely follow the contour of the existing channel and bank. In particular, the upstream corner of the RSP at pier 3 should be configured in a way not to increase shear stress in this area and reduce the propensity of the RSP at this corner to push flow towards pier 2, as it currently is configured in designs presented in the BA.
    ii) Install flow alignments structures that are designed to keep the channel thalweg towards the channel centerline and away from the toe of RSP at either pier 2 or 3. These structures could include either rock groin and/or LWD structures. LWD structures have the advantage of providing significantly higher habitat value. Due to the relatively narrow width of alluvial material between the RSP at pier 2 and 3 and the long stream length of proposed RSP along both piers, NMFS anticipates that multiple flow training structures will be needed to prevent the thalweg from scouring to the toe of either pier 2 or 3. At least one structure is expected to be needed upstream of the proposed RSP to help control flow direction at the entrance to the crossing, and additional structures are likely needed along the length of or embedded into the RSP to bounce flow back away from the RSP.
    iii) Reduce the likelihood that the RSP along pier 3 will become exposed, including lowering the elevation of the proposed RSP so that it is deeper and closer to the pile cap. The annotated design cross-section (Enclosure C additional information) shows that the elevation of the proposed RSP on pier 3 is substantially higher in elevation than the RSP at pier 2. The RSP at pier 3 is drawn as 2 to 3' above the existing channel thalweg, and 3 to 4' above the pile cap that it is primarily trying to protect. While the proposed RSP at pier 3 is depicted as currently being subsurface relative to the existing ground surface, there is a reasonably high likely that it could be exposed during the life of the project, in part due to the additional channel constriction the proposed project would force. Should the RSP at pier 3 become exposed, it will likely further accelerate erosion and scour at the site.
h) The final design at the San Gregorio site shall:
    i) Ensure the footprint of the upstream corner closely follows the contour of the

upstream bank by retracting the amount of the RSP that protrudes into the channel at the upstream end, and reducing the angle at the upstream corner.

ii) Place a flow redirection component upstream of the RSP that extends from the bank at a downstream angle with the tip of the flow-training element protruding into the channel just beyond the RSP footprint, if the modifications in (h)(i) above are insufficient to shift flow and scouring forces away from the proposed RSP.

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 for each project site. 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:

d) **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 address the source of the performance problems.

e) **Topographic Survey** – Caltrans shall obtain a topographical survey of the channel thalweg at Pilarcitos Creek, and submit results of the survey to NMFS within 30 calendar days of completion of the survey. The survey should be approximately 20 times the channel bankfull width, extending equal distances up- and downstream of the project. The topographic survey shall possess sufficient details to quantify pool depths, hydraulic drops, headcuts, and any other information NMFS believes is necessary to validate our understanding of the implications of the project for threatened steelhead and critical habitat for this species.

f) **Fish Passage Conditions Monitoring** - Caltrans must develop and submit for NMFS' review a plan to assess salmonid fish passage conditions in the action area. A draft of the 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 fish passage conditions 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 velocity, depths, hydraulic drops, and other information necessary to evaluate fish passage conditions, as determined by NMFS, and any maintenance necessary to improve conditions. Photographs must be included. If poor conditions are documented, the report must include recommendations to improve conditions.

2.9.5. 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).

1. Caltrans implements programs and leads fish passage advisory committees, collaborating with stakeholders throughout California to identify, remediate, and remove fish passage barriers within the California highway system. NMFS values these efforts, notes their ongoing success, and recommends that Caltrans continue this work with NMFS, California Department of Fish and Wildlife, United States Fish and Wildlife Service, and the San Francisco Bay Water Quality Control Board to remedy fish passage impediments, and improve instream access for anadromous salmonids throughout California.

2.10. Reinitiation of Consultation

This concludes ESA consultation for the San Mateo State-Route 1 (SR-1) and SR-84 Structures and Scour Mitigation Project.

As 50 CFR 402.16 states, 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 if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) 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 (4) a new species is listed or critical habitat designated that may be affected by the action.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA , EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)]

This analysis is based, in part, on the EFH assessment provided by Caltrans and descriptions of EFH for Pacific Coast salmon (PFMC 2014) contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

Pacific Coast Salmon EFH may be adversely affected by the proposed action within the San Gregorio portion of the action area.

3.2. Adverse Effects on Essential Fish Habitat

The potential adverse effects of the project on EFH for Pacific Coast Salmon have been described in the preceding biological opinion and include temporary minor disturbances to the streambed, bank, and flow from project site dewatering; temporary elevated turbidity levels from suspended sediment and degraded water quality; loss of riparian vegetation; and streambank habitat degradation and preclusion of natural fluvial and geomorphic channel dynamics, and impaired fish passage. As described in the biological opinion above, the project site dewatering and turbidity effects are anticipated to be temporary and minor due to the small amount of area impacted relative to the total quantity of habitat available in the action area. The project includes measures to protect water quality in the action area, and although riparian vegetation will be degraded, in-kind on-site revegetation of native trees will occur to replace vegetation lost during construction activities to restore the area. However, the streambank habitat degradation, preclusion of natural fluvial and geomorphic channel dynamics, and impaired fish passage will persist into the future.

3.3. Essential Fish Habitat Conservation Recommendations

Based on information developed in our effects analysis (see preceding biological opinion), NMFS has determined that the proposed action would adversely affect EFH for federally managed CCC coho salmon within the Pacific Salmon FMP. Section 305(b)(4)(a) of the MSA authorizes NMFS to provide EFH Conservation Recommendations that will minimize adverse effects of an activity on EFH. Although adverse effects are anticipated as a result of the proposed project, the proposed minimization and avoidance measures, and best management practices in the accompanying biological opinion are sufficient to avoid, minimize, and/or mitigation for the anticipated affects. Therefore, no additional EFH Conservation Recommendations are necessary at this time that would otherwise offset the adverse effects to EFH.

3.4. Supplemental Consultation

Caltrans must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. 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.

4.1. 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 two weeks at the NOAA Library Institutional Repository. The format and naming adheres to conventional standards for style.

4.2. 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.

4.3. 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 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 and EFH consultation *c*ontain 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 MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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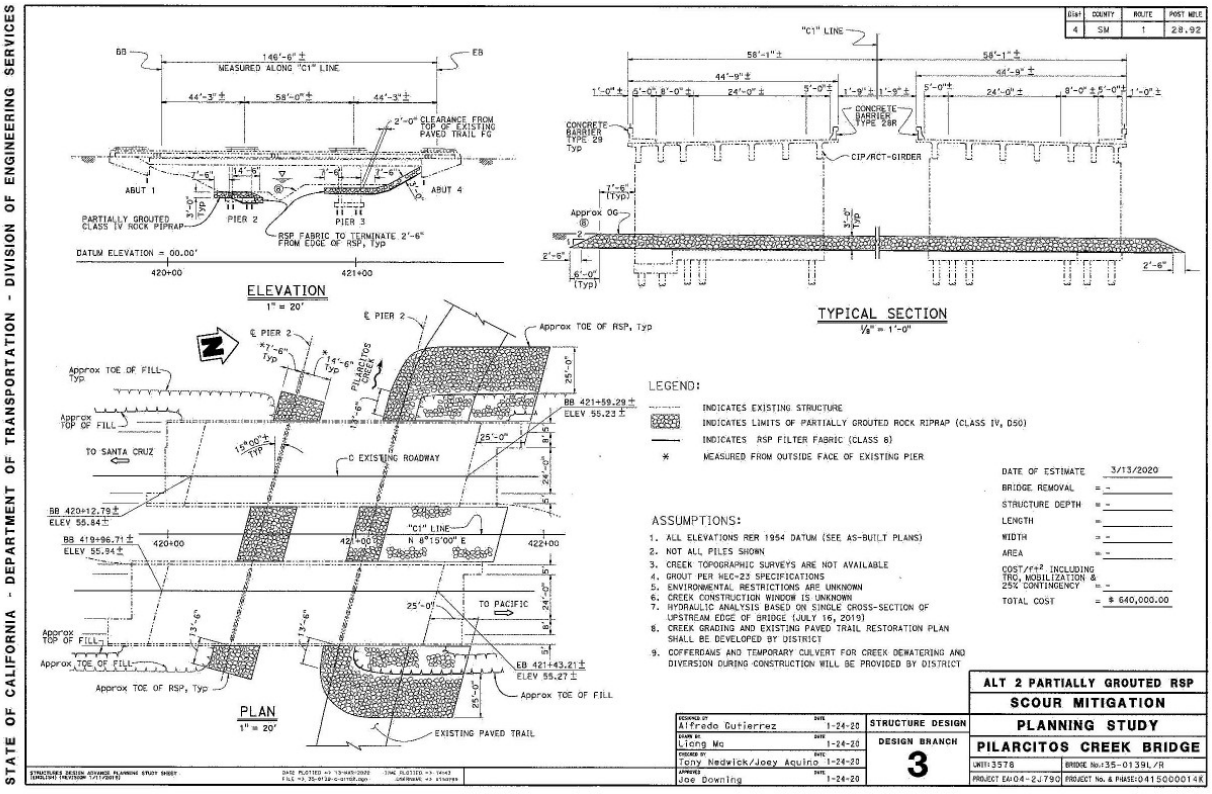
6. APPENDICES

6.1. Appendix A: Pilarcitos Creek Scour Protection Construction Plan Sheet



6.2. Appendix B: San Gregorio Creek Scour Protection Construction Plan Sheet