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

January 27, 2021 **Refer to NMFS No:** WRCO-2020-02001

Connor Ritchie
Environmental Planner/Biologist
California Department of Transportation, District 5
50 Higuera Street
San Luis Obispo, California 93401-5414

Re: Endangered Species Act Section 7(a)(2) Biological Opinion for the Refugio Bridge Replacement Project at SR-101 in Santa Barbara County (EA: 05-1C950)

Dear Mr. Ritchie,

On July 22, 2020, NOAA's National Marine Fisheries Service (NMFS) received the California Department of Transportation's (Caltrans) request for formal consultation under Section 7 of the U.S. Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.). This request concerns the Refugio Creek Bridge replacement at SR-101 and associated fish passage improvements. The proposed action is within range of the Southern California (SC) Distinct Population Segment (DPS) of steelhead (*Oncorhynchus mykiss*) and designated critical habitat for the species. This consultation was conducted in accordance with the 2019 revised regulations that implement Section 7 of the ESA (50 CFR 402, 84 FR 45016).

The biological opinion concludes that the proposed action is not likely to jeopardize the continued existence of the endangered SC DPS of steelhead or destroy or adversely modify its designated critical habitat. NMFS believes the proposed action is likely to result in incidental take of steelhead, therefore, the attached incidental take statement includes the amount and extent of anticipated incidental take with reasonable and prudent measures and non-discretionary terms and conditions to minimize and monitor incidental take of endangered steelhead.

Please contact Jess Fischer in Long Beach, California at jessica.fischer@noaa.gov or (562) 533-6813 if you have a question concerning this consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: John Wooster, NMFS (john.wooster@noaa.gov)
Copy to E-File: ARN 151422WCR2020CC00158

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

Refugio Bridge Replacement Project

NMFS Consultation Number: WCRO-2020-02001
Action Agency: California Department of Transportation

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?
Southern California steelhead (*Oncorhynchus mykiss*)	Endangered	Yes	No	Yes	No

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

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: January 27, 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 USC 1531 et seq.), and implementing regulations at 50 CFR 402, as amended.

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 [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at NMFS' California Coastal Office, Southern California Branch in Long Beach, California.

1.2 Consultation History

On July 22, 2020, NMFS received from the California Department of Transportation (Caltrans) a written request for formal consultation under Section 7 of the ESA for the Refugio Bridge Replacement Project at SR-101 in Santa Barbara County. Caltrans' written request included a biological assessment (BA) describing the effects of the proposed action on endangered Southern California steelhead (*Oncorhynchus mykiss*) and designated critical habitat for the species in Refugio Creek. Following review of the consultation request and BA, NMFS requested more information in a letter dated August 7, 2020. On August 28, 2020, NMFS received Caltrans' letter responding to our letter with additional information including a longitudinal profile. Caltrans and NMFS participated in a conference call on September 22, 2020, to discuss the possibility of incorporating additional naturalization to the proposed channel design. The uniform-weir design was discussed as well and NMFS suggested an alternating roughened ramp and long-pool design as an alternative. Over the following week, Caltrans provided the information requested during the call, several hydraulic models, photographs, and videos of Refugio Creek, and consultation was initiated on September 28, 2020.

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).

1.3.1 Overview of Proposed Action

Caltrans proposes to replace both the northbound and southbound bridges on State Route (SR) 101 (#51-0215R and #51-0215L) over Refugio Creek between post miles 36.0 and 37.0 due to alkali-silica reactive aggregate being found in the concrete. The project also involves channel modifications in an effort to improve endangered steelhead migration within the action area. Construction will occur during three seasons, with instream construction being confined to June 1 through October 31 of a given year. Each of the first two years will involve demolition and construction of one of the Refugio bridges and the third season will focus on fish passage

modifications. Best-management practices (BMP) are incorporated into the proposed action and will be implemented when bridge-construction activities are undertaken.

1.3.2 Proposed Activities to Prepare the Work Area for Construction

Prior to finalizing design plans, geotechnical drilling will be conducted at Refugio Creek. Three borings will be drilled; one next to each of the abutments and one next to the center columns. All three borings will occur outside the creek and will be backfilled with a grout and water mixture and sealed.

To prepare for construction in dry conditions, the work area will be temporarily isolated from flowing water and steelhead within the affected area will be relocated. Caltrans proposes to evaluate relocation sites based on water quality, cover, and living space, though the specific parameters are not provided. Sites will be chosen to minimize overcrowding. Steelhead will be captured via dip-net or seine and transported by buckets pre-filled with water at an appropriate temperature.

Temporary clear-water stream diversions will be installed each season to pass upstream flows around the active construction zone. Caltrans has not specified the parameters of the diversion, though it will likely include a diversion pipe covered by clean washed gravel wrapped in plastic sheeting, which will also cover the creekbed. Temporary diversions may also include pumps and cofferdams, depending on the site conditions. Vegetation will be cleared for creek access.

During the first year, approximately 400 feet of stream will be dewatered in the uppermost reach where channel work will occur. An access road will be used to transport equipment to this section of stream. Downstream, the creek will remain untouched until the creek reaches the southbound bridge where an additional 200 feet of creek will be temporarily dewatered with a diversion for demolition and construction of the bridge. The diversion will consist of a check dam connected to a diversion pipe under the SR-101 bridges. Clean washed gravel wrapped in plastic sheeting will be placed on top of the diversion pipe and creekbed for protection from falling debris. Access to the portion of creek under the southbound bridge will be accessed via Refugio Road adjacent to the creek.

During the second year, Refugio Creek will be diverted from the downstream side of the previous year's dewatered area for channel work for approximately 550 feet to include the area involving demolition and construction of the northbound bridge. Fish-passage improvements and bridge construction will occur within this area. During the third year, approximately 350 feet of creek will be dewatered from the downstream edge of the previous diversion to the box culvert at the downstream boundary of the project.

In general, areas of the creek where demolition and construction will occur will utilize a diversion pipe while areas subject to channel work will be dewatered. For dewatering a section of creek, a check dam will be installed upstream of where fish passage improvements will occur that year and a bypass pump will be used to dewater the work area. The pump will be placed just upstream of the dam and screened. A secondary pump may be placed just downstream of the dam to capture any water passing through the dam, though will likely not be necessary due to low or lack of creek flow expected at the time of construction. This will be necessary for equipment access and ease of work within the channel where a diversion pipe would otherwise be in the way. Water that passes through the pumps will be allowed to settle and filter in a Baker

tank before being returned to the creek downstream of the fish passage construction. If there is enough water where steelhead may be present, block nets will be placed upstream of the check dam to further exclude individuals from the dewatered area. If water levels are unusually high, a diversion pipe may be needed in place of a pumped configuration.

Diversion pipes will be used through the areas where bridge demolition and construction will occur. The pipe and concrete lining of the channel will be protected with washed gravel wrapped in thick plastic sheeting to cushion the impact of falling concrete. Following demolition, the debris, gravel fill, and plastic sheeting will be removed from the creek. If the creek lining is damaged during this process, it will be repaired with cement.

Any pools remaining in the dewatered and diverted areas will be dip netted for juvenile steelhead. After all steelhead have been relocated, the remaining pools will be dewatered with a screened pump into a Baker-tank system for filtration and returned to the creek downstream of the dewatered area.

Several utilities will be relocated or protected in place prior to construction, though it has not yet been determined which utilities may be present within the action area. Dewatering and vegetation removal will result in 17,903 ft^2 (0.411 acres) of temporary impacts to designated critical habitat for endangered steelhead.

Caltrans proposes to implement the following BMPs as part of the proposed action:

- Prior to installing surface-water diversions, a biologist shall conduct an environmental training for onsite workers. This training will include a description of steelhead, and avoidance and minimization measures to be implemented during the project.
- During instream work, a biologist shall be retained with experience in steelhead biology and ecology, aquatic habitats, biological monitoring, and capturing, handling, and relocating fish species. The biologist will continuously monitor placement and removal of stream diversions to capture (e.g., dip-net, seine-net, etc.) and relocate stranded steelhead to suitable habitat. The biologist shall note the number of steelhead observed in the affected area, the number of steelhead relocated, and the date and time of collection and relocation.
- During instream work, if pumps are incorporated, intakes shall be completely screened with no larger than 0.2-inch (5 mm) wire mesh to prevent steelhead from entering the pump system. Pumps shall release additional water to a silt filtration bag and settling basin, allowing the suspended sediment to settle out prior to re-entering the stream. The form and function of all pumps used during the dewatering activities shall be checked daily to ensure a dry work environment and minimize adverse effects to steelhead and critical habitat.
- Dewatering shall be limited to the low-flow period between June 1 and October 31.

1.3.3 Proposed Construction Activities

1.3.3.1 Bridge Construction

During the first year, the southbound bridge will be saw cut and demolished. The center columns will be excavated to 3 feet below the finish grade of the pedestrian path and capped with fill materials. The excavation footprint (5x18 feet) will result in minor disturbances to the

creek banks and concrete-grouted rock-slope-protection (RSP). The abutments will be excavated to 15-20 feet below grade with temporary sheet piling around the excavations. The existing piles will be abandoned in place. Pile driving will be used to install support piles at each of the four bridge abutments located more than 100 feet from the creek. Sound equivalent levels (SEL) will remain below 150dB and are not expected to cause injury to steelhead. Piles will be 16-inch steel piles filled with reinforced concrete; an estimated 69 piles will be required for each abutment, totaling 276 piles for both bridges. Falsework will be used to construct the bridge soffit and removed after construction of the bridge is completed.

During the second year of construction, the northbound bridge will be demolished and built using the same methods. The new bridges will be 7feet wider than the existing bridges and the new abutments will be closer to the creek than existing. Caltrans' hydraulic study determined encroachments created by the project would not affect 100-year flood conditions upstream or downstream of the project.

1.3.3.2 Channel Modifications

Fish-passage modifications will be made over 975 feet of Refugio Creek with approximately 350 feet being worked on each year. The partial barrier caused by the concrete-grouted RSP within the creek will be removed and the bottom of the creek will be naturalized. An estimated 907 linear feet (23,087 ft^2) of RSP will be removed from the channel.

The grouted RSP along banks will remain to prevent scour, though the lower 350 feet will be replaced. Caltrans considered a bioengineering approach for the creek banks, but due to the banks being composed of highly erosive soils and the sheer stress caused by 100-year storm events in Refugio, it was determined that bioengineering solutions would fail and ultimately jeopardize the bridge and associated structures.

Stone and gravel will be used to create 32 ungrouted rock weirs that will create areas with slow-moving water and resting pools. Large boulders will be placed in arches pointing upstream and anchored at adequate depth to resist scour. Additional rock material will be placed between the weirs, below the new creekbed material. The edges of the rock weirs will be keyed into a continuous rock toe that will be placed along the length of the creek. The rock toe will be grouted to the existing RSP lining the banks to ensure stability of the toe. Improvements should restore fish passage for all life stages of steelhead within the project limits, though Caltrans does not provide how effectiveness will be verified.

Caltrans proposes to implement the following BMPs for the channel modifications and bridge replacements as part of the proposed action:

- When onsite, the biologist shall evaluate erosion and sediment controls to identify and correct any conditions that could adversely affect steelhead or critical habitat. The biologist shall recommend measures to avoid and minimize adverse effects as needed.
- All hazardous materials spills within the project site shall be cleaned immediately with readily accessible spill prevention and cleanup materials that will be kept on-site at all times.
- Cleaning and refueling of equipment and vehicles will occur within a designated staging area located a minimum of 100 feet from the creek or if the area is less than 100 feet from aquatic areas the area will be surrounded by barriers (e.g. fiber rolls or equivalent). All

equipment and vehicles will be checked and maintained daily to ensure proper operation and avoid potential leaks or spills.

- All refueling, maintenance, and staging of equipment and vehicles, along with all herbicides, fuels, and lubricants to be stored, poured, or refilled, will occur at least 60 feet from riparian habitat or water bodies to avoid spills draining directly toward aquatic habitat. Stationary equipment that would be infeasible to stage greater than 60 feet from riparian habitat will be fitted with additional secondary containment in an exemption to the above condition. The biologist shall ensure contamination of habitat does not occur during operations.

1.3.4 Proposed Post-Construction Activities

Caltrans will develop a Landscape Architecture Planting plan and a Mitigation and Monitoring plan with a 1:1 mitigation ratio for temporary impacts, and a 3:1 ratio for permanent impacts. Riparian trees will be planted along creek to provide shade to the creek. In addition, a 2-acre planting easement will be acquired for mitigation planting in Refugio Creek to coincide within the limits of the existing 140-ft wide Caltrans drainage easement.

Because the existing pedestrian path under the bridge parallel to Refugio Road is expected to be damaged during demolition, following construction of the new bridges, the pathway will be reconstructed to current standards.

Following completion of construction activity, Caltrans shall provide NMFS a written summary of work performed, BMPs implemented, and supporting photographs. Documentation describing steelhead surveys and re–location efforts will include name(s) of the biologist(s), location and description of area surveyed, time and date of survey, all survey methods used, a list and tally of all steelhead observed, and a detailed discussion of capture and relocation efforts.

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 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.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of endangered steelhead 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 Status of the Species

The endangered southern California (SC) Distinct Population Segment (DPS) of steelhead extends from the Santa Maria River in Santa Barbara County to the Mexican border (inclusive). NMFS characterized the abundance of steelhead in the DPS when the species was originally listed (August 18, 1997, 62 FR 43937) and cited this information as the basis for the re-listing of the SC DPS of steelhead as endangered (May 3, 2006, 71 FR 834). Estimates of historical (pre-1960s) and more recent (1997) abundance show a precipitous drop in numbers of spawning adults for major rivers in the southern California DPS. An updated status report states that the chief causes for the numerical decline of steelhead in southern California include urbanization, water withdrawals, channelization of creeks, human-made barriers to migration, and the introduction of exotic fishes and riparian plants (Good et al. 2005), and the most recent viability assessments and status reviews indicate these threats are essentially unchanged (NMFS 2011; Williams et al. 2011; NMFS 2016; Williams et al. 2016). Historical data on steelhead numbers for this region are sparse. The historic and recent steelhead abundance estimates, and percent decline are summarized in Table 1. The run-size estimates illustrate the severity of the numerical decline for the major rivers within range of the SC DPS of steelhead (Good et al. 2005; NMFS 2011; Williams et al. 2011; NMFS 2016; Williams et al. 2016).

Stream surveys to document the species' current pattern of occurrence concluded that of the 46 watersheds in the DPS which steelhead occupied historically, *O. mykiss* currently occupy only about 40% to 50% of these watersheds (Boughton et al. 2005). Fish surveys by NOAA's Southwest Fisheries Science Center (SWFSC), direct observations by NMFS biologists, and anecdotal information from local biologists working on major rivers and creeks throughout the DPS suggest that although steelhead populations continue to persist in some coastal watersheds, the population numbers are exceedingly small (Good et al. 2005; Williams et al. 2011; Williams et al. 2016). On a positive note, there have been observations of steelhead recolonizing vacant watersheds during years with abundant rainfall, notably San Mateo Creek and Topanga Creek (Good et al. 2005; Bell et al. 2011) including a recent observation of *O. mykiss* in San Mateo Creek (NMFS 2017). Also, California Department of Fish and Wildlife discovered an adult female steelhead (TL 57.46 cm) on April 26, 2013, during a flow-rate survey in Conejo Creek (Camarillo, California).

NMFS reviews the status and viability of the SC DPS of steelhead on the basis of available information (including new information) about the species abundance, population growth rate, spatial structure, and diversity (McElhany et al. 2000) every five years as required by the ESA. In the last two status reviews, NMFS concluded that the risk of extinction of the endangered SC DPS of steelhead was unchanged (NMFS 2011, 2016).

Table 1. Historical and recent abundance estimates of adult steelhead in the Southern California DPS. Data are from Good et al. (2005); (NMFS 2011), and NMFS SWR redd surveys 2009-2011 (R. Bush, NMFS, personal communication).

	Pre-1950	Pre-1960	1990s	2000s	Percent Decline
Santa Ynez River	20,000-30,000		< 100		99
Ventura River		4,000-5,000	< 100	< 100	96
Santa Clara River		7,000-9,000	< 100	< 10	99
Malibu Creek		1,000	< 100		90

2.2.1.1 General Life History of Steelhead

O. mykiss possess an exceedingly complex life history (Behnke 1992). Distinctly different than other Pacific salmon, steelhead adults can survive their first spawning and return to the ocean to reside until the next year to reproduce again. For returning adults, the specific timing of spawning can vary by a month or more among rivers or streams within a region, occurring in winter and early spring. The spawning time frames depend on physical factors such as the magnitude and duration of instream flows and sand-bar breaching. Once they reach their spawning grounds, females will use their caudal fin to excavate a nest (redd) in streambed gravels where they deposit their eggs. Males will then fertilize the eggs and, afterwards, the females cover the redd with a layer of gravel, where the embryos (alevins) incubate within the gravel. Hatching time can vary from approximately three weeks to two months depending on surrounding water temperature. The young fish (fry) emerge from the redd two to six weeks after hatching. As steelhead begin to mature, juveniles or "parr" will rear in freshwater streams anywhere from 1-3 years. Juvenile steelhead can also rear in seasonal coastal lagoons or estuaries of their natal creek, providing over-summering habitat.

Juvenile steelhead emigrate to the ocean (as smolts) usually in late winter and spring and grow to reach maturity at age 2-4, but steelhead can reside in the ocean for an additional 2-3 years before returning to spawn. The timing of emigration is influenced by a variety of parameters such as photoperiod, temperature, breaching of sandbars at the river's mouth and streamflow. Extended droughts can cause juveniles to become landlocked, unable to reach the ocean (Boughton et al. 2006).

Through studying the otolith (ear stone) microchemistry of *O. mykiss*, researchers further understand the complex and intricate life history of steelhead. Specifically, resident rainbow trout can produce steelhead progeny; likewise, steelhead can yield resident rainbow trout progeny (Zimmerman and Reeves 2000). Additionally, evidence indicates that sequestered populations of steelhead (e.g., above introduced migration barriers) can exhibit traits that are the same or similar to anadromous specimens with access to the ocean. Examples include inland resident fish exhibiting smolting characteristics and river systems producing smolts with no regular access for adult steelhead. This evidence suggests the ecological importance of the resident form to the viability of steelhead and the need to reconnect populations upstream and downstream of introduced migration barriers. The loss or reduction in anadromy and migration of juvenile steelhead to the estuary or ocean is expected to reduce gene flow, which strongly influences population diversity (McElhany et al. 2000). Evidence indicates genetic diversity in populations of southern California steelhead is low (Girman and Garza 2006).

2.2.1.2 Steelhead Habitat Requirements

Habitat requirements of steelhead generally depend on the life history stage. Steelhead encounter several distinct habitats during their life cycle. Water discharge, water temperature, and water chemistry must be appropriate for adult and juvenile migration. Suitable water depth and velocity, and substrate composition are the primary requirements for spawning. Furthermore, dissolved oxygen concentration, pH, and water temperature are factors affecting survival of incubating embryos. The presence of interspatial area between large substrate particle types is important for maintaining water-flow through the nest as well as dissolved oxygen levels within the nest. These spaces can become filled with sand and smaller particles. Additionally, juveniles need abundant food sources, including insects, crustaceans, and other small fish. Habitat must also provide places to hide from predators, such as under logs, root wads and boulders in the stream, and beneath overhanging vegetation. Steelhead also need places to seek refuge from periodic high-flow events (side channels and off channel areas), and may occasionally benefit from the availability of cold-water springs or seeps and deep pools during summer. Estuarine habitats can be utilized during the seaward migration of steelhead, as these habitats have been shown to be nurseries for steelhead. Estuarine or lagoon habitats can vary significantly in their physical characteristics from one another, but remain an important habitat requirement as physiology begins to change while juvenile steelhead become acclimated to a saltwater environment.

2.2.1.3 Influence of a Changing Climate on the Species

One factor affecting the rangewide status of endangered steelhead, and aquatic habitat at large, is climate change. For the Southwest region (southern Rocky Mountains to the Pacific Coast), the average temperature has already increased roughly 1.5°F compared to a 1960-1979 baseline period. High temperatures will become more common, indicating that southern California steelhead may experience increased thermal stress even though this species has shown to endure higher than preferable body temperatures (Spina 2007).

Precipitation trends are also important to consider. The Southwest region, including California, showed a 16 percent increase in the number of days with heavy precipitation from 1958 to 2007. Potential impacts to SC steelhead in freshwater streams include damage to spawning redds and washing away of incubating eggs due to higher winter stream flow (USGCRP 2009), and poor freshwater survival due to longer and warmer periods of drought (Hanak et al. 2001; Mastrandrea and Luers 2012), which may lead to lower host resistance of steelhead to more virulent parasitic and bacterial diseases (McCullough 1999; Marcogliese 2001). Snyder and Sloan (2005) projected mean annual precipitation in southwestern California to decrease by 2.0 cm (four percent) by the end of the 21st century.

Wildfires periodically burn large areas of chaparral and adjacent woodlands in autumn and winter in southern California (Westerling et al. 2004). Increased wildfire activity over recent decades reflects sub-regional responses to changes in climate, specifically observations of warmer and earlier onset of spring along with longer summer-dry seasons (Westerling et al. 2004; Westerling and Bryant 2008).

The Thomas Fire impacted SC steelhead viability through direct and indirect effects to PBF mainly in the Ventura River Watershed relative to the Santa Clara River Watershed. The fire burned nearly 80 miles of designated critical habitat. In general, fire impacts include changes in

geomorphology (e.g., sediment filled pools and riffles), decreased pool depth, increased solar radiation owing to losses in riparian cover, changes in water quality, increased dissolved nutrients and pH, and changes in pool:riffle ratios (Dunham et al. 2003; Earl and Blinn 2003; Aha et al. 2014). However, these effects may be pronounced or muted depending on the fire burn severity, timing of subsequent rainfalls (e.g., January 9, 2018, storm event), intensity and duration of ensuing rains, and volume of debris and sediment entering streams.

After a fire disturbance, decreased water quality and loss of SC steelhead habitat can be facilitated by the following physical, chemical and biological changes (USFS 2018):

- increased surface flows resulting in flooding;
- increased sedimentation leading to changes in food web structure, reducing primary productivity, with effects to grazers and other benthic macroinvertebrates and their predators (e.g., fish);
- changes to water quality and chemistry due to ash, smoke, nutrients, and hazardous materials;
- increased water temperature due to reduction/elimination of riparian cover and increased fine sediment loads;
- scouring of riparian/aquatic vegetation;
- changes in streambed/pool habitat due to geomorphic movement (debris flows);
- mass failure of culverts leading to stream habitat degradation;
- flushing and extirpation of aquatic biota with limited ability to recolonize rivers, including fish, downstream during and after flood events, respectively.

Debris flows are among the most hazardous consequences of rainfall on burned hillslopes (WERT 2018). The January 9, 2018, storm event trigged a debris flow when Matilija Canyon received approximately six inches of rain in 24 hours. This storm event initiated several debris flows within the Santa Ynez Mountains, and consequently inundated areas within Montecito and Carpinteria in Santa Barbara County. The overall peak runoff throughout impacted areas will likely increase relative to unburned areas for the 2-year and 10-year recurrence intervals.

The Thomas Fire affected 11% of total designated critical habitat within the range of the SC DPS of steelhead; burned critical habitat was mainly in the Ventura River Watershed (56%) and to a lesser degree in the Santa Clara River Watershed (18%). Indirect effects from the fire (e.g., mudflow, mudslides) likely increase the extent and amount of habitat destruction downstream to the estuary-ocean interface by altering PBF essential to the conservation of a species including a delay in development of such features, which the species relies upon during various life stages.

Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia et al. 2002). Additionally, upper ocean temperature is the primary physical factor influencing the distribution of steelhead in the open ocean, and a warming climate may result in a north-ward shift in steelhead distribution (Myers and Mantua 2013).

In summary, observed and predicted climate-change effects are generally detrimental to the species, given the unprecedented rate of change and uncertainty about the ability to adapt, so unless offset by improvements in other factors, status of the species and critical habitat is likely to decline over time. The climate change projections referenced above cover the time period between the present and approximately 2100. In general, climate change projections cannot be

distinguished from annual and decadal climate variability for approximately the first 10 years of the projection period (see Cox and Stephenson 2007). While there is uncertainty associated with projections beyond 10 years, which increases over time, the direction of change is relatively certain (McClure et al. 2003).

2.2.2 Designated Critical Habitat

Critical habitat for the SC DPS of steelhead was designated on September 2, 2005, and consists of the stream channels listed in (70 FR 52488). Critical habitat has a lateral extent defined as the width of the channel delineated by the ordinary high-water line as defined by the Corps in 33 CFR 329.11, or by its bankfull elevation, which is the discharge level on the streambank that has a recurrence interval of approximately 2 years (September 2, 2005, 70 FR 52522). PBF are components of stream habitat that have been determined to be essential for the conservation of the SC DPS of steelhead, and are specific habitat components that support one or more steelhead life stages and in turn contain physical or biological features essential to steelhead survival, growth, and reproduction, and conservation. These include:

1. **Freshwater spawning sites** with sufficient water quantity and quality and adequate substrate (i.e., spawning gravels of appropriate sizes) to support spawning, incubation and larval development.

2. **Freshwater rearing sites** with sufficient water quantity and floodplain connectivity to form and maintain physical habitat conditions and allow salmonid development and mobility; sufficient water quality to support growth and development; food and nutrient resources such as terrestrial and aquatic invertebrates and forage fish; and natural cover such as shade, submerged and overhanging large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

3. **Freshwater migration corridors** free of obstruction and excessive predation with adequate water quantity to allow for juvenile and adult mobility; cover, shelter, and holding areas for juveniles and adults; and adequate water quality to allow for survival.

4. **Estuarine areas** that provide uncontaminated water and substrates; food and nutrient sources to support steelhead growth and development; and connected shallow water areas and wetlands to cover and shelter juveniles.

5. **Marine areas** with sufficient water quality to support salmonid growth, development, and mobility; food and nutrient resources such as marine invertebrates and forage fish; and near-shore marine habitats with adequate depth, cover, and marine vegetation to provide cover and shelter.

Streams designated as critical habitat in the SC steelhead DPS contain the above PBF (PBF 1-3) in differing amounts and to varying degrees, depending on the particular stream, the characteristics of the watershed, and the degree that the watersheds are impacted by anthropogenic factors. Perennial streams with PBF and conditions suitable for steelhead are fewer in the southern portion of the DPS compared to the northern portion. Some of this is due to the amount of coastal development and because there is generally less rainfall in the southern region. During the summer many creeks at the southern edge of the range become intermittent in

sections or dry completely (in some cases this occurrence is natural and in other cases it is due to anthropogenic factors), and stream temperatures may become a factor in terms of suitability for rearing steelhead. Overall, steelhead over-summering habitat is thought to have a restricted distribution more so than winter spawning and rearing habitat in the SC steelhead DPS (Boughton et al. 2006).

Streams with high conservation value have most or all of the PBF of critical habitat and extensive areas that are suitable for steelhead spawning, rearing, and migration (NMFS 2012). Streams with medium or low conservation value are less suitable for steelhead in terms of spawning, rearing, and migration, and have less of the PBF necessary for steelhead survival growth and reproduction, generally due to anthropogenic factors. Both the Ventura River and Santa Clara River watersheds have been found to have high conservation value for the survival and recovery of the SC DPS of steelhead. While many streams in the DPS have been found to have high conservation value for survival and recovery of the species, the spawning, rearing, and migratory habitat within the DPS are heavily impacted by dams, diversions, and human development. As a result, much of the available habitat has become severely degraded, and habitat degradation has been a main contributing factor to the current endangered status of the DPS (Good et al. 2005). The most recent status reviews found that these threats have remained essentially unchanged (Williams et al. 2011; National Marine Fisheries Service (NMFS) 2016; Williams et al. 2016).

2.2.2.1 Status of Critical Habitat

Habitat for steelhead has suffered destruction and modification, and anthropogenic activities have reduced the amount of habitat available to steelhead (Nehlsen et al. 1991; NMFS 1997; Boughton et al. 2005; NMFS 2006). In many watersheds throughout the range of the SC DPS, the damming of streams has precluded steelhead from hundreds of miles of historical spawning and rearing habitats (*e.g.*, Twitchell Reservoir within the Santa Maria River watershed, Bradbury Dam within the Santa Ynez River watershed, Matilija Dam within the Ventura River watershed, Rindge Dam within the Malibu Creek watershed, Pyramid Dam and Santa Felicia Dam on Piru Creek). These dams created physical barriers and hydrological impediments for adult and juvenile steelhead migrating to and from spawning and rearing habitats. Likewise, construction and ongoing impassable presence of highway projects have rendered habitats inaccessible to adult steelhead (Boughton et al. 2005).

Within stream reaches that are accessible to this species (but that may currently contain no fish), urbanization (including effects due to water use) have in many watersheds eliminated or dramatically reduced the quality and amount of living space for juvenile steelhead. The number of streams that historically supported steelhead has been dramatically reduced (Good et al. 2005). Groundwater pumping and diversion of surface water contribute to the loss of habitat for steelhead, particularly during the dry season (e.g., NMFS 2005; see also Spina et al. 2005). The extensive loss and degradation of habitat is one of the leading causes for the decline of steelhead abundance in southern California and listing of the species as endangered (NMFS 1997, 2006).

A significant amount of estuarine habitat has been lost across the range of the DPS with an average of only 22-percent of the original estuarine habitat remaining (Williams et al. 2011). The condition of these remaining wetland habitats is largely degraded, with many wetland areas at continued risk of loss or further degradation. Although many harmful practices have been

halted, much of the historical damage remains to be addressed and the necessary restoration activities will likely require decades. Many of these threats are associated with the larger river systems such as the Santa Maria, Santa Ynez, Ventura, Santa Clara, Los Angeles, San Gabriel, Santa Ana, San Luis Rey, Santa Margarita, San Dieguito, and San Diego rivers, but they also apply to smaller coastal systems such as Malibu, San Juan, and San Mateo creeks. Overall, these threats have remained essentially unchanged for the DPS as determined by the last status review (NMFS 2016) though some individual, site specific threats have been reduced or eliminated as a result of conservation actions such as the removal of small fish passage barriers.

Climate-driven changes to stream and estuarine environments have the potential to significantly impact critical habitat for steelhead populations. Coupled with naturally stressful environments at the southern limit of the species distribution, multiple stressors are likely to be amplified by ongoing increases in temperature, changes in precipitation patterns, and decreases in snowpack (Mote et al. 2003; Hayhoe et al. 2004). Research suggests that a change in climate would be expected to shift species distributions as they expand in newly favorable areas and decline in marginal habitats (Kelly and Goulden 2008). When climate interacts with other stressors such as habitat fragmentation, additional threats to natural resources will likely emerge (McCarty 2001), including threats to the viability of steelhead populations. In particular, seasonal access to perennial, cool water habitats, especially smaller streams at higher elevations, will likely become more important to endangered salmonids seeking refuge from unsuitable temperature and streamflow (Crozier et al. 2008).

While continued changes in climate are highly likely, estimating the magnitude of the change is more difficult the further into the future one must go. For example, increases in air temperatures globally are more certain than increases in air temperature in a particular watershed in California. Increases in global air temperatures may shift wind patterns, and these changes, in combination with regional topography, may affect how air temperatures in a particular watershed change in relation to changes in global air temperatures.

Environmental monitoring data in the southwestern United States indicate changes in climatic trends that have the potential to affect steelhead critical habitat. Southern California is also experiencing an increasing trend in droughts, measured by the Palmer Drought Severity Index from 1958 to 2007 (USGCRP 2009). Snyder and Sloan (2005) project mean annual precipitation in central western California will decrease by about 3-percent by the end of the century. Small thermal increases in summer water temperatures have resulted in suboptimal or lethal habitat conditions and consequent reductions in *O. mykiss* distribution and abundance in the northwestern United States (Ebersole et al. 2001). Thus, climate variability is an important factor in evaluating how the status of the species and critical habitat is influenced by changing climate.

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 proposed action will take place in Refugio Creek which is designated critical habitat for endangered SC steelhead. The action area includes the linear extent (upstream and downstream) of the SR-101 bridges at Refugio Creek, the extent of RSP upstream of the bridges, and encompasses the riparian corridor to the top of the bank. The grouted RSP lining in this section of Refugio Creek measures

approximately 35 feet wide and 10 feet deep. The action area extends approximately 675 feet upstream of the northbound bridge where the grouted RSP begins, and 500 feet downstream of the double box culvert downstream of the southbound bridge and diversion where temporary sedimentation effects due to the proposed action are anticipated to cease. The approximate length of Refugio Creek in the action area is 1,475 feet. This section of creek is expected to have little to no flow during the time of the proposed action due to the intermittent nature of the creek.

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 Status of Steelhead in the Action Area

Steelhead are expected to be in low abundance in the action area. Surveys and incidental sightings since the 1970s have observed individuals at various locations, though mostly in the lower portion of the creek (Stoecker and CCP 2002; Boughton and Fish 2003). Up until the 1950s, steelhead were regularly observed in Refugio Creek (Stoecker and CCP 2002). During wetter years that sustain flow over temporal barriers there is a potential for steelhead to migrate into the action area. Allowing for variability with flow conditions and production within the stream, NMFS estimates that there may be up to 20 juvenile steelhead present in the area to be dewatered each year. Adult steelhead are not expected to the present within the action area during the time of the proposed action (June 1 to October 31).

2.4.2 Status of Critical Habitat in the Action Area

Refugio Creek is a 5.5 mile-long stream, originating in the Santa Ynez Mountains at the merging of several smaller streams and entering the Pacific Ocean at Refugio Beach State Park. Riparian vegetation along the creek in the action area mainly consists of coyote brush scrub (*Baccharis pilularis*) and arroyo willow (*Salix lasiolepis*). The action area is adjacent to a state park and a few ranch properties. Surface water is typically present throughout the year, though flows may be absent during the mid to late summer months. Overall, while the PBFs of critical habitat for juvenile steelhead rearing (i.e., natural cover, shelter water quality/quantity, and riparian) exist in the upper portion of the action area, it has been diminished and reduced due to anthropogenic factors. In the action area, the threat to SC steelhead from climate change is likely to include a continued increase in summer air temperature, more extreme heat waves, and an increased frequency in drought (McClure et al. 2003). Finally, the PBFs for migration are partially hindered through the action area due to the concrete grouted RSP, and during low flows at the box culvert and road crossings on either side of the action area.

2.4.3 Factors Affecting Species Environment in Action Area and Vicinity

2.4.3.1 Road Encroachment

Highway 101 traverses the creek within the action area. The location of the roads likely result in runoff from the road surfaces entering the creek during rainstorms, and a related reduction in water quality within the action area to an unknown degree. Runoff from road surfaces contains dirt, oils, automotive fluids, and petro chemicals that are harmful to aquatic life, including steelhead (Spence et al. 1996). Road and rural development along the creek within the action area have contributed to the confinement of the stream channel and diminished the breadth of riparian vegetation.

2.4.3.2 Agricultural Development

Cultivated fields and open farmland dominate the area upstream of the action area on Refugio Creek. Agricultural conversions of floodplains are recurring sources of threats to instream habitat. There is potential for increased turbidity or nutrient loading due to runoff from agriculture areas adjacent to the creek. High turbidity concentrations can cause fish mortality, reduce fish feeding efficiency, and decrease food availability (Berg and Northcote 1985; McLeay et al. 1987; Gregory and Northcote 1993; Velagic 1995). Agricultural runoff can transfer nutrients and pesticides to the creek, which can turn lower dissolved oxygen levels by increasing algae growth in streams and decreasing forage for steelhead (Spence et al. 1996).

2.4.3.3 Migration Barrier

An impediment to upstream steelhead migration within the action area exists due to the concrete grouted RSP within the channel. The California Fish Passage Assessment Database (PAD)[1] classifies this rip-rap channelization underneath the SR-101 bridges as a partial barrier. Temporal barriers to steelhead also exist on the lower portion of the creek at the double box culvert owned by California State Parks, just downstream of the project location and two private road crossings upstream of the action area. These barriers reduce opportunities for steelhead to access additional spawning and rearing areas in the upper watershed and as a result, overall steelhead productivity and rearing capacity has the potential to be reduced in Refugio Creek, including the action area.

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).

[1] The PAD can be accessed at: https://apps.wildlife.ca.gov/bios/?al=ds69.

2.5.1 Effects of the Action on Critical Habitat

2.5.1.1 Temporarily Altering Aquatic Habitat

Installing the water diversions in the work area is expected to temporarily prevent a portion of Refugio Creek from serving as a freshwater migration corridor and freshwater rearing site for endangered steelhead for up to five months during the dry season (June 1 through October 31) each year. The temporary loss of habitat is expected to have at least a few consequences, described as follows.

The temporary loss of habitat is expected to translate into temporary loss of aquatic macroinvertebrate forage within the action area. Aquatic insects provide a source of food for instream fish populations and may represent a substantial portion of food items consumed by juvenile steelhead. Effects to aquatic macroinvertebrates resulting from stream flow diversions will be temporary because construction activities will be temporary, and rapid recolonization (about one to two months) of the restored channel area by macroinvertebrates is expected following re-watering (Cushman 1985; Thomas 1985; Harvey 1986). In addition, the effect of macroinvertebrate loss as a food source is expected to be negligible because food from upstream sources would be available upstream and downstream of the isolated area via drift. Consequently, the temporary loss of aquatic macroinvertebrates as a result of isolation activities is not expected to adversely affect forage opportunities within the area over the long term.

The temporary loss of habitat due to isolating a portion of the creek represents an adverse effect to habitat for steelhead, for at least a few reasons. First, the loss of habitat translates into a loss of a freshwater rearing area, which is essential for the growth and survival of juvenile steelhead (the life stage expected to be present at the time the proposed action is implemented). Without freshwater rearing areas, the habitat cannot fulfill the intended conservation role for the species. Second, the quality and availability of habitat in the action area has already been diminished and reduced due to anthropogenic factors. Therefore, the loss of habitat due to isolation represents further loss of habitat. However, the area impacted by the diversion is relatively small compared to the amount and extent of habitat available elsewhere in Refugio Creek and, perhaps more importantly, the diversion will be removed following completion of the proposed action and the concrete RSP in the creekbed will be removed. Freshwater rearing habitats upstream and downstream of the action area will be unaffected by the proposed action and, therefore, continue providing the intended conservation role for the species. Overall, the loss of aquatic habitat associated with the water diversion will be temporary, and no long-term diminishment is anticipated from the proposed action in the physical capacity of the habitat to serve the intended functional role for steelhead.

2.5.1.2 Disturbance to the Creekbed

Although manipulation and disturbance of the creekbed can result in changes to channel morphology and hydraulic conditions that may create impediments to steelhead migration, the proposed action is expected to result in improved steelhead passage conditions through the project reach by removing the concrete RSP below and upstream of the SR-101 bridges and constructing a series of weirs. However, the design is conceptual and methods of construction have not been submitted and there are uncertainties as to how the final project conditions will function. Hence, there exists a need to review the draft design plans and methods of construction to ensure the final design would promote attainment of NMFS' fish-passage criteria. Caltrans

also has not proposed monitoring of fish passage conditions, which should be verified following construction.

2.5.1.3 Alteration of Water Quality

NMFS does not expect acute or chronic effects on aquatic habitat in Refugio Creek because substantive increases in sedimentation and turbidity levels resulting from construction activities are expected to be minimal and temporary, for a few reasons. First, the proposed action includes a number of sediment and erosion-control measures to reduce the likelihood that sediment would be introduced to the wetted area, though these measures are not specified. Second, the proposed BMPs that are intended to preclude equipment leaks from reaching the creek channel are expected to be efficient in this regard. As a result, we don't expect water-quality alterations due to equipment leaks. Although accidental spills of chemical contaminants are speculative, the proposed action incorporates measures to prevent a spill reaching the creek channel.

2.5.1.4 Disturbance to Streamside Vegetation

The proposed action has the potential to temporarily cause a discrete loss of shade and cover along Refugio Creek. This loss has the potential to translate into increased water temperatures (Mitchell 1999; Opperman and Merenlender 2004) and decreased water quality (Welsch 1991). However, the loss of vegetation as a result of the proposed action is expected to be temporary and confined to a small localized area. In addition, riparian vegetation will be replanted throughout the disturbed areas to minimize impacts from project construction. Based on NMFS' experience observing the response of riparian vegetation to human-made disturbances, the riparian zone is expected to recover from the project one to two years following the completion of construction. Notwithstanding this expectation, the proposed action does not include monitoring the replanted areas within the action area following completion of the project or other provision to notify NMFS of the performance of the proposed plantings over time.

2.5.2 Effects of the Action on Endangered Steelhead

The expected effects of the action on endangered steelhead are related to the proposed isolation of a portion of Refugio Creek within the action area. What follows is a discussion of these effects, including discussion of the expected effects due to the proposed capture and relocation of steelhead.

2.5.2.1 Habitat Isolation Consequences for Juvenile Steelhead

Habitat isolation is expected to have two principal consequences: (1) a loss of service to juvenile steelhead through the loss of living space, and (2) stresses related to handling and crowding owing to the capture and relocation. Each of these is explained more fully as follows.

Loss of Living Space.—The temporary loss of habitat owing to dewatering could translate into an adverse effect on juvenile steelhead, chiefly through the short-term loss of a freshwater rearing area and displacement of steelhead, presuming presence of this species. This could increase densities of steelhead in neighboring reaches of the creek outside the action area. However, based on our observations of the creek upstream and downstream of the action area, and our general familiarity of steelhead abundance, we anticipate that number of steelhead experiencing a loss of service will be low. The diversions under the bridges will contain pipes that are expected to allow steelhead movement between habitats upstream and downstream of the

dewatered area; the habitat in those areas appear to be similar in quality as the affected area. Overall, we anticipate the presence of the water diversion would affect only a small number of steelhead for a relatively short period of time during the dry season.

The effect of macroinvertebrate loss on juvenile steelhead is expected to be negligible because food from upstream sources would be available downstream of the isolated area via drift. The increase in shading at Refugio Creek due to the expanded bridge could translate to a decrease in primary productivity and in turn a decrease to macroinvertebrates. However, any decrease is expected to be negligible owing to macroinvertebrate abundance outside the action area.

Capture and Relocation.—Although isolating the action area has the potential to harm or kill rearing juvenile steelhead, the proposed action includes precautions to reduce the likelihood of harm and mortality. Prior to installation of the diversions, biologists will capture and relocate steelhead to the nearest suitable habitat upstream or downstream of the work space. Caltrans proposes that biologists will be experienced with steelhead handling, and will continuously monitor the placement of the diversion to capture and relocate stranded steelhead.

Although Caltrans will document the capture and relocation of juvenile steelhead within the isolated area, the proposed action does not include a provision to notify NMFS of the number of steelhead that may be harmed or injured as a result of the proposed action. In addition, the specific criteria that Caltrans will use to select relocation areas are not described in the proposed action, though categories for criteria are given. Based on our experience and familiarity with selection of relocation areas, the sites selected for relocating juvenile steelhead should have ample habitat.

Stress from crowding, including increased competition for food among juvenile steelhead in the relocation areas, is expected to be temporary, if experienced, because when the proposed action is finished steelhead will be able to colonize the area that had been isolated. In addition, the available information indicates abundance of juvenile steelhead in the action area is quite low and not likely to produce crowding effects.

Based on steelhead survey results and anecdotal observations of juvenile steelhead in the vicinity of the action area in Refugio Creek, NMFS expects no more than 20 juvenile steelhead will need to be relocated each construction season (60 steelhead over three construction seasons). NMFS expects that 2 juvenile steelhead may be injured or killed as a result of the proposed action each construction season (6 steelhead over three construction seasons). This estimated mortality is based on NMFS' experience and knowledge gained on similar projects in Santa Barbara County during the last several years. Based on NMFS' general familiarity of steelhead abundance in southern California in general, and Santa Barbara County streams in particular, the anticipated number of juvenile steelhead that may be injured or killed as a result of the proposed action is likely to represent a small fraction of the overall watershed-specific populations and the entire SC DPS of endangered steelhead. Therefore, the effects of the relocation on steelhead are not expected to give rise to population-level effects.

2.5.2.2 Consequences of Physical Habitat Alterations

The sources of physical alteration to the habitat for steelhead involve the loss of riparian habitat, removal of the concrete grouted RSP within the channel, and naturalization of the channel bottom. The expected consequences of the alterations for steelhead due to these activities are

described as follows, and have been informed from the anticipated consequences to designated critical habitat for steelhead that we described earlier.

The loss of shade and cover along Refugio Creek is expected to have only temporary consequences for steelhead. This is because the loss of vegetation as a result of the proposed action is expected to be short lived. In addition, riparian vegetation will be replanted throughout the disturbed areas to minimize impacts from project construction. The expected consequences to steelhead involve experiencing a reduction in overhead shade and cover, potentially increasing risk of avian predation to individual fish until the riparian vegetation recovers to pre-project condition.

The removal of the concrete grouted RSP from the channel will remove the existing barrier for migrating steelhead. Restoration of the creek bottom, installation of weirs or other channel structure, and riparian plantings are expected to improve the PBFs for migrating steelhead and juvenile rearing within the action area. Depending on the channel design and placement of weirs, pools may be created that would provide resting areas for migrating steelhead and rearing areas for juvenile steelhead.

2.6 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

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

NMFS is generally familiar with activities in the action area, and at this time is unaware of such actions that would be reasonably certain to occur. Consequently, no cumulative effects are likely, beyond the continuing effects of present land uses that are reasonably certain to occur into the future.

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.

Juvenile steelhead are expected to be present in the action area during the time the proposed action will be implemented and, therefore, subject to effects of the proposed action. The main risk to individual steelhead involves effects due to dewatering and capture and relocation. The adverse effects include potential displacement, injury, and mortality during dewatering and the process of capture and relocation, but precautions are in place to minimize, if not eliminate, the risk of injury and mortality, and upstream and downstream habitats are expected to suitably harbor the relocated steelhead. The expected effects associated with the habitat alteration due to dewatering will be short lived and localized.

Based on steelhead surveys and observations described in the environmental baseline section, NMFS concludes non-lethal take of no more than 20 juvenile steelhead that may be captured and relocated each construction season at Refugio Creek as a result of dewatering the action area (60 over three seasons) with a potential lethal take of no more than 2 out of the 20 individuals at each construction season (6 over three construction seasons), thus the risk of mortality is low. Any juvenile steelhead present in the action area likely make up a small proportion of the SC DPS of steelhead.

Regarding the consequences to designated critical habitat for endangered steelhead, the proposed action will result in improvement for steelhead migration due to the removal of 23,087 ft^2 of concrete RSP from the channel. The channel design installed following RSP may also create pools that juvenile steelhead could utilize for rearing. The replanted areas are expected to create a functional riparian zone that provides cover for steelhead within the action area of Refugio creek. The impacts from disturbing the streambed are not expected to reduce the function or value of designated critical habitat in the action area.

The action area could be subject to higher average summer temperatures and lower precipitation levels in the future as a result of climate change, which would lead to higher creek temperatures and longer dry periods. Reductions in the amount of precipitation would reduce the amount and extent of flow. For this project, the above effects of climate change are unlikely to be detected by the time construction is completed. The short-term effects of the proposed action are expected to have elapsed prior to these climate-change effects. The long-term changes in the channel at the bridge sites are confined to small areas and are unlikely to significantly magnify the likely climate change impacts.

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 not likely to jeopardize the continued existence of the endangered SC DPS of steelhead or 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: All steelhead in the action area, expected to be no more than 20 juveniles each construction season (60 over three construction seasons). No more than 2 juvenile steelhead are expected to be injured or killed as a result of relocating the species each construction season (total of 6 juvenile steelhead). No other incidental take is anticipated as a result of the proposed action. The accompanying biological opinion does not anticipate any form of take that is not incidental to the proposed action.

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 and monitor incidental take of steelhead. The results of the analysis provide the basis for the following reasonable and prudent measures:

1. Avoid and minimize harm and mortality of steelhead during relocation activities.

2. Submit draft design plans, findings from project analyses, hydraulic models and results, and methods of construction for NMFS' review and agreement to ensure fish-passage criteria are met within the affected area affected by the proposed action.

3. Develop and implement a monitoring plan to ensure the channel design does not result in reduced steelhead-passage opportunities within in the affected area of the proposed action.

4. Prepare and submit a post-construction report regarding the effects of fish relocation and construction activities.

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 applicant has a continuing duty to monitor the impacts of incidental take and must report the

progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. Caltrans' biologist shall select relocation habitat(s) for steelhead prior to undertaking relocation activities. The biologist shall select relocation sites based on attributes such as adequate water quality (a minimum dissolved oxygen level of 5 mg/L and suitable water temperature), size or area, cover (instream and over-hanging vegetation or woody debris), number of fish already present in the site, and adequacy of the living space (e.g., water-column depth, accessible egress, and flowing water through the habitat). Multiple relocation sites may be necessary to prevent overcrowding of a single site depending on the number of steelhead captured, current number of steelhead already occupying the relocation habitat(s), and the size of the receiving habitat(s). Electrofishing shall not be used to capture steelhead.

    b. Steelhead will be relocated as soon as possible to the selected relocation sites, and distributed among multiple relocation sites if Caltrans' biologists determine that overcrowding would otherwise occur.

    c. Captured fish shall be handled with extreme care and kept in water to the maximum extent possible during relocation activities. All captured fish shall be kept in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream, and fish shall not be removed from this water except when released. To avoid predation, the biologist shall have at least two containers and segregate young-of-year fish from larger age classes and other potential aquatic predators. Captured salmonids will be relocated, as soon as possible, to a suitable instream location in which habitat conditions are present to allow for adequate survival of transported fish and fish already present.

    d. Caltrans shall contact NMFS (Jess Fischer, 562-533-6813) immediately if one or more steelhead are found dead or injured. The purpose of the contact shall be to review the activities resulting in take and to determine if additional protective measures are required. All steelhead mortalities shall be retained, frozen as soon as practical, and placed in an appropriate-sized sealable bag that is labeled with the date and location of the collection and fork length and weight of the specimen(s). Frozen samples shall be retained by the biologist until additional instructions are provided by NMFS. Subsequent notification must also be made in writing to Jess Fischer, jessica.fischer@noaa.gov, or NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, California 90802 within five days of noting dead or injured steelhead. The written notification shall include 1) the date, time, and location of the carcass or injured specimen; 2) a color photograph of the steelhead; 3) cause of injury or death; and 4) name and affiliation of the person whom found the specimen.

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 to increase the likelihood that NMFS' fish-passage criteria would be incorporated in the completed project. At a minimum Caltrans shall provide to NMFS: plan, profile, cross-sections, hydraulic modeling results, and all relevant construction detail drawings of the channel design. Caltrans shall revise the design according to NMFS' comments for the purpose of ensuring the final design would promote attainment of NMFS' fish-passage criteria and remain a stable, functioning solution. Caltrans shall provide NMFS a minimum of 45 calendar days to review and develop comments regarding the draft design plans. Draft design plans should be sent to Jess Fischer, jessica.fischer@noaa.gov, or NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, California 90802.

    b. Caltrans shall provide to NMFS (Jess Fischer, jessica.fischer@noaa.gov, or NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, California 90802-4213) a written description of the construction methods used to implement the channel design (e.g., engineered stream bed material placement, rock weir or roughened ramp installation) to ensure the project is stable and provides suitable steelhead-passage conditions. Measures should be taken to prevent the project from being flanked, undermined, or mobilized during high-flow events (e.g., framework and habitat feature rocks), localized erosion or deposition, and having piping and sub-surface flow. Caltrans must receive NMFS written agreement for the methods of construction before the proposed action is implemented.

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

    a. Caltrans shall collaborate with NMFS to develop and implement a monitoring and maintenance plan that is appropriate for the assessment of post-project hydraulic and geomorphic conditions resulting from the steelhead-passage project. This collaboration is necessary to ensure the channel design meets passage requirements of steelhead immediately after construction as well as after significant high-flow events, which validate the long-term stability of the channel design. Monitoring results would support any potential maintenance efforts required from Caltrans. At a minimum, the monitoring and maintenance plan shall address such items as presented in term and condition 3b below. Prior to implementing the plan, Caltrans shall submit the plan to Jess Fischer, jessica.fischer@noaa.gov, or NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, California 90802 for review and potential approval. Caltrans must receive NMFS written agreement for the plan before the proposed action is implemented.

    b. Following construction of the proposed action, Caltrans shall obtain a new topographical survey of the channel thalweg, and then submit the results of the survey to NMFS within 30 calendar days of completion of the survey (Jess Fischer, jessica.fischer@noaa.gov, NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, California, 90802). The survey shall start slightly downstream of the

box culvert and end slightly upstream where the modified creekbed intersects the existing grade. The topographic survey shall possess sufficient detail to quantify pool depths, hydraulic drops, headcuts, key rock framework and cross sections, and any other information NMFS believes is necessary to verify the planned improvements for endangered steelhead and critical habitat for this species.

c. Caltrans shall periodically monitor the project site (particularly after major storm events) at a frequency agreeable to NMFS for the purpose of ensuring NMFS' steelhead-passage guidelines are attained over time and potential maintenance of the project is addressed. Items to be monitored include:

    i. The formation and maintenance of a low-flow fish-passage channel throughout the action area.

    ii. Steelhead-passage conditions through the channel (e.g., depth, velocity, flow patterns, formation of resting pools, etc.).

    iii. The amount and extent of erosion and deposition within or immediately upstream or downstream of the action area.

    iv. The stability of the weirs (i.e., weirs are maintaining the stream grade and not being undermined) and effectiveness for creating and maintaining a low-flow fish passage channel and resting pools.

    v. The condition of the project site over time through the establishment of photo-reference sites.

4. The following terms and conditions implement reasonable and prudent measure 4:

    a. Caltrans shall provide a written report to NMFS by January 15 of the year following the construction season. The report shall be sent to Jess Fischer, jessica.fischer@noaa.gov, or NMFS, 501 West Ocean Boulevard, Suite 4200, Long Beach, California 90802. The reports will contain, at a minimum, the following information:

        i. Construction related activities – The report will include the dates construction began and was completed; a discussion of any unanticipated effects or unanticipated levels of effects on steelhead, 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 steelhead; the number of steelhead killed or injured during project construction; and photographs taken before, during, and after the activity from photo reference points.

        ii. Fish Relocation – The report will include (1) the number and size of all fish relocated during the proposed action; (2) the date and time of the collection and relocation; (3) a description of any problem encountered

during the project or when implementing terms and conditions; and (4) any effect of the proposed action on steelhead that was not previously considered.

iii. Revegetation – The report will include a description of the locations seeded or planted, the area revegetated, proposed methods to monitor and maintain the revegetated area, criteria used to determine the success of the plantings, and pre-and post-planting color photographs of the revegetated area. Caltrans shall provide the results of the vegetation monitoring by January 15 following completion of each annual site inspection following completion of the project. NMFS suggests five years of monitoring to document vegetation establishment. Each report shall include color photographs taken of the project area during each inspection and before implementation of the proposed action.

2.10 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

- Stormwater discharges to streams may carry various pollutants that are toxic to salmonids. To aid in recovery of steelhead, Caltrans should include bioretention areas or other landscape features adapted to treat stormwater runoff from US-101 to Refugio Creek at this construction site.
- In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations. This notification shall be submitted to Jess Fischer, NMFS 501 West Ocean Blvd., Suite 4200, Long Beach, California 90802.

2.11 Reinitiation of Consultation

This concludes formal consultation for the Refugio Bridge Replacement 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 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

3.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion is Caltrans. Other interested users could include California Department of Fish and Wildlife and U.S. Fish and Wildlife Service. Individual copies of this opinion were provided Caltrans. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

3.2 Integrity

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

3.3 Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

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