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

August 2, 2019 **Refer to NMFS No:** WCRO-2019-00276

Alessandro Amaglio
Environmental Officer
U.S. Department of Homeland Security
FEMA, Region IX
1111 Broadway, Suite 1200
Oakland, California 94607-4052

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Russian River- Cotati Intertie Pipelines Seismic Hazard Mitigation Project

Dear Mr. Alessandro:

Thank you for your letter of April 10, 2019, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for providing federal financial assistance, through the California Governor's Office of Emergency Services to the Sonoma Water Agency (Subrecipient), to replace two segments of the Russian River-Cotati Intertie Pipeline due to seismic concerns.

In this biological opinion, NMFS concludes that the project is not likely to jeopardize the continued existence of Central California Coast (CCC) steelhead, CCC coho salmon, or California Coastal (CC) Chinook salmon. NMFS has also concluded the proposed project is not likely to result in the destruction or adverse modification of critical habitat for CCC steelhead, CCC coho salmon, or CC Chinook salmon. However, NMFS concludes take of CCC steelhead and CCC coho salmon could potentially occur as a result of the Project. An incidental take statement with non-discretionary terms and conditions is, therefore, included with the enclosed biological opinion.

NMFS also reviewed the likely effects of the proposed action on essential fish habitat (EFH), pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)). Based on our review, the proposed project will occur within an area identified as EFH for coho salmon and Chinook salmon, managed under the Pacific Coast Salmon Fishery Management Plan. The project is proposed with design, staging, monitoring, and adaptive management strategies recommended by NMFS to avoid or minimize potential adverse effects to EFH of the project, and with elements to promote habitat recovery. Thus, no additional EFH conservation recommendations are currently provided.

Please contact Dan Wilson of the California Coastal Office at 707-578-8555 or dan.wilson@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Copy to ARN File # 151422WCR2019SR00078

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

NMFS Consultation Number: WCRO-2019-00276

Action Agency: Federal Emergency Management Agency (FEMA)

Table 1. Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Central California Coast Coho Salmon (*Oncorhynchus kisutch*)	Endangered	Yes	No	*Yes*	*No*
Central California Coast steelhead (*O. mykiss*)	Threatened	Yes	No	*Yes*	*No*
California Coastal Chinook (*O. tshawytscha*)	Threatened	No	No	*Yes*	*No*

Table 2. Essential Fish Habitat and NMFS' Determinations:

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

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

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: August 2, 2019

Table of Contents

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.

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

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404.

1.2 Consultation History

On May 21, 2018, consultants from AECOM, who represent FEMA, discussed with NMFS staff a draft project description with the intent of identifying potential impacts, avoidance and minimization measures.

On June 18, 2018, AECOM and FEMA shared a written project description and a draft map of the Action Area. NMFS, AECOM, and FEMA discussed the project description and the map by phone on June 20, 2018. This discussion focused primarily on the logistics of fish rescue and relocation within the Mark West Creek portion of the project.

On August 3, 2018, AECOM, FEMA, NMFS, Sonoma Water, and the U.S. Fish and Wildlife Service (USFWS) conducted a site visit to see the alignment of the pipeline with respect to potential habitat of ESA listed species.

On November 20, 2018, AECOM and FEMA shared with NMFS and the USFWS a draft Biological Assessment (BA) to review. On February 15, 2019 NMFS asked five questions regarding the content of the BA specific to the project description. On February 16, 2019, AECOM and FEMA responded to NMFS stating that responses to the questions would be provided in the final BA.

On April 12, 2019, AECOM on behalf of FEMA submitted the BA of the proposed project and requested to initiate consultation with NMFS.

On April 26, 2019, NMFS deemed the BA and initiation package complete and initiated consultation.

1.3 Proposed Federal Action

"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). The United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) proposes to provide federal financial assistance, through the California Governor's Office of Emergency Services, to the Sonoma Water Agency (SWA or Subrecipient), to replace portions of the Subrecipient's Russian River-Cotati Intertie Seismic Pipeline due to seismic concerns (Project). FEMA's financial assistance would be provided through the Pre-Disaster Mitigation Program. This program assists states and communities by providing federal financial assistance to implement sustained, pre-disaster, natural-hazard mitigation programs to reduce the risk of injury and damage from natural disasters and to reduce reliance on financial assistance from disaster declarations.

The Subrecipient has identified the Russian River-Cotati Intertie as vulnerable to failure as a result of a moderate to severe earthquake. Any damage to the pipelines would result in limiting water supplies for residents and businesses in the Subrecipient's service area. The Subrecipient proposes to mitigate this hazard of pipeline failure by modifying the Russian River-Cotati Intertie Pipeline to improve its ability to withstand the effects of ground deformation, liquefaction, and lateral spread. The pipeline is 48-inch diameter steel and delivers water from the Subrecipient's Mirabel Facility near the confluence of the Russian River and Mark West Creek, north of Forestville, to the southern parts of Sonoma County. The Proposed Project encompasses two crossings, the Russian River Crossing and the Mark West Creek Crossing.

The Russian River Crossing activity would consist of the installation of two 48-inch-diameter steel pipeline segments, one each on the northern and southern sides of the Russian River channel. The new pipeline segments would replace the existing pipeline segments; they would be installed parallel to (and within 50 feet of) the existing pipeline and buried 18 to 30 feet deeper than the existing pipeline. The existing pipeline segments would be disconnected, filled with a low-strength concrete mixture, and abandoned in place. The northern pipeline segment would be approximately 400 feet long and the southern pipeline segment would be no more than 700 feet long. The new pipeline segments would tie into (be welded to) the existing 48-inch-diameter pipeline that runs beneath the Russian River channel. The segment of existing pipeline that runs beneath the Russian River channel would remain unchanged and would not be replaced. At the Mirabel Facility (on the northern side of the Russian River Crossing), an existing 20-inch-diameter pipe connection between Collector #5 and the Russian River-Cotati Intertie would be replaced with a new 30- to 36-inch 328-foot steel pipe. The existing 20-inch pipeline would be capped, filled with a low-strength concrete mixture, and abandoned in place.

The Mark West Creek Crossing consists of the installation of approximately 767 linear feet of a 48-inch-diameter steel pipeline segment across the Mark West Creek channel and adjacent uplands. The new pipeline segment would replace the existing pipeline segment beneath the creek channel and uplands; it would be installed parallel to (and within 25 feet of) the existing pipeline and buried approximately 6 to 8 feet deeper than the existing pipeline. The existing pipeline segment to be replaced would be disconnected, filled with a low-strength concrete mixture, and abandoned in place. The new pipeline segment would connect to the existing 48-inch-diameter Russian River-Cotati Intertie pipeline to the north and south of Mark West Creek.

In general, Proposed Project implementation would occur in the following sequence at both the Russian River and Mark West Creek Crossings: site clearing, installation of water infiltration barriers, cofferdam installation and creek diversion (only at Mark West Creek and discussed further below), trench excavation, dewatering of infiltrating groundwater, pipe installation, trench backfilling, and site restoration. Work adjacent to the Russian River active channel and in the Mark West Creek channel would include the installation of water infiltration barriers, such as sheet piles, prior to trench excavation, to prevent ground water (or in the event of rising river water levels, surface water) from entering the work area. At both crossings, trench excavation, pipe installation, and trench backfilling would occur in short segments at a time, extending in phases down the length of the pipeline alignments. There would be at most 120 feet of trench open at one time. Trenches would be excavated using an excavator, with excavated topsoil and soils side-casted and stockpiled adjacent to the trench. The spoils would be used to backfill already open trenches after the pipe has been installed.

At Mark West Creek, the trench would extend into upland areas on the northern and southern sides of the creek, and would cross the creek channel. The trench would be a maximum of approximately 60 feet wide, with cut angled slopes. Some parts of the trench may include shoring. The trench would be as deep as 20 feet below the ground surface. Construction fencing would be placed around the trench to exclude wildlife and unauthorized persons from entering the site during construction. Trees and vegetation on the banks, in the riparian zone, and in the channel in the work area would be removed. Within the creek channel, surface flows would be diverted using a cofferdam or other flow exclusion structure on one side of the channel at a time during the in-water work period. After the installation of the flow exclusion structure, fish relocation would be conducted as surface water is pumped out of the isolated work area. Water pumped from within the flow exclusion structure would not be discharged to Russian River or Mark West Creek. Once construction is completed, the work area will be restored through riparian plantings and erosion control measures. Following restoration activities, the flow exclusion structure isolating the work area would be removed to restore creek flow back to the natural channel width. Turbidity spikes, during removal of the flow exclusion structure, will be avoided using turbidity curtains in both upstream and downstream ends of the work area.

Following construction activities at both crossings, the river and creek banks will be restored to stable contours, and preconstruction drainage patterns will be established by constructing willow lift bank protection. Additionally, erosion and sedimentation controls would be incorporated into project specifications, such as hydroseeding with native grasses to stabilize soil and prevent erosion in areas where construction activities result in exposed soil. The willow lifts would stabilize and protect the banks of the Russian River and Mark West Creek, and the toe of the bank of Mark West Creek in the work area. The willow lifts along the banks would consist of approximately 1-foot-tall layers of native topsoil, wrapped in biodegradable filter fabric and tacked with wooden stakes into the back of the bank. The layers of wrapped soil would be stacked to match the preconstruction contours of the banks of the disturbed area, while creating a stable slope. Live plant stems, such as willow stems, would be installed between the layers in intervals and would protrude from the willow lifts. Vertically oriented stakes containing plants would be installed at intervals through wrapped layers of soil.

At Mark West Creek, the toe of the slope at the junction between the bank and the active channel would be stabilized with riprap. In the channel, the riprap would be approximately 2 feet thick. The riprap would be surrounded by native gravel and rock bedding material and would be built on a base layer of biodegradable filter fabric. Long plant tubes would be installed into the riprap at the bottom of the bank at intervals for replanting riparian vegetation. The terminus of the willow lifts would conform with, and tie into, the existing contours of the adjacent undisturbed banks and channel. Riparian habitat removed for construction would be replanted on site. An additional 0.12 acre of ruderal and riparian vegetation would be enhanced with riparian plantings adjacent to the Russian River. The Subrecipient proposes to implement "Riparian Habitat Revegetation Plans" for each crossing. These plans were developed by the Subrecipient and are in Appendix A of the BA. The Subrecipient intends to have a 1.1:1 restoration ratio (area restored: area disturbed) for the affected areas that support native riparian plants, and a 2:1 tree replacement ratio (trees planted: trees removed).

In general, these plans include the following:

1. Plant species were selected for revegetation based on surveys of riparian habitat along Mark West Creek/Russian River upstream and downstream of the project site.
2. Planting requirements in the revegetation plan were based on species composition and density recommendations associated with the overall habitat enhancement design for the project.
3. If soil moisture is deficient, new vegetation would be supplied with supplemental water until vegetation is firmly established.
4. Revegetation would be monitored annually for 5 years to assess revegetation success, or until 75 percent survival is achieved at the Russian River and 90 percent survival is achieved at Mark West Creek. Monitoring would continue until the survival criteria are met.
5. If invasive plant species colonize the area, action would be taken to control their spread; options include hand and mechanical removal and replanting with native species.
6. The Subrecipient would provide annual reports that include photo-points, survival rates, and site summaries that would be submitted to appropriate regulatory agencies.

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 provides 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/or an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of “to jeopardize the continued existence of” a listed species, which is “to engage in an action that 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 for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features” (81 FR 7214).

The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace 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.

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

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an “exposure-response-risk” approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a RPA to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "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 current function of the essential PBFs that help to form that conservation value.

This biological opinion analyzes the effects of the action on the following listed salmonids and their designated critical habitat:

- Endangered CCC coho salmon Evolutionarily Significant Unit (ESU)
  Listing determination (70 FR 37160; June 28, 2005)
  Critical habitat designation (64 FR 24049; May 5, 1999);

- Threatened CCC steelhead Distinct Population Segment (DPS)
  Listing determination (71 FR 834; January 5, 2006)
  Critical habitat designation (70 FR 52488; September 2, 2005);

- Threatened CC Chinook salmon (*O. tshawytscha*) ESU
  Listing determination (70 FR 37160; June 28, 2005)
  Critical habitat designation (70 FR 52488; September 2, 2005).

CC Chinook salmon, CCC coho salmon, and CCC steelhead critical habitat occurs within the action area. Only CCC coho salmon and CCC steelhead occur in Mark West Creek in the vicinity of the action area during Project construction.

2.2.1 CCC steelhead status

Historically, approximately 70 populations[1] of steelhead existed in the CCC steelhead DPS (Spence *et al.* 2008, Spence *et al.* 2012). Many of these populations (about 37) were independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts (Bjorkstedt *et al.* 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (McElhaney *et al.* 2000, Bjorkstedt *et al.* 2005).

While historical and present data on abundance are limited, CCC steelhead numbers are

[1] Population as defined by Bjorkstedt *et al.* 2005 and McElhaney *et al.* 2000 as, in brief summary, a group of fish of the same species that spawns in a particular locality at a particular season and does not interbreed substantially with fish from any other group. Such fish groups may include more than one stream. These authors use this definition as a starting point from which they define four types of populations (not all of which are mentioned here).

substantially reduced from historical levels. A total of 94,000 adult steelhead were estimated to spawn in the rivers of this DPS in the mid-1960s, including 50,000 fish in the Russian River - the largest population within the DPS (Busby *et al.* 1996). Recent estimates for the Russian River are on the order of 4,000 fish (NMFS 1997). Abundance estimates for smaller coastal streams in the DPS indicate low but stable levels with recent estimates for several streams (Lagunitas, Waddell, Scott, San Vicente, Pudding, and Caspar creeks) of individual run sizes of 500 fish or less (62 FR 43937). Some loss of genetic diversity has been documented and attributed to previous among-basin transfers of stock and local hatchery production in interior populations in the Russian River (Bjorkstedt *et al.* 2005). In San Francisco Bay streams, reduced population sizes and fragmentation of habitat has likely also led to loss of genetic diversity in these populations. For more detailed information on trends in CCC steelhead abundance, see: Busby *et al.* 1996, NMFS 1997, Good *et al.* 2005, Spence *et al.* 2008, and Williams *et al.* 2011.

CCC steelhead have experienced serious declines in abundance and long-term population trends suggest a negative growth rate. This indicates the DPS may not be viable in the long term. DPS populations that historically provided enough steelhead immigrants to support dependent populations may no longer be able to do so, placing dependent populations at increased risk of extirpation. However, because CCC steelhead remain present in most streams throughout the DPS, roughly approximating the known historical range, CCC steelhead likely possess a resilience that is likely to slow their decline relative to other salmonid DPSs or ESUs in worse condition. The 2005 status review concluded that steelhead in the CCC steelhead DPS remain "likely to become endangered in the foreseeable future" (Good *et al.* 2005). On January 5, 2006, NMFS issued a final determination that the CCC steelhead DPS is a threatened species, as previously listed (71 FR 834).

A more recent viability assessment of CCC steelhead concluded that populations in watersheds that drain to San Francisco Bay are highly unlikely to be viable, and that the limited information available did not indicate that any other CCC steelhead populations could be demonstrated to be viable[2] (Spence *et al.* 2008). Although there were average returns (based on the last ten years) of adult CCC steelhead during 2007/08, research monitoring data from the 2008/09 and 2009/10 adult CCC steelhead returns shows a decline in returning adults across their range compared to the last ten years (Jeffrey Jahn, personal communication, 2010). The most recent status update concludes that steelhead in the CCC steelhead DPS remains "likely to become endangered in the foreseeable future" (Howe 2016), as new and additional information available since Williams *et al.* (2011) does not appear to suggest a change in extinction risk.

2.2.2 CCC coho salmon status

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

[2] Viable populations have a high probability of long-term persistence (> 100 years).

and loss of genetic diversity is documented, as described below.

Brown *et al.* (1994) estimated that annual spawning numbers of coho salmon in California ranged between 200,000 and 500,000 fish in the 1940's, which declined to 100,000 fish by the 1960's, followed by a further decline to 31,000 fish by 1991. More recent abundance estimates vary from approximately 600 to 5,500 adults (Good *et al.* 2005). Recent status reviews (Williams *et al.* 2011) indicate that the CCC coho salmon are likely continuing to decline in number. CCC coho salmon have also experienced acute range restriction and fragmentation. Adams *et al.* (1999) found that in the mid 1990's coho salmon were present in 51 percent (98 of 191) of the streams where they were historically present, and documented an additional 23 streams within the CCC coho salmon ESU in which coho salmon were found for which there were no historical records. Recent genetic research has documented reduced genetic diversity within subpopulations of the CCC coho salmon ESU (Bjorkstedt *et al.* 2005). The influence of hatchery fish on wild stocks has likely also contributed to the lack of diversity through outbreeding depression and disease.

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

The substantial decline in the Russian River coho salmon abundance led to the formation of the Russian River Coho Salmon Captive Broodstock Program (RRCSCBP) in 2001. Under this program, offspring of wild captive-reared coho salmon are released as juveniles into tributaries within their historic range with the expectation that some of them will return as adults to naturally reproduce. Juvenile coho salmon and coho salmon smolts have been released into several tributaries of the lower Russian River, including Mark West Creek.

None of the five diversity strata defined by Bjorkstedt *et al.* (2005) currently support viable coho salmon populations. According to Williams *et al.* (2016), recent surveys suggest CCC coho abundance has improved slightly since 2011 within several independent populations (mainly north of SF bay), although all populations remain well below their high-risk dispensation thresholds identified by Spence *et al.* (2008). The Russian River and Lagunitas Creek populations are relative strongholds for the species compared to other CCC ESU populations, the former predominantly due to out-planting of hatchery-reared juvenile fish from the RRCSCBP. The overall risk of CCC coho salmon extinction remains high, and the most recent status review reaffirmed the ESU's endangered status (Rogers 2016).

2.2.3 CC Chinook salmon status

The CC Chinook salmon ESU was historically comprised of approximately 32 Chinook salmon populations (Bjorkstedt *et al.* 2005). Many of these populations (about 14) were independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts. The remaining populations were likely more dependent upon immigration from nearby independent populations than dependent populations of other salmonids (Bjorkstedt *et al.* 2005). In 1965, CDFG (1965) estimated escapement for this ESU at over 76,000 spawning adults. Most were in the Eel River (55,500), with smaller populations in Redwood Creek (5,000), Mad River (5,000), Mattole River (5,000), Russian River (500) and several smaller streams in Humboldt County (Myers *et al.* 1998). Currently available data indicate abundance is far lower, suggesting an inability to sustain production adequate to maintain the ESU's populations. The one exception is the Russian River population, which has an average escapement of a few thousand adults over the past several years (SWA 2017).

CC Chinook salmon populations remain widely distributed throughout much of the ESU. Notable exceptions include the area between the Navarro River and Russian River and the area between the Mattole and Ten Mile River populations (Lost Coast area). The lack of Chinook salmon populations both north and south of the Russian River (the Russian River is at the southern end of the species' range) makes it one of the most isolated populations in the ESU. Myers *et al.* (1998) reports no viable populations of Chinook salmon south of San Francisco, California.

Because of their prized status in the sport and commercial fishing industries, CC Chinook salmon have been the subject of many artificial production efforts, including out-of-basin and out-of-ESU stock transfers (Bjorkstedt *et al.* 2005). It is therefore likely that CC Chinook salmon genetic diversity has been significantly adversely affected despite the relatively wide population distribution within the ESU. An apparent loss of the spring-run Chinook life history in the Eel River Basin and elsewhere in the ESU also indicates risks to the diversity of the ESU. Data from the 2009 adult CC Chinook salmon return counts and estimates indicated a further decline in returning adults across the range of CC Chinook salmon on the coast of California (Jeffrey Jahn, NMFS, personal communication 2010). Ocean conditions are suspected as the principal short term cause because of the wide geographic range of declines (SWFSC 2008). However, the number of adult CC Chinook salmon returns in the Russian River Watershed increased substantially in 2010/2011 compared to 2008/09 and 2009/10 returns6. Increases in adult Chinook salmon returns during 2010/2011 have been observed in the Central Valley populations as well.

Using an updated analysis approach, the 2011 status review (Williams *et al.* 2011) found that the loss of representation from one diversity stratum, the loss of the spring-run history type in two diversity substrata, and the diminished connectivity between populations in the northern and southern half of the ESU pose a concern regarding viability for this ESU. The most recent status review (Seghesio and Wilson 2016) reaffirmed the Threatened status for CC Chinook salmon, finding a "lack of compelling evidence to suggest that the status of these populations has improved or deteriorated appreciably since the previous status review."

The NMFS' recovery plan (NMFS 2016) for the CC Chinook salmon ESU identified the major threats to recovery. These major threats include: channel modification, roads, logging and wood harvesting; water diversions and impoundments; and severe weather. The impacts of these major threats are described in the effects to critical habitat section.

2.2.4 Status of CCC steelhead, CC Chinook and CCC coho salmon critical habitat

In designating critical habitat, NMFS considers, among other things, the following requirements of the species: 1) space for individual and population growth, and for normal behavior; 2) food, water, air, light, minerals, or other nutritional or physiological requirements; 3) cover or shelter; 4) sites for breeding, reproduction, or rearing offspring; and, generally; and 5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on Physical or Biological Features (PBF)[3] and/or essential habitat types within the designated area that are essential to the conservation of the species and that may require special management considerations or protection (81 FR 7214).

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

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

For CCC coho salmon critical habitat, the following essential habitat types were identified: 1) juvenile summer and winter rearing areas; 2) juvenile migration corridors; 3) areas for growth and development to adulthood; 4) adult migration corridors; and 5) spawning areas. Within these areas, essential features of coho salmon critical habitat include adequate: 1) substrate, 2) water quality, 3) water quantity, 4) water temperature, 5) water velocity, 6) cover/shelter, 7) food, 8) riparian vegetation, 9) space, and 10) safe passage conditions (64 FR 24029).

The condition of CCC coho salmon and CCC steelhead critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that currently depressed population conditions are,

[3] NMFS previously used the term "Primary Constituent Elements", but has now shifted to using "Physical or Biological Features. 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 primary constituent elements, physical or biological features, or both."

in part, the result of the following human-induced factors affecting critical habitat[4]: logging, agriculture, mining, urbanization, stream channelization and bank stabilization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation). Habitat impacts of concern include altered stream bank and channel morphology, elevated water temperature, lost spawning and rearing habitat, habitat fragmentation, impaired gravel and wood recruitment from upstream sources, degraded water quality/quantity, lost riparian vegetation, and increased sediment delivery into streams from upland erosion (Weitkamp *et al.* 1995; Busby *et al.* 1996; 64 FR 24049; 70 FR 37160; 70 FR 52488). Widespread diverting of rivers and streams, as well as the pumping of groundwater hydraulically connected to stream flow, has dramatically altered the natural hydrologic cycle in many of the streams within the CCC ESU and DPS, which can delay or preclude migration, dewater aquatic habitat, and degrade water quality. Stream channelization, commonly caused by streambank hardening and stabilization, represents a very high threat to instream and floodplain habitat throughout much of the designated critical habitat for both species, as detailed within the CCC coho salmon and CCC steelhead recovery plans (NMFS 2012 and 2016, respectively). Streambank stabilization confines stream channels and precludes natural channel movement, resulting in increased streambed incision, reduced habitat volume and complexity.

2.2.5 Global Climate Change and Additional Threats to Critical Habitat

Another factor affecting the rangewide status of CCC coho salmon and steelhead, and aquatic habitat at large, is climate change. Global climate change presents an additional potential threat to salmonids and their critical habitats. Impacts from global climate change are already occurring in California. For example, average annual air temperatures, heat extremes, and sea level have all increased in California over the last century (Kadir *et al.* 2013). Snow melt from the Sierra Nevada has declined (Kadir *et al.* 2013). However, total annual precipitation amount have shown no discernable change (Kadir *et al.* 2013). Listed salmonids may have already experienced some detrimental impacts from climate change. NMFS believes the impacts on listed salmonids to date are likely fairly minor because natural, and local, climate factors likely still drive most of the climatic conditions CCC steelhead experience, and many of these factors have much less influence on steelhead abundance and distribution than human disturbance across the landscape.

The threat to salmonids from global climate change will increase in the future. Modeling of climate change impacts in California suggests that average summer air temperatures are expected to continue to increase (Lindley *et al.* 2007; Moser *et al.* 2012). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe *et al.* 2004, Moser *et al.* 2012; Kadir *et al.* 2013). Total precipitation in California may decline; critically dry years may increase (Lindley *et al.* 2007; Schneider 2007; Moser *et al.* 2012). Wildfires are expected to increase in frequency and magnitude (Westerling *et al.* 2011, Moser *et al.* 2012).

For Northern California, most models project heavier and warmer precipitation. Extreme wet and

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

dry periods are projected, increasing the risk of both flooding and droughts (DWR 2013). Estimates show that snowmelt contribution to runoff in the Sacramento/San Joaquin Delta may decrease by about 20 percent per decade over the next century (Cloern *et al.* 2011). Many of these changes are likely to further degrade CCC coho salmon and steelhead habitat by, for example, reducing streamflow during the summer and raising summer water temperatures. Estuaries may also experience changes detrimental to salmonids. Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia *et al.* 2002, Ruggiero *et al.* 2010). In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Brewer and Barry 2008; Feely 2004; Osgood 2008; Turley 2008; Abdul-Aziz *et al.* 2011; Doney *et al.* 2012). The projections described above are for the mid to late 21st Century. In shorter time frames, climate conditions not caused by the human addition of carbon dioxide to the atmosphere are more likely to predominate (Cox and Stephenson 2007; Santer *et al.* 2011).

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the Project encompasses the Mark West Creek and Russian River stream channels, and associated floodplains and riparian corridors, within 230ft upstream and downstream of the existing pipeline crossings.

2.4 Environmental Baseline

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 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

2.4.1 Status of Listed Species and Critical Habitat in the Action Area

Little information exists regarding fish status in the extreme lower Mark West Creek watershed. A 1996 CDFG survey that began several miles upstream documented a few juvenile steelhead among the numerous warm-water species encountered (e.g., tule perch, sunfish, roach, etc.) (CDFG 2006). Further downstream but still upstream of the action area, the Sonoma Water Agency operates a juvenile out-migrant trap during late winter and spring. Catch records at the trap show steelhead as the most prevalent salmonids species encountered, with smaller numbers of coho salmon and Chinook salmon (Chase 2017). All three species may inhabit the action area during construction of some portion of the pipeline project. Chinook salmon will be absent during summer months due to their behavior of migrating to the ocean shortly after birth, but coho salmon and steelhead juveniles may inhabit the action area at any time during the construction window on account of their life history pattern of residing in freshwater for at least one full year. In any event, salmonid densities encountered during the Project window of construction should be low, given the poor habitat and water quality conditions that these rearing fish would likely encounter.

Within the Action area at the Russian River Crossing, both juvenile and adult steelhead and salmon (both Chinook and coho) can be found within the action area, depending upon season. Instream habitat within the area is largely migratory in nature. Summer juvenile rearing throughout the lower Russian River is generally limited by poor water quality, high water temperatures, and scarce instream cover, while high flow velocities and poor floodplain/channel connectivity likely precludes appreciable winter rearing in the area. For most anadromous salmonids[5], the action area functions as a section of migratory habitat connecting the estuary to higher quality spawning and rearing habitat located further upstream (both in the mainstem and tributaries). Therefore, the number and species of anadromous salmonids residing in the action area can vary greatly due to each species' migration period seasonality and the ephemeral nature by which salmon and steelhead pass through. Adult fish migrate in the fall through the action area beginning in early October, with Chinook salmon the first run to appear, followed closely by coho salmon and steelhead in the next few months. Steelhead adults can continue migrating through the spring into lower Russian River into late May, although the majority of the April/May fish sampled are post-spawn kelts that are returning to the ocean. Typically, no adult fish are in the action area from June through September. The highest density of juvenile steelhead and salmon (both smolts and parr) migrating through the action area occurs during spring (April/May) when smolts migrate to the estuary, and parr relocate to summer rearing habitats. However, a few juvenile salmonids (mainly steelhead) may be found in the Wohler Pool (*i.e.*, the impounded area behind the inflatable dam) during the summer work window.

2.4.2 Factors Affecting Species Environment within the Action Area

Given the noted over-drafting of groundwater resources within the aquifer underlying the action area and surrounding area (Nishikawa 2013), as well as the numerous surface water diversions upstream of the action area, summer and fall streamflow volume is likely lower than historical levels and stressful to juvenile steelhead and salmon. Encroaching vineyards on both streambanks restrict lateral channel migration, which is often an important mechanism that creates and maintains complex instream habitat.

2.4.3 Previous Section 7 Consultations and Section 10 Permits in the Action Area

The Russian River Biological Opinion (RRBO) (NMFS 2008) analyzed SWA, Corps and Mendocino County Russian River Flood Control and Water Conservation Improvement District actions concerning water management, flood control, and channel maintenance throughout the entire Russian River watershed. As part of the RRBO's Reasonable and Prudent Alternative, SWA and the Corps agreed to several changes to their Russian River operations, most significantly their summer releases from Lake Mendocino, Russian River estuary management,

[5] SCWA (2005) notes that a few juvenile steelhead can typically be found in the action area throughout the year, suggesting steelhead juvenile either migrate throughout the year, or a very limited amount of rearing may occur in the Mirabel area.

and agreeing to undertake habitat restoration within the Dry Creek watershed. In addition, and most relevant for the this consultation, is the that Reasonable and Prudent Measure (RPM) 6 of the RRBO required the Subrecipient to …" *complete design of a new fish screen at Mirabel within three years of the issuance of this biological opinion, and replace the fish screen within three years after completion of the design*." Along with replacing the existing fish screens, SWA proposed to also replace an appurtenant fish ladder at the facility, as well as construct a new underwater viewing chamber that would serve both the public and SWA personnel. NMFS analyzed the effects of the implementation RPM 6 in its consultation with the U.S. Army Corps of Engineers (Corps) ARN 151422WCR2013SR00285.

Also within just a hundred feet or so of the Action area at the Mark West Creek Crossing, NMFS consulted with the Corps on the replacement of Wohler Bridge over Mark West Creek. NMFS analyzed the effects of this action with the Corps in ARN 151422WCR2017SR00277. At the time of this writing, this project has not been implemented.

2.5 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

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

Project activities that are likely to affect listed salmonids which will occur at the Mark West Creek Crossing during construction include, fish capture and relocation prior to construction, and potential mortality during construction to those fish that evade capture and relocation. The project is also expected to result in temporary impacts to critical habitat at the Russian River Crossing and Mark West Creek Crossing, particularly changes to water quality, and disturbance to stream banks and riparian vegetation including vegetation removal. A total of 1.9 acres of designated critical habitat for listed salmonids would be temporarily disturbed as a result of the Project. This includes impacts to open water and vegetated habitats.

2.5.1 Fish Capture and Relocation

Data are not available to precisely quantify the number of steelhead that will be relocated prior to dewatering activities. Fish relocation activities will occur during the summer low-flow period after emigrating smolts have left, and before adults have immigrated to the proposed Project site. Due to the degraded rearing conditions, limited stream flow, and warm water temperature the presence of significant numbers of rearing juvenile steelhead or coho salmon during Project construction is unlikely. Chinook salmon are unlikely to occur on site because they do not rear in fresh water during the summer low flow period.

Based upon survey estimates from the action area, we expect up to 50 CCC steelhead, and 25 CCC coho salmon (all juveniles) may be relocated for each work season, or a total of 100 CCC steelhead and 50 CCC coho salmon in the two seasons. There is always the potential for injury or mortality when relocating juvenile salmonids. Fish collecting gear, whether passive (Hubert 1996) or active (Hayes *et al.* 1996) has some associated risk to fish, including stress, disease transmission, injury, or death. The amount of unintentional injury and mortality attributable to fish capture varies widely depending on the method used, the ambient conditions, and the expertise and experience of the field crew. Since 2004, data on fish relocation activities associated with California Department of Fish and Game (CDFG) habitat restoration projects show that most mortality rates associated with individual fish relocation sites are well below three percent and the mean annual mortality rates are below one percent for either coho salmon or steelhead (Collins 2004, 2005; CDFG 2006, 2007, 2008, 2009, 2010). Based on this information, NMFS will use 3% as the maximum amount of mortality likely from fish relocation for the Project. Of captured fish, no more than two steelhead, and one coho salmon will perish during the relocation effort during each season. Those fish that avoid capture may be exposed to risks described in the following section on dewatering.

Generally speaking, fish relocated to new areas may experience crowded conditions, depending on the number relocated, the number of fish inhabiting the new area, and the condition and amount of available habitat. Relocated fish may also face increased competition for available resources such as food and habitat. Some of the fish released at a relocation site may choose not to remain in the area and may move either upstream or downstream to areas with better habitat and lower fish densities -- as each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. Fish populations are likely low within the reach of Mark West Creek adjacent the action area, and therefore available habitat will likely be available to displaced fish. To minimize the likelihood of competition-related, the Subrecipient will ensure released fish are well distributed into available habitat. Based on the foregoing, adversely affecting the fitness of relocated steelhead and coho salmon through fish inter- and intraspecific competition is unlikely.

Although sites selected for relocating fish should have ample habitat, in some instances relocated fish may endure short-term stress from crowding at the relocation sites. Relocated fish may also face increased competition for available resources such as food and habitat. Some of the fish released at the relocation sites may choose not to remain in these areas and may move either upstream or downstream to areas that have more habitat and a lower density of fish. Because relocated fish will have the opportunity to quickly relocate into adjacent areas, thereby minimizing competition and crowding stress, NMFS does not believe capture and relocation activities will reduce the fitness of individual fish.

2.5.2 Dewatering

Stream flow diversions could harm individual rearing juvenile salmonids by concentrating or stranding them in residual wetted areas before they are relocated (Cushman 1985). Rearing salmonids could be killed or injured if crushed during diversion and construction activities, though direct mortality is expected to be minimal due to relocation efforts prior to installation of the diversion. Fish that avoid capture in the Project work area will likely die during dewatering activities due to desiccation or thermal stress. NMFS expects that the total number of juvenile steelhead that will be killed as a result of stranding will be less than those killed during relocation (*i.e.*, less than 1 percent of the total present at the Project site prior to relocation efforts).

NMFS anticipates temporary changes in stream flow within and downstream of the Project site during dewatering activities. Where they occur, fluctuations in flow are anticipated to be small, gradual, and short-term. Stream flow in the vicinity of the Project site should be the same as free-flowing conditions, except during dewatering. Stream flow diversion and dewatering are expected to temporarily reduce or alter aquatic habitat. NMFS anticipates that only a small reach of stream habitat at the Project site will be dewatered for in-channel excavation activities, representing a very minor portion of habitat currently utilized by steelhead within the Mark West Creek watershed.

2.5.3 Turbidity

At the Mark West Creek Crossing, disturbing the streambed or bank during cofferdam construction and channel excavation may temporarily increase turbidity levels within and downstream of the Project site. NMFS anticipates that short-term increases in turbidity may occur during cofferdam construction and removal. Actual excavation work is unlikely to elevate instream sediment concentrations since the work will be performed contained within the sheet piles and erosion control technology will be used.

Sediment may affect salmonids in several ways. High concentrations of suspended sediment can disrupt normal feeding behavior and efficiency (Cordone and Kelly 1961; Bjornn *et al.* 1977; Berg and Northcote 1985), reduce growth rates (Crouse *et al.* 1981), and increase plasma cortisol levels (Servizi and Martens 1992). High turbidity concentrations can lower dissolved oxygen in the water column, reduce respiratory function, lower disease tolerance, and even cause fish mortality (Sigler *et al.* 1984; Berg and Northcote 1985; Gregory and Northcote 1993; Velagic 1995; Waters 1995). Even small pulses of turbid water will cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, decreasing survival. With regard to physical habitat condition, increased sediment deposition can fill pools and reduce the amount of cover available to fish, decreasing the survival of juvenile salmonids (Alexander and Hansen 1986).

Turbidity levels in the action area are expected to be less intense than the conditions encountered in the above-mentioned studies. Dry season conditions will preclude sediment deposition from affecting the system at the time of construction. Any elevation in turbidity would most likely occur following the first storm event following excavation, as flows could mobilize any recently disturbed sediment that remained. However, NMFS anticipates Project turbidity effects will fall below the threshold necessary to injure or kill fish. Instead, the most likely result of Project turbidity levels will be minor behavioral responses (*e.g.*, avoidance, relocation, etc.) that are not expected to appreciably reduce the fitness of individual fish.

2.5.4 Effects to Critical Habitat

To construct the Proposed Project, riparian vegetation must be cleared from the project footprint. Removal of this vegetation would affect an approximately 180-foot-wide portion of the right and left banks of the Russian River, and approximately 100 feet of the right and left banks of Mark West Creek. The removal of riparian vegetation may indirectly affect habitat for salmonids by incrementally increasing water temperatures by removing shade, removing cover from overhanging vegetation, removing a source of large wood, and reducing terrestrial inputs of forage items. As the length of streambank cleared increases, the potential severity of these indirect effects increase.

We expect severity of these effects to be insignificant because the Action Area is located very low within the greater watershed where the influence of riparian vegetation on habitat is relatively minor compared to low order streams (Vannote *et al.* 1980). In addition, both upstream and downstream of the Action Area, the Russian River and Mark West Creek have extended bands of unbroken riparian vegetation and the disturbed bands within the Action Area is relatively small. In this context, the Proposed Project would only affect a very small proportion of riparian habitat in the affected reaches. Furthermore, the BA includes a revegetation plan that would result in the replacement of the vegetation removed. We expect several years of growth will be required before the planted area begins to offer the same habitat contributions as mature riparian habitat. Due to this temporal loss of riparian habitat, adverse effects to designated critical habitat could occur. For this reason, the Subrecipient plans to enhance riparian restoration outside of the work area, meaning that there would be an expansion of riparian habitat in the Action Area following the completion of the project. As such, NMFS does not expect the temporary loss of this vegetation as a result of the Project will diminish the ability of the Russian River or Mark West Creek to continue providing the necessary PBFs for listed salmonids.

During dewatering activities at Mark West Creek, benthic (i.e., bottom dwelling) aquatic macroinvertebrates within the construction site may be killed or their abundance reduced (Cushman 1985), although large numbers of stream-dwelling invertebrates are not expected within many of the action areas due to the benthic characteristics at each site (i.e., little cobble/gravel substrate and a high percentage of fine sediment). However small, this effect will be temporary since construction activities will be relatively short-lived, and rapid recolonization (about one to two months) of disturbed areas by macroinvertebrates is expected following dewatering (Cushman 1985; Thomas 1985; Harvey 1986). In addition, the effect of lost macroinvertebrate production on juvenile steelhead is likely negligible, since food from upstream sources (via drift) would be available downstream of the dewatered areas (any upstream flow is diverted around the construction site). Based on these considerations, NMFS anticipates that any impacts to CCC coho salmon, CCC steelhead and CC Chinook critical habitat, caused by dewatering activities will be minor, short-lived.

The site will be re-planted and stabilized using willow lifts and rock riprap after construction. By design, streambank stabilization projects prevent lateral channel migration, effectively forcing streams into a simplified linear configuration that, without the ability to move laterally, instead erode and deepen vertically (Leopold *et al.* 1968; Dunn and Leopold 1978). The resulting "incised" channel fails to create and maintain aquatic and riparian habitat through lateral migration, and can instead impair groundwater/stream flow connectivity and repress floodplain and riparian habitat function. These "simplified" stream reaches typically produce limited macroinvertebrate prey and provide poor functional habitat for rearing juvenile salmonids (Pollock *et al.* 2007; Florsheim *et al.* 2008). Because bank stabilization utilizing rip rap is typically designed to withstand high streamflow caused by large storm events, the riprap structure, and by extension the impacts to instream habitat, are in effect everlasting, harming future fish generations in perpetuity. Moreover, streambank stabilization impacts not only extend temporally; altered geomorphic and hydraulic processes can propagate spatially both upstream and downstream of hardened bank structures, dependent upon site- and structure-specific characteristics (Henderson 1986 and Arnaud-Fassetta *et al.* 2005, as cited in Florsheim *et al.* 2008). Finally, riprap as a stabilization material immediately and permanently replaces a natural earthen streambank, which can provide complex fish habitat (e.g., undercut banks, submerged rootwads, etc.) (Fischenich and Copeland 2001), with a relatively simple, homogenous streambank structure less suitable for juvenile salmon and steelhead (Schmetterling *et al.* 2001; Fischenich 2003).

Vineyard encroachment and the bridge over Wohler road has caused widespread channelization both upstream and downstream of the Project site. The proposed addition of willow lifts within sections of the riprap does add habitat complexity, which helps ameliorate the poor habitat interface that existed previously. Nevertheless, the Project does establish a small bank stabilization presence within the action area for the foreseeable future, delaying the ability to achieve necessary recovery actions of restoring natural channel-forming processes and functional salmonid habitat.

Quantifying the number of individuals injured or killed by the proposed action's impact on natural channel function is difficult because there are no studies or surveys in the action area identifying the yearly abundance or distribution of CC Chinook salmon, CCC coho salmon or CCC steelhead, nor are there any that quantify expected harm to a population resulting from bank stabilization. Some rearing individual coho salmon or steelhead in the action area would likely move away seeking more suitable habitat, which may exist in reaches with levees or other more natural streambanks. However, a number of individuals may remain in the area directly adjacent to the shoreline, and some proportion (likely small) of these individuals would indirectly be injured or killed in the long-term by the degraded cover and forage habitat resulting from the RSP bank stabilization.

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). 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 does not anticipate any cumulative effects in the action area other than those ongoing actions already described in the Environmental Baseline above, and resulting from climate change. In the long term, climate change may produce temperature, precipitation, and other changes that may adversely affect steelhead and coho salmon habitat in the action area, but impacts will likely be realized on a temporal scale of decades, not over the few years of the proposed action.

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 diminishes the value of designated or proposed critical habitat for the conservation of the species.

Both CCC steelhead and CC Chinook salmon are widespread throughout available habitat in the Russian River, as well as throughout their larger geographic regions (Howe 2016; Seghesio and Wilson, 2016). Although the population size of both species is low compared to historical abundances, they do appear stable, and their spatial distribution throughout their respective DPS/ESU is encouraging. The CCC coho salmon ESU remains at significant risk of extinction (Rogers 2016). The only CCC coho salmon population affected by the proposed action is the Russian River functionally independent population, which includes the Mark West Creek watershed sub-population. Recent abundance trends (2011-2015) in the Russian River show slight improvement, especially within the Mark West Creek drainage where coho salmon were recently re-introduced through the RRCSCBP. Yet despite these gains, the CCC coho salmon population remains just above depensation levels and well short of identified recovery targets

(Williams *et al.* 2016).

Habitat in the action area is impacted by upstream water diversions/groundwater pumping, as well as vineyard encroachment that has channelized this section of Mark West Creek and the Russian River. Available critical habitat generally supports identified PBFs and essential habitat types, although habitat quality remains degraded from historical conditions. A small proportion of the juvenile coho salmon, Chinook salmon and steelhead inhabiting the action area will experience a higher likelihood of perishing prior to reaching adulthood and spawning, primarily due to reduced fitness and growth brought about by the proposed bridge replacement project, and the potential direct impacts to relocated fish. However, the anticipated small loss of juvenile coho salmon, steelhead, and Chinook salmon is unlikely to appreciably impact the future survival and recovery at the ESU and DPS scale, since large areas of underutilized, high-quality habitat remain within other areas of Mark West Creek from which the lost production can be regained.

The proposed action will degrade PBFs and essential habitat types in the action area, namely those related to juvenile rearing. Stream channelization, one of the main culprits limiting habitat quality in the action area, will be little changed by the Project, since there is only a small quantities or riprap being use (i.e. 2,000 square feet). Installing new riprap does effectively preclude recovery of natural stream channel processes for the next several decades within the action area, which will impair the value of critical habitat toward species recovery. However, other suitable habitat located throughout the Russian River and CCC steelhead DPS/coho salmon ESU is likely adequate to support future recovery efforts. Thus, the effects of the proposed action, when added to the environmental baseline, cumulative effects, and species status, are not expected to appreciably reduce the quality and function of critical habitat at the larger CC Chinook salmon, CCC coho salmon ESU or CCC steelhead DPS, and not impair the ability of said habitat to play its intended conservation role.

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, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of CCC coho salmon, CCC steelhead, and CC Chinook salmon

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 incidental take statement.

2.9.1 Amount or Extent of Take

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

NMFS anticipates that the proposed action will result in incidental take of juvenile CCC coho salmon, and CCC steelhead. However, quantifying the number of fish impacted is difficult, given the complex and variable components at play. Individual fish behavior, and how that behavior adapts to evolving habitat conditions, will primarily influence how many fish will be impacted by the Project, and to what degree. In this biological opinion, NMFS concluded that up to 100 CCC steelhead, and 50 CCC coho salmon may be captured and relocated during the two work seasons. Of those fish captured each season, no more than four steelhead, and two coho salmon, will perish. Regarding the number of individuals lost resulting from impacts to critical habitat, NMFS cannot provide an amount of take that would be caused by the proposed action. In instances such as this, NMFS designates the expected level of take in terms of the extent of take allowed. Here, the best available indicator for the extent of take is related to the area of habitat lost due to streambank riprap armoring at the Project site. This variable is directly proportional to extent and nature of harm attributable to this project. Therefore, for harm associated with permanent placement of rock armor along Mark West Creek, the linear length of streambank covered by riprap rock armor will serve as an effective take indicator. Specifically, the anticipated take will be exceeded if the total area of riprap rock armor placement is greater than 2,000 square feet. This take indicator operates as an effective reinitiation trigger because FEMA has authority to conduct compliance inspections and to take actions to address noncompliance, including post-construction (33 CFR 326.4).

2.9.2 Effect of the Take

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

2.9.3 Reasonable and Prudent Measures

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

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of CCC steelhead, CCC coho salmon, and CC Chinook salmon:

1. Ensure completion of a monitoring and reporting program to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are effective in minimizing incidental take.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the FEMA or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The FEMA 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: The following Terms and Conditions implement Reasonable and Prudent Measure 1:
    a. Implementation Monitoring Report Required. The Subrecipient shall submit an implementation monitoring report to NMFS, at 777 Sonoma Avenue, Santa Rosa, California, within 30 days of completing all construction work. The implementation monitoring report will describe the Subrecipient's success meeting his or her permit conditions.
        i. Implementation Monitoring Report Contents. The monitoring report will include the following information:
            1. Project Identification.
                a. Permittee name, permit number, and project name.
                b. Project location by sixth-field HUC and by latitude and longitude as determined from the appropriate United States Geological Survey 7-minute quadrangle map.
                c. FEMA and Subrecipient contact person.
            2. Habitat Conditions. Photos of habitat conditions at the project site before, during, and after project completion.
                a. Include general views and close-ups showing details of the project and project area.
                b. Include photos of the streambank contouring operations for the riprap construction. Label each photo with date, time, project name, photographer's name, and a comment about the subject.
            3. Project data. Include the following specific project data in the monitoring report.
                a. Total areal extent of any new rock slop protection or bioengineering slope protection.
                b. Fish collection report including numbers of each species caught, and survival and mortalities occurring during the fish rescue.
    b. Implementation of BMP 12 and 13 in the Biological Assessment.
        i. The Subrecipient will implement BMP 12 listed in Appendix A of the BA. BMP 12 is titled "Biological Resource Protection Impact Avoidance and Minimization during Dewatering."
        ii. The Subrecipient will implement BMP 13 listed in Appendix A of the BA. BMP 13 is titled "Fish and Amphibian Species Relocation Plan for Dewatering.

2.10 Conservation Recommendations

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

1. NMFS recommends the purchase of conservation bank credits at a NMFS-approved conservation bank for the following: (1) temporary loss of cover and forage habitat due to riprap armoring.

2.11 Reinitiation of Consultation

This concludes formal consultation for Project. As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental 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 agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

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

3.1 Essential Fish Habitat Affected by the Project

EFH managed under the Pacific Coast Salmon Fishery Management Plan may be adversely Adverse Effects on Essential Fish Habitat.

3.2 Adverse Effects on Essential Fish Habitat

The potential adverse effects of the Project on EFH have been described in the preceding Biological Opinion. To summarize, the project may degrade instream habitat by preventing natural fluvial and geomorphic processes that create and maintain salmonid habitat. The project is proposed with design, monitoring, and Best Management Practices meant to avoid or minimize potential adverse effects to EFH from the project, and with elements to promote habitat recovery. As such, NMFS provides no EFH Conservation Recommendations at this time.

3.3 Essential Fish Habitat Conservation Recommendations

There are no practical EFH Conservation Recommendations to provide because impacts to EFH are expected to be minor, temporary, localized, or addressed through avoidance and minimization measures.

3.4 Supplemental Consultation

FEMA 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 effects the basis for NMFS' EFH Conservation Recommendations (50 CFR600.920(1)).

4 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are FEMA. Other interested users could include Sonoma County Water Agency. Individual copies of this opinion were provided to the FEMA and Sonoma County Water Agency. The format and naming adheres to conventional standards for style.

4.2 Integrity

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

4.3 Objectivity

Information Product Category: Natural Resource Plan

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

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation 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 MSA, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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