UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802

January 22, 2026 **Refer to NMFS No:** WCRO-2025-01976

Dominic Vitali
Senior Environmental Scientist, Branch Chief E2
California Department of Transportation, District 1
1656 Union Street
Eureka, California 95501-3700
dominic.vitali@dot.ca.gov

Re: Endangered Species Act Section 7(a)(2) Condensed Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the HUM 254 Culvert Rehabilitation Project (01-0H240)

Dear Mr. Vitali:

This letter responds to your August 29, 2025, request for initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act (ESA) for the subject action. Your request qualified for our expedited review and analysis because it met our screening criteria and contained sufficient information on, and analysis of, your proposed action and its potential effects to threatened California Coast (CC) Chinook salmon (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU)[1], Southern Oregon/Northern California Coast (SONCC) coho salmon (*O. kisutch*) ESU[2], and Northern California (NC) steelhead (*O. mykiss*) Distinct Population Segment (DPS)[3] and designated critical habitat.[4,5] Additionally, we received your request for Magnuson-Stevens Fishery Conservation and Management Act (MSA) essential fish habitat (EFH) consultation.

We reviewed California Department of Transportation's (Caltrans) consultation request and related initiation package. Where relevant, we have adopted the information and analyses you have provided and/or referenced but only after our independent, science-based evaluation confirmed they meet our regulatory and scientific standards. In our biological opinion below, we indicate what parts of your document we have incorporated by reference and where that information is being incorporated. We adopt by reference here section of the *Biological Assessment for the HUM 254 Culvert Rehabilitation Project (01-0H240)* including appendices (BA: Caltrans, August 2025), specifically the: Chapter 1.2

[1] CC Chinook salmon: Threatened on September 16, 1999 (64 FR 50394) and June 28, 2005 (70 FR 37159); updated April 14, 2014 (79 FR 20802)
[2] SONCC coho salmon: Threatened on May 6, 1997 (62 FR 24588) and June 28, 2005 (70 FR 37159); updated April 14, 2014 (79 FR 20802)
[3] NC steelhead: Threatened on June 07, 2000 (65 FR 36074) and January 5, 2006 (71 FR 833); updated April 14, 2014 (79 FR 20802)
[4] CC Chinook, NC steelhead: 70 FR 52487; September 2, 2005
[5] SONCC coho salmon: 64 FR 24049; May 5, 1999

Project Summary of the Proposed Action, Chapter 2 Description of the Proposed Actions, Chapter 3 Environmental Baseline, Chapter 4 Effects of the Action, Chapter 6 Essential Fish Habitat Assessment for Pacific Coast Salmon, and Appendices. The information contained in the specified sections are being incorporated for the environmental baseline, action area, effects analysis, and incidental take statement.

On June 27, 2025, Caltrans requested initiation of informal consultation for this project. Following a request from NMFS, on July 13, 2025, Caltrans surveyed the culvert at Post Mile (PM) 8.13 for the presence of water at a project site. Caltrans biologists observed listed juvenile SONCC coho salmon and juvenile NC steelhead in the remaining water in the culvert. Following the on-site survey and a series of meetings in July and August, Caltrans amended the consultation to include all the culvert rehabilitation projects described in the BA, including the box culvert at PM 8.13 and full span bridge projects at Chadd and Mowry creeks.

On August 29, 2025, Caltrans requested formal consultation for this project. On September 11, 2025, NMFS, CDFW, and Caltrans discussed and agreed that Caltrans Hydraulic Design will work with NMFS and CDFW engineers to finalize the Chadd Creek fish passage design.

On September 23, 2025, NMFS and Caltrans biologists and engineers attended a site visit. During the site visit at Chadd Creek, one juvenile SONCC coho salmon was observed in the pool downstream of the culvert at PM 40.83. No water or fish were observed in the culvert at PM 8.13.

On August 29, 2025, NMFS initiated consultation. From October 1 to November 13, the consultation was held in abeyance for 43 days due to a lapse in appropriations and resulting government shutdown. Consultation resumed on November 13, 2025.

On December 17, 2025, Caltrans provided NMFS updated effects maps for PM 8.13 and Chadd Creek to show the increased area of streambed grading.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 FR 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the ESA (89 FR 24268; 84 FR 45015). We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been any different under the 2019 regulations or pre-2019 regulations.

Caltrans proposes to rehabilitate and restore 45 existing drainage systems between PM 0.0 to 43.0 along State Route (SR) 254, also known as Avenue of the Giants (i.e., Humboldt Redwoods State Park), in Humboldt County, California. The purpose of the project is to decrease the risk of loss of roadway due to erosion or embankment failures within the roadway prism and to extend the service life of SR 254. Repairing the damaged culverts will reduce sediment input to the Eel River and South Fork of the Eel River. The project also includes restoration activities to improve habitat conditions for fish passage at Chadd Creek, Mowry Creek, and an unnamed intermittent tributary of the South Fork Eel River at PM 8.13. The proposed work at 42 other culverts in the action area are not accessible to anadromous fish species.

Work for the proposed action will occur between 2026 and 2028. All in-water work will occur during a June 15 to October 15 work window and will be monitored by a qualified biologist to minimize impacts to salmonids. Pile driving will occur from June 15 to July 31 for Mowry and Chadd creeks and will be monitored by a qualified fish biologist to minimize impacts to salmonids. To stay below the currently agreed upon 183 dB and 187 dB cumulative SEL threshold for fish injury, a daily construction time limit as determined by monitoring may be required and will be included in the *Hydroacoustic Monitoring Plan*. Stormwater runoff will be directed from SR 254 to infiltrate live vegetation, duff/leaf litter, and well-developed soils.

For the 42 culvert repair projects, culvert rehabilitation strategies include structure replacement, correcting drainage inlets and outlets, and cut and cover or trenchless culvert replacement. Some culverts require rock slope protection (RSP) or downdrains for bank stabilization. See Table 1 in the BA for a summary of culvert location, culvert current and future dimensions, and repair/replacement methods. Typical equipment used for construction will include: pickup truck, dump truck, water truck, concrete truck, concrete mixer, concrete pump, sweeper truck, loader, backhoe, excavator, pumps, generators and compressors, ground compactor, vibratory roller, impact pile driving hammer, roller, equipment backup alarms/horns, paver, dozers, horizontal augers.

The existing culvert at PM 8.13 will be replaced with a 10-foot long and 8-foot-tall upsized reinforced concrete box culvert, with engineered streambed material (ESM) placed throughout the culvert and outlet. Work will include: clear and grub vegetation and selective tree trimming for stream access, fish capture and relocation, temporary stream diversion and dewatering approximately 158 linear feet of creek, streambed and bank grading with engineered streambed material (ESM), and installation of Best Management Practices (BMPs) for erosion control. Construction will occur during one season.

The existing culvert at Mowry Creek (PM 15.04) will be excavated and removed, and then replaced with a single span slab bridge approximately 20-feet long and 30-feet wide. The clearance of the bridge over stream channel will be approximately 6 feet. Work will include: clear and grub vegetation and trees for stream access, fish capture and relocation, temporary pumping of groundwater (if present), temporary stream diversion and dewatering approximately 167 linear feet of creek, pile driving (12 14-inch driven steel H-piles; or 16 24-inch driven cast-in-steel-shell [CISS] piles or cast-in-drilled-hole [CIDH] reinforced concrete piles), streambed and bank grading with ESM, and installation of BMPs for erosion control. Construction will occur over two seasons.

The existing culvert at Chadd Creek (PM 40.81) will be excavated and removed to restore perennial flow under the newly constructed bridge. Currently, the creek splits into a perennial flow reach at PM 40.83 and an intermittent flow reach at PM 40.81. When the original highway 101 was built, the creek was realigned, altering the historic flow. Caltrans proposes to realign the perennial reach with the historic channel at PM 40.81. To realign the perennial channel to flow under the new bridge at Chadd Creek (PM 40.81), a 3-foot-wide berm contoured with a 4:1 ratio slope will be constructed. The proposed berm will be stabilized by buried Class 4 RSP on the left bank that will only be overtopped during 50-year flow events. The newly constructed bridge at PM 40.81 is anticipated to be a single span slab structure approximately 50-feet long and 34-feet wide. Clearance of the bridge over the stream channel will be approximately 10 feet in height. The existing culvert at Chadd Creek (PM 40.83) will be used as a temporary creek diversion system during construction. Following bridge construction, the Chadd Creek culvert (PM 40.83) will no longer support perennial flow, but will remain in place as an intermittent overflow channel and, when dry, will provide additional terrestrial passage. Work will

include: clear and grub vegetation and trees for stream access, fish capture and relocation, temporary dewatering of approximately 273 linear feet of creek, pile driving (12 14-inch driven H-piles; or 16 24-inch CISS or CIDH piles), pumping for groundwater (if necessary), streambed and bank grading with ESM, and installation of BMPs for erosion control. Up to 10 riparian trees will be removed at PM 40.81. Construction will occur over two seasons. Caltrans also proposes to remove historic concrete bridge abutments and grouted concrete weirs from the streambed.

CESA Mitigation for Chadd and Mowry Creeks
Mitigation for incidental take, as defined under the California Fish and Game Code, will be implemented onsite through the removal of the historic concrete bridge abutments and weirs from the banks and streambed of Chadd Creek as well as riparian enhancement of the newly contoured banks after the channel hardening elements are removed. Caltrans shall provide funding security for mitigation requirements, in compliance with the Master Funding Agreement entered into by the California Department of Fish and Wildlife and Caltrans on September 3, 2021, to ensure that it has adequate funding to complete the additional mitigation described in Section 2.4.2 of the BA. Caltrans will create a separate mitigation project, identified by expenditure authorization number (EA #) 01-0H247, for the principal purpose of funding security for mitigation and associated monitoring and adaptive management requirements, referred to as a Child Mitigation Project EA. The concrete removal scope will be funded and implemented through the Child Construction Project EA 01-0H245 (i.e., Chadd Creek and Mowry Creek Bridge Replacements) but subsequent revegetation and monitoring will necessitate funding the Child Mitigation Project EA 01-0H247. Costs required to remove the existing concrete abutments from the banks and grouted concrete from the channel of Chadd Creek and implement and monitor revegetation and streambank restoration at that location are estimated to range from $60,000.00 to $200,000.00.

Prior to construction activities that could take California Endangered Species Act (CESA) species, and with the Consistency Determination request, Caltrans will submit final documentation ("Funding Memorandum") to CDFW to show that sufficient funds have been allocated in the Child Mitigation Project EA 01-0H247 to ensure implementation of all measures described here to fully mitigate the incidental take of state-listed species resulting from construction of the proposed project and in accordance with the State of California Fish and Game Code Section 2081(b)(2). See section 2.4.2 of the BA for success criteria for CESA mitigation.

BIOLOGICAL OPINION

We examined the status of each species that would be adversely affected by the proposed action to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. We also examined the condition of critical habitat throughout the designated area and discuss the function of the physical or biological features (PBFs) essential to the conservation of the species that create the conservation value of that habitat. As discussed in the *Threatened and Endangered Species* section of the BA, SONCC coho salmon, CC Chinook salmon, and NC steelhead occur within the action area. The action area contains critical habitat for SONCC coho salmon, CC Chinook salmon, and NC steelhead.

NMFS also reviewed the most recent status review for SONCC coho salmon (NMFS 2024c), CC Chinook salmon (NMFS 2024a), and NC steelhead (NMFS 2024b). With few exceptions, threats

remain unchanged since previous 5-year reviews (NMFS 2024a, 2024b, 2024c). An emerging threat for salmonids, especially coho salmon, is contaminated stormwater runoff from roadways and streets. Stormwater containing a degradation product of tires (6PPD-q) causes coho salmon mortality at concentration of less than 0.1 part per billion (ppb; Peter et al. 2018; Titan et al. 2021). Two-year-old juvenile steelhead experience mortality at a concentration of 1 ppb (Brinkmann et al. 2022), while alevin steelhead are more sensitive with mortality at a concentration of 0.56 ppb (Roberts et al. 2025). As determined by NMFS in 2024, the status of SONCC coho salmon ESU (NMFS 2024c), CC Chinook salmon ESU, and NC steelhead DPS have not changed significantly since the 5-year review.

"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). As discussed in Chapter 3.1, the action area extends from PM 0.0 to 43.0 on SR-254, with 42 discreet culvert replacement projects (see Table 1 in BA), an upsized culvert project at PM 8.13, and two culvert to bridge replacement projects at Mowry (PM15.04) and Chadd creeks (PM 40.81 and PM 40.83). The action area encompasses the riparian corridor to top-of-bank and creek channel where construction activities will occur at each project site. The upper boundary of the action area begins in creek channels up to 30 feet upstream of each individual culvert site and extends up to 300-feet downstream where effects of the proposed action, such as elevated turbidity and hydroacoustic sound, are anticipated to terminate. See Appendix A in the BA for more details.

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 impacts to listed species or designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

We adopt by reference here *Chapter 3: Environmental Baseline* of the BA. To inform the importance of the population/subpopulations in the action area to the species' survival and recovery, NMFS also relied on information obtained in NMFS' recovery plans (NMFS 2014, NMFS 2016), as summarized below.

The proposed action is within the Butte Creek-South Fork Eel River hydraulic unit. The bridges will be built across Mowry and Chadd creeks and a culvert across an unnamed tributary (PM 8.13)—all three sites are located in tributaries to the South Fork Eel River. The unnamed tributary at PM 8.13 and Mowry Creek are intermittent streams, while Chadd Creek at PM 40.83 is a perennial stream. The confluence of the South Fork Eel River is approximately 2,000 feet from the PM 8.13 project site, approximately 600 feet from the Mowry Creek project site, and approximately 7,200 feet from the Chadd Creek project site. The 42 discreet culvert rehabilitation sites are not within designated critical habitat nor anadromous fish-bearing streams.

The terrain near the action area is characterized by an evergreen landscape dominated by redwood forest, with rugged and steep ridges and narrow stream valleys. Elevations in the watershed range from 200 to 2,600 feet. The area is influenced by coastal marine climate, with mild, foggy summers and wet winters (57 inches of average annual precipitation). Mass wasting, flooding, erosion, and

sedimentation associated with major rainstorms in 1955 and 1964 resulted in the death of hundreds of old growth redwood trees and eroded streambanks, causing landslides. Surface waters within the Eel River are sediment impaired and water quality limited due to impairments such as culverts, ditches, dikes, and other stormwater runoff conveyance structures. If surface water is present during summer months, low stream flow and high-water temperatures will likely render most of this habitat unsuitable for salmonid rearing. The 85th percentile 24-hour storm for the project area is 1.48 inches. The Average Annual Daily Traffic (AADT) in 2021 on SR 254 from PM 0.0 to 43.0 was 987 (northbound) and 1,128 (southbound). Posted speed limit is 55 miles per hour (mph).

The South Fork Eel River population of SONCC coho salmon is an independent population in the Interior Eel River Diversity Stratum with a delisting spawner target of 9,300 adults (NMFS 2014). While in the greater Eel River system, adults spawn from December to February. Fry emerge between March and July, peaking between March and May. Rearing juvenile coho are found in lakes, sloughs, side channels, estuaries, beaver ponds, and low-gradient tributaries to large rivers. Juvenile coho migrate downstream into the ocean between April and May.

Juvenile coho are not typically present during the summer months in PM 8.13 and Mowry Creek because the stream is usually dry in the action area during the summer; however, potential presence cannot be discounted due to the interannual variability of surface water levels. In wet years, these streams may have water until late July. Caltrans documented juvenile coho within the action area of PM 8.13 in July 2025 following a wet season with above average precipitation and rain extending into June. Juvenile coho are expected to be present year-round in pools within Chadd Creek, but presence may be limited in the summer months due to low water depths. We do not expect juvenile coho to be present at the 42 culvert remediation sites.

The Lower Eel River (Lower Mainstem/South Fork Eel River) CC Chinook salmon population is a functionally independent population in the North Coastal Diversity Stratum with a delisting spawner target of 7,400 adults (NMFS 2016 [Volume II. California Coastal Chinook Salmon]). CC Chinook salmon in the Eel River system are fall-run, with most spawning occurring lower reaches of rivers and tributaries from November through January, peaking in December. Juvenile Chinook salmon use deeper water areas with higher flows and riparian areas with cover to minimize predation and conserve energy.

Juvenile Chinook salmon may be present at PM 8.13, Mowry Creek (PM 15.04), and Chadd Creek project sites. Many stream reaches are typically dry in the action area during summer months (June 15-October 15); however, in wet years, these streams may have water until late July. Juvenile Chinook typically migrate downstream from mid-April through early June, but may be present in remaining pools at PM 8.13, Mowry Creek, and Chadd Creek through June (CDFW 2005, CDFG 1992-1995). We do not expect juvenile Chinook to be present at the other 42 culvert replacement sites.

The South Fork Eel River NC steelhead population is an independent population in the Northern Coastal Diversity Stratum with a delisting spawner target of 19,000 (NMFS 2016 [Volume III. Northern California Steelhead]). NC steelhead in the South Fork Eel River are winter-run (Kannry et al. 2020), spawning between December and early April (Busby et al. 1996) or early May with wet conditions (Moyle et al. 2008). Young-of-year juveniles school together and seek shallow waters with gentle currents, while older juveniles (one to three years) rear in faster water and pool habitats. Smolts migrate into estuaries in early spring and into the ocean from December to May (CDFW 2013).

Steelhead are not typically present at PM 8.13 and Mowry Creek during the in-water work window (June 15-October 15) because the streams typically dry in the action area; however, potential presence cannot be discounted due to interannual variability of surface water levels. In wet years, these streams may have water until late July. Caltrans documented steelhead using the remaining water in the culvert at PM 8.13 during a July 2025 survey, which followed a wet season with above average precipitation and rain extending into June. Juvenile steelhead may be present year-round in Chadd Creek in areas with greater water depth. We do not expect juvenile steelhead to be present at the other 42 culvert replacement.

In *Chapter 4.1.1 Exposure and Mortality Estimates* in the BA, juvenile fish density rate is used to estimate fish presence during fish capture and relocation and dewatering activities. Based on surveys in the area, fish densities in action area are approximately 0.1 salmon (coho and Chinook) and 0.2 steelhead per square meter. However, based on Caltrans' recent observations within this watershed, environmental and population variability may result in up to 25 percent more fish at project sites than the observed average densities (L. Douglas, Caltrans, pers. obs., July 11, 2025). At PM 8.13, we expect 20 coho, 20 Chinook, and 39 juvenile steelhead. In Mowry Creek, we expect 42 coho, 42 Chinook, and 82 steelhead each season. In Chadd Creek, we expect 89 coho, 89 Chinook, and 178 steelhead. At the other 42 culvert sites, we do not expect salmonids to be present.

Designated critical habitat for SONCC coho salmon, CC Chinook salmon, and NC steelhead is present within the South Fork Eel River and mainstem Eel River, including the action areas at PM 8.13, Mowry Creek, and Chadd Creek. In 1999, critical habitat was designated for SONCC coho salmon, including all accessible reaches of all rivers between the Mattole River in California and Elk River in Oregon (64 FR 24049). In 2005, critical habitat for CC Chinook salmon and NC steelhead was designated, which includes the stream channels within designated stream reaches and a lateral extent defined by the ordinary high-water mark, or bank-full elevation (33 CFR 329.11).

Critical habitat PBFs for listed species within the action areas include adequate substrate, freshwater migration corridors, water temperature, water velocity, food availability, riparian vegetation, and freshwater rearing sites rearing habitat with natural cover such as shade, submerged and overhanging large wood, log jams, and undercuts. The intermittent tributary at PM 8.13 is characterized as a run with gravel substrate. The riparian area is vegetated by shrubs and redwood trees with approximately 80% canopy cover. Mowry Creek is characterized as a pool with gravel substrate with low instream cover complexity. The bank is composed of fine sediment and vegetated by redwood trees with approximately 90% canopy cover. The habitat at Chadd Creek is characterized as a pool with cobble substrate with low instream cover. The bank is composed of fine sediment and vegetated by deciduous trees with approximately 90% canopy cover. No critical habitat is present at the 42 culvert sites.

NMFS recovery plans for SONCC coho salmon, CC Chinook salmon, and NC steelhead (NMFS 2014, NMFS 2016), lists "improving instream habitat quality and quantity" as recovery strategies for this watershed. Salmonid rearing habitat in the South Fork Eel River and its tributaries has been described as "Fair" to "Poor" because of high levels of fine sediment (NMFS 2014, NMFS 2016). Habitat complexity, sediment transport, estuary/lagoon quality, and water quality (turbidity) were rated as "Fair" to "Poor" for the South Fork Eel River Watershed by the Recovery Plans (NMFS 2014, NMFS 2016). High levels of instream fine sediment, originating from private and public roads and landslides, likely impairs salmonid spawning and rearing success throughout this watershed (NMFS 2014, NMFS 2016). A lack of functional instream wood is a primary limiting factor in regard to escape cover for rearing salmonid juveniles. Streamside road density was identified as the most significant

impact to instream and riparian habitat quality with all life stages rated as "Poor" (NMFS 2016). A Water Quality Assessment Report (Caltrans 2019) confirmed that the surface waters within the Eel River are listed as "sediment impaired and water quality limited" by the U.S. Environmental Protection Agency under the Total Daily Maximum Load program. Sources of impairments include culverts, ditches, dikes, and other stormwater runoff conveyance structures.

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.

The BA provides a detailed discussion and comprehensive assessment of the effects of the proposed action in Chapter 4 *Effects of the Action* of the BA, and is adopted here (50 CFR 402.14(h)(3)). NMFS has evaluated this section and after our independent, science-based evaluation, we have determined it meets our regulatory and scientific standards. Below, we summarize the effects of the proposed action as described in the BA.

During the construction work window of June 15 to October 15, only rearing juvenile salmonids are expected to be present. Fish capture and relocation and dewatering activities are expected to result in the injury or mortality of a small number of salmonids—less than three percent of the fish encountered during dewatering and fish relocation. Construction-related impacts such as turbidity, sedimentation, and introduction of construction-related hazardous materials will either be avoided or minimized to the extent that individual SONCC coho salmon, CC Chinook salmon, or NC steelhead will not be harmed. Temporary reduction in rearing habitat during dewatering will impact small areas at each project site and suitable nearby habitat is available to accommodate relocated individuals without inducing overcrowding. Individual salmonids relocated from the dewatered area are therefore not expected to experience reductions in fitness. Salmonids in the action area may also be exposed to artificial light at night; however, light will be restricted to minimal need and directed onto work areas to avoid illuminated channels and to minimize impacts to fish.

Pile driving activities are proposed to occur after dewatering has occurred at Mowry and Chadd creeks, minimizing the impacts on fish. Due to shallow water conditions and the small channel widths, the cumulative SEL impact zone will most likely be limited to the immediate area of the pile driving operations as indicated in the 203 dB cumulative SEL threshold for injury. Noise levels will be monitored by a qualified hydroacoustic specialist during all operations. A daily construction time limit determined by monitoring will be required to stay below 183 dB and 187 dB cumulative SEL for injury. All in-stream pile driving activities will be limited to June 15 to July 31 to avoid adult and smolt migration and minimize exposure to rearing salmonids. Based on the above avoidance and minimization measures, hydroacoustic effects to fish will be negligible.

Vegetation removal (e.g., invasive vegetation removal, tree trimming, and vegetation grubbing) will impact small areas at each project site and on-site native revegetation (both natural and supplemental) is expected to restore vegetation within three years after project activities. Because vegetation removal (excluding tree removal) will result in small and temporary reductions in vegetation, the potential impacts of vegetation removal on salmonids are expected to be negligible.

The project will continue to influence fish in the action area after construction is complete through stormwater runoff, hardscape, and tree removal. Stormwater from the surface of the bridge will be directed to infiltrate into live vegetation, duff/leaf litter, and soils adjacent to SR 254. The soil is expected in infiltrate 100 percent of the volume of the 85th percentile 24-hour storm (1.48 inches), which is expected to sufficiently reduce contaminants in stormwater to levels below those know to harm fish. Although the streambed grading at PM 8.13 will remove a small area of juvenile salmonid rearing habitat, the grading will improve fish passage at the new upsized culvert. Juvenile salmonids are not expected to be harmed by the small amount of habitat loss because nearby suitable habitat upstream and downstream of the area impacted by ESM grading is available for juvenile salmonids to forage and rear. Tree removal at PM 8.13, Mowry Creek, and Chadd Creek will slightly reduce shade in the action area over a ten-year regrowth period. This minor reduction in shade is not expected to diminish habitat in a manner that will impair fish fitness or growth during the tree regrowth period.

As discussed in the BA, the project is expected to result in temporary and permanent alterations to designated critical habitat for SONCC coho salmon, CC Chinook salmon, and NC steelhead. During construction, the project will result in temporary increases in sedimentation, erosion, and turbidity for up to 300 linear feet downstream, dewatering, and the potential for spills of hazardous materials (e.g., heavy equipment hydraulic fluid) for all culvert rehabilitation sites. The effects of construction and vegetation removal will be temporary and are not expected to significantly alter shade, habitat complexity, water quality, substrate conditions, or pool habitat to the extent that PBFs in the action area will be diminished. NMFS expects areas that are affected by temporary impacts will be restored within one year following construction because Caltrans will implement sufficient revegetation, erosion control, and invasive plant suppression within affected areas.

Designated critical habitat for SONCC coho salmon, CC Chinook salmon, and NC steelhead will be adversely affected by tree removal and stream realignment. Caltrans will remove 10 trees at Chadd Creek and 2 redwood trees at Mowry Creek. The tree removals will reduce riparian shade, cover, and forage habitat for rearing juvenile salmonids; however, the reduction in shade is expected to be minimal because the riparian area is densely forested. The trees will be replaced at a 3:1 ratio; we expect riparian vegetation attributes will return to pre-project levels within 10 years following tree planting. Caltrans will realign Chadd Creek to its historic channel at PM 40.81 by constructing a berm upstream of PM 40.83, which will convert a perennial reach to an intermittent reach during high flow events. This realignment will permanently reduce available foraging habitat for rearing juvenile salmonids in Chadd Creek. Juvenile salmonids will rear in nearby suitable habitat upstream and downstream of the area impacted by the realignment. The realignment is not expected to impact spawning habitat or impede migration.

Caltrans will implement several habitat enhancement elements to improve substrate, freshwater migration, and rearing habitat PBFs in the action area. At PM 8.13, Caltrans proposes to improve fish passage by removing the partial fish passage barrier created by the current culvert. At Mowry Creek, Caltrans proposes to improve fish passage, place large wood materials in the creek channel, including removed riparian trees and saplings, to provide instream habitat complexity, riparian shade, and foraging and cover habitat for rearing fish. At Chadd Creek, Caltrans proposes to restore fish passage by removing 0.032 acre of historic concrete bridge abutments and weirs, and grading the stream to a more natural alignment. The natural perennial channel will be restored to the creek's historic channel by constructing a berm at 40.83 and by replacing a partially impassable culvert with a bridge at PM 40.81.

"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). 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. In the BA, *Chapter 4.4 Simultaneous Construction Impacts*, Caltrans concluded that no other actions within the vicinity of the project are certain to occur. However, NMFS expects traffic, vegetation management, and road maintenance are reasonably certain to continue at similar rates as they currently occur. Given current baseline conditions and trends, NMFS does not expect to see significant changes in habitat conditions in the near future due to these existing actions within the action area, which we expect to be similar to the frequency and scope of that observed in the last decade.

Some continuing non-Federal activities (e.g., vehicle use and vegetation management) are reasonably certain to contribute to the effects of environmental variation within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global environmental variation 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 *Chapter 3 Environmental Baseline* of the BA and the status of the species summary above.

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 to the environmental baseline and the cumulative effects, taking into account the status of the species and critical habitat, 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 status of the listed salmonids that are the basis of this biological opinion indicates the prospects for long-term survival and growth of these species is poor, both range-wide and in the action area for this consultation. The Project recognizes the serious condition of the species populations and the limited quality and availability of habitat through incorporation of a seasonal work window to avoid impacts to migrating or spawning adults, exclusion and relocation practices to minimize direct impacts to juveniles due to construction, and various AMMs and BMPs to restore and/or minimize impacts to critical habitat. As described in the BA and supplemental information contained in this opinion, NMFS identified the following components of the proposed action that may result in effects to listed salmonids: fish collection and relocation, dewatering, pile driving activities, increases in sedimentation and turbidity, pollution from hazardous materials and contaminants, removal of riparian vegetation and trees, increase in shading, and streambed and bank grading. Of these, fish collection and relocation, and dewatering, have the potential to result in reduced fitness, injury, and/or mortality of a small number of juvenile coho salmon, Chinook salmon, and steelhead.

As explained more fully in the BA and supplemental information contained in this opinion, the proposed action will cause temporary and permanent impacts to salmonid critical habitat. As described in Chapter 2, specifically *Section 2.4 Compensation* and *Section 2.5 Standard Measures and Best Management Practices* in the BA, sufficient AMMs and BMPs will be implemented to sufficiently avoid or minimize impacts to habitat in the action area. As described in *Section 2.4 Compensation* in the BA, replacing the undersized culverts with bridges at Chadd and Mowry creeks, and an upsized

culvert at PM 8.13 will remove partial barriers and increase access to upstream habitat for all life stages of salmonids by approximately 0.79 mile at PM 8.13, 0.20 mile at Mowry Creek, and 0.92 mile at Chadd Creek. Following construction, the channels will be restored to pre-construction conditions. In areas of temporary ground disturbance, native revegetation and riparian habitat enhancement will occur with 5-years of maintenance and monitoring. Approximately 0.092 acre of riparian habitat will be restored at Chadd Creek to compensate for the permanent loss of 19 trees. Additionally, the removal of the historic bridge abutments at Chadd Creek and restoring the channel with natural graded and planted slopes will improve habitat for rearing salmonids. Although critical habitat is not present at 42 culvert remediation sites, the receiving waters at designated critical habitat downstream of the culvert rehabilitation sites may be temporarily impacted by increased sedimentation and turbidity post-construction. However, the South Fork Eel River and Eel River's water quality will be improved from reduced sediment input due to culvert rehabilitation and restoration.

The number of fish injured or killed during implementation of the proposed action is not expected to have a detectable effect on the overall population of SONCC coho salmon, CC Chinook salmon, and NC steelhead in the unnamed tributary at PM 8.13, Mowry Creek, and Chadd Creek. This is because only a very small portion of the juvenile SONCC coho salmon population, juvenile CC Chinook salmon population, and juvenile NC steelhead DPS population will be injured or killed during these activities. It is unlikely that the loss of this number of juveniles will reduce future adult returns. Due to the relatively large number of juveniles produced by each spawning pair, salmonids spawning in this watershed in future years are likely to produce enough juveniles to replace the individuals that may be lost during the proposed action.

Regarding future environmental variation impacts in the action area, California is likely to be subject to higher average summer air temperatures and lower total precipitation levels. Reductions in the amount of rainfall would reduce streamflow levels in Northern California rivers. Estuaries may also experience changes in productivity due to changes in freshwater flows, nutrient cycling, and sediment amounts. For this action, effects of construction activities are minor and mainly temporary. Long-term changes in habitat in the action area will be very small. Thus, the effects of the proposed action are unlikely to combine with environmental variation impacts in more than a negligible way now or in the future.

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 SONCC coho salmon, CC Chinook salmon, and NC steelhead or destroy or adversely modify their designated critical habitat.

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). "Harass" is further defined by guidance as to "create the likelihood of injury to wildlife by annoying it

to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS. The take exemption conferred by this incidental take statement is based upon the proposed action occurring as described in the Biological Opinion and in more detail in the Biological Assessment.

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 SONCC coho salmon, CC Chinook salmon, and NC steelhead is likely to occur during fish relocation and dewatering of the unnamed tributary at PM 8.13, Mowry Creek, and Chadd Creek between June 15 and October 15. Construction activities associated with construction require creek dewatering, and subsequent fish handling and relocation, will be completed in one construction season for PM 8.13 and two construction seasons for Mowry and Chadd creeks. The number of SONCC coho salmon, CC Chinook salmon, and NC steelhead that are likely incidentally taken during dewatering activities is expected to be small, limited to pre-smolt and YOY juvenile life stage. Of those captured, NMFS expects that no more than two percent of the juvenile coho salmon, Chinook salmon, and steelhead present within areas to be dewatered at PM 8.13, Mowry Creek, and Chadd Creek will be injured, harmed, or killed during fish relocation activities. NMFS also expects that no more than one percent of the fish present prior to relocation and dewatering could inadvertently be left in the area to be dewatered and be injured, harmed, or killed during dewatering activities. If more than three percent of the total number of juvenile coho Chinook, or steelhead encountered during fish capture, relocation, and dewatering are harmed or killed, incidental take will have been exceeded.

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.

Reasonable and Prudent Measures

"Reasonable and prudent measures" refer to those actions the Director considers necessary or appropriate to minimize the impact of the incidental take on the species (50 CFR 402.02).

1. Undertake measures to ensure that injury and mortality to coho salmon, Chinook salmon, and steelhead 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 to NMFS regarding fish capture and relocation, dewatering, construction activities, pile driving activities, riparian mitigation, and post-construction site-performance.

Terms and Conditions

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

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

    a. Caltrans or the contractor shall allow any NMFS employee(s), or any other person designated by NMFS, to accompany field personnel to visit the project site during activities described in this opinion.

    b. Caltrans or the contractor shall retain qualified biologists with expertise in the area of anadromous salmonid biology, including handling, collecting, and relocating salmonids; salmonid/habitat relationships; and biological monitoring of salmonids. All fish biologists working on this project shall be qualified to conduct fish collections in a manner that minimizes all potential risks to ESA-listed salmonids. Electrofishing, if used, shall be performed by a qualified biologist and conducted according to NMFS' electrofishing guidelines (NMFS 2000).[6]

    c. Caltrans or the contractor shall ensure that a biologist monitors the construction site during placement and removal of cofferdams and water diversion to ensure that any adverse effects to steelhead and coho are minimized. A biologist shall notify NMFS staff at nmfs.wcr.cco.caltrans@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 fish biologist shall contact NMFS at the above email if capture, injury, or mortality of SONCC coho, CC Chinook, and NC steelhead exceeds the take listed above, at which time NMFS shall stipulate measures to reduce the take of SONCC coho, CC Chinook, and NC steelhead.

    d. Salmonids shall be handled with extreme care and kept in water to the maximum extent possible during rescue 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-the-year from older age classes and other potential aquatic predators. Captured salmonids shall be relocated as soon as possible to an instream location in which suitable habitat conditions are present to allow for survival of transported fish and fish already present in the stream.

[6] https://media.fisheries.noaa.gov/dam-migration/electro2000.pdf

e. If any salmonids are found dead or injured beyond the anticipated amount or extent of incidental take, the biological monitor or fish biologist shall contact NMFS staff at nmfs.wcr.cco.caltrans@noaa.gov. The purpose of this contact is to review the activities resulting in take, determine if additional protective measures are required, and to ensure appropriate collection and transfer of steelhead mortalities and tissue samples. All salmonid mortalities shall be retained. Tissue samples are to be collected from each salmonid mortality per the methods identified in the NMFS Southwest Fisheries Science Center Repository protocols (contact the NMFS staff listed above) and send 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 fish streams, or areas where they could access anadromous fish habitat.

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

a. To ensure that the project at Chadd Creek is built to NMFS (NMFS 2022) and CDFW Fish Passage Design Criteria (CDFW 2010), Caltrans Hydraulic Design shall consult with NMFS and CDFW engineers on the design. Caltrans shall send interim design deliverables to NMFS and CDFW for review throughout the design process, including the final design plans for Chadd Creek for review and acceptance prior to project construction.

b. To ensure that the project is built as designed and contractors adhere to construction best management practices, monitoring shall be performed during construction by skilled individuals. Monitors shall demonstrate prior knowledge and experience in stream channel design and restoration, fish passage design, construction minimization measures, and the needs of native fish, including salmonids. Monitoring shall be performed daily. The monitor(s) shall 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. Caltrans or its contractor, shall make available to NMFS data from the hydroacoustic monitoring on a real-time basis (i.e., daily monitoring data should be accessible to NMFS upon request).

d. Any pumps used to divert live stream flow shall be screened and maintained throughout the construction period to comply with NMFS' Fish Screening Criteria for Anadromous Salmonids (2022).

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

f. Once construction is completed, all project-introduced materials must be removed, unless otherwise noted above, leaving the creek as it was before construction. Excess materials should be disposed of at an appropriate disposal site.

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

a. Caltrans must provide a written report to NMFS by January 15 of the year following construction. The report must be submitted to the parties addressed and described above in 1.c. The report must contain, at minimum, the following information:

b. Project construction and fish relocation report – the report shall contain the following contents:

i. **Construction Related Activities** – The report(s) shall include the dates the construction started, a discussion of design compliance including vegetation installation; 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 proposed action; and photographs taken before, during, and after the activity from photo reference points.

ii. **Fish Relocation** – The report shall 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 use 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 captured and relocated by species; the number of fish injured or killed during capture and relocation and dewatering 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 and dewatering 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 shall be sent to the address above in 1.c., and shall include the following contents:

i. **Post-Construction Vegetation Monitoring and Reporting** – Caltrans shall 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 above in 1.c.) for review and approval prior to the beginning of the in-stream work season. Reports documenting post-project conditions of vegetation installed at the site shall 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 shall be extended. Reports will document vegetation

health and survivorship and percent cover, natural recruitment of native vegetation (if any), and any maintenance or replanting needs. Photographs must be included. If poor establishment is documented, the report must include recommendations to improve conditions.

Conservation Recommendations

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). NMFS does not have any conservation recommendations for Caltrans' proposed action.

Reinitiation of Consultation

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

ESSENTIAL FISH HABITAT RESPONSE

Thank you also for your request for essential fish habitat (EFH) consultation. NMFS reviewed the proposed action for potential effects on EFH pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. We have concluded that the action would adversely affect EFH designated under the Pacific Coast Fishery Management Plan (FMP).

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

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 associated physical, chemical, and biological 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 may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-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 (50 CFR 600.905(b)).

EFH Affected by the Proposed Action

The proposed project occurs within EFH for various federally managed fish species within the Pacific Coast Salmon FMP. There are no Habitat Areas of Particular Concern located in the action area of the proposed action.

Adverse Effects on EFH

Based on information reviewed and summarized in the preceding biological opinion, NMFS determined the proposed action would adversely affect EFH under the Pacific Coast Salmon FMP as follows: 1) temporary and minor loss of riparian vegetation, 2) temporary and minor increases in turbidity, and 3) long-term reductions in shade at Mowry Creek and Chadd Creek project sites, and 4) permanent loss of 0.072 acre of rearing habitat at Chadd Creek due to channel realignment. Although adverse effects are anticipated as a result of the proposed action, the proposed minimization, avoidance, and habitat restoration measures, including best management practices described in the accompanying biological opinion, are sufficient to avoid, minimize, and/or mitigate the anticipated effects. Therefore, NMFS has no additional EFH conservation recommendations to provide at this time. This concludes the EFH consultation.

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)).

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

Please direct questions regarding this letter Page Vick, Santa Cruz, California via email at page.vick@noaa.gov or (916) 930-3728.

Sincerely,

Penny Ruvelas
Assistant Regional Administrator
California Coastal Office

cc: Leigh Douglas, Caltrans, Leigh.Douglas@dot.ca.gov
Dawn Graydon, Caltrans, Dawn.Graydon@dot.ca.gov
Greg O'Connell, CDFW, Gregory.OConnell@wildlife.ca.gov
e-file:151422WCR2025SR00168

REFERENCES

Brinkmann, M., D. Montgomery, S. Selinger, J. G. P. Miller, E. Stock, A. J. Alcaraz, J. K. Challis, L. Weber, D. Janz, M. Hecker, and S. Wiseman. 2022. Acute Toxicity of the Tire Rubber-Derived Chemical 6PPD-quinone to Four Fishes of Commercial, Cultural, and Ecological Importance. Environmental Science & Technology Letters 9(4):333-338.

Busby, P. J., Wainwright, T. C., Bryant, G. J., Lierheimer, L. J., Waples, R. S., Waknitz, F.W. and Lagomarsino, I. V., 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California.

California Department of Fish and Game (CDFG). 1987-1990. North Coast Watershed and Planning Coordination Project "Chadd Creek Stream Inventory Report".

CDFG. 1992-1995. Survey Field Note Observations.

CDFG. 1993. Chadd Creek Stream Inventory Report.

CDFG. 1993. Mowry Creek Stream Inventory Report.

California Department of Fish and Wildlife (CDFW). 2005. Chadd Creek Stream Inventory Report.

CDFW. 2010. California Salmonid Stream Habitat Restoration Manual 4th Ed. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=22610&inline

CDFW. 2014. South Fork Eel River Watershed Assessment. Coastal Watershed Planning and Assessment Program. California Department of Fish and Wildlife, Fortuna, CA.

CDFW. 2022. Passage Assessment Database. https://www.calfish.org/ProgramsData/Habitatand Barriers/CaliforniaFishPassageAssessmentDatabase.aspx

Caltrans (California Department of Transportation). 2024. Final—Summary of Published Science, Caltrans Monitoring Results, and Treatment Approaches Related to 6PPD-Q in Stormwater – December 2024. Report No. CTSW-TM-24-425.20.01. 74 pages.

Caltrans. 2025. Hum 254 Culvert Rehab Project 01-HUM-254 PMs 0.0 to 43.0 (EA 01-0H240), Caltrans District 01, Humboldt County, California. August 2025. 124 pages plus appendices.

Caltrans. 2019. Water Quality Assessment: Wilson Creek Permanent Restoration.

Hastings, M. C., and A. N. Popper. 2005. Effects of Sound on Fish. Jones and Stokes. 2600 V Street, Sacramento, CA 95818. 82pp.

Kannry, S. H., Thompson, S. A., O'Rourke, S. M., Harris, S. L., Kelson, S. J. and Miller, M. R., 2020. On the ecology and distribution of steelhead (*Oncorhynchus mykiss*) in California's Eel River. Journal of Heredity 111(6):548-563.

Moyle, P. B., J. A. Israel, and S. E. Purdy. 2008. Salmon, steelhead, and trout in California: status of an emblematic fauna. Center for Watershed Sciences, University of California, Davis, CA

NMFS (National Marine Fisheries Service). 2014. Final Recovery Plan for Southern Oregon/Northern California Coast Evolutionarily Significant Unit of coho salmon (*Oncorhynchus kisutch*) Evolutionarily Significant Unit. National Marine Fisheries Service, West Coast Region, Arcata, California.

NMFS. 2016. Coastal Multispecies Recovery Plan. National Marine Fisheries Service, West Coast Region, Santa Rosa, California.

NMFS 2022. NOAA Fisheries West Coast Region Anadromous Salmonid Passage Design Manual. National Marine Fisheries Service, West Coast Region, Portland, Oregon.

NMFS. 2024a. 2024 5-Year Review: Summary & Evaluation of California Coastal Chinook Salmon. National Marine Fisheries Service, West Coast Region, North Central-Coast Office, Santa Rosa, California.

NMFS. 2024b. 2024 5-Year Review: Summary & Evaluation of Northern California Steelhead. National Marine Fisheries Service, West Coast Region, Northern California Office, Arcata, California.

NMFS. 2024c. 2024 5-Year Review: Summary & Evaluation of Southern Oregon/Northern California Coast Coho Salmon. National Marine Fisheries Service, West Coast Region, Northern California Office, Arcata, California.

Peter, K. T., Z. Tian, C. Wu, P. Lin, S. White, B. Du, J. K. McIntyre, N. L. Scholz, and E. P. Kolodziej. 2018. Using High-Resolution Mass Spectrometry to Identify Organic Contaminants Linked to Urban Stormwater Mortality Syndrome in Coho Salmon. Environmental Science & Technology 52(18):10317-10327.

Roberts, C., E. Kohlman, N. Jain, M. Amekor, A.J. Alcaraz, N. Hogan, M. Brinkmann, and M. Hecker. 2025. Subchronic and Acute Toxicity of 6PPD-Quinone to Early Life Stage Rainbow Trout (*Oncorhynchus mykiss*). Environmental Science & Technology 59(13):6771–6777.

Tian, Z. Y., H. Q. Zhao, K. T. Peter, M. Gonzalez, J. Wetzel, C. Wu, X. M. Hu, J. Prat, E. Mudrock, R. Hettinger, A. E. Cortina, R. G. Biswas, F. V. C. Kock, R. Soong, A. Jenne, B. W. Du, F. Hou, H. He, R. Lundeen, A. Gilbreath, R. Sutton, N. L. Scholz, J. W. Davis, M. C. Dodd, A. Simpson, J. K. McIntyre, and E. P. Kolodziej. 2021. A ubiquitous tire rubber-derived chemical induces acute mortality in coho salmon. Science 371(6525):185-189.