CITY OF LARKSPUR

BON AIR ROAD BRIDGE REPLACEMENT PROJECT

INITIAL STUDY

MAY 2011

Prepared by:
ICF International

Prepared for:
City of Larkspur

BON AIR ROAD BRIDGE REPLACEMENT PROJECT
INITIAL STUDY

PREPARED FOR:

City of Larkspur
400 Magnolia Avenue
Larkspur, CA 94939
Contact: Hamid Shamsapour, Director of Public Works
415.927.5017

PREPARED BY:

ICF International
630 K Street, Suite 400
Sacramento, CA 95814
Contact: Debbie Loh, Project Manager
916.737.3000

May 2012

ICF International. 2012. Bon Air Road Bridge Replacement Project, Initial Study. May. (ICF 00277.08.) Sacramento, CA. Prepared for City of Larkspur, Larkspur, CA.

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Acronyms and Abbreviations

µg/m^3	micrograms per cubic meter
AB 32	Assembly Bill
ABAG	Association of Bay Area Governments
ac	acre
ADL	aerially deposited lead
ADT	average daily trips
APE	area of potential effects
APN	Assessor Parcel Number
ARB	California Air Resources Board
BAAQMD	Bay Area Air Quality Management District
BCDC	Bay Conservation and Development Commission
BCMMs	basic construction mitigation measures
BMPs	Best Management Practices
CCC	Central California Coast
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CGS	California Geological Survey
CH_4	methane
City	City of Larkspur
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalents
County	Marin County
dB	decibel
dBA	A-weighted decibels
DFG	California Department of Fish and Game
DPM	Diesel particulate matter
DPS	distinct population segment
EFH	Essential Fish Habitat
ESA	environmentally sensitive area
ESU	Evolutionarily Significant Unit
FESA	federal Endangered Species Act

GHGs	greenhouse gases
GWP	global warming potential
IPCC	Intergovernmental Panel on Climate Change
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
L_{min} and L_{max}	minimum and maximum sound levels
LOTBs	Log of Test Borings
L_{xx}	percentile-exceeded sound levels
MBTA	Migratory Bird Treaty Act
MCSTOPPP	Marin County Stormwater Pollution Prevention Program
mg/kg	milligram per kilogram
MMWD	Marin Municipal Water District
MND	Mitigated Negative Declaration
mph	miles per hour
MSA	Magnuson-Stevens Fishery Conservation and Management Act
N_2O	nitrous oxide
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PM	particulate matter
PPV	peak particle velocity
ROG	reactive organic gases
RWQCB	Regional Water Quality Control Board
SEL	sound exposure level
SFBAAB	San Francisco Bay Area Air Basin
SMAQMD	Sacramento Metropolitan Air Quality Management District
SPL	sound pressure level
SWPPP	Storm Water Pollution Prevention Plan
TCPA	Twin Cities Police Authority
TDM	Transportation Demand Management
USACE	United States Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VMT	vehicle miles travel

Proposed Mitigated Negative Declaration

The City of Larkspur has reviewed the proposed project described below to determine whether it could have a significant effect on the environment as a result of project completion. "Significant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance.

Name of Project: Bon Air Road Bridge Replacement Project

Project Description: The proposed project involves replacing the existing Bon Air Road Bridge with a new bridge that is 388 feet long and 62.5 feet wide. The bridge would generally follow the alignment of the existing bridge with the north edge of the new bridge extending approximately 13 feet beyond the north edge of the existing bridge structure. The new bridge would reduce the number of spans and columns to less than half of the number that currently exist. Five spans and two columns (8 to 10 feet in diameter) per bent, for a total of eight columns, are proposed thereby improving the conveyance capacity of the creek. The structure would carry one 12-foot lane of traffic in each direction and have a 6-foot Class 1 bicycle path and 5-foot sidewalk in each direction.

Project Location: Bon Air Road Bridge over Corte Madera Creek, City of Larkspur

Mailing Address and Phone Number of Applicant Contact Person:
Hamid Shamsapour, Public Works Director, City of Larkspur
400 Magnolia Avenue
Larkspur, California 94939
415-927-5017

Findings

The City of Larkspur finds the project described above will not have a significant effect on the environment in that the attached initial study identifies one or more potentially significant effects on the environment for which the project applicant, before public release of this Proposed Mitigated Negative Declaration, has made or agrees to make project revisions that clearly mitigate the effects to a less-than-significant level. The City of Larkspur further finds that there is no substantial evidence that this project may have a significant effect on the environment.

Mitigation Measures Included in the Project to Reduce Potentially Significant Effects to a Less-Than-Significant Level

Aesthetics

Mitigation Measure 1-1: Implement Project Landscaping Plan

Air Quality

Mitigation Measure 3-1: Implement Current BAAQMD Control Measures to Control Construction-Related Dust

Mitigation Measure 3-2: Implement BAAQMD Basic Construction Mitigation Measures, as Outlined in the Draft 2009 CEQA Guidelines

Biological Resources

Mitigation Measure 4-1: Develop and Implement a Revegetation/Enhancement Plan for Temporary Impacts on Riverine Wetland

Mitigation Measure 4-2: Compensate for Permanent Losses of Riverine Wetland during Project Construction

Mitigation Measure 4-3: Install Fencing to Protect Biologically Sensitive Areas Adjacent to the Project Area

Mitigation Measure 4-4: Conduct Environmental Awareness Training for Construction Crews and Provide Biological Monitoring

Mitigation Measure 4-5: Provide an On-Call Biological Monitor to Relocate Western Pond Turtles as Needed

Mitigation Measure 4-6: Begin Work Prior to the Nesting Season or Conduct Preconstruction Surveys for Nesting Migratory Birds

Mitigation Measure 4-7: Specify and Implement Survey Requirements in Construction Contract if Work on the North Side of the Bridge Occurs during the California Clapper Rail/Black Rail Breeding Season

Mitigation Measure 4-8: Halt Work if a Federally Listed Species is Observed in the Work Area

Mitigation Measure 4-9: Care for Injured Federally Listed Species

Mitigation Measure 4-10: Monitor Construction Activities during Extreme High Tides

Mitigation Measure 4-11: Implement Lighting Specifications to Minimize Potential Light Pollution Effects on Animals

Mitigation Measure 4-12: Compensate for the Loss of Suitable Habitat for California Clapper Rail and California Black Rail

Mitigation Measure 4-13: Conduct Preconstruction Surveys for Roosting Bats

Mitigation Measure 4-14: Remove Vegetation in Salt Marsh Harvest Mouse Habitat by Hand and Install Exclusion Fencing

Mitigation Measure 4-15: Conduct Preconstruction Survey for Swallow Nests and Implement Measures to Deter Nesting

Mitigation Measure 4-16: Conduct All In-Water Construction Activities before December 1

Mitigation Measure 4-17: Implement Measures to Minimize Exceedance of Interim Threshold Sound Levels during Pile Driving

Mitigation Measure 4-18: Implement a Hydroacoustic Monitoring Plan

Mitigation Measure 4-19: Implement a Storm Water Pollution Prevention Plan

Cultural Resources

Mitigation Measure 5-1: Stop Work and Consult with Qualified Archaeologist

Mitigation Measure 5-2: Stop Work and Consult with Marin County Coroner and/or Native American Heritage Commission

Greenhouse Gas Emissions

Mitigation Measure 7-1: Implement the Bay Area Air Quality Management District Best Practices for Greenhouse Gas Emissions (recommended)

Hazards and Hazardous Materials

Mitigation Measure 8-1: Sample Suspect Materials for Asbestos Containing Construction Materials

Mitigation Measure 8-2: Provide Notification of Presence of ADL and Lead Based Paint

Mitigation Measure 8-3: Minimize Disturbance of Soils Containing Lead, Lead Containing Paints, and Lead Based Paints

Mitigation Measure 8-4: Contain Lead Containing Paints and Lead Based Paints on Site during Demolition

Noise

Mitigation Measure 12-1: Employ Noise–Reducing Construction Practices

Mitigation Measure 12-2: Employ Vibration-Reducing Construction Practices

Public Review Period

Before June 22, 2012 any person may:

(1) Review the Proposed Mitigated Negative Declaration (MND); and

(2) Submit written comments regarding the information, analysis, and mitigation measures in the Proposed MND to the contact person above.

Name: Hamid Shamsapour

Title: Director of Public Works, City of Larkspur

Signed: Hamid Shamsapour

Circulated on: May 21, 2012

Adopted on: _____

Introduction

The City of Larkspur (City) proposes to replace the Bon Air Road Bridge located in the City of Larkspur within Marin County (County). Figure 1 shows the project vicinity and Figure 2 shows the location of the existing bridge and immediate surrounding area. The City is acting as state lead agency for this project under the California Environmental Quality Act (CEQA).

Since federal funds from the Federal Highway Administration would be used in part to construct the proposed bridge improvements, National Environmental Policy Act (NEPA) compliance will also be required. Caltrans is acting as federal lead agency under NEPA under its assumption of responsibility pursuant to 23 U.S.C. 327. NEPA approval is expected to be achieved with a Section 6004 Categorical Exclusion under the Safe, Accountable, Flexible, Efficient Transportation Equity Act, A Legacy for Users.

This Initial Study will be used by the City of Larkspur for the following project approvals:

- Adoption of a Mitigated Negative Declaration and Mitigation Monitoring Program by the Larkspur City Council.
- Approval of the proposed project.

The Initial Study will also be used by other local and state agencies responsible for issuing approvals or permits that are needed for the proposed project.

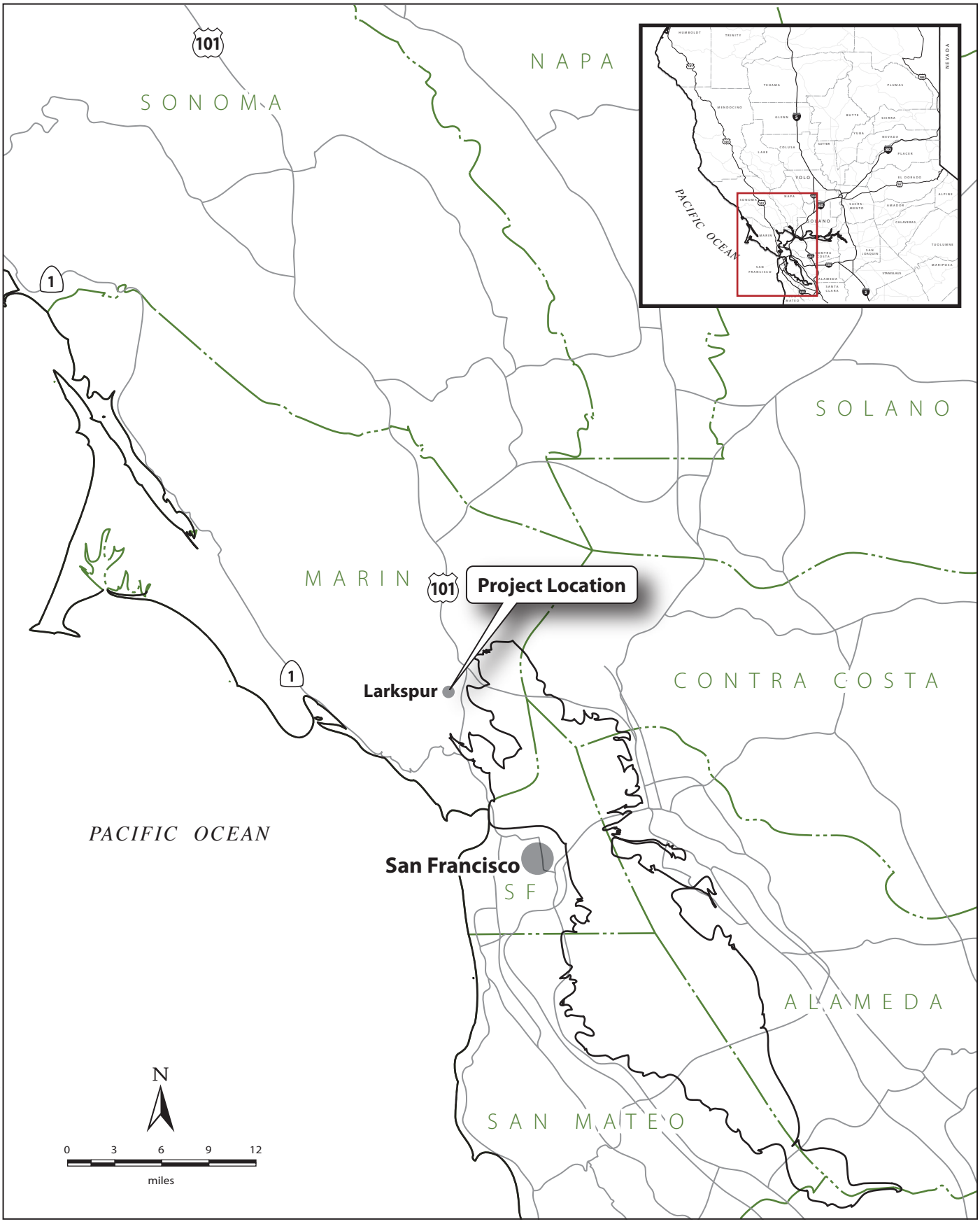
1.	**Project Title:**	Bon Air Road Bridge Replacement Project
2.	**Lead Agency Name and Address:**	City of Larkspur 400 Magnolia Avenue, Larkspur, California 94939
3.	**Contact Person and Phone Number:**	Hamid Shamsapour, Director of Public Works, City of Larkspur 415-927-5017
4.	**Project Location:**	City of Larkspur, Marin County, California
5.	**Project Sponsor's Name and Address:**	City of Larkspur 400 Magnolia Avenue, Larkspur, California 94939
6.	**General Plan Designation:**	The Bon Air Road Bridge spans Corte Madera Creek. Northwest of Bon Air Road Bridge: Hillview residential neighborhood and Marin County Flood Control and Water Conservation District levee maintenance road on the west bank of Corte Madera Creek Southwest of Bon Air Road Bridge: Designated Commercial and Shoreline/Marsh Conservation Northeast of Bon Air Road Bridge: Corte Madera Creek Pathway, Creekside Park, and land designated as Administrative & Professional Southeast of Bon Air Road Bridge: Designated Administrative & Professional
7.	**Zoning:**	West of Bon Air Road Bridge: R-1(First District Residential) and PD (Planned Development) East of Bon Air Road Bridge: Park and AP (Administrative Professional)

8. Description of Project:

Background

Bon Air Road is a major thoroughfare in Marin County. It links Magnolia Avenue in downtown Larkspur with Sir Francis Drake Boulevard in Greenbrae (adjacent community to the northeast of Larkspur), both of which serve as major connections to U.S. 101. Bon Air Road Bridge provides access to the numerous medical offices on South Eliseo Drive and to Marin General Hospital, as well as to commercial businesses along Bon Air Road (Figure 2). The bridge currently carries approximately 11,800 average daily trips (ADT), and ADT is expected to increase to 12,600 by 2036.

The Bon Air Road Bridge was constructed in 1958 over Corte Madera Creek as a seven-span composite steel girder and concrete deck bridge on a concrete substructure. In 1965, the U.S. Army Corps of Engineers lengthened the bridge by three spans since Corte Madera Creek was being widened; parts of the bridge's substructure and foundations were also modified at this time. In 1994, the bridge was seismically retrofitted and widened to accommodate a Class 1 bicycle lane on the north side of the bridge. The bridge currently is 420 feet long by 44 feet wide. The bridge bents consist of concrete caps with vertical or battered concrete piles. Five of the bridge bents have eight piles each; while three of the bents have nine piles each. Diaphragm type concrete abutments are also supported on vertical or battered concrete piles. The bridge carries one lane of traffic in each



Graphics/Projects/00277.08/City of Larkspur/Bon Air/Initial Study (04-12) SS

Figure 1
Project Vicinity

Graphics/Projects/00277.08/City of Larkspur/Bon Air/Initial Study (04-12) SS

Figure 2
Project Location

direction and has an 8-foot Class 1 bicycle path on the north side of the bridge and a 5-foot sidewalk on the south side of the bridge.

Under Caltrans' Local Agency Bridge program, the Bon Air Road Bridge was determined to be structurally deficient with a sufficiency rating of 36.5, a number low enough to warrant replacement of the bridge. Tidal flow has eroded the supporting bridge piles and caused cracks and deterioration of the bridge. In 2000, inspections of the bridge indicated crumbling at several support locations. Further inspections in 2003 revealed severe deterioration of the bridge concrete, including visible cracks and spalls with exposed rebar on some supports and poor deck conditions. Steel girders and bearing plates show excessive rust. Concrete spalls directly below the bearing plates result in multiple locations where bearing plates are mostly unsupported.

The condition of the bridge continues to deteriorate and will likely result in restrictions on permit or other vehicular use unless mitigation occurs.

Rehabilitation of the bridge would not be fully effective since the rust of the steel girder and bearing components, concrete spalls, and corrosion of exposed rebar would likely continue to spread. Further, the life cycle of the repaired structure would be significantly less than the proposed replacement structure and would, therefore, not be cost effective.

Various conceptual designs for the new Bon Air Road Bridge were presented to the Larkspur City Council and the public during City Council meetings on June 4, 2008; August 20, 2008; and December 3, 2008. A public meeting was also held on the proposed replacement bridge on June 26, 2008. At this meeting, different conceptual designs were presented including a design featuring suspended sidewalks, an arch and trapezoidal girder system, and a few variations of these designs with lighted overlooks. Public comments received on these designs included the following (the listing below is not in any particular order and does not reflect the frequency of comments):

- Draw attention to and accentuate the natural landscape
- Reflect the wide, flat stream at the point of crossing
- Keep views of the surrounding hills open from the bridge
- Connect the bridge seamlessly to the Corte Madera Creek Pathway
- Include aesthetic treatments on the sides of the bridge since they are visible from the Corte Madera Creek Pathway and the water
- Include lights that are short and downward on the bridge to avoid light pollution and glare impacts for those living near the bridge

Project Objectives

The project objectives are to:

- **Correct structural deficiencies associated with the Bon Air Road Bridge in the most cost-effective manner by replacing the bridge.**

  As noted above, the Bon Air Road Bridge has a sufficiency rating that justifies replacement of the bridge. Rehabilitation of the bridge would not be fully effective from a structural, life cycle, or cost perspective.

- **Minimize traffic disruptions during construction.**

  Bon Air Road is a major thoroughfare in the City and County and serves as primary access to Marin General Hospital. The bridge currently carries a Class 1 bicycle lane that connects with the Corte Madera Creek Pathway along the eastern side of Corte Madera Creek and with Class 2 lanes along Bon Air Road. Therefore, it is essential that disruptions to vehicular and non-vehicular traffic are minimized during construction of the proposed bridge replacement.

- **Provide an aesthetically-pleasing "signature" design for the bridge that makes a gateway statement.**

  Based on public input received on the proposed project, the public values the design of the community's bridges, including the Bon Air Road Bridge. As described below under the "Proposed Improvements" section, the proposed design of the bridge is intended to reflect the surrounding wetlands and tall grass fields.

- **Provide a bridge design that is sensitive to the natural Corte Madera Creek environment and the recreational uses of the creek.**

  Bon Air Road Bridge crosses over Corte Madera Creek, an area containing sensitive habitat for wildlife and fish species. The project would incorporate the conditions of permits and approvals required from federal and state resource and flood control agencies for project construction. Corte Madera Creek is also used by recreationists such as the Marin Rowing Association. Construction activities associated with the proposed bridge replacement would be conducted to minimize impacts to these recreationists.

Proposed Improvements

The proposed project involves replacing the existing Bon Air Road Bridge with a new bridge that is 388 feet long and 62.5 feet wide (Figures 3 and 4). The proposed bridge design is based on public input as well as the site constraints. The existing roadway profile, limited right-of-way and high water elevation in the creek largely dictate the bridge configuration and profile.

The proposed bridge would generally follow the alignment of the existing bridge with the north edge of the new bridge extending approximately 13 feet beyond the north edge of the existing bridge structure. The new bridge would reduce the number of spans and columns to less than half of the number that currently exist. Five spans and two columns (8 to 10 feet in diameter) per bent, for a total of eight columns, are proposed thereby improving the conveyance capacity of the creek. The structure would carry one 12-foot lane of traffic in each direction and have a 6-foot Class 1 bicycle path and 5-foot sidewalk in each direction (Figure 3 and Figure 4). With wider sidewalks than currently exist, bicyclists and pedestrians would have safer access across the creek. The tangent alignment of the proposed bridge would also improve the overall operational safety of this bridge.

Construction activities would take place 60 feet north and 60 feet south of the Bon Air Road Bridge within the Corte Madera Creek right-of way.

Figure 5 presents an artistic rendering of the proposed bridge. The design is intended to serve as a gateway to the community with ornamental "acorn" light post pedestals at the entries to the bridge and along the length of the bridge. The repetition of these light elements visually unifies the bridge as one passage and differentiates the bridge from the roadways leading to the bridge. Architectural details, such as the green wave form on the handrails and the detailing in the pavement patterning are also proposed to mimic the movement of the grass fields that surround the bridge.

Legend

- Parcel lines
- 020-121-015 APN = Assessors Parcel Number
- Area of Ground Disturbance
- Staging Areas (* = includes a portion of paved shoulder of Magnolia Avenue)
- Temporary Construction Easement
- Right-of-Way Acquisition

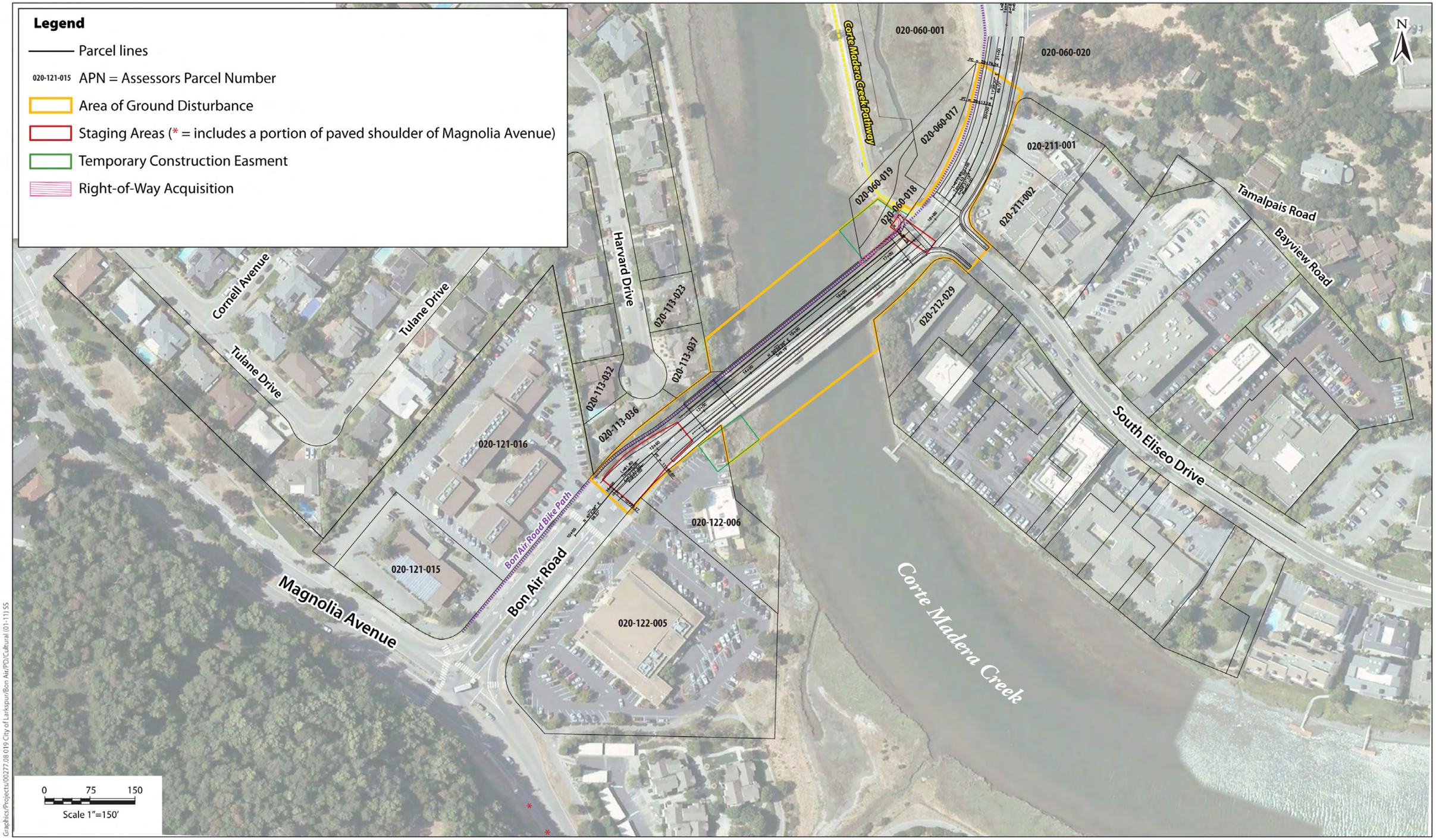


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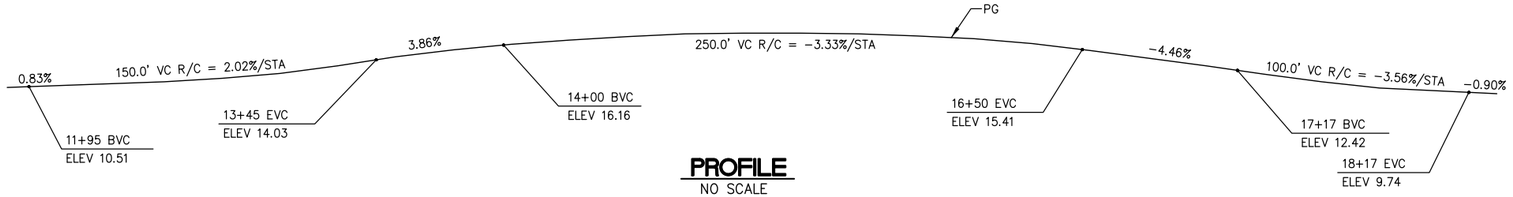
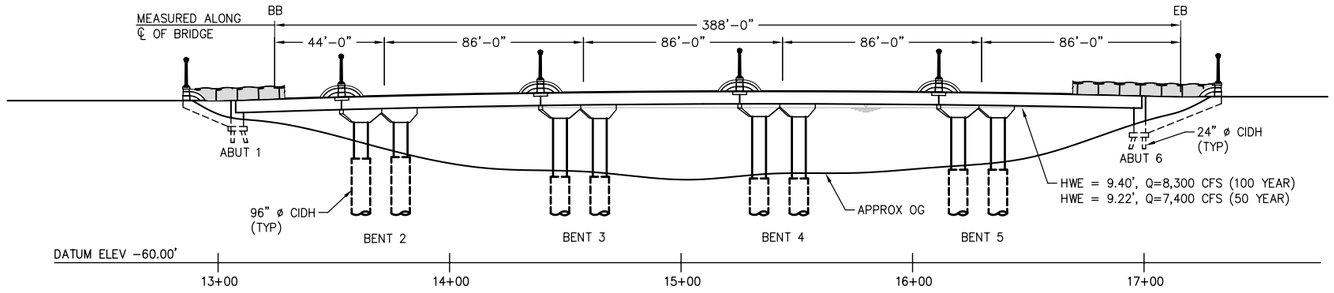
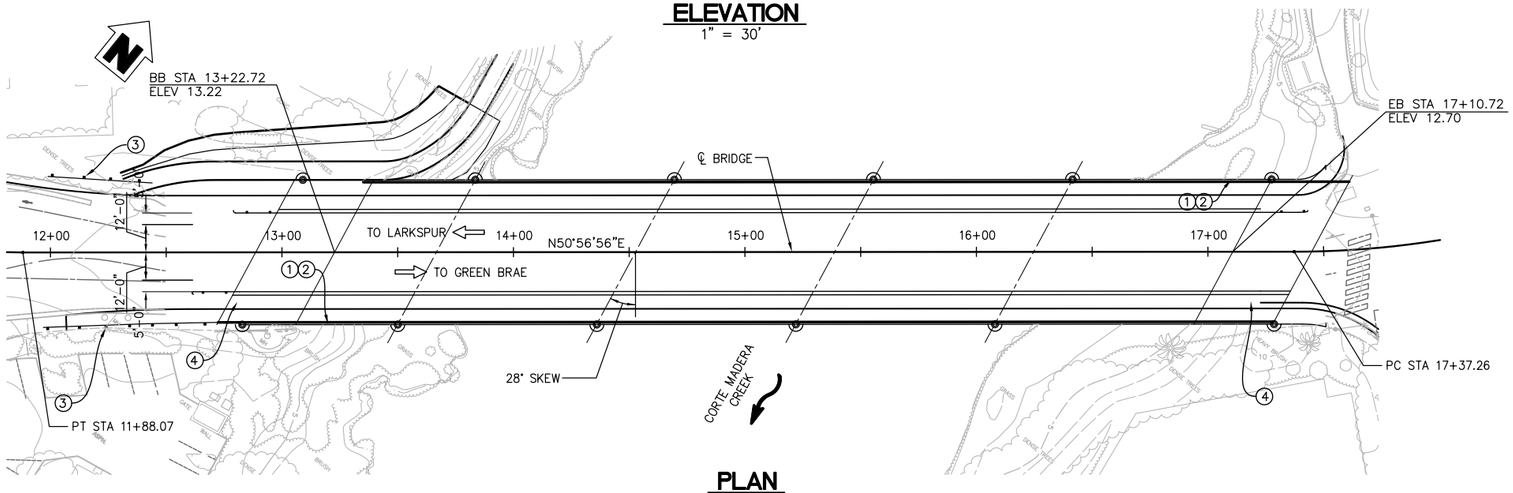
Figure 3
Bon Air Road Bridge Replacement Project



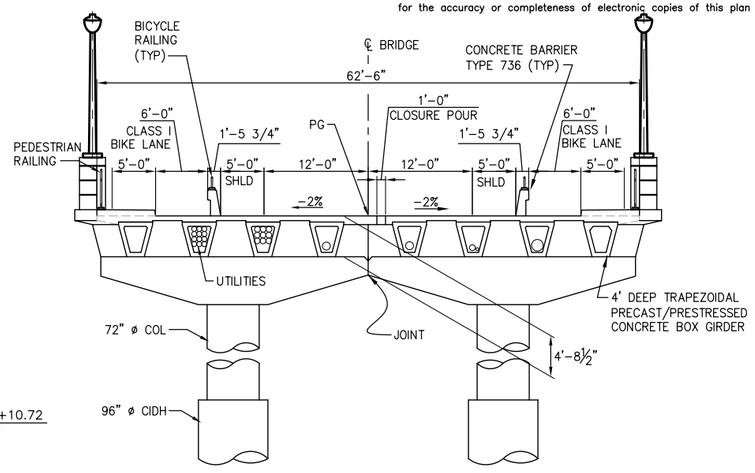
PROFILE
NO SCALE



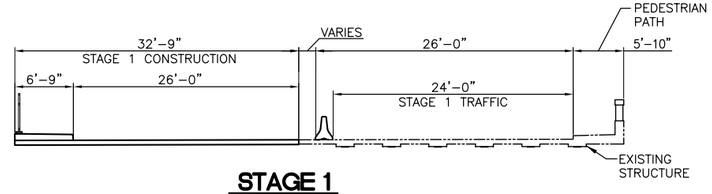
ELEVATION
1" = 30'



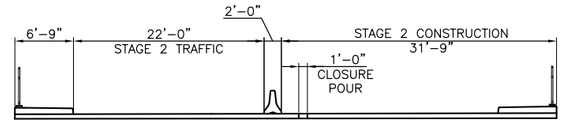
PLAN
1" = 30'



TYPICAL SECTION
1/8"=1'-0"



STAGE 1



STAGE 2

CONSTRUCTION STAGING
NO SCALE

NOTE:
CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL

DIST.	COUNTY	ROUTE	POST MILE TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	MRN				

LEGEND
1. PAINT BRIDGE NO. 27C0028
2. PAINT "BON AIR ROAD BRIDGE"
3. MBGR. SEE " ROAD PLANS"
4. APPROACH SLAB TYPE N(30S)

⇨ INDICATES DIRECTION OF TRAFFIC

REGISTERED ENGINEER – CIVIL

REGISTERED PROFESSIONAL ENGINEER — No. Exp. CIVIL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

PARSONS BRINCKERHOFF

		BY:	CHECKED:			
DESIGN OVERSIGHT	DESIGN	C. RAMIREZ		LOAD AND RESISTANCE FACTOR DESIGN	LIVE LOADING: HL93 W/ "LOW BOY": PERMIT DESIGN VEHICLE	
SIGN OFF DATE	DETAILS	J. OGREN		LAYOUT	C. RAMIREZ	
	QUANTITIES	C. RAMIREZ		SPECIFICATIONS		

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

PREPARED FOR THE CITY OF LARKSPUR DEPARTMENT OF PUBLIC WORKS

B. CONSOLACION
PROJECT ENGINEER

CU
EA

BRIDGE NO.	BON AIR ROAD BRIDGE REPLACEMENT
27C0028	
POST MILE	GENERAL PLAN

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES (PRELIMINARY STAGE ONLY) 4/10/09 | SHEET | OF

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Figure 4
Bon Air Road Bridge Replacement General Plan

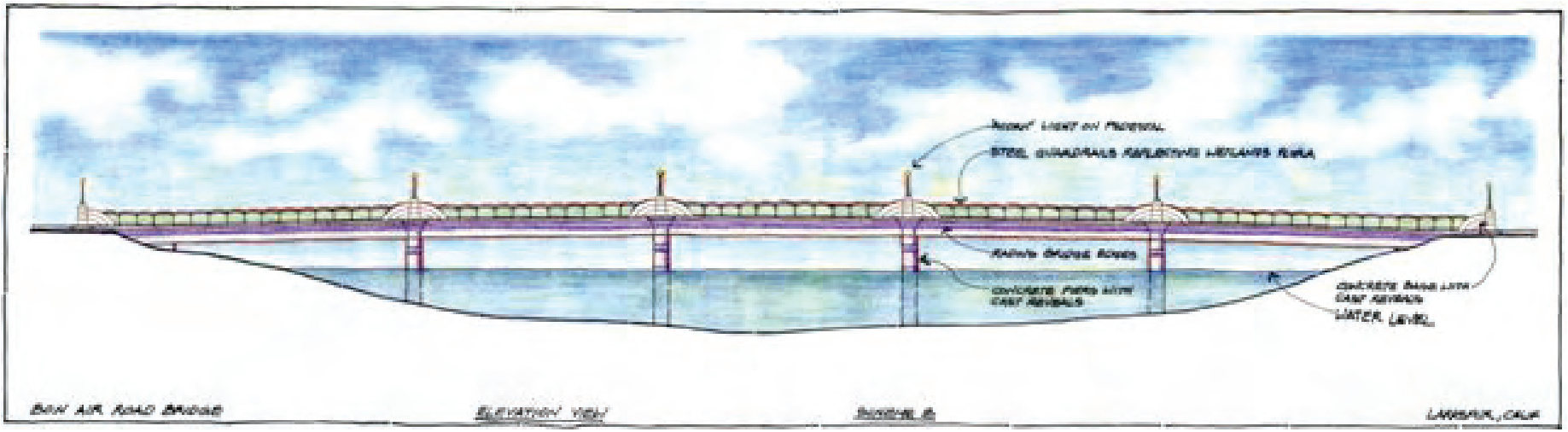

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Figure 5
Rendering of Proposed Bon Air Road Bridge

Proposed Construction Activities

Figure 6 presents the sequencing of construction activities for construction of the proposed bridge replacement. These activities are summarized below.

In-Water Construction Activities: Trestle Bridges and New Bridge Piles

To minimize impacts to vehicular and non-vehicular traffic during construction, the proposed bridge would be constructed using two temporary trestle bridges spanning across Corte Madera Creek, one constructed on the north side of the existing Bon Air Road Bridge and a second constructed on the south side of the bridge. First, a temporary 30 to 50-foot wide trestle would be constructed on the north side of the existing bridge with a tie-in point to Bon Air Road. From the banks of the creek, approximately 64 12- to14-inch steel "H" piles would be placed into the creek approximately 30 feet apart and 70 feet deep for the northern trestle. These piles would support the timber trestle deck. From the trestle, approximately 15 feet of the northern portion of the existing bridge would be demolished and four new columns for the northern half of the new permanent bridge would be constructed.

To construct each of the four new bridge columns that would support the northern half of the bridge, a temporary 10-foot diameter steel casing would be placed into the creek to a depth of approximately 70 feet. After the 10-foot diameter casings are in place, an 8-foot diameter hole will be drilled inside each casing. A temporary 8-foot diameter casing may be utilized to keep the holes stable. Concrete would then be placed into the 8-foot diameter holes.

The same construction method would be used for construction of the southern portion of the bridge. Both trestle bridges would be removed after the new bridge is completed.

The approximately 128 temporary steel "H" piles for the northern and southern trestle bridges and the eight steel casings for the permanent piles would be driven to a depth of 70 feet using a vibratory and impact pile driver. It is anticipated that vibratory driving can effectively drive each pile/casing to a depth of about 50 feet. An impact pile driver will likely be required to drive the remaining 20 feet.

The City's contractor would conduct all pile driving (in-water installation and removal of temporary trestle piles and steel casings) between September 1 and November 30 to avoid impacts to protected wildlife and fish species with the goal of completing pile driving activities as early as possible during this 3-month period of time (Figure 6).

Out-of-Water Construction Activities

Figure 6 shows the activities that would occur related to demolition of the existing bridge and construction of the bridge superstructure, abutments, and the roadway approaches to the bridge. This figure also shows activities that would occur in the dewatered area of the eight temporary steel casings.

Demolition of the north side of the bridge would involve removal of the bridge railing, pedestrian sidewalk, deck, and a portion of the girders and pier caps; approximately 15 feet of the bridge width would initially be removed. During construction of the south portion of the bridge, the remaining bridge width would be removed, and the existing bridge piles would be cut approximately one foot below the channel bottom.

Other above-water construction activities are related to construction of the bridge abutments, construction of a pier cap on each new bridge column, placement of pre-fabricated "girders" or beams would be placed over the new bridge pier-caps to provide horizontal support for the new bridge, construction of the new bridge deck, and concrete placement for the roadway that connects to the new bridge.

As noted above, to construct each of the eight new bridge columns that would support the bridge, concrete would be poured into the dewatered area created by eight 10-foot diameter casings.

Sequencing of Construction Activities

The sequencing of construction activities have been scheduled to avoid any construction on the north side of the bridge between January 15 and August 31 to avoid the breeding season of the federally-listed and state-fully protected California clapper rail. Demolition and construction of the northern portion of the bridge would occur from September 1–January 14, 2014 and from September 1–January 14, 2015 to avoid the clapper rail breeding season. All in-water work related to construction of the north side of the bridge would occur between September 1–November 30, 2013 to avoid the clapper rail breeding season and to avoid impacts to federally-listed fish species. No construction activities would occur on the northern portion of the bridge from January 15–August 31, 2014.

Demolition and construction of the southern portion would occur from September 1–November 1, 2014 and from June 2015 until the end of the construction period in October 2016. All in-water work related to construction of the south side of the bridge would occur between September 1–November 30 to avoid impacts to federally-listed fish species.

Traffic Management on the Bridge during Construction

A Traffic Management Plan would be prepared to ensure safe travel during construction. As shown in Figure 6, during construction of the northern portion of the new bridge, existing two-way vehicular traffic would be diverted south to the remaining 30-feet of bridge width, and a barrier would be used to separate traffic from the construction zone. The existing 5-foot sidewalk on the southern half of the bridge would be used for bicycle and pedestrian travel during construction of the northern portion of the bridge.

Then, traffic would be shifted north to the new bridge during construction of the south portion of the bridge. During this period, bicycle and pedestrian travel would be accommodated on the northern portion of the bridge.

In general, with a few exceptions of short duration, travel across the bridge would be maintained throughout the bridge construction period. Three full bridge closures are expected to be needed during construction (Figure 6). These bridge closures would likely be scheduled during three weekends beginning Friday at 10 p.m. and ending on Monday morning at 5 a.m. The first two weekend closures would be required during erection of the prefabricated girders on the bridge pier-caps. The third closure would be needed to place the roadway/bridge joints at each end of the bridge and for the closure pour to connect the north and south bridge segments.

During the bridge closures, a temporary detour would be required as shown on Figure 7. The detour would route traffic through Marin Community College via Magnolia Avenue, College Avenue, and Sir Francis Drake Boulevard. The detour would add a distance of approximately two miles or five minutes to the travel time.

CONSTRUCTION SEQUENCE AND TIMELINE

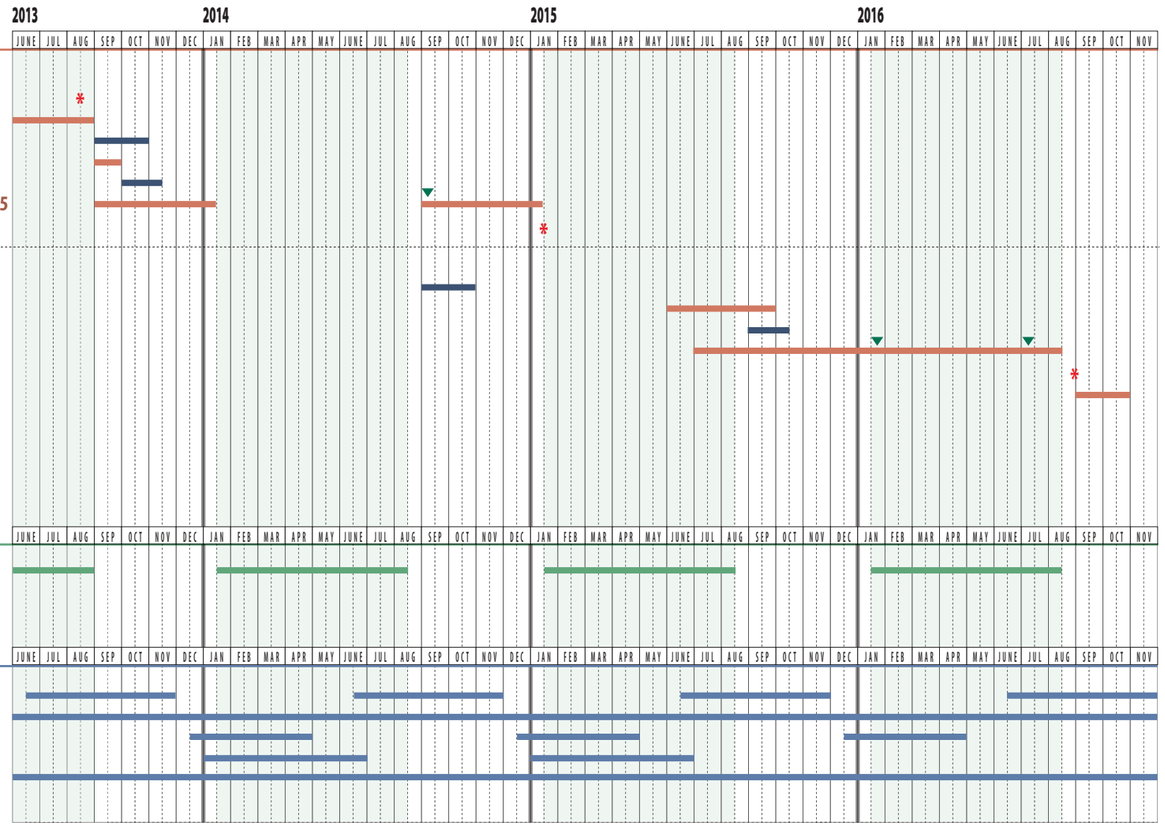
Construction of North Half of Bridge	
• Shift traffic to south side of bridge	August 15, **2013**
• Mobilization	June 1 - August 31, **2013**
• North-side trestle bridge	September 1 - November 1, **2013**
• Demolish existing north side of bridge	September 1 - October 1, **2013**
• Install four casings for north side	October 1 - November 15, **2013**
• Abutments, foundation, pier caps, girder erection, deck placement, approach roadway	September 1, **2013** - January 15, **2014** and September 1, **2014** - January 15, **2015**
• Shift traffic to north side of bridge	January 15, **2015**
Construction of South Half of Bridge	
• South-side trestle bridge	September 1 - November 1, **2014**
• Demolish existing south side of bridge	June 1 - October 1, **2015**
• Install four casings for south side	September 1 - October 15, **2015**
• Abutments, foundation, pier caps, girder erection, deck placement, approach roadway	June 1, **2015** - August 15, **2016**
• Open north and south side bridge to traffic	September 1, **2016**
• Remove both trestles	September 1 - October 31, **2016**

CLAPPER RAIL CONSTRAINTS AND SURVEY REQUIREMENTS

Clapper Rail breeding season	January 15 - August 31

ANADROMOUS FISH SPECIES CONSTRAINTS

• NMFS in-water work window	June 15 - November 30
• Juvenile steelhead rearing	Year-round
• Adult steelhead migration	December 15 - May 1
• Steelhead smolt emigration	January 1 - July 1
• Green sturgeon feeding and rearing	Year-round



Assumptions:

1. Construction award on June 1 or earlier
2. No construction on north side of bridge between January 15 and August 31
3. No use of impact, vibratory, or oscillatory pile driving hammers between January 15 and August 31 on either side of bridge
4. Continuous construction allowed on south side of bridge except for use of impact, vibratory, or oscillatory pile driving hammers is prohibited between January 15 and August 31
5. No construction delays due to bad weather or unusually high flows in the creek

In-water construction activities
Weekend closure to traffic
Traffic/Pedestrian-Related Impacts

Graphics/Projects/00277.08/City of Larkspur/Bon Air/Initial Study (04-12) SS

ICF INTERNATIONAL

Figure 6
Bon Air Road Bridge Replacement Project Construction Schedule and Key Biological Resources Constraints

Graphics/Projects/00277.08/City of Larkspur/Bon Air/Initial Study (04-12) SS

Figure 7
Temporary Detour During Bridge Construction

Other Access Considerations during Construction

The trail head to the Corte Madera Creek Pathway (the area to the south of the parcourse, adjacent to Marin County's Creekside Park),[1] would be narrowed to approximately eight feet wide to provide enough room for the temporary construction easement. Use of the multi-use path and the parcourse (located on the west side of the path) would not be affected during construction (Figure 3).

The Marin County Flood Control District levee maintenance road's connection to Bon Air Road would be slightly realigned to allow adequate space for construction activities and for the increased overall bridge width. However, access to the maintenance road would be maintained during and after construction of the proposed project (Figure 3).

Proposed Right-of-Way Acquisition, Temporary Construction Easements, and Staging Areas

Figure 3 shows the areas that would be used for staging construction equipment and vehicles. Figure 3 shows that a sliver of Assessor Parcel Number (APN) 022-060-18 would need to be acquired north of Bon Air Road for the westbound bridge approach right-of-way.

Temporary construction easements would be required from the parking lot of APN 020-122-06 and from APN 022-060-18 and APN 022-060-19 on the northeast end of the bridge. The temporary construction easements would be used for construction of the temporary trestle bridge as described above. These areas may also be used for temporary utility relocations during construction. Excavation of these areas would not be required.

During demolition and construction on the northern portion of the bridge, the northern portion of the approach to the bridge would be used for staging, and the southern half would be used for bridge access. During demolition and construction of the southern portion of the bridge, the southern portion of the approach to the bridge would be used for staging and the northern portion would be used for access. The paved shoulder of Magnolia Avenue, south of Bon Air Road, would also be used for construction staging (i.e., storage of equipment and for placement of construction trailers) during all phases of bridge construction.

Proposed Utility Work

The utilities that require relocation are located within the City right-of-way or within the temporary construction easement areas shown in Figure 3 and described above. Shallow excavations would be conducted (2 to 6 feet) for temporary utility relocation.

Construction Schedule

Construction of the project is proposed to occur over a 3.5-year period beginning in mid-2013 and that would be completed in late 2016.

Night-time construction activities would be required for a total of approximately eight nights during the proposed weekend closures of the bridge to through traffic. See the section above entitled

[1] Creekside Park was recently renamed Hal Brown Park at Creekside. The park's name was changed after renovations were completed in 2010 (Marin County 2011). However, for the purposes of this document the park is referred to as Creekside Park.

"Traffic Management on the Bridge during Construction" for further details on the construction activities proposed during the weekend closures.

Required Permits and Approvals

The following permits are likely to be required for project construction:

Agency	Permit	Status
U.S. Army Corps of Engineers	Section 404 nationwide permit 14 (linear crossings) and/or Section 10 permit	To be obtained during the final design phase of the project
San Francisco Bay Regional Water Quality Control Board	Section 401 water quality certification	To be obtained during the final design phase of the project
California Department of Fish and Game	Streambed Alteration Agreement	To be obtained during the final design phase of the project
California State Lands Commission	Land use lease	To be obtained during the final design phase of the project, if required
San Francisco Bay Conservation and Development Commission	Development permit application	To be obtained during the final design phase of the project, if required
Marin County Flood Control District	Temporary construction easement	To be obtained prior to construction

9. Surrounding Land Uses and Setting:

Bon Air Road Bridge crosses Corte Madera Creek that flows into the San Francisco Bay and is tidally influenced. The bridge is bounded by the following land uses:

- Northwest: Hillview residential neighborhood and a Marin County Flood Control and Water Conservation District levee maintenance road on the west bank of Corte Madera Creek.
- Southwest: Medical offices (two Bon Air Professional Offices and Mt. Tam Orthopedics)
- Northeast: 28.5-acre Creekside Park and the Corte Madera Creek Pathway. Amenities at the park include picnic tables, a children's play area, amphitheater, benches, lawn areas, restrooms, restored marshland, and a trail network that connects to the Corte Madera Creek Pathway. The park is owned and operated by the Marin County Department of Parks and Open Space.
- The 3-mile Corte Madera Creek Pathway is a Class 1 multi-use path that extends from Ross to Larkspur Landing along the east bank of Corte Madera Creek and western edge of Creekside Park.
- Southeast: Medical offices and Marin General Hospital.

10. Other Public Agencies Whose Approval is Required:

See the "Required Permits and Approval" section above.

Environmental Factors Potentially Affected

The environmental factors checked below would potentially be affected by this project (i.e., the project would involve at least one impact that is a "Potentially Significant Impact"), as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agricultural and Forestry	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology/Soils
☐ Greenhouse Gas Emissions	☐ Hazards and Hazardous Materials	☐ Hydrology/Water Quality
☐ Land Use/Planning	☐ Mineral Resources	☐ Noise
☐ Population/Housing	☐ Public Services	☐ Recreation
☐ Transportation/Traffic	☐ Utilities/Service Systems	☐ Mandatory Findings of Significance

Determination

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions to the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have an impact on the environment that is "potentially significant" or "potentially significant unless mitigated" but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards and (2) has been addressed by mitigation measures based on the earlier analysis, as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier ENVIRONMENTAL IMPACT REPORT or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier ENVIRONMENTAL IMPACT REPORT or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the project, nothing further is required.

Signature — May 11, 2012 (Date)

Debbie Loh, Project Manager, ICF International (Printed Name) — City of Larkspur (For)

1. Aesthetics	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings along a scenic highway?	☐	☐	☐	☒
c. Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☒	☐	☐
d. Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?	☐	☒	☐	☐

This section is based on the Visual Resource Impacts Memorandum prepared for the proposed project (ICF International 2011a).

Discussion

The proposed project is located in the City of Larkspur less than eleven miles north of San Francisco, four miles east of the peak of Mount Tamalpais, and two miles west of the San Francisco Bay. The project area is located in Ross Valley, formed by Corte Madera Creek, and is bounded to the north by Southern Heights Ridge and to the south by Corte Madera Ridge. Corte Madera Creek flows into the nearby San Francisco Bay and is tidally influenced. The narrow valley is well-developed with residential, commercial, and public uses, many of which take advantage of their creek side locations and have piers for direct water access (Figure 1-1, Photo 1). Open spaces, such as parks and small tidal marshes are scattered throughout the project area. The hillsides of the ridges are also developed, but denser vegetation creates an attractive contrast to this development and development is not a dominant visual feature (Figure 1-1, Photo 2). The creek and valley, back-dropped by the vegetated hills and sky, create an attractive visual environment.

The project site crosses Corte Madera Creek and is bounded to the northeast by Creekside Park and Marin Catholic High School; southeast by medical facilities and the Marin General Hospital; northwest by residential development and the Bon Air Professional Offices; southwest by the 2 Bon Air Professional Center, Mt. Tam Orthopedics, and residents adjacent to the creek and south of 2 Bon Air Professional Center. Views of the project site are readily available from trails within Creekside Park (Figure 1-1, Photo 3), but views from Marin Catholic High School are not present because screened fencing around athletic fields and vegetation precludes views of the bridge. Views from the medical facilities and professional centers are limited to those adjacent to each end of the bridge. Views of the bridge would be available from upper floors of the hospital, but distance and the raised vantage point would prevent viewers from seeing a great deal of detail as one would see at ground level. Views from residents vary based on location. Like hospital vantages, views from hillside residents would be limited by distance, vegetation, and a raised vantage point where viewers would

Photo 1: View looking east across Corte Madera Creek from the creekside pathway near Creekside Drive.

Photo 2: View looking north from Bon Air Road bridge toward Creekside Park and Southern Heights Ridge.

Figure 1-1
Representative Photographs

Photo 3: View looking south from Creekside Park toward Bon Air Road bridge and Corte Madera Ridge.

Photo 4: View looking north from the levee maintenance road behind residents along Harvard Drive, just north of Bon Air Road.

Figure 1-1
Representative Photographs

Photo 5: View looking north across Corte Madera Creek from the creekside pathway near Creekside Drive toward Bon Air Road bridge.

Photo 6: View looking northeast from Bon Air Road toward the bridge.

Figure 1-1
Representative Photographs

Photo 7: View looking northeast from Bon Air Road toward landscaping located at the northwest end of the bridge.

Figure 1-1
Representative Photographs

see less detail compared with ground level views. Views from residents northwest of the project site are not present due to fencing and ornamental landscaping that block views; however, the levee maintenance road behind these residents is actively used for recreation and some residents do have gates that open to this gravel road (Figure 1-1, Photo 4). Residents to the southwest, the apartments at Edgewater Place, and homes off of Creekside Drive that are adjacent to the creek have the most direct view compared to other residents in the area (Figure 1-1, Photo 5). These residents have lower growing landscaping, second story or slightly elevated finish floor elevations, and a nearby pathway that skirts along the edge of development and allows more direct views toward the bridge. Views from recreationists on the creek are direct and unobstructed.

The proposed project involves construction of a bridge that extends north and 18.5 feet wider than the existing bridge (Figure 1-1, Photo 6). It would be constructed of concrete and include aesthetic treatments that reflect the creek and nearby fields of Creekside Park and ornamental "acorn" post lighting. Viewers of the proposed project include residents along the creek and on hillsides; roadway users on Bon Air Road and on hillside roadways with unobscured views; businesses located nearby; recreationists using the creek, Creekside Park, Corte Madera Creek Pathway; and pedestrians/joggers/bicyclists using sidewalks, the bicycle path on Bon Air Road, and other nearby pathways.

Comments

1a: Less-than-Significant Impact

Scenic vistas exist from Bon Air Road and from nearby vantages that include views of the Corte Madera Creek and the bridge. Construction activities would create temporary visual impacts during the multi-year construction period, but these impacts would be temporary. Permanent changes to views would be minor. The bridge would be widened by a few feet, and the mass of the bridge would not be substantially altered. The project includes aesthetic design treatments including lighting that would complement the surroundings. In addition, the new bridge would be constructed of concrete like the existing bridge and would not substantially change vistas and views toward the bridge and creek or from the bridge. These impacts would be minor and less than significant, and mitigation is not required.

1b: No Impact

There are no local or state scenic routes in or around the project area that would be affected by the proposed project, and there would be no impact (Caltrans 2010).

1c: Less-than-Significant Impact with Mitigation Incorporated

As discussed above, construction activities would create temporary visual impacts during the multi-year construction period, but these impacts would be temporary and are not considered significant. Views of the creek and from the bridge would be maintained, and the existing visual character would not be altered because the new bridge would be similar to the existing bridge. The bike path and sidewalks would be improved for safety by adding a bicycle path to the south side of the bridge, creating more viewing opportunities. Mitigation Measure 4-1 (refer to Section 4, Biological Resources, below) calls for habitat revegetation and enhancement thereby reducing this impact to less-than-significant.

The project would require the removal of ornamental landscaping that exists along the residential backyards at the northwest end of the bridge between Bon Air Road and residents at the south end of Harvard Drive (Figure 1-1, Photo 7). This landscaping creates a dense hedge that is a visually-pleasing screen compared to a fence. The vegetation may also act to screen residents' views of Bon Air Road. Ornamental landscaping that fronts the medical offices in the southeast quadrant of Bon Air Road/South Eliseo Drive and at the northwest end of the project would also be removed with project implementation. These areas would be re-landscaped to reduce impacts to the existing visual character. Implementation of Mitigation Measure 1-1 would minimize impacts as a result of vegetation removal and disturbance, reducing these impacts to a less-than-significant level.

Mitigation Measure 1-1: Implement Project Landscaping Plan

The project Landscape Architect and contractor shall adhere to the following practices in implementing the project landscaping plan:

- The species composition shall reflect species that are native and indigenous to the project area. The species list should include trees, shrubs, and an herbaceous understory of varying heights, as well as evergreen and deciduous types as appropriate for the location. Plant variety will increase the effectiveness of the planting by providing multiple layers, seasonality, more diverse habitat, and reduced susceptibility to disease.
- Under no circumstances shall any invasive plant species be used at any location.
- Vegetation shall be planted within the first year following project completion.
- An irrigation and maintenance program shall be implemented during the plant establishment period and carried on only on an as-needed basis.
- Irrigation shall utilize a smart watering system that evaluates the existing site conditions and plant material against weather conditions to avoid overwatering of such areas. The irrigation system will be managed in such a manner that any broken spray head, pipes, or other components of the system are fixed within 1 to 2 days, or the zone or system will be shut down until it can be fixed to avoid undue water flows. The irrigation system shall be designed to prevent run-off and overspray.

Mitigation Measure 4-1: Develop and Implement a Revegetation/Enhancement Plan for Temporary Impacts on Riverine Wetland

This measure is described in detail in the "Biological Resources" section below.

1d: Less-than-Significant Impact with Mitigation Incorporated

The proposed project would not create a new source of substantial light or glare that would impact daytime or nighttime views in the area. Once the bridge has been built, the widened roadway would increase the amount of reflective surface present, but not to a level that would substantially alter the amount of glare perceived within the project area. The bridge would be constructed of similar material to the existing bridge and would not increase glare. Project implementation would require that existing vegetation be removed along the right-of-way within the project area increasing the impact of glare. However, Mitigation Measures 1-1 and 4-1 call for replanting disturbed landscaped and habitat areas thereby reducing glare caused by removal of shrubs and trees. New ornamental lights would be installed, similar to existing lights, and would not increase reflective daytime glare

or nighttime light. With implementation of Mitigation Measure 1-1, this impact would also be reduced to a less than significant level.

Sources

Caltrans. 2010. Eligible (E) And Officially Designated (OD) Routes. Revised May 19, 2008. Available at: < http://www.dot.ca.gov/hq/LandArch/scenic/cahisys.htm> Accessed: June 24, 2010.

City of Larkspur. 2009. City of Larkspur Zoning District Map. Revised September 10, 2009. Available at: <http://www.ci.larkspur.ca.us/211-ZoningDistrictMap.pdf> Accessed: March 25, 2010.

ICF International. 2011a. Bon Air Road Bridge Replacement Project: Visual Resource Impacts Memorandum. Final. July 28. Sacramento, CA. Prepared for the California Department of Transportation.

2. Agricultural and Forestry Resources	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
In determining whether impacts on agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts on forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project, and forest carbon measurement methodology provided in the Forest Protocols adopted by the California Air Resources Board. Would the project:				
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b. Conflict with existing zoning for agricultural use or conflict with a Williamson Act contract?	☐	☐	☐	☒
c. Conflict with existing zoning for, or cause rezoning of forest land (as defined in Public Resources Code Section 12220[g]), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104[g])?	☐	☐	☐	☒
d. Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e. Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

Discussion

Review of the Marin County Important Farmland Map 2010 found that the area adjacent to the Bon Air Road Bridge is classified as "Urban and Built-up Land" and was not included in any Important

Farmland classification (California Department of Conservation 2011). Land adjacent to the project area is not under a Williamson Act contract (Marin County 2010). The proposed project is not located in an area zoned for agricultural uses (Marin County 2011). Further, the project area is not located within or in the immediate vicinity of forested lands.

Comments

2a–e: No Impact

Bon Air Road Bridge is not located in an area zoned for agricultural use by the City, nor is it adjacent to agricultural or forested lands. There are no Prime Farmland, Unique Farmland or Farmland of Statewide Importance identified adjacent to the project area. No land within the vicinity of the project is under a Williamson Act contract. The proposed project would not affect agricultural resources or forest lands.

Sources

California Department of Conservation. 2011. Division of Land Resource Protection, Farmland Mapping and Monitoring Program, Marin County Important Farmland Map 2010. Map published May 2011. Available:< ftp://ftp.consrv.ca.gov/pub/dlrp/FMMP/pdf/2010/mar10.pdf >. Accessed: August 24, 2011.

Marin County. 2010. Information Services and Technology – Geographic Information System – Agricultural Lands map. Available at: <http://gisprod.co.marin.ca.us/Agriculture/viewer.htm>. Accessed: March 25, 2010.

———. 2011. Marin Map. Available at: < http://www.marinmap.org/dnn/> Accessed: September 16, 2011.

3. Air Quality	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
When available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☒	☐	☐
c. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a nonattainment area for an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☐	☒	☐	☐
d. Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e. Frequently create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐
f. Contribute to CO concentrations exceeding the State AAQS of 9ppm averaged over 8 hours and 20 ppm for 1 hour [Pursuant to BAAQMD, localized carbon monoxide concentrations should be estimated for projects in which (1) vehicle emissions of CO would exceed 550 lbs./day; (2) intersections or roadway links would decline to LOS D, E, or F; (e) intersections operating at LOS E or F will have reduced LOS; or (4) traffic volume increase on nearby roadways by 10 percent or more unless the increase in traffic volume is less than 100 vehicles per hour.]	☐	☐	☐	☒
g. Result in total emissions of ROG, NO_X, or PM10 of 15 tons per year or greater, or 80 pounds (36 kilograms) per day or greater?	☐	☒	☐	☐
h. Result in a potential to exposure persons to substantial levels of Toxic Air Contaminants (TAC) such that the probably of contracting cancer for the Maximally Exposed Individual (MEI) exceeds 10 in one million?	☐	☐	☒	☐
i. Result in ground level concentrations of non-carcinogenic TACs such that the Hazard index would be greater than 1 for the MEI?	☐	☐	☒	☐
j. Result in a substantial increase in diesel emissions?	☐	☐	☒	☐

This section is based on the Air Quality and Climate Change Analysis prepared for the proposed project (ICF International 2010).

Discussion

The City of Larkspur is located in southeastern Marin County in the San Francisco Bay Area Air Basin (SFBAAB). The SFBAAB is characterized by complex terrain consisting of coastal mountain ranges, inland valleys, and bays, which distort normal wind flow patterns. Given the vast topography, the basin is divided into 11 climatological subregions. The proposed project is located in the Marin County basin.

The Marin County basin is bounded on the west by the Pacific Ocean, on the east by the San Pablo Bay, on the south by the Golden Gate, and on the north by the Petaluma Gap. Although there are a few mountains above 1,500 feet in Marin County, most of the terrain is only 800 to 1,000 feet high, which usually is not high enough to block the marine layer. In southern Marin, the distance from the ocean is short and elevations are low, resulting in higher incidence of maritime air in that area.

The prevailing wind directions throughout Marin County are generally from the northwest. The complex terrain in central Marin creates sufficient friction to slow the incoming air flow. The eastern side of the county has warmer weather than the western side because of its distance from the ocean and because the hills that separate eastern Marin from western Marin occasionally block the flow of the marine air. The City of Larkspur typically experiences the warmest temperatures in July, with an average high of 85 degrees Fahrenheit. The coldest temperatures are recorded in December and January, with average low around 41 degrees Fahrenheit (The Weather Channel 2010).

Air pollution potential is highest in eastern Marin County where most of population is located in semi-sheltered valleys. In the southeast, the influence of marine air keeps pollution levels low. However, as development moves further north, there is greater potential for air pollution to build up because the valleys are more sheltered from the sea breeze. While Marin County does not have many polluting industries, the air quality on its eastern side may be affected by emissions from increasing motor vehicle use within and through the county (Bay Area Air Quality Management District 1999).

Comments

3a: Less-than-Significant Impact

The SFBAAB, including Marin County, is considered a "nonattainment area" for the state and federal ozone standards. The Bay Area Air Quality Management District (BAAQMD), which is the local agency responsible for establishing air quality regulations, is currently in the process of updating its ozone attainment strategy. The current *Bay Area 2005 Ozone Strategy* reviews past achievements in reducing ozone, describes existing conditions, and outlines new measures to further decrease ozone levels in the Bay Area. The plan hinges on a set of control measures designed to reduce ozone precursors and control the downwind transport of ozone to neighboring basins.

A project is typically deemed inconsistent with local air quality plans if it would result in population and/or employment growth that exceeds the estimates included in the applicable air quality plan thereby generating emissions not accounted for in the adopted air quality plan. The proposed project entails replacing the Bon Air Road Bridge. It is not capacity increasing and will not generate

additional motor vehicle trips, employment, or population growth. In addition, the project will comply with all applicable BAAQMD rules and regulations, and follow the district's recommended CEQA mitigation (discussed below). Therefore, the proposed project would not conflict or obstruct implementation of the *Bay Area 2005 Ozone Strategy*. This impact is considered less than significant. No mitigation is required.

3b: Less-than-Significant Impact with Mitigation Incorporated

Marin County is currently designated a "nonattainment area" for the state and federal particulate matter (PM) $PM_{2.5}$ standard, the state PM_{10} standard,[2] and the state and federal ozone standards. As part of its effort to help the SFBAAB achieve attainment with these standards, the BAAQMD has established thresholds of significance for several criteria air pollutants. These standards are published in their *1999 CEQA Guidelines* (Bay Area Air Quality Management District 1999).

The BAAQMD is currently in the process of updating its 1999 thresholds of significance, and has published a draft *2009 CEQA Guidelines* (Bay Area Air Quality Management District 2009). Because the draft guidelines have not been approved, they are still subject to ongoing public comment and may not be adopted in their current form. Consequently, to provide a conservative analysis, this section analyzes the project under both the current and draft guidelines and discloses potential construction-related impacts under both documents.

Construction Emissions

Construction activities associated with the proposed project would generate short-term emissions of reactive organic gases (ROG), nitrogen oxides (NO_x), carbon monoxide (CO), PM_{10}, and $PM_{2.5}$. The "Bridge Construction" setting in the Sacramento Metropolitan Air Quality Management District's (SMAQMD's) Road Construction Emissions Model (Version 6.3.2) was used to estimate these construction emissions. The model estimates emissions for load hauling (on-road heavy-duty vehicle trips), worker commute trips, construction site fugitive dust (PM_{10} and $PM_{2.5}$), and off-road construction vehicles. Equipment horsepower and load factors were based on the SMAQMD's Road Construction Model defaults. Emissions were calculated based on the equipment assumptions described in Table 3-1.

Table 3-1. Equipment Assumptions

Equipment Piece	Equipment Piece
Air compressor	Signal board (solar)
Concrete saw	Welder
Small crane	Tractor/loader/backhoe
Forklift	Concrete mixer
Generator	Concrete pump
Jackhammer	Surfacing equipment
Concrete removal equipment	Dump truck/flat-bed trucks/haulers
Source: Consolacion pers. comm.	

The maximum daily emissions from construction activities are summarized in Table 3-2.

[2] PM_{10} refers to PM less than 10 microns in diameter and $PM_{2.5}$ refers to PM less than 2.5 microns in diameter.

Table 3-2. Summary of Construction Emissions (pounds/day)

				PM_{10}			$PM_{2.5}$		
Phase	ROG	NO_X	CO	Total	Exhaust	Dust	Total	Exhaust	Dust
Bridge removal	5.04	46.39	21.92	9.47	1.97	7.50	3.36	1.80	1.56
Earthwork	5.56	50.64	22.48	9.68	2.18	7.50	3.55	1.99	1.56
Foundation work	6.32	59.74	25.58	9.95	2.45	7.50	3.80	2.24	1.56
Girder erection	3.33	33.09	13.12	8.76	1.26	7.50	2.71	1.15	1.56
Surface work	3.77	36.71	15.59	1.62	1.62	0.00	1.49	1.49	0.00
Draft BAAQMD threshold	*54*	*54*	*n/a*	*n/a*	*82*	*n/a*	*n/a*	*54*	*n/a*
Exceed threshold?	No	Yes	–	–	No	–	–	No	–

Current BAAQMD Guidelines

The current BAAQMD guidelines do not require quantification of construction emissions. Instead, they require implementation of effective and comprehensive feasible control measures to reduce PM_{10}. According to the BAAQMD, if all control measures are implemented (as appropriate, depending on the size of the project area), air pollutant emissions from construction activities are considered less than significant (Bay Area Air Quality Management District 1999). Consequently, in accordance with the current BAAQMD thresholds, this impact is considered less than significant with implementation of Mitigation Measure 3-1.

Mitigation Measure 3-1: Implement Current BAAQMD Control Measures to Control Construction-Related Dust

In accordance with the BAAQMD's current CEQA guidelines (1999), the project applicant shall implement the following BAAQMD-recommended basic control measures to reduce particulate matter emissions from construction activities. Enhanced and optional control measures are recommended and will be implemented to the extent feasible.

Basic Control Measures

- All active construction areas shall be watered at least twice daily.
- All trucks hauling soil, sand, and other loose debris shall be covered, or all trucks shall be required to maintain at least 2 feet of freeboard on public roads.
- All unpaved access roads, parking areas, and staging areas at construction sites shall be paved or watered three times daily, or nontoxic soil stabilizers shall be applied.
- All paved access roads, parking areas, and staging areas at construction sites shall be swept daily (with water sweepers).
- If visible soil material is carried onto adjacent public streets, adjacent streets shall be swept daily (with water sweepers).

Enhanced Control Measures

- All inactive construction areas (previously graded areas inactive for 10 days or more) shall be hydroseeded, or nontoxic soil stabilizers shall be applied.
- Exposed stockpiles (dirt, sand, etc.) shall be enclosed, covered, and watered, or nontoxic soil binders shall be applied.
- As feasible, traffic speeds on unpaved roads shall be limited to 15 miles per hour (mph).
- Sandbags or other erosion-control measures shall be installed to prevent silt runoff to public roadways.
- Disturbed areas shall be replanted as quickly as possible.

Optional Control Measures

- Wheel washers shall be installed for all exiting trucks, or all trucks and equipment leaving the site shall be washed off.
- Wind breaks or trees/vegetative wind breaks shall be installed at windward sides of construction areas.
- Excavation and grading activity shall be suspended when winds exceed 25 mph.
- The area subject to excavation, grading, and other construction activity at any one time shall be limited.

Draft BAAQMD Guidelines

The draft *2009 BAAQMD CEQA Guidelines* propose quantitative thresholds for construction-related emissions (Bay Area Air Quality Management District 2009). According to the draft guidelines, projects are considered significant if they:

- produce an average of more than 54 pounds /day of ROG, NO_x, or $PM_{2.5}$ (exhaust emissions only), or more than 82 lbs/day of PM_{10} (exhaust emissions only);
- result in an increased cancer risk for a person with maximum exposure potential by more than 10 in 1million or a non-cancer health index more than 1 for either acute or chronic exposure; or
- result in an ambient annual average increase in $PM_{2.5}$ more than 0.3 micrograms per cubic meter ($\mu g/m^3$).

Based on Table 3-2, construction activities associated with the proposed project are anticipated to exceed the draft BAAQMD thresholds for NO_x. The draft BAAQMD guidelines recommend that that all projects, regardless of whether emissions exceed thresholds, implement basic construction mitigation measures (BCMMs). BCMMs are summarized in Mitigation Measure 3-2. Construction emissions are not anticipated to impede attainment or maintenance of ozone or PM standards with iimplementation of the mitigation measure identified below. This impact is considered less than significant with mitigation.

Mitigation Measure 3-2: Implement BAAQMD Basic Construction Mitigation Measures, as Outlined in the Draft 2009 CEQA Guidelines

In accordance with the BAAQMD's draft CEQA guidelines (2009), the project applicant shall implement, to the extent feasible, the BAAQMD's BCMMs. (BCMMs that overlap with current BAAQMD-recommended dust control measures have been removed.)

- All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxics Control Measure—13 California Code of Regulations [CCR] 2485). Clear signage shall be provided for construction workers at all access points.
- Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The BAAQMD's telephone number shall also be visible to ensure compliance with applicable regulations.

Operational Emissions

Long-term air quality emissions are those associated with motor vehicles operating on the roadway network, predominantly those operating in the project vicinity. The proposed project entails replacing the Bon Air Road Bridge and will not increase the number of travel lanes. It will not affect vehicle miles travel (VMT) or traffic speeds in the project area. Because, VMT and traffic speeds are directly related to fuel consumption and vehicle exhaust emissions, implementation of the proposed project would result in no operational emissions or adverse effects. No mitigation is required.

3c: Less-than-Significant Impact with Mitigation Incorporated

Implementation of the project would not create a significant air quality impact (discussed above in 3b) following implementation of Mitigation Measures 3-1 and 3-2. Therefore, a cumulatively considerable net increase of any pollutant would not occur. This impact is considered less than significant.

3d: Less-than-Significant Impact

Diesel particulate matter (DPM), which is classified as a carcinogen by the California Air Resources Board, is the primary pollutant of concern with regard to health risks to sensitive receptors. Sensitive receptors include residences, hospitals, schools, parks, and places of worship. Within the project area, there are single-family dwellings immediately adjacent to westerly entrance to the Bon Air Road Bridge. There are also several medical facilities and parks within the project vicinity.

A cancer risk of 10 in 1 million is considered significant by the current and draft BAAQMD CEQA guidelines. In addition, the draft thresholds consider an increase of more than 0.3 $\mu g/m^3$ of $PM_{2.5}$ to be significant. Although diesel-powered equipment will operate on the project site, construction is only anticipated to last for approximately 26 months over a 3.5-year period, which is well below the recommended cancer risk assessment period of 70 years. In addition, as shown in Table 3-2, PM exhaust emissions are expected to be minimal. Over the long-term, the proposed project will not

affect the vehicle fleet mix and, therefore, will not increase the number of heavy-duty diesel-powered trucks traveling through the project area. DPM levels are neither expected to exceed the current or draft BAAMQD thresholds, nor result in adverse health effects. This impact is considered less than significant. No mitigation is required.

3e: Less-than-Significant Impact

Diesel exhaust from construction activities may generate minor odors. However, once construction activities have been completed, these odors would cease. Moreover, since the project area is only approximately three acres and use of construction equipment is relatively minor, odors generated by diesel exhaust are not likely to be noticeable beyond the immediate project area. This impact is therefore considered less than significant. No mitigation is required.

3f: No Impact

As discussed above, the proposed project would not affect VMT or traffic speeds in the project area. Therefore, there would be no impact on CO concentrations. No mitigation is required.

3g: Less-than-Significant Impact with Mitigation Incorporated

See 3b and 3c.

3h–j: Less-than-Significant Impact

See 3d.

Sources

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4. Biological Resources	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☒	☐	☐
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f. Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

This section is based on the Natural Environment Study prepared for the proposed project (ICF International 2011b), U.S. Fish and Wildlife Service (USFWS) Biological Assessment (ICF International 2011c), and National Marine Fisheries Service (NMFS) Biological Assessment (ICF International 2011d) completed for this project.

Discussion

Methods

Biological surveys were conducted in 2005, 2007, 2008 and 2010 in the project study area (Figure 4-1) by ICF International biologists. Surveys included a delineation of wetlands and other waters, botanical surveys for sensitive plants at the appropriate identification periods (May and August), habitat based surveys for sensitive fish and wildlife species, and a site assessment for California red-legged frog (*Rana draytonii*).

The following literature sources and databases were also reviewed to determine potential biological species and biological resources of concern in the study area:

- the California Native Plant Society's (CNPS's) *Inventory of Rare and Endangered Plants of California* (2008);
- a list of sensitive species from the California Natural Diversity Database (CNDDB) records search for the U.S. Geological Survey (USGS) 7.5-minute San Rafael, San Geronimo, Novato, Petaluma Point, San Quentin, San Francisco North, Point Bonita, and Bolinas quadrangles (2008);
- a list of threatened and endangered species provided by the USFWS for the USGS 7.5-minute San Rafael quadrangle (2008); and
- *Soil Survey of Marin County, California* (Kashiwagi 1985).

This information was used to develop lists of sensitive species and vegetation communities of special concern that could be present in the project vicinity. Species from the lists were considered if they were known to occur within a 10-mile radius of the study area. Table 4-1 (plant species) and Table 4-2 (wildlife and fish species) contain the 2011 information from these data sources for the project vicinity.

Graphics/Projects/00277.08/City of Larkspur/Bon Air/Initial Study (04-12) SS

Figure 4-1
Natural Communities in the Biological Study Area
Bon Air Road Bridge Replacement Project

Table 4-1. Special-Status Plant Species Identified as Having Potential Habitat in the Biological Study Area

Common and Scientific Names	Legal Status (Federal/ State/CNPS)[a]	General Habitat Description	Habitat Present/A bsent	Rationale
Sonoma alopecurus *Alopecurus aequalis* var. *sonomensis*	E/–/1B.1	Known from scattered occurrences in Sonoma and Marin counties. Occurs in freshwater marshes and swamps, riparian scrub at elevations of 16–1,197 feet. Reported blooming period is May–July.	Present	Potential habitat present in saline emergent wetland and riverine wetland but not observed during surveys conducted in blooming period. Nearest occurrence is ~10 mi. from study area.
Marsh sandwort *Arenaria paludicola*	E/E/1B.1	Known from only two natural occurrences in Black Lake Canyon on Nipomo Mesa and Oso Flaco Lake, San Luis Obispo County; historically more wide ranging through central and south coast. Occurs in sandy openings in freshwater or brackish marshes and swamps at elevations of 10–558 feet. Reported blooming period is May–August.	Present	Potential habitat present in saline emergent wetland and riverine wetland but not observed during surveys conducted in blooming period.
Bristly sedge *Carex comosa*	–/–/2.1	Known from scattered occurrences throughout California; Oregon, Washington. Occurs in coastal prairie, marshes and swamps at lake margins, valley and foothill grassland at elevations below 2,050 feet. Reported blooming period is May–September.	Present	Potential habitat present in saline emergent wetland and riverine wetland but not observed during surveys conducted in blooming period.
Lyngbye's sedge *Carex lyngbyei*	–/–/2.2	Known from North Coast: from Del Norte to Marin Counties; Oregon and elsewhere. Occurs in brackish or freshwater marshes and swamps at elevations below 33 feet. Reported blooming period is May–August.	Present	Potential habitat present in saline emergent wetland and riverine wetland but not observed during surveys conducted in blooming period. Nearest occurrence ~4 mi. from study area.
Hairless popcorn-flower *Plagiobothrys glaber*	–/–/1A	Known from coastal valleys from Marin County to San Benito Counties. Occurs in alkaline meadows and seeps, coastal salt marsh and swamps at elevations of 49–590 feet. Reported blooming period is March–May.	Present	Potential habitat present in saline emergent wetland and riverine wetland but not observed during surveys conducted in blooming period.

Common and Scientific Names	Legal Status (Federal/ State/CNPS)[a]	General Habitat Description	Habitat Present/A bsent	Rationale
Marin knotweed *Polygonum marinense*	–/–/3.1	Known from coastal Marin, Marin, Napa, Solano, and Sonoma Counties. Occurs in coastal salt marsh, brackish marsh at elevations below 33 feet. Reported blooming period is (uncommonly April) May–August (uncommonly October).	Present	Potential habitat present in saline emergent wetland and riverine wetland but not observed during surveys conducted in blooming period. Nearest occurrence ~1 mi. from study area.

[a] Status explanations:

Federa
E = listed as endangered under the federal Endangered Species Act.
– = no listing

State
E = listed as endangered under the California Endangered Species Act.
– = no listing

California Native Plant Society (CNPS
1A = List 1A pecies: presumed extirpated in California.
1B = List 1B species: rare, threatened, or endangered in California and elsewhere.
2 = List 2 species: rare, threatened, or endangered in California but more common elsewhere.
3 = List 3 species: more information is needed about this plant.
4 = List 4 species: limited distribution and on a watch list.
0.1 = seriously endangered in California.
0.2 = fairly endangered in California.
* = presumed extirpated from that County.

Table 4-2. Special-Status Wildlife and Fish Species That Could Occur in the Biological Study Area

Common and Scientific Names	Legal Status (Federal/ State)[a]	General Habitat Description	Habitat Present/ Absent	Rationale
Western pond turtle *Actinemys marmorata*	–/SSC	Occurs throughout California west of the Sierra-Cascade crest; found from sea level to 6,000 ft; does not occur in desert regions except for along the Mojave River and its tributaries; occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation in woodlands, grasslands, and open forests.	Present	Suitable habitat in and adjacent to Corte Madera Creek; likelihood of turtles being present is reduced due to the proximity to human activity along roadway and walking path.
Northern harrier *Circus cyaneus*	–/SSC	Occurs in grasslands, meadows, marshes, and seasonal and agricultural wetlands throughout lowland California.	Present	Suitable nesting habitat in saline emergent wetland in and adjacent to study area; unlikely to nest due to the proximity to human activity along roadway and walking path.

Common and Scientific Names	Legal Status (Federal/ State)[a]	General Habitat Description	Habitat Present/ Absent	Rationale
White-tailed kite *Elanus leucurus*	–/FP	Lowland areas west of Sierra Nevada from the head of the Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the Mexico border; low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging	Present	Suitable nest trees in and adjacent to study area; could perch or forage in or adjacent to study area.
California clapper rail *Rallus longirostris obsoletus*	E/E, FP	Marshes around the San Francisco Bay and east through the Delta to Suisun Marsh. Restricted to salt marshes and tidal sloughs; usually associated with heavy growth of pickleweed; feeds on mollusks removed from the mud in sloughs.	Present	Could nest, forage, or rest in saline emergent wetland in and adjacent to study area.
California black rail *Laterallus jamaicensis coturniculus*	–/T, FP	Permanent resident in the San Francisco Bay and eastward through the Delta into Sacramento and San Joaquin Counties; small populations occur in Marin, Santa Cruz, San Luis Obispo, Orange, Riverside, and Imperial Counties. Occurs in tidal salt marshes associated with heavy growth of pickleweed; also occurs in brackish marshes or freshwater marshes at low elevations.	Present	Could nest, forage, or rest in saline emergent wetland in and adjacent to study area.
Short-eared owl *Asio flammeus*	–/SSC	Permanent resident along the coast from Del Norte County to Monterey County although very rare in summer north of San Francisco Bay, in the Sierra Nevada north of Nevada County, in the plains east of the Cascades, and in Mono County. Occurs in freshwater and salt marshes, lowland meadows, and irrigated alfalfa fields; needs dense tules or tall grass for nesting and daytime roosts.	Present	Could nest, forage, or rest in saline emergent wetland in and adjacent to study area.
San Francisco common yellowthroat *Geothlypis trichas sinuosa*	–/SSC	Found only in the San Francisco Bay Area in Marin, Napa, Sonoma, Solano, Contra Costa, San Francisco, San Mateo, Santa Clara, and Alameda Counties. Breeds in fresh and brackish marsh associated with and close to Bay wetlands. Freshwater marshes are used in summer and salt or brackish marshes in fall and winter; requires tall grasses, tules, and willow thickets for nesting and cover.	Present	Could nest, forage, or rest in saline emergent wetland in and adjacent to study area.

Common and Scientific Names	Legal Status (Federal/ State)[a]	General Habitat Description	Habitat Present/ Absent	Rationale
Samuels (San Pablo) song sparrow *Melospiza melodia samuelis*	–/SSC	Found in San Pablo Bay. Uses tidal sloughs within pickleweed marshes; requires tall bushes (usually grindelia) along sloughs for cover, nesting, and songposts; forages over mudbanks and in the pickleweed.	Present	Could nest, forage, or rest in saline emergent wetland in and adjacent to study area.
Western red bat[b] *Lasiurus blossevillii*	–/SSC	Found throughout much of California at lower elevations. Found primarily in riparian and wooded habitats. Occurs at least seasonally in urban areas. Day roosts in trees within the foliage. Found in fruit orchards and sycamore riparian habitats in the Central Valley.	Present	May roost in foliage of trees in study area.
Pallid bat[b] *Antrozous pallidus*	–/SSC	Occurs throughout California except the high Sierra from Shasta to Kern County and the northwest coast, primarily at lower and mid elevations. Found in a variety of habitats from desert to coniferous forest. Most closely associated with oak, yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California. Relies heavily on trees for roosts.	Present	May roost in foliage of trees in study area
Salt marsh harvest mouse *Reithrodontomys raviventris*	E/E, FP	Occurs at San Francisco, San Pablo, and Suisun Bays and in the Delta. Habitat consists of salt marshes with a dense plant cover of pickleweed and fat hen with an adjacent upland area for flood escape.	Present	May occur in saline emergent wetland in and adjacent to study area.
Central California coast steelhead *Oncorhynchus mykiss*	T/–	Occurs in coastal streams from Russian River to Aptos Creek (Santa Cruz County); tributaries to San Francisco, San Pablo, and Suisun Bays; and coastal marine waters off California. Occurs in well-oxygenated, cool, riverine habitat with water temperatures from 7.8 to 18°C (Moyle 2002); habitat types include riffles, runs, and pools of freshwater streams and rivers, and coastal estuaries.	Present	Suitable migration habitat for adults and juveniles (smolts) and rearing habitat for juveniles is present in Corte Madera Creek in the study area. Spawning habitat occurs upstream of the study area in flowing, freshwater reaches of Corte Madera Creek and tributaries. Critical habitat includes Corte Madera Creek in the study area (70 FR 52488 September 2, 2005).

Common and Scientific Names	Legal Status (Federal/ State)[a]	General Habitat Description	Habitat Present/ Absent	Rationale
Central California coast coho salmon *Oncorhynchus kisutch*	E/E	Occurs in coastal streams from Punta Gorda (Humboldt County) south to and including the San Lorenzo River (Santa Cruz County), as well as populations in tributaries to San Francisco Bay, excluding the Sacramento-San Joaquin River system. Occurs in cool (12–14°C), clear, well-oxygenated streams with deep (0.5 to 1 meter or more) pools and dense riparian (overhead) and submerged cover (e.g., undercut banks, woody material), particularly in the pools or runs (Moyle 2002; Moyle et al. 2008)	Present	Although present historically, coho salmon have not been observed in Corte Madera Creek since 1986. However, suitable migration habitat for adults and juveniles (smolts) and rearing habitat for juveniles is present in Corte Madera Creek in the study area. Critical habitat include Corte Madera Creek in the study area (64 FR 24049 May 5, 1999).
North American green sturgeon *Acipenser medirostris*	T/–	Occurs in marine waters of the Pacific Ocean from the Bering Sea to Ensenada, Mexico. In anadromous reaches of rivers from British Columbia south to the Sacramento River, primarily in the Klamath/Trinity and Sacramento Rivers. Juveniles are believed to be distributed widely throughout San Francisco, San Pablo, and Suisun Bays for feeding and rearing and are present in all months of the year (74 FR 52305).	Present	Juveniles could feed and rear in tidal channel of Corte Madera Creek in the study area. Critical habitat includes Corte Madera Creek in the study area (74 FR 52300-52351 November 9, 2009).

[a] Status explanations:

Federa
E = listed as endangered under the federal Endangered Species Act.
T = listed as threatened under the federal Endangered Species Act.
– = no listing.

State
E = listed as endangered under the California Endangered Species Act.
T = listed as threatened under the California Endangered Species Act.
FP = fully protected under the California Fish and Game Code.
SSC = species of special concern in California.
– = no listing.

[b] This bat is considered a high priority species in California by the Western Bat Working Group. Available: http://www.wbwg.org/spp_matrix.html)

Study Area

The 3.311-acre (ac) study area (Figure 4-1) includes the proposed project area (i.e., where project-related ground-disturbing construction, staging, or access activities would occur; see Figure 3), as well as natural areas adjacent to the project area. The study area encompasses the Bon Air Road Bridge, portions of Bon Air Road and South Eliseo Drive, Corte Madera Creek, and a small portion of Creekside Park. Land uses adjacent to the study area are residential, commercial, recreational, and natural/open space.

There are five natural communities in the study area (Table 4-3; Figure 4-1), which are briefly discussed below. In addition, a portion of the study area is developed.

Table 4-3. Total Area of Natural Communities and Development in the Study Area

Natural Communities	Extent within Study Area (acres)
Ruderal annual grassland	0.185
Landscaped/ornamental	0.227
Riverine wetland	0.153
Saline emergent wetland	0.291
Riverine/open water	1.283
Total[a]	**2.139**

[a] Total area does not include 1.172 ac of development, including roads, sidewalks, and road shoulders.

Ruderal Annual Grassland

The distribution of ruderal annual grassland in the study area is limited to narrow swaths located adjacent to Bon Air Road and the paved paths on both sides of Corte Madera Creek north of the bridge. The ruderal annual grassland is characterized by a high proportion of non-native plant species, including naturalized annual grasses. Annual grasses observed in the ruderal annual grassland were wild oat (*Avena fatua*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), rattlesnake grass (*Briza maxima*), soft chess (*Bromus hordeaceus*), and ripgut brome (*Bromus diandrus*). Forbs observed in the ruderal annual grassland were fennel (*Foeniculum vulgare*), prickly lettuce (*Lactuca serriola*), and bristly ox-tongue (*Picris echioides*). The ruderal annual grassland in the study area is subject to regular maintenance (e.g., mowing).

Landscaped/Ornamental

The landscaped/ornamental portions of the study area are associated with the neighborhood located north of the bridge on the west side of Corte Madera Creek and the commercial development located south of the bridge on both sides of the creek. As indicated, these areas are vegetated with ornamental species planted for landscaping purposes. Oleander (*Nerium oleander*), pepper tree (*Schinus molle*), English ivy (*Hedera helix*), and Monterey pine (ornamental cultivar of *Pinus radiata*) were representative species observed in landscaped/ornamental areas.

Riverine Wetland

A narrow fringe of riverine wetland occurs below the high tideline along both banks of the creek on each side of the bridge. The high tide line refers to the intersection of the land with the water's surface at the maximum height reached by a rising tide (33 CFR 328.3[e]). The riverine wetlands contain a mixture of native and non-native plants. Native species observed in riverine wetlands were alkali heath (*Frankenia grandifolia*), pickleweed (*Salicornia virginica*), saltgrass (*Distichlis spicata*), gumweed (*Grindelia stricta* var. *angustifolia*), and western marsh-rosemary (*Limonium californicum*). Non-native species present were dense-flowered cord grass (*Spartina densiflora*) and alkali Russian thistle (*Salsola soda*).

Saline Emergent Wetland

The saline emergent wetland is located northeast of the bridge in the low area between Bon Air Road and Corte Madera Creek Pathway. The saline emergent wetland is considered estuarine because it is a tidally influenced wetland adjacent to Corte Madera Creek that is semi-enclosed by land. Plant species observed in the saline emergent wetland were saltgrass, alkali heath, pickleweed, western marsh-rosemary, arrowgrass (*Triglochin maritima*), and big bulrush (*Scirpus robustus*).

Riverine/Open Water

The riverine/open water community type consists of Corte Madera Creek which is approximately 337 feet wide within the study area. Riverine wetlands are associated with the banks of the creek. The substrate is silt and sand. Corte Madera Creek is tidally influenced and consequently has a high salinity level. Corte Madera Creek is considered a water of the United States based on its hydrological connection with San Francisco Bay.

Developed

The developed cover type consists of the Bon Air Road Bridge, portions of Bon Air Road and South Eliseo Drive, and the sidewalks and roads shoulders adjacent to these areas. These areas are essentially unvegetated and do not provide habitat for wildlife.

Special-Status Plant Species

The study area is outside the elevation range and/or does not support potential habitat for the majority of the sensitive plant species known to occur in the project region (Table 4-1). No sensitive plant species were observed during spring and summer botanical surveys that were conducted during the reported blooming period of sensitive plants for which there was potential habitat in the study area. Therefore, based on a lack of potential habitat and the negative results of the botanical surveys, it was determined that the proposed project would not result in impacts on sensitive plant species.

Special-Status Wildlife and Fish Species

Sensitive wildlife species that could occur in the study area were identified based on a review of existing information, reconnaissance-level field surveys, and discussions with species experts. Table 4-2 lists all sensitive wildlife species that were identified during the prefield investigation with potential to occur in the study area. After biological field surveys were conducted and species experts were consulted, it was determined that 12 wildlife species listed in Table 4-2 have the potential to occur in or adjacent to the study area, and may be impacted by the proposed project. In addition, two sensitive fish species—Central California Coast (CCC) steelhead (threatened) and green sturgeon (threatened)—occur or have the potential to occur in the study area and may be affected by construction activities. Corte Madera Creek is also designated as critical habitat for steelhead, coho salmon, and green sturgeon, and is considered Essential Fish Habitat (EFH) for Pacific salmon, groundfish, and coastal pelagic species. Table 4-2 provides a description of the habitat for each sensitive species. The following is a brief description of the species' legal status and survey results.

Western Pond Turtle

Western pond turtle is a California species of special concern. There are two CNDDB records of occurrence of this species within five miles of the study area. Although the salinity level in Corte Madera Creek is relatively high, western pond turtles occur in brackish water along the California coast and can tolerate prolonged immersion in sea water (Jennings et al 1992:11). Therefore, it is probable that western pond turtles could occur in this creek. However, the potential for turtles to be present in the creek in the study area is decreased due to the high amount of human activity (humans, dogs, etc.) in the surrounding area, such as along the Corte Madera Creek Pathway in Creekside Park. Likewise, turtles are unlikely to nest in grassland areas adjacent to the creek.

Northern Harrier

Northern harrier is a California species of special concern. Focused surveys for northern harrier were not conducted. There is one CNDDB (2011) record of an occurrence of northern harrier approximately 8 miles from the study area. The saline emergent wetland in and adjacent to the study area provides suitable nesting habitat; although the potential for nesting in this area is considered low due to the high amount of development in the surrounding area. In addition, there is a limited amount of open area for foraging in the vicinity of the study area.

White-Tailed Kite

The white-tailed kite is fully protected under the California Fish and Game Code (CFGC). Focused surveys for white-tailed kite nests were not conducted. There are two CNDDB (2011) records for occurrences of white-tailed kite approximately 8 and 10 miles from the study area. Suitable nest trees are located in and adjacent to the study area. However, due to the high amount of development surrounding the project site, it is unlikely that white-tailed kites would nest in these areas although they could occasionally perch or forage in or adjacent to the study area.

California Clapper Rail and California Black Rail

California clapper rail is federally and state endangered and fully protected under the CFGC. California black rail is state threatened and fully protected under the CFGC. Focused surveys for California clapper rail and California black rail were not conducted. However, previous surveys along Corte Madera Creek within and adjacent to the study area detected California clapper rails immediately northwest of the study area in the adjacent saline emergent wetland as well as in other portions of the creek area and Creekside Park. No California black rails were noted during these surveys. There are also CNDDB (2011) records of occurrences for both species in Corte Madera Marsh, approximately 1.5 miles southeast of the study area. The riverine wetlands, creek bank, and saline emergent wetland in and adjacent to the study area provide suitable nesting, foraging, or cover habitat for California clapper rails and California black rails.

Short-Eared Owl

Short-eared owl is a California species of special concern. Focused surveys for short-eared owls were not conducted. There is one CNDDB (2011) record for an occurrence of two short-eared owls approximately 8 miles from the study area. The saline emergent wetland in and adjacent to the study area provides suitable nesting and cover habitat. They could also forage in or adjacent to the study area. The potential for short-eared owl to occur in or adjacent to the study area is considered low due to the amount of development and human activity surrounding these areas.

San Francisco Common Yellowthroat

San Francisco common yellowthroat is a California species of special concern. Focused surveys for San Francisco common yellowthroat were not conducted. There are four CNDDB (2011) records for occurrences of San Francisco common yellowthroat 7 to10 miles from the study area. The saline emergent wetland in and adjacent to the study area provides suitable nesting, cover, and foraging habitat for San Francisco common yellowthroat.

Samuels (San Pablo) Song Sparrow

Samuels song sparrow is a California species of special concern. Focused surveys for Samuels song sparrow were not conducted. However, there are five CNDDB (2011) records for occurrences 2–5 miles from the study area and seven records for occurrences within 5 to 10 miles of the study area. The saline emergent wetland in and adjacent to the study area provides suitable nesting, foraging, and cover habitat for Samuels song sparrow.

Western Red Bat and Pallid Bat

Western red bat and pallid bat are both California species of special concern and considered high priority species in California by the Western Bat Working Group. Acoustic surveys for bats were not conducted. Because the bridge is a steel girder bridge, it does not provide suitable habitat for roosting bats. Trees on the northeast side of the bridge may provide suitable roosting habitat for bats. There are no CNDDB (2011) records for western red bat within 10 miles of the study area. There are two records for occurrences of pallid bat within 2.5 miles of the study area and two records for occurrences that are 5 to 10 miles from the study area.

Salt Marsh Harvest Mouse

Salt marsh harvest mouse is federally and state endangered, and is fully protected under the CFGC. Surveys for salt marsh harvest mouse were not conducted. There are nine CNDDB (2011) records for occurrences of salt marsh harvest mouse within five miles of the study area. The closest record (from 1959) is immediately upstream of the Bon Air Road Bridge and six records for occurrences within 5 to 10 miles of the study area. The saline emergent wetland in and adjacent to the study area provides suitable habitat for salt marsh harvest mouse. Although the habitat immediately adjacent to the bridge is lower quality than the adjacent saline emergent wetland, salt marsh harvest mice could occasionally occur in the area adjacent to the bridge.

Migratory Birds Including Swallows

Migratory birds are protected by federal and state laws, including the Migratory Bird Treaty Act (MBTA) and CFCG. Several non-special-status migratory birds, including Anna's hummingbird *(Calypte anna)*, scrub jay *(Aphelocoma coerulescens)*, American robin *(Turdus migratorius)*, song sparrow *(Melospiza melodia)* cliff swallows *(Petrochelidon pyrrhonota)* and barn swallows *(Hirundo rustica)* could nest in and adjacent to the project area. Suitable nesting habitat for migratory birds is present within the saline emergent wetland, and shrubs and trees in and adjacent to the study area. Swallow nests were observed on the Bon Air Road bridge structure. No other nests were noticed in or adjacent to the study area during field surveys, but a focused nest survey was not conducted.

Central California Coast Steelhead Distinct Population Segment

CCC steelhead distinct population segment (DPS) is federally listed as threatened. CCC steelhead have been consistently documented in Corte Madera Creek since 1960 (Rich 2000; Walsh pers. comm.). The riverine/open water habitats in the study area provide migration habitat for adults and juveniles (smolts), although some adults and juveniles may be present earlier in the season depending on flow and water temperatures.

Corte Madera Creek within the study area is included in the designated critical habitat for CCC steelhead. The primary constituent elements of critical habitat in the study area include freshwater and estuarine areas with water quantity and quality, salinity, natural cover, forage, and passage conditions supporting migration and rearing of steelhead. The critical habitat includes the lateral extent of the channel up to the ordinary or mean high water elevation.

Central California Coast Coho Salmon Evolutionarily Significant Unit

The CCC coho salmon Evolutionarily Significant Unit (ESU) is federally listed as endangered as well as endangered under the California Endangered Species Act (CESA). Designated critical habitat for coho salmon includes Corte Madera Creek within the study area. Although historically present, CCC coho salmon are assumed to be extirpated from Corte Madera Creek. Available records indicate that coho salmon have not been observed in Corte Madera Creek since 1986 (National Marine Fisheries Service 2009). Because coho salmon are not currently present in Corte Madera Creek, the following analysis focuses on project-related effects on designated critical habitat for CCC salmon.

The primary constituent elements of critical habitat in the study area include freshwater and estuarine areas with water quantity and quality, salinity, natural cover, forage, and passage conditions supporting migration and rearing of steelhead. Critical habitat includes the lateral extent of the channel up to the ordinary or mean high water elevation.

North American Green Sturgeon Distinct Population Segment

North American green sturgeon are divided into two DPSs: a northern and southern DPS. The southern DPS of green sturgeon are federally listed as threatened. Designated critical habitat for green sturgeon includes all tidally influenced areas of San Francisco, San Pablo, and Suisun Bays, including the study area. There are no records of green sturgeon in the study area but general information on their distribution and habitat use indicate that green sturgeon have the potential to occur in the study area year-round.

The primary constituent elements of critical habitat in the study area include freshwater and estuarine areas with water quality, depth, forage, sediment quality, and passage conditions supporting foraging and rearing of green sturgeon. Critical habitat includes the lateral extent of the channel up to the ordinary or mean high water elevation.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with the National Oceanic and Atmospheric Administration Fisheries on activities that may adversely affect EFH. Important components of EFH are substrate; water quality; water quantity, depth, and

velocity; channel gradient and stability; food; cover and habitat complexity; space; access and passage; and habitat connectivity.

Corte Madera Creek is considered EFH for salmonid, groundfish, and coastal pelagic species. The Magnuson-Stevens managed species observed in Corte Madera Creek estuary Northern anchovy, starry flounder, and Chinook salmon, although other MSA-managed species may also be present.

Comments

4a: Less-than-Significant Impact with Mitigation Incorporated

As discussed above, sensitive species that could potentially occur in the project area were identified based on a review of existing information, coordination with agency personnel and wildlife species experts, and biological field surveys. Potential impacts from the proposed project on natural communities of special concern and sensitive species identified are discussed below.

Natural Communities of Special Concern

Riverine Wetland

The proposed project would directly affect the riverine wetland along Corte Madera Creek as a result of temporary and permanent impacts. Temporary impacts would occur on 0.126 acre of riverine wetland that are located within the temporary construction limits. Permanent impacts would occur on 0.027 acre of riverine wetland that are located where project components (e.g., abutments) would be installed or where the ground would be shaded by the bridge (i.e., where reestablishment of vegetation would be precluded). On-site revegetation of the riverine wetlands through implementation of Mitigation Measures 4-1 and 4-2 would reduce this impact to less than significant.

Mitigation Measure 4-1: Develop and Implement a Revegetation/Enhancement Plan for Temporary Impacts on Riverine Wetland

The City will retain a qualified restoration ecologist to develop a revegetation plan to revegetate and enhance the riverine wetland areas where temporary impacts would occur during project construction activities. The revegetation plan would be implemented upon completion of project construction activities at such time as deemed appropriate according to the planting schedule in the plan. The revegetation plan will specify the native planting stock appropriate for riverine wetlands subject to brackish conditions and tidal influence. The plan will employ the most successful techniques available at the time of planting. Success criteria will be established as part of the plan. Plantings will be maintained for a minimum of 5 years, including invasive weed removal and herbivory protection. Replanting will be necessary if success criteria are not met. The riverine wetland revegetation/enhancement will be considered successful when the native vegetation established meets the success criteria, the habitat no longer requires active management, and vegetation is arranged in groups that, when mature, replicate the area, natural structure, and species composition of similar riverine wetland habitats in the region.

Mitigation Measure 4-2: Compensate for Permanent Losses of Riverine Wetland during Project Construction

As part of the permitting process, the City will compensate for permanent impacts on waters of the United States (including wetlands) to ensure that there is no loss of wetland habitat functions and values. The compensation will be determined as part of the state (Section 401 water quality certification or Waste Discharge Requirements) and federal (Section 404 permit) processes and may be a combination of off-site restoration/creation or mitigation credits. Compensation for the loss of wetlands will include restoring or enhancing in-kind wetland habitat at a minimum ratio of 1:1 but the final ratio will be determined through the project-specific permitting process and through coordination with resource agencies to ensure no net loss of wetland habitat functions and values.

Saline Emergent Wetland and Corte Madera Creek

Contaminants and debris from the construction zone could enter the saline emergent wetland located adjacent to the project site.

The proposed project would directly affect the Corte Madera Creek as a result of the replacement of the nine existing bridge piers (supported by 76 16-inch diameter piles) with four new piers (supported by eight 96-inch diameter piles) during project construction. The nine existing piers have a total area of 0.002 acre (106 square feet), and the four new piers have a total area of 0.009 acre (402 square feet). Therefore, implementation of the proposed project would result in a 0.007-acre (296 square feet) increase in the area of Corte Madera Creek occupied by bridge piers.

Replacement of the existing bridge piers with new bridge piers would result in a net permanent habitat loss of approximately 0.007 acre.

Implementation of Mitigation Measures 4-3 and 4-4 would reduce this impact to less than significant.

Mitigation Measure 4-3: Install Fencing to Protect Biologically Sensitive Areas Adjacent to the Project Area

The City or its contractor will install construction barrier fencing (including sediment fencing) to prevent contaminants and debris from entering the saline emergent wetland, and other biologically sensitive areas in and adjacent to the project area. Before construction begins, the City or its contractor will work with the project engineer and a resource specialist to identify the locations for the barrier fencing and will mark those locations with stakes or flagging. The protected area will be clearly identified as an environmentally sensitive area (ESA) on the construction specifications. The construction barrier/sediment fencing will be in place before construction activities are initiated. The fencing will be maintained by the City or its contractor throughout the duration of the construction period. If the fencing is removed, damaged, or otherwise compromised during the construction period, construction activities will cease until the fencing is replaced.

Mitigation Measure 4-4: Conduct Environmental Awareness Training for Construction Crews and Provide Biological Monitoring

The City or its contractors will conduct environmental awareness training for construction crews before project implementation. The awareness training will be provided to all construction personnel to brief them on the need to avoid impacts on sensitive biological resources (i.e., wetlands adjacent to the project area and special-status species). The education program will include a brief review of the special-status species that could potentially occur in the study area (including their life history, habitat requirements, and photographs of the species). The training will identify the portions of the study area in which the species may occur, as well as their legal status and protection under the federal Endangered Species Act (FESA), CESA and CFGC. The program will also cover the restrictions and guidelines that must be followed by all construction personnel to reduce or avoid effects on these species during project implementation. This will include the steps to be taken if a sensitive species is found within the construction area (i.e., notifying the crew foreman who will call a designated biological monitor). The crew foreman will be responsible for ensuring that crew members adhere to the guidelines and restrictions. Education programs will be conducted for appropriate new personnel as they are brought on the job during the construction period. A USFWS and CDFG approved biological monitor will be designated for the project and will visit the site periodically to ensure that fencing around environmentally sensitive areas is intact and that activities are being conducted in accordance with the agreed upon project schedule. The monitor will provide the City with a monitoring log for each site visit, who will submit it to USFWS and CDFG.

Special-Status Wildlife Species

The following section discusses the 12 sensitive wildlife species with potential to occur in or adjacent to the study area that may be impacted by the proposed project.

Western Pond Turtle

In-water work within Corte Madera Creek could cause entrapment of western pond turtles resulting in injury or mortality of turtles. Construction noise or activity could disturb turtles or cause them to avoid the area. With implementation of Mitigation Measures 4-3, 4-4, and 4-5, potential impacts on western pond turtle are considered less than significant.

Mitigation Measure 4-5: Provide an On-Call Biological Monitor to Relocate Western Pond Turtles as Needed

During environmental awareness training (Mitigation Measure 4-4), the construction contractor will provide the construction crew with information on the steps to be taken if a western pond turtle becomes trapped during work within Corte Madera Creek. The construction crew will be instructed to notify the crew foreman who will contact a biological monitor that has been designated for the project. The designated biological monitor's CDFG scientific collecting permit will include capture and relocation of turtles. If a turtle is found trapped within the construction area, work in the area where the turtle is trapped will stop until the biological monitor arrives and removes the turtle. The turtle will be relocated upstream or downstream of the construction area in suitable aquatic habitat. The biological monitor will report their activities to the City and the CDFG within one day of relocating the turtle.

Northern Harrier, White-Tailed Kite, Short-Eared Owl, San Francisco Common Yellowthroat, and Samuels (San Pablo) Song Sparrow

Construction would occur during the breeding seasons of northern harrier, white-tailed kite, short-eared owl, San Francisco common yellowthroat, and Samuels song sparrow and could result in the disturbance of these species. Noise or other construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. Because there is a low likelihood that white-tailed kites would nest in or adjacent to the study area, the potential for this impact to occur is considered low for this species.

Approximately 0.027 acre of suitable foraging habitat for short-eared owl would be permanently removed and 0.126 acre would be temporarily disturbed as a result of construction activities (Figure 4-2).

The project would not result in the permanent or temporary loss of saline emergent wetland habitat that provides suitable cover and nesting habitat for short-eared owl, San Francisco common yellowthroat, and Samuels song sparrow.

With implementation of Mitigation Measures 4-3, 4-4, 4-5, and 4-6 (discussed below for California clapper rail and California black rail) potential impacts on northern harrier, white-tailed kite, short-eared owl, San Francisco common yellowthroat, and Samuels song sparrow are considered less than significant.

Mitigation Measure 4-6: Begin Work Prior to the Nesting Season or Conduct Preconstruction Surveys for Nesting Migratory Birds

Vegetation removal will occur during the non-breeding season for most migratory birds (generally between October 1 and January 31) to the extent feasible.

If possible, construction activities will begin prior to the nesting season for most birds (generally, February 1 through September 30). Beginning construction prior to the breeding season will establish a level of noise disturbance that will dissuade noise-sensitive raptors and other birds from attempting to nest within or near the study area.

If beginning construction activities (including vegetation removal) prior to the breeding season is not possible, the City will retain a qualified wildlife biologist with knowledge of the relevant species to conduct nesting surveys before the start of construction. A minimum of three separate surveys will be conducted for migratory birds, including raptors. Surveys will include a search of all trees and shrubs, and riverine wetland areas that provide suitable nesting habitat, in the project area. In addition, a 500-foot area around the project area will be surveyed for nesting raptors. Surveys should occur during the height of the breeding season (March 1 to June 1) with one survey occurring in each of two consecutive months within this peak period and the final survey occurring within 1 week of the start of construction. If no active nests are detected during these surveys, no additional measures are required.

If an active nest is found in the survey area, a no-disturbance buffer will be established around the site to avoid disturbance or destruction of the nest site until the end of the breeding season (September 30) or until after a qualified wildlife biologist determines that the young have fledged and moved out of the project area (this date varies by species). The extent of these buffers will be determined by the biologist in coordination with USFWS and CDFG and will depend on the level of noise or construction disturbance, line-of-sight between the nest and the

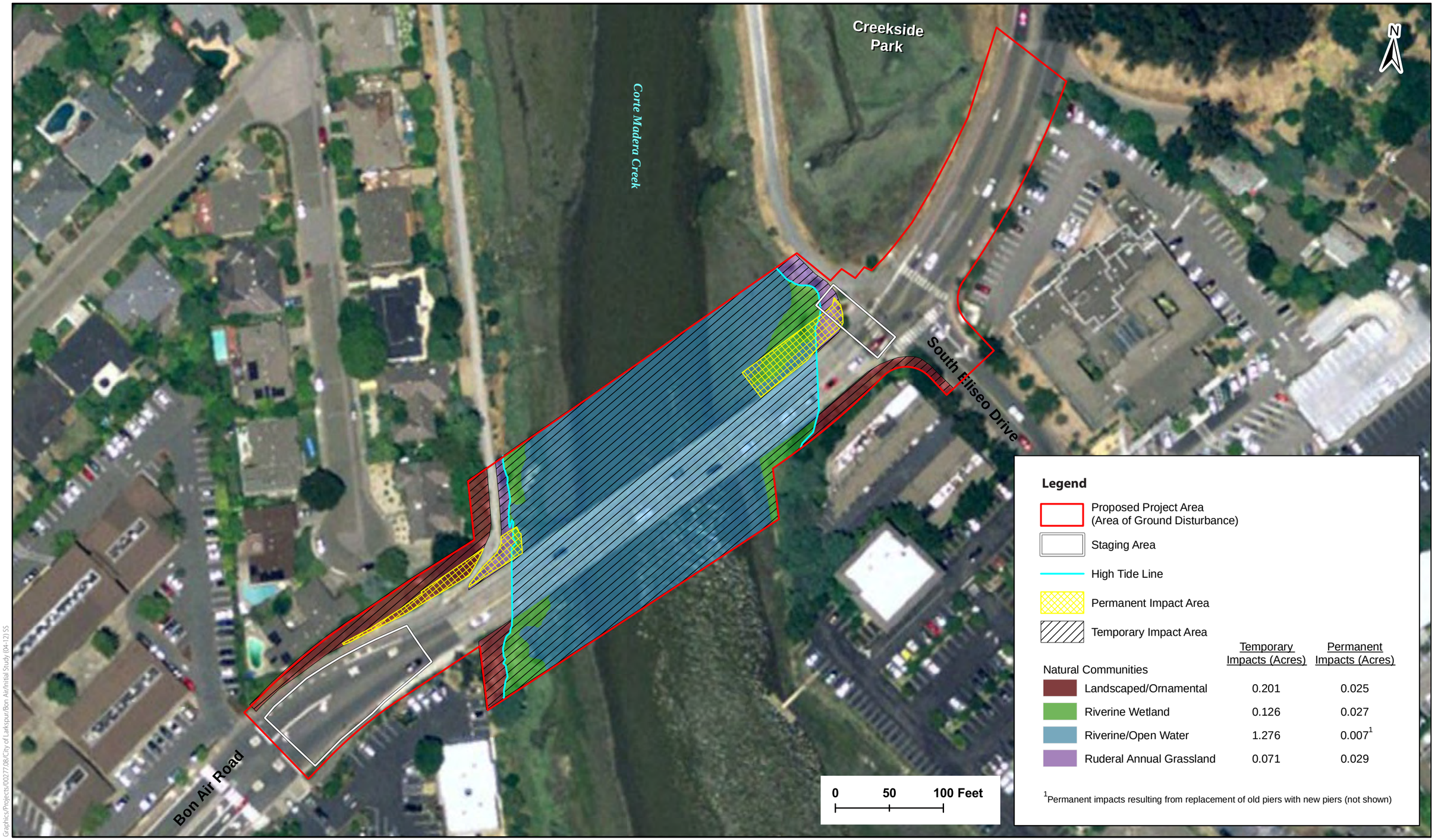

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Figure 4-2
Impacts from the Bon Air Bridge Replacement Project

disturbance, ambient levels of noise and other disturbances, and other topographical or artificial barriers. Suitable buffer distances may vary between species.

California Clapper Rail and California Black Rail

Potential direct effects would include disturbance of California clapper rail during construction and removal and temporary disturbance of suitable habitat. Pile driving would not be conducted within the Bon Air Road Bridge Replacement project area during the February 1–August 31 rail breeding season. No construction activities would occur on the north (upstream) side of the bridge during the breeding season. Construction activities, other than pile driving, are proposed on the south (downstream) side of the bridge during the breeding season (Figure 6). Therefore, disturbance of California clapper rails and California black rails are not expected during their breeding seasons (February 15–August 31 and February 15–July 30, respectively). Implementation of Mitigation Measure 4-7 would be required if construction activities were to occur on the north side of the bridge during the breeding seasons.

Approximately 0.027 acre of suitable riverine wetland habitat (most likely used as foraging habitat because of its location immediately adjacent to Corte Madera Creek) would be permanently removed and 0.126 acre would be temporarily disturbed as a result of construction activities (Figure 4-2). However, because temporarily impacted areas would be affected for more than one year, temporary impacts will be considered permanent, for the purpose of determining compensation. Therefore, 0.153 acre is considered permanently impacted.

Potential indirect project effects that could disturb clapper rails include traffic-related impacts, including traffic noise; increased disturbance from humans and dogs; increased predation by cats and other predators; and increased lighting. The project's potential to indirectly affect clapper rail is discussed below.

The two-lane bridge currently carries approximately 11,800 vehicles a day and serves primarily local traffic for the City of Larkspur and Kentfield. The proposed bridge replacement would not increase the number of travel lanes or the capacity of the bridge to accommodate additional vehicular traffic. Therefore, the project would not increase the volume of traffic on the bridge. Population growth in the area over the next 25 years is expected to increase by approximately 7%, and this growth is expected to increase traffic volumes on the bridge by a commensurate amount, but this growth would occur even without implementation of the project. The local area in which the bridge is located is nearly built out and there are no plans for new roadways that would bring outside traffic to the bridge. Therefore, increased capacity and the resulting increase in traffic noise would not occur, other than under normal growth conditions, and would not be an indirect effect of the project.

The riverine wetland and saline emergent wetland are located within Creekside Park, which has a popular recreational path along the east side of Corte Madera Creek (see Corte Madera Creek Pathway in Figure 3). People use this path for walking, jogging, bicycling, and dog walking. The clapper rails that breed within Creekside Park appear to be accustomed to the human activity that regularly occurs along the recreational path. Pedestrians and bicyclists that use this path may access it across the Bon Air Road Bridge. There is an existing 8-foot Class 1 bicycle path (a protected lane separated from traffic by a barrier) on the north side of the bridge and a 5-foot sidewalk on the south side of the bridge The new structure will have a 6-foot Class 1 bicycle path and 5-foot sidewalk in each direction. These changes would improve safety but would not change travel patterns or provide new connections to newly developed areas. The proposed project, when

complete, would not affect access to the trail or otherwise result in increased use of the trail. Therefore, increased disturbance of clapper rails from pedestrians, bicyclists and dogs would not occur and is not an indirect effect of the project.

Potential increased predation by common city mammals (skunks, raccoons) and cats can be an indirect effect if the project results in an increase of human presence. Increased inhabitance of people may result in an increase in the number of cats in an area. An increased presence or use by people can result in an increase in garbage, which can in turn attract potential predators to an area. The project, when complete, would not result in an increase of humans inhabiting the area, nor would it affect access to the Corte Madera Creek Pathway or otherwise result in increased use of the trail (as discussed above). Therefore, increased predation of clapper rails by cats or common city mammals as a result of increased human inhabitance or presence would not occur and is not an indirect effect of the project.

The existing bridge structure contains five acorn style lights with 70 watt clear high pressure sodium bulbs on the north side of the bridge. The current illumination of these lights is not known. The proposed project includes the installation of a total of 12 acorn style lights, six on the north side of the bridge and six on the south side of the bridge. If the same light fixtures and bulbs are used, there would be an increase in the amount of light emitted from existing conditions. Additionally, the illuminated area could be larger than existing conditions because of the increased number of lights. These conditions could result in disturbance of clapper rail activities by disrupting activity cycles and the internal circadian system (Rich and Longcore 2006: 23). Disruption of the circadian clock from artificial night lighting can result in changes to foraging efficiency, risk of predation, parental care, which could have adverse effects on the animal. These individuals would be out of sync with their neighbors living in a natural light-dark cycle, and could affect mating success. (Rich and Longcore 2006: 30–31) The potential indirect effects of increased artificial night lighting on clapper rails would be minimized through the implementation of Mitigation Measure 4-11.

A Biological Opinion for California clapper rail was issued by the USFWS for this project on April 12, 2012 (Appendix A).

With implementation of Mitigation Measures 4-3, 4-4, and 4-7 through 4-12, potential impacts on California clapper rail and California black rail are considered less than significant.

Mitigation Measure 4-7: Specify and Implement Survey Requirements in Construction Contract if Work on the North Side of the Bridge Occurs during the California Clapper Rail/Black Rail Breeding Season

Pile driving associated with construction of the project is not proposed within the Bon Air Road Bridge Replacement project area during the February 1–August 31 rail breeding season. Construction activities are also not proposed to occur on the north (upstream) side of the bridge during the breeding season. Construction activities, other than pile driving, are proposed on the south (downstream) side of the bridge during the breeding season (Figure 6).

The construction contract will specify that if construction on the north side of the bridge occurs during the breeding season, then implementation of the following measures would be required (Terry pers. comm.).

- Full protocol-level surveys (conducted January through mid-April) will be conducted during the same year as proposed breeding season construction activities.

- Surveys will be initiated in mid-late January following a minimum 2-week cessation of any on-going construction work along the upstream side of the bridge.
- Construction on the upstream side of the bridge will not be allowed to begin until the protocol-level surveys have been completed and the USFWS and CDFG have reviewed the results and given approval for construction along the upstream side of the bridge to begin.
- If, based on the protocol-level survey results, the USFWS and/or CDFG determine that construction along the upstream side of the bridge may disturb nesting rails, then construction in this area will not be allowed to begin until September 1.
- If construction on the north side of the bridge is necessary for more than 1 year, the previous four conditions will be implemented prior to each year of construction.

Surveys will generally follow USFWS's draft survey protocol for California clapper rail (U.S. Fish and Wildlife Service 2000). The biologist leading the surveys will consult with CDFG for appropriate methodology for the California black rail surveys. The specific methodology for the surveys will be submitted to USFWS and CDFG for approval prior to the start of the surveys. The surveyor(s) will possess the required permits from USFWS and CDFG for conducting the surveys.

Mitigation Measure 4-8: Halt Work if a Federally Listed Species is Observed in the Work Area

The resident engineer shall halt work in the immediate vicinity and immediately contact the City, designated biological monitor, USFWS, and DFG in the event that a California clapper rail or salt marsh harvest mouse is found within 10 feet of any at-grade construction activities. The resident engineer shall suspend all construction activities within 10 feet of the detected California clapper rail or salt marsh harvest mouse until the species leaves the area voluntarily.

Mitigation Measure 4-9: Care for Injured Federally Listed Species

Injured California clapper rails or salt marsh harvest mice shall be cared for by a licensed veterinarian or other qualified person, such as the designated biological monitor. Dead individuals shall be preserved according to standard museum techniques and held in a secure location. The USFWS and CDFG shall be notified within one working day of the discovery of the death or injury of a listed species.

Mitigation Measure 4-10: Monitor Construction Activities during Extreme High Tides

Pile driving and jack hammering will be scheduled to avoid extreme high tides (i.e., no work will occur near the salt marsh within two hours before or after extreme high tides 6.5 feet National Geodetic Vertical Datum (NGVD) or above, as measured at the Golden Gate Bridge, or adjusted to the timing of local extreme high tide events in which the marsh plain is flooded), because protective cover for salt marsh harvest mice and California clapper rails is limited, and activities during high tides could prevent them from reaching available cover. The designated biological monitor will be present to monitor all other construction activities that are scheduled to occur during extreme high tides.

Mitigation Measure 4-11: Implement Lighting Specifications to Minimize Potential Light Pollution Effects on Animals

To minimize the potential negative effects of artificial light on animals, including the California clapper rail and salt marsh harvest mouse, the following criteria will be identified in the lighting plans and specifications.

Acorn style lights that are International Dark Sky Association approved "Dark Sky Friendly" will be installed. This type of lighting ensures 0 percent light above 90 degrees, directs light toward the bridge, and minimizes the amount of backward and side lighting, thereby reducing light pollution on habitat and animals in the surrounding area, and the air space above the lights. One possible model is Holophane Utility Washington Postlite LED luminaire WFL 070 4K AS L3 B. This model or an equivalent model, approved by the City, will be specified. The lowest luminaire wattage that still provides safe conditions for vehicular traffic, bicyclists, and pedestrians will be used. If possible, correlated color temperature (an indication of how "warm" or "cool" the light source appears) range of the light source will be between 3,800 and 4,000 Kelvins. This range corresponds to "warm" light that would be less disturbing to animals in adjacent areas than "cool" (brighter white) light.

Mitigation Measure 4-12: Compensate for the Loss of Suitable Habitat for California Clapper Rail and California Black Rail

The City will compensate for the permanent loss of 0.153 acre of suitable habitat for California clapper rail and California black rail by contributing $45,475 to the Friends of Corte Madera Creek to enhance 0.549 acre of tidal marsh/upland refugia habitat at Hal Brown Park at Creekside Marsh per the USFWS' Biological Opinion (Appendix A). The City will contribute an additional $2,175 for each year of monitoring that is required per the Biological Opinion. This funding will compensate for both the Bon Air Road and Doherty Drive Bridge Replacement projects.

Western Red Bat and Pallid Bat

Trees in the study area that provide suitable roosting habitat for special-status bats may be removed or trimmed during construction activities associated with bridge rehabilitation. Tree trimming/removal and noise or other construction activities could result in the disturbance of roosting bats, if present within the foliage or cavities of trees. With implementation of Mitigation Measures 4-4 and 4-13, potential impacts on western red bat, pallid bat, and other foliage roosting bats are considered less than significant.

Mitigation Measure 4-13: Conduct Preconstruction Surveys for Roosting Bats

Prior to tree removal or trimming, a qualified biologist will examine trees with suitable roosting habitat for bats. If bats or sign of bats are observed, tree trimming and removal will be delayed until the bats leave the roosting sites or until CDFG authorizes trimming/removal of the tree. The biologist will monitor the tree(s) to determine when the bats have left the roosting site.

Salt Marsh Harvest Mouse

Potential direct effects would include disturbance of salt marsh harvest mouse during construction and removal and temporary disturbance of suitable habitat. Construction noise and vibrations and

construction work at night could result in the disturbance of salt marsh harvest mouse. The 8 days of night work would subject mice (if present) to artificial light conditions, which could affect their ability to forage or increase their risk of predation. Night work (girder deliveries) would occur in approximately 2–3 day blocks in September 2014, January 2016, and July 2016.

Construction activities would result in the permanent removal of 0.027 acre and temporary disturbance of 0.126 acre of lower quality riverine wetland habitat for salt marsh harvest mouse. This habitat is located immediately adjacent to the bridge (Figure 4-2). Because temporarily impacted areas would be affected for more than 1 year, temporary impacts will be considered permanent, for the purpose of determining compensation. Therefore, 0.153 acre is considered permanently impacted. There would be no permanent or temporary loss of habitat within the larger saline emergent wetland in and adjacent to the study area (Figure 4-1).

Potential indirect effects that could disturb salt marsh harvest mouse include traffic-related impacts, including traffic noise; increased disturbance from humans and dogs, increased predation by cats and other predators, and increased lighting on the bridge. The project's potential to indirectly affect the salt marsh harvest mouse is similar to those discussed above for the California clapper rail. Regarding increased night lighting effects on mammals, potential effects include disruption of foraging patterns, increased predation risk, disruption of biological clocks, increased mortality on roads, and disruption of dispersal movements because of artificially lighted landscapes (Rich and Longcore 2006: 19). Artificial night lighting has been shown to affect nocturnal rodents. Several species of small rodents harvested an average of 21% less seed in response to a single fluorescent or gasoline camping lantern. Although small mammals can respond to bright moonlight by shifting foraging activities to darker conditions, this is not an option for animals subjected to artificially increased illumination throughout the night. Unless they leave the lighted area, they are either at greater risk of predation from foraging in the lighted area, or reduce their food consumption to avoid increased predation risk. (Rich and Longcore 2006: 28–29.)

A Biological Opinion for salt marsh harvest mouse was issued by the USFWS for this project on April 12, 2012 (Appendix A).

With implementation of Mitigation Measures 4-3, 4-4, 4-11, and 4-14, potential impacts on salt marsh harvest mouse are considered less than significant.

Mitigation Measure 4-14: Remove Vegetation in Salt Marsh Harvest Mouse Habitat by Hand and Install Exclusion Fencing

Before construction activities begin, all suitable tidal marsh and upland refugia within the project area and within a 2-foot buffer around the project footprint will be removed by hand using only non-mechanized hand tools (i.e., trowel, hoe, rake and shovel) prior to the initiation of work within these areas. Vegetation shall be removed to bare ground or stubble no higher than one inch. Vegetation shall be removed under the supervision of a USFWS-approved biologist. Vegetation removal may begin when no mice are observed and shall start at the edge farthest from the salt marsh or the poorest habitat and work its way towards the salt marsh or the better salt marsh habitat.

To prevent salt marsh harvest mice from moving through the proposed project site during construction, temporary exclusion fencing shall be placed around a defined work area prior to the start of construction activities. The temporary exclusion fencing shall be installed immediately after the hand removal of all vegetation (as described above) from the work area

and a 2-foot buffer around the work area. The fence shall be made of a heavy plastic sheeting material that does not allow salt marsh harvest mice to pass through or climb, and the bottom shall be buried to a depth of 4 inches so that the listed mouse cannot crawl under the fence. Fence height shall be at least 12 inches higher than the highest adjacent vegetation with a maximum height of 4 feet. All supports for the exclusion fencing shall be placed on the inside of the work area.

Migratory Birds Including Swallows

Construction would occur during the nesting season of migratory birds (generally February 1 through September 30) and could result in the loss of nesting birds, including swallows, which could nest on the Bon Air Road bridge structure. Removal of nests or construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. With implementation of Mitigation Measures 4-3, 4-4, 4-6, and 4-15, potential impacts on migratory birds, including swallows are considered less than significant.

Mitigation Measure 4-15: Conduct Preconstruction Survey for Swallow Nests and Implement Measures to Deter Nesting

To avoid impacts on nesting swallows and other bridge-nesting migratory birds that are protected under the MBTA and CFGC, the City will implement the following measures:

- The City will hire a qualified wildlife biologist to inspect the bridge during the swallows' non-breeding season (September 1 through February 28). If nests are found and are abandoned, they may be removed. To avoid damaging active nests adjacent to new bridge construction, nests must be removed before the breeding season begins (March 1).
- After nests are removed, the undersides of the bridge will be covered with 0.5- to 0.75-inch mesh net by a qualified contractor. All net installation will occur before March 1 and will be monitored by a qualified biologist throughout the breeding season (typically several times a week). The netting will be anchored so that swallows cannot attach their nests to the bridge through gaps in the net.
- As an alternative to netting the underside of a bridge, the City may hire a qualified biologist to remove nests as the birds construct them and before any eggs are laid. Visits to the site would need to occur daily throughout the breeding season (March 1 through August 31) as swallows can complete a nest in a 24-hour period.
- If netting of the bridges does not occur by March 1 and swallows colonize the bridge, modifications to the structure will not begin before August 31 of that year or until a qualified biologist has determined that the young have fledged and all nest use has been completed.

Central California Coast Steelhead

Pile Driving Noise

Noise from pile driving could affect CCC steelhead and their designated critical habitat. The effects of pile driving noise on fish may include behavioral responses, physiological stress, temporary and permanent hearing loss, tissue damage (auditory and non-auditory), and direct mortality (Popper and Hastings 2009). In general, factors that may influence the magnitude of effects include species,

life stage, and size of fish; type and size of pile and hammer; frequency and duration of pile driving; site characteristics (e.g., depth); and distance of fish from the source.

The primary sources of underwater noise associated with the project would be the driving and removal of temporary piles to support the trestles, demolition of the existing bridge piers, and driving and removal of the temporary steel casings to isolate the construction areas for the permanent bridge piers.

Impacts were assessed focusing on the potential for injury to fish based on predicted noise levels associated with impact pile driving. The peak sound pressure level (SPL) is considered the maximum sound pressure level a fish can receive from a single strike without injury. The cumulative sound exposure level (SEL) is considered the total amount of acoustic energy that a fish can receive from a single or multiple strikes without injury. Assumptions used for the assessment are provided in Table 4-4. Table 4-5 presents the summary of results of the pile driving noise impact analysis. For a detailed description of the pile driving analysis, refer to the Natural Environment Study conducted for this project (ICF International 2011b).

Table 4-4. Pile Driving Assumptions for Bon Air Road Bridge

	Temporary Trestle Bridge Method					
	Pile Diameter/ Type	Driver/ Extractor	Number of Piles	Piles per Day	Strikes or Minutes per Pile	Total Driving Period
Temporary trestle piles[a]	12- to 14-inch steel "H" piles	Vibratory driver/ Extractor (ICE V55, Delmag 30-32)[b]	64 piles[c] per trestle	**Installation (vibratory and impact)** 6 piles/day **Extraction (vibratory)**[d] 10 piles/day	**Installation (vibratory and impact)** Top 50 feet: 8 min vibratory Next 10 feet: 150 strikes Final 10 feet: 400 strikes for total of 30 min driving **Extraction (vibratory)**[d] 60 minutes/pile	**Installation (vibratory and impact)** 10–12 days **Extraction** 6 days
Temporary steel casings	10-foot diameter steel casing (1-inch thick)	Vibratory driver/ extractor (ICE V 360, Delmag 50)	4 piles (1 per bent) per half bridge	**Installation (vibratory and impact)** 0.5–1 pile/day **Extraction** 0.5–1 pile/day	**Installation (vibratory and impact)** Top 50 feet: 16 min vibratory Next 10 feet: 200 strikes Final 10 feet: 500 strikes for total of 30 min driving **Extraction (vibratory)**[e] 70 minutes/pile 0.5–1 day/pile	**Installation (vibratory and impact)** 4–8 days **Extraction** 4–8 days

Geotechnical Assumptions:

[a] Trestle piles are assumed at 30 tons capacity/pile. The number of piles is assumed based on 13 rows of pile, 4 piles/row, and pile distance of 35 +- ft c-t-c.

[b] Pile will be installed using combination of vibratory machines (ICE V55 and ICE V360) and driving hammers using impact hammer (Delmag 30-32 or Delmag 50).

[c] All piles are assumed to be 70 feet long with no splicing, continuous driving, and 70 feet full penetration.

[d] The removal of the piles will depend on whether the pile is damaged (crumbled) at the tip. Removal may take between 40 minutes to several hours.

[e] Depends on the experience of the contractor, proper equipment, and possible damage at pile tip; it may take between 1 hour to several days.

Table 4-5. Summary of Pile Driving Noise Impact Analysis

							Distance (feet) to Threshold		
							Onset of Physical Injury		
	Driver	Peak	SEL	RMS	Impact Conditions	Number of Strikes per Day	Peak dB	Cumulative SEL dB Fish ≥ 2 g	Data Source/ Notes
Interim Criteria for Peak and Cumulative Sound Exposure Levels (dB)							**206**	**187**	
14-inch H Pile (Trestle)									
Without attenuation	Impact	195	170	183	6 piles/day, 550 strikes/pile	3,300	<33	535	Caltrans 2009. 12-inch steel H
With attenuation[a]	Impact	185	160	173	6 piles/day, 550 strikes/pile	3,300	<33	115	
10-foot Diameter Steel Casing									
Without attenuation	Impact	218	193	206	1 pile/day, 700 strikes/pile	700	207	6,497[b]	Caltrans 2009. 126-inch steel pipe
With attenuation[a]	Impact	208	183	196	1 pile/day, 700 strikes/pile	700	45	1,400[b]	
With attenuation[a]	Impact	208	183	196	0.5 pile/day, 700 strikes/pile	350	45	882[b]	

[a] 10 dB of attenuation assumed for attenuation system (e.g., bubble curtain).

[b] These distances are likely overestimated compared to actual distances because the presence of shallow water, mud flats, and turns in Corte Madera Creek would limit the distance that underwater noise would travel.

The north trestle would be constructed in the first year of construction and the south trestle would be constructed in the second year of construction. A total of 64 12- to 14-inch steel H piles would be installed in or adjacent to the creek to support each trestle. The temporary trestle piles would be driven to a depth of 70 feet using a vibratory and impact pile driver. It is anticipated that vibratory driving can effectively drive each pile to a depth of 50 feet. An impact pile driver will likely be required to drive the remaining 20 feet. Based on a start date of September 1, the temporary trestles are expected to be completed by November 1 in the first and second years of construction.

The sound levels produced by impact driving of the trestle piles are not expected to exceed the single-strike SPL and SEL criteria (measured 33 feet from the source pile) (Table 4-5). Cumulative SELs exceeding the interim threshold (187 dB for fish ≥ 2 grams) could occur up to several hundred feet away from the source piles depending on the number of piles that are driven on a given day. It is estimated that the contractor can install up to 6 trestle piles per day. Impact driving of the final 20 feet of each pile will require 550 strikes, resulting in a maximum of 3,300 strikes per day. Under this scenario, the potential for exposure of fish to cumulative sound levels exceeding the interim threshold would occur out to 535 feet away from the source pile. The City proposes to use a bubble curtain to reduce this distance to approximately 150 feet.

The temporary steel casings would be installed in the first and third year of construction. Following construction of the north trestle and demolition of the northern half of the bridge in year 1, a total of four 10-foot diameter steel casings would be installed in the creek to isolate the drilling sites for the permanent bridge piers. This would be repeated in year 3. It is assumed that one to two days would be required to drive each of the steel casings. The temporary steel casings would be driven to a depth of 70 feet using a vibratory and impact pile driver. It is anticipated that vibratory driving can effectively drive each pile to a depth of 50 feet. An impact pile driver will likely be required to drive

the remaining 20 feet. Installation of the steel casings would likely be completed by November 15 in year 1 and by October 15 in year 3.

Impact driving of a steel casing of this size is expected to produce a single-strike peak SPL of 218 dB and single-strike SEL of 193 dB (measured at 10 meters from a pile), which exceed the interim criteria (Table 4-5). Peak SPLs above the interim threshold (206 dB) would extend 200 feet from the source pile. Based on an assumed maximum rate of 700 strikes per day (1 pile per day), cumulative SELs exceeding the interim threshold (187 dB for fish ≥ 2 grams) would occur out to 6,500 feet away from the source pile. The City proposes to use a bubble curtain to reduce the single-strike peak SPL to 208 dB and the single-strike SEL to 183 dB. This would reduce the potential impact area associated with peak SPLs to 45 feet and the potential impact area associated with cumulative SELs to 1,400 feet.

The City proposes to conduct all pile driving activities between September 1 and November 30 to limit noise-generating activities to the non-breeding season for clapper rail (Figure 6). The proposed timing of pile driving activities and use of sound attenuation measures are expected to minimize the exposure of listed fish species to potentially harmful pile driving sounds. However, the potential for injury or mortality would still exist within areas of less than 33 feet (trestle piles) and 45 feet (steel casings) of the source piles for single-strike exposures, and within areas of 150 feet (trestle piles) and 1,400 feet (steel casings) of the source piles for multiple-strike exposures to impact pile driving sounds. The probability for adults and juvenile steelhead to occur in the study area is low during the proposed pile driving window (September 1–November 30), but generally increases as the fall season progresses. Installation of the steel casings in the first year of construction presents the greatest concern because of the timing of installation (pile driving activities may extend into November) and the relatively large channel area that would be subject to cumulative sound levels exceeding the injury thresholds.

Mitigation Measure 4-16 would require completion of all in-water pile driving activities before the primary steelhead migration season. Small numbers of adult and juvenile steelhead may be subject to pile driving noise during the proposed pile driving window, and there is the possibility that juvenile and adult green sturgeon may be present in the study area year-round. Mitigation Measures 4-17 and 4-18 would require the use of vibratory driving and other sound attenuation measures to minimize the exposure of listed fish species to potentially harmful pile driving sounds.

Contaminant Spills

Construction activities that occur in or near stream channels can result in the discharge of contaminants that are potentially lethal to fish. The operation of heavy equipment, cranes, pile drivers, drilling rigs, and other construction equipment can result in spills and leakage of fuel, lubricants, hydraulic fluids, and coolants. Other sources of potential contamination include asphalt, wet concrete, and other materials that may come into direct contact with surface water during construction activities.

The potential magnitude of biological effects resulting from contaminant spills depends on a number of factors, including the proximity of spill to the stream; the type, volume, concentration, and solubility of the contaminant; and the timing and duration of the spill. Contaminants can affect survival, growth, and reproductive success of fish and other aquatic organisms. The level of effect depends on the species, life stage sensitivity, duration of exposure, condition or health of exposed individuals, and the physical and chemical properties of the water (e.g., temperature, dissolved oxygen).

Mitigation Measure 4-19 would minimize the risk of contaminant spills and the potential effects of any spills on fish and other aquatic organisms. In addition, use of the temporary steel casings to dewater and isolate the drilling sites for the new bridge piers would eliminate the risk of direct contact of drilling fluids with surface water.

Erosion and Mobilization of Sediment

Site clearing, demolition activities, earthwork, and bridge construction would disturb soil and streambed sediments, resulting in temporary increases in turbidity and suspended sediments in Corte Madera Creek. In addition, dewatering of the steel casings used during construction of the new bridge piers could result in temporary increases in turbidity and suspended sediments in the creek if drilling spoils are not properly contained.

The severity of biological effects depends on the sediment concentration, duration of exposure, and sensitivity of the affected life stage. Short-term increases in turbidity and suspended sediment may disrupt feeding activities or result in avoidance or displacement of fish from preferred habitat. Mitigation Measure 4-19 would minimize the potential for mobilization of sediment and increased sedimentation and turbidity in Corte Madera Creek. Some harassment of adult and juvenile steelhead may occur due to temporary, localized plumes of sediment during installation and removal of piles and demolition activities.

Loss of Aquatic Habitat

The proposed project would result in the temporary and permanent loss of aquatic habitat area, including foraging and rearing habitat for juvenile steelhead and green sturgeon. Installation of the piles for the temporary trestles would result in the temporary loss of aquatic habitat (substrate and water column) equal to the cumulative area of the in-water piles (628 square feet [0.014 acre]).

Replacement of the existing bridge piers with new bridge piers will result in a net permanent habitat loss of approximately 296 square feet (0.007 acre). Because the trestle piles represent a temporary impact and the amount of permanent impact from constructing the new permanent piers is small compared to the total area of existing habitat in the study area, the project is not expected to have long-term effects on steelhead and green sturgeon rearing and forage habitat.

The new bridge is also expected to result in additional shading of the creek as a result of the increase in bridge width; however, the small amount of shade increase is expected to have a negligible effect on habitat quality.

A Biological Opinion was issued for this project for CCC steelhead and its designated critical habitat by the NMFS on March 30, 2012 (Appendix B).

Implementation of Mitigation Measures 4-3, 4-4, and 4-16 through 4–19 would minimize impacts on CCC steelhead and designated critical habitat of CCC steelhead, thereby reducing these impacts to a level less than significant.

Mitigation Measure 4-16: Conduct All In-Water Construction Activities before December 1

The City proposes to conduct all pile driving (in-water installation and removal of temporary trestle piles and steel casings) between September 1 and November 30 to avoid the breeding season for clapper rails (March–August) and the primary steelhead migration season (December–June) in the project area. Because of the potential for steelhead adults and juveniles

to begin their migration earlier than December 1, the City will conduct all pile driving activities as early as possible during the September 1–November 30 window.

Mitigation Measure 4-17: Implement Measures to Minimize Exceedance of Interim Threshold Sound Levels during Pile Driving

The City will require the contractor to implement the following measures to minimize the exposure of listed fish species to potentially harmful underwater sounds:

- The City will require the contractor to vibrate all piles to the maximum depth feasible before using an impact hammer. During impact driving, the contractor will limit the number of strikes per day to the minimum necessary to complete the work.
- The smallest pile driver and minimum force necessary will be used to complete the work.
- During impact driving, the City will require the contractor to use a bubble ring or similar device to minimize the extent to which the interim peak and cumulative SEL thresholds are exceeded.
- No pile driving activity will occur at night.

Mitigation Measure 4-18: Implement a Hydroacoustic Monitoring Plan

The City will develop and implement a hydroacoustic monitoring plan. The monitoring plan will be submitted to NMFS for approval at least 60 days before the start of project activities. The plan will include the following requirements:

- The City will monitor underwater noise levels during all impact pile driving activities on land and in water to ensure that that peak and cumulative SELs do not exceed estimated values (Table 4-5).
- The monitoring plan will describe the methods and equipment that will be used to document the extent of underwater sounds produced by pile driving, including the number, location, distances, and depths of the hydrophones and associated monitoring equipment.
- The plan will include a reporting schedule that includes provision of daily summaries of the hydroacoustic monitoring results to NMFS and more comprehensive reports on a monthly basis during the pile driving season.
- The reports will include the number of piles installed per day, the number of strikes per pile, the interval between strikes, the peak SPL, SEL, and RMS per strike, and accumulated SEL per day at each monitoring station.
- The City or its contractors will ensure that a qualified fish biologist is on site during impact pile driving to document any occurrences of stressed, injured, or dead fish.

Mitigation Measure 4-19: Implement a Storm Water Pollution Prevention Plan

A Storm Water Pollution Prevention Plan (SWPPP) will be implemented as part of the National Pollutant Discharge Elimination System (NPDES) and a General Construction Activity Storm Water Permit to minimize the potential for sediments or contaminants to be discharged into Corte Madera Creek. A toxic materials control and spill response plan will be implemented to regulate the use of petroleum-based products (fuel and lubricants) and other potentially toxic materials associated with project construction.

The following measures will be implemented to minimize or avoid potential increases in sediment inputs to the creek:

- Conduct all construction work according to site-specific construction plans that minimize the potential for sediment input to the aquatic system.
- Minimizing the extent of all areas requiring clearing, grading, revegetation, and recontouring.
- Grade areas following construction to minimize surface erosion.
- Avoid wetland vegetation wherever possible and install fencing to protect wetlands adjacent to the project area.
- Revegetate and enhance riverine wetland areas where temporary impacts would occur during project construction.
- Minimize disturbance to the water column and river bottom by restricting heavy equipment to the temporary trestle.

The following measures will be implemented to minimize the risk of spills or discharges of toxic materials to the creek:

- Establish a hazardous material spill prevention control and countermeasure plan before construction begins that will minimize the potential for, and the effects of, spills of hazardous or toxic substances during construction. The plan will include storage and containment procedures to prevent and respond to spills, and will identify the parties responsible for monitoring the spill response.
- Prevent raw cement, concrete or concrete washings, asphalt, paint or other coating material, oil or other petroleum products, or any other substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses.
- Prevent discharge of turbid water to the stream during dewatering activities by filtering the discharge first using a filter bag, diverting the water to a settling tank, and/or treating the water in a manner to ensure compliance with water quality requirements prior to discharging water back to the creek.
- Clean up all spills immediately according to the spill prevention and countermeasure plan.
- Provide areas located outside the OHWM for staging and storing equipment, materials, fuels, lubricants, solvents, and other possible contaminants.
- Remove vehicles from the normal high-water area of the waterway before refueling and lubricating or ensure that stormwater runoff in areas where equipment is refueled or lubricated below the OHWM is storm-proofed to prevent contaminants from being discharged to the stream. Contaminated water would be pumped to a holding tank for proper disposal.
- Limit operation of vehicles and equipment in flowing water.

The City will review and approve the contractors' toxic materials spill prevention control and countermeasure plan before allowing construction to begin. The City will routinely inspect the construction site to verity that best management practices (BMPs) specified in the plan are properly implemented and maintained. The City will notify the contractor immediately if there is a noncompliance issue and will require compliance.

The City also will obtain a 401 Water Quality Certification from the San Francisco RWQCB, which may contain additional BMPs and water quality measures to ensure the protection of water quality.

Central California Coast Coho Salmon

Because CCC coho salmon are not currently present in Corte Madera Creek, the analysis for this species focused on project-related effects on designated critical habitat. Impacts on the critical habitat of CCC coho salmon would be the same as those described for steelhead critical habitat. A Biological Opinion was issued for this project for CCC coho salmon designated critical habitat by the NMFS on March 30, 2012 (Appendix B).

With implementation of Mitigation Measures 4-3, 4-4, and 4-16 through 4-19, these impacts are considered less than significant.

North American Green Sturgeon

Project impacts on green sturgeon would be similar to those described for steelhead although green sturgeon may be at higher risk of exposure to construction-related impacts because of their potential year-round occurrence and non-migratory behavior (i.e., potential use of the study area as foraging or rearing habitat). Green sturgeon would also be considered more sensitive to the loss of natural channel substrates because of their dependence on benthic food organisms. However, the net loss in channel area resulting from installation of the new bridge piers (0.007 acre) represents a negligible fraction of the total foraging habitat available to green sturgeon in the study area and surrounding waters. Project impacts on the critical habitat of green sturgeon would be similar to those described for the critical habitat of CCC steelhead.

A Biological Opinion was issued for this project for green sturgeon and its designated critical habitat by the NMFS on March 30, 2012 (Appendix B).

With implementation of Mitigation Measures 4-3, 4-4, and 4-16 through 4-19, these impacts are considered less than significant.

Essential Fish Habitat

EFH for Pacific salmon, groundfish, and coastal pelagic species could be affected by the project. Effects on EFH for Pacific salmon would be similar to the species and critical habitat effects discussed above for steelhead and coho salmon. Environmental conditions potentially affecting groundfish and coastal pelagic species EFH include:

- sedimentation and turbidity
- hazardous materials and contaminants
- disturbance and direct injury
- loss of aquatic habitat.

Effects associated with sedimentation and turbidity, hazardous materials and contaminants, disturbance and direct injury, and habitat loss on groundfish and coastal pelagic EFH would be temporary. Potential adverse effects of increased fine sediment and turbidity on EFH will be avoided or minimized through implementation of all applicable BMPs. The potential environmental effects of the project would be limited to short-term, localized, and minor increases in turbidity and

suspended sediment. Implementation of the SWPPP along with applicable BMPs would substantially reduce or eliminate the potential for accidental spill and unintentional discharge of contaminants and potential associated effects on EFH.

Potential injury and mortality associated with pile driving will be avoided or minimized by:

- Limiting the number and size of piles to the minimum necessary to meet the engineering and design requirements of the project;
- Using vibratory hammers whenever feasible;
- Using the smallest pile driver and minimum force necessary to complete the work; and
- Using a bubble ring or similar device to minimize the magnitude and extent of potentially harmful underwater noise levels.

Long-term and permanent effects on EFH would be limited to the footprint of the new bridge piers which would be approximately 296 square feet (0.007 acre) larger than the current footprint of the existing bridge piers; therefore the footprint of disturbance of EFH would be insignificant compared to the total extent of EFH available to these species.

The proposed project would adversely affect EFH; however, the effects would be temporary and small relative to the EFH available.

4b: Less-than-Significant with Mitigation Incorporated

See the discussion in 4a above.

4c: Less-than-Significant with Mitigation Incorporated

See the discussion in 4a above.

4d: Less-than-Significant with Mitigation Incorporated

See the discussion above related to pile driving.

4e: No Impact

The majority of the trees in the study area are non-native, ornamental species planted for landscaping purposes (e.g., Peruvian pepper tree, Monterey pine cultivar), and only a few native trees, e.g. coast live oak *(Quercus agrifolia)* are present. None of the trees in the study area have been designated as heritage trees by the City or meet the size requirements to qualify as a heritage tree. Therefore, there would be no impact on protected tree resources.

4f: No Impact

See 4b for discussion of potential impacts on the natural communities in the study area. The proposed project would not conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan because the proposed project is not located within an area covered by any of these types of plans. No impact would occur.

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5. Cultural Resources	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☒	☐	☐
b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☒	☐	☐
c. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

This section is based on the Historic Property Survey Report and Archaeological Survey Report prepared for the proposed project (ICF International 2011e).

Discussion

The area of potential effects (APE) that was evaluated for the presence of cultural resources was established in consultation with the California Department of Transportation. The archaeological and architectural APE encompass the project footprint and follows the maximum possible area of direct impact resulting from the project, including all new construction, easements, and staging areas, and a 60- foot-wide buffer on the south and north sides of the bridge within the Corte Madera Creek channel needed for construction of the temporary trestle bridge. The vertical APE includes the depth needed to drive piles and steel casings as well as shallow excavations for temporary utility relocation.

Background research was conducted to identify any known cultural resources within or adjacent to the project area. The research included a records search at the North West Information Center of the California Historical Resources Information System located at Sonoma State University in Rohnert Park, California in November 2008. The records search was specific to the APE and included a 0.5-mile surrounding radius to identify any adjacent cultural resources or cultural resources studies. Sources consulted during the records search included maps of previous cultural resources studies and known cultural resource locations, the Historic Properties Data File (11/10/08); the National Register of Historic Places; California Register of Historical Resources; California Inventory of Historic Resources (1976); California Historical Landmarks (1996); and California Points of Historical Interest (May 1992 and updates). The records search resulted in the finding that no prehistoric or historic era sites had been recorded, reported, or identified in or adjacent to the project area. However, one site was recorded within 0.50 mile of the project area that comprised a shell mound recorded in 1907(Nelson 1907). No historic properties or historical resources were identified adjacent to or within 0.5 mile of the project area.

Letters were sent to the Native American contacts provided by the Native American Heritage Commission requesting any information known regarding resources located within the proposed project area or that may be affected by the proposed project was requested. No comments have been received to date.

Archaeologists conducted intensive pedestrian surveys of the APE using 5-meter transect intervals in 2008 and 2010. No archaeological resources were located.

After review of the results of the records search and coordination with the City, an architectural historian determined that built environment resources present within the APE were exempt from evaluation per the criteria set forth in Attachment 4 (Properties Exempt from Evaluation) of the National Historic Preservation Act Section 106 Programmatic Agreement.

The original Bon Air Road Bridge was constructed in 1958 and extensive repairs to the bridge were made in 1968. In 1971, the bridge was lengthened and in 1994, the bridge was seismically retrofitted. The bridge was previously determined not eligible for inclusion in the National Register of Historic Places and/or registration as a California Historical Landmark.

Comments

5a–c: Less-than-Significant Impact with Mitigation Incorporated

No cultural resources were identified in the APE. The intensive pedestrian survey did not locate any archaeological resources in the APE and one prehistoric resource has been recorded within 0.5 mile of the project. The archaeological sensitivity assessment indicates that the area is not sensitive for buried prehistoric resources. It is unlikely construction would disturb buried archaeological resources or human remains, including those interred outside formal cemeteries.

However, because ground disturbance is required, there is still a chance that the project could uncover previously undiscovered archaeological resources. Implementation of Mitigation Measures 5-1 and 5-2 would reduce this impact to a less-than-significant level.

Mitigation Measure 5-1: Stop Work and Consult with Qualified Archaeologist

If buried cultural materials are encountered during construction, work in that area must stop until a qualified archaeologist can evaluate the nature and significance of the find.

Mitigation Measure 5-2: Stop Work and Consult with Marin County Coroner and/or Native American Heritage Commission

If human remains are discovered, State Health and Safety Code Section 7050.5 states that further disturbances and activities would stop in any area or nearby area suspected to overlie remains, and the Marin County Coroner contacted. Pursuant to Public Resources Code Section 5097.98, if the remains were thought to be Native American, the coroner would notify the Native American Heritage Commission, which would then notify the Most Likely Descendent. At this time, the person who discovered the remains would contact Caltrans District 4 Environmental Branch so that they may work with the Most Likely Descendent on the respectful treatment and disposition of the remains. Further provisions of Public Resources Code 5097.98 are to be followed as applicable.

Sources

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6. Geology and Soils	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
1 Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
2 Strong seismic ground shaking?	☐	☐	☒	☐
3 Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
4 Landslides?	☐	☐	☒	☐
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c. Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an onsite or offsite landslide, lateral spreading subsidence, liquefaction, or collapse?	☐	☐	☒	☐
d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☒	☐
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒

This section was prepared by Parson Brinckerhoff, Inc. based in part on the geotechnical investigation performed and draft Log of Test Borings (LOTBs) provided by Parikh Consultants, Inc. and Web-based available resources from the U.S. Geological Survey (USGS), California Geological Survey (CGS), and Association of Bay Area Governments (ABAG) that are cited in the "Sources" section below. Detailed geotechnical analyses will be performed prior to final design of the project based on final LOTBs.

Discussion

Regional Geology

The project area is located in the San Francisco Bay region within the Coast Range Geologic Province that is a belt of sedimentary, volcanic and metamorphic rocks that extend throughout California. The geology of the Coast Range is complex and is caused by the interaction between North American and Pacific tectonic plates. The two major faults, San Andreas and Hayward, which control the regional tectonics, are located within 10 miles of the project area.

The regional geologic formations in the San Francisco Bay area range from the Franciscan complex of Jurassic to recent Holocene ages. Due to thousands of years of weathering of surrounding mountains and rises in sea level, various alluvium and marine and marsh deposits have accumulated in the region. The Quaternary Geology and Liquefaction Susceptibility Maps of the San Francisco, California Quadrangle, indicate that the site is mainly underlain by recent Artificial Fill, Holocene Bay Mud deposits, Late Pleistocene to Holocene Alluvial Fan deposits, and Pre-Quaternary deposits and bedrock.

Regional Seismicity

The project site is located in a seismically active part of the San Francisco Bay area in northern California. Many faults that result from the interaction of Pacific and North American tectonic plates occur in the San Francisco Bay area. Movement between these two plates predominantly occurs on the San Andreas, Hayward-Rogers Creek, Calaveras, San Grogorio and Concord-Green Valley faults. These faults are capable of producing strong earthquakes.

The closest active faults to the project site are San Andreas fault (North Coast section) and the Hayward fault (Northern section) (California Department of Transportation 2007). The maximum credible earthquake magnitudes of these faults represent the largest earthquakes that could occur on a given fault (Table 6-1).

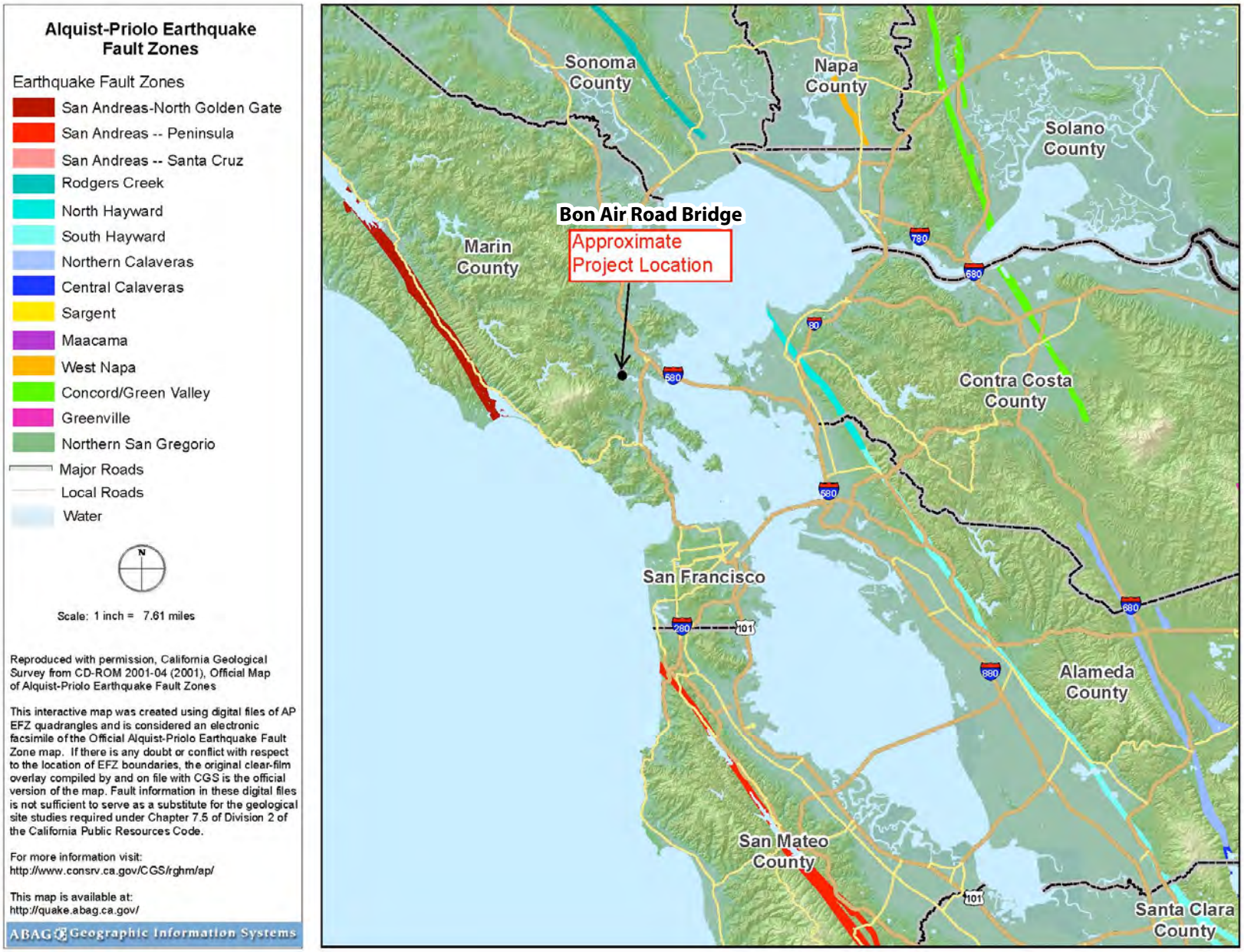
Table 6-1. Active Faults in Vicinity of Bon Air Road Bridge

Fault (ID)	Distance From Site (km)	Maximum Credible Earthquake Magnitude
San Andres (308)	12.3	7.9
Hayward (353)	15.8	7.3
Source: California Department of Transportation 2007.		

Figure 6-1 presents faults in the project area. It indicates that the project is not located within an Alquist-Priolo Earthquake Fault Zone.

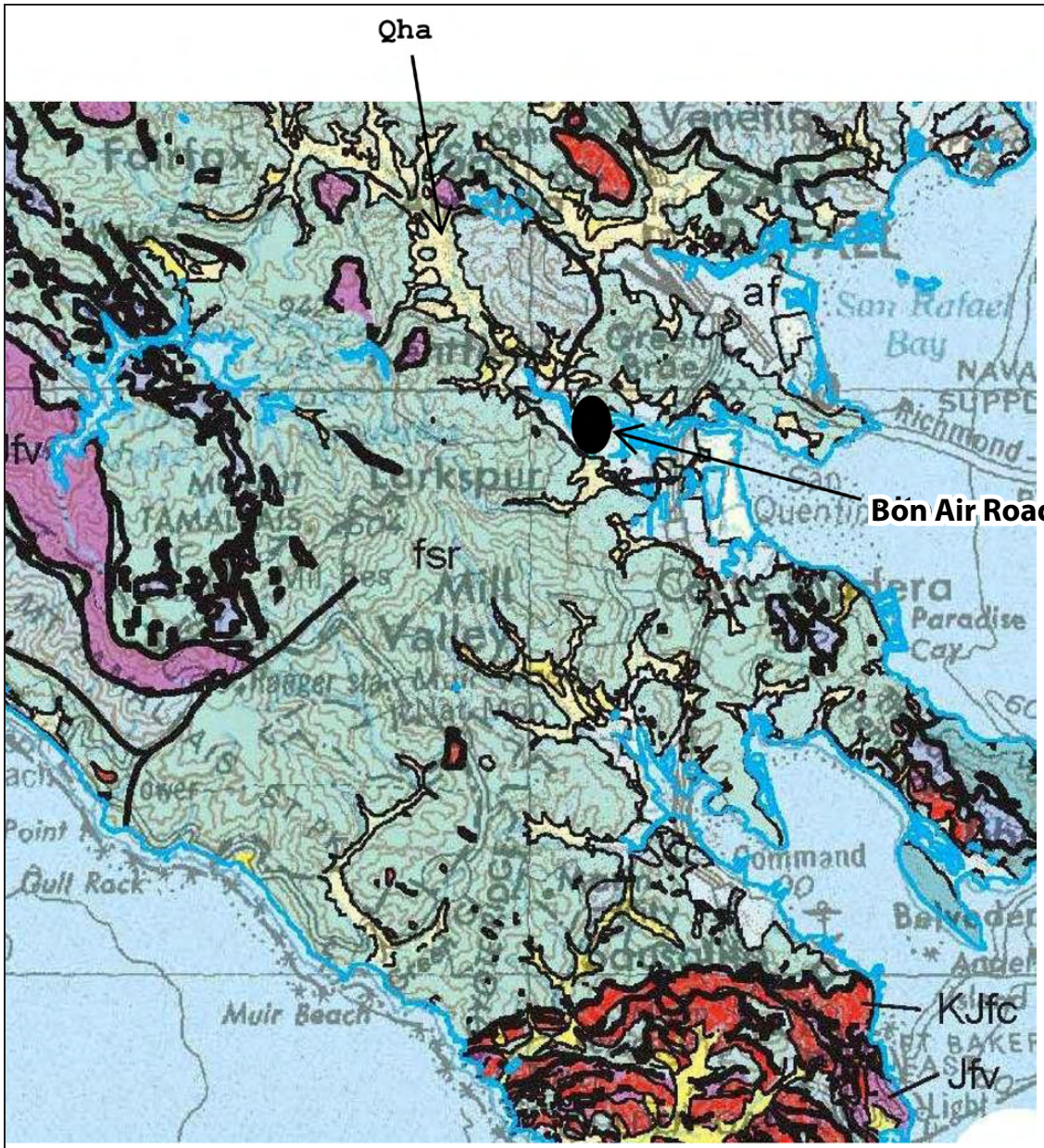
Site Geology

The Bon Air Road Bridge site is mainly underlain by recent Artificial Fill and Holocene Alluvium fan deposits (combination of bay mud, sands, gravels, etc) and Franciscan Complex sedimentary rocks (Cretaceous) (R. W. Graymer et al. 2006) (Figure 6-2).



Source: Association of Bay Area Governments Interactive Hazard Maps and Information. U.S. Geological Survey San Francisco Bay Region Landslide Folio digital map.

Figure 6-1
Fault Zone Map, Bon Air Road Bridge Replacement Project



Key:

af	Artificial Fill,
Qha	Alluvium (Holocene)
Kfs	Franciscan Complex volcanic rocks (Cretaceous)
fsr	Franciscan Complex mélange (Eocene, Paleocene, Late Cretaceous)

Source: R.W. Graymer, et al. 2006

Graphics/Projects/00277.08/City of Larkspur/Bon Air/Initial Study (04-12) SS

Figure 6-2
Geology Map of the San Francisco Bay Region, Bon Air Road Bridge Replacement Project

A soil investigation was performed in August 2005. During this field investigation, four soil borings were drilled at Bon Air Road, including two in Corte Madera Creek and two on the existing embankments. The borings were drilled to maximum depth of 100 feet below existing ground. These soil borings indicated alternative layers of clay, organic clay (Bay Mud), and sand overlying bedrock (shale, claystone, and sandstone). The organic clay and clay layers were very soft to stiff and the sand layers loose to dense. The rock was highly weathered to hard in consistency. Based on the field investigation, the depth to the bedrock is estimated to be 55 to 85 feet below ground surface.

Comments

6a-1: Less-than-Significant Impact

The proposed Bon Air Road Bridge is not located within the Alquist-Priolo Earthquake Fault Zones, and a Fault-Rupture Hazard Zones study is not considered necessary. Impacts related to the Alquist-Priolo Earthquake Fault Zone mapping and rupture of known earthquake faults are less than significant.

6a-2: Less-than-Significant Impact

The closest fault to the project is the San Andreas fault-North Golden Gate located approximately 7.5 miles west of the project site. Although the project site is not located closer to an active fault, it is in a seismically active area of the San Francisco Bay region that has experienced moderate to high levels of ground shaking. The proposed bridge, during its life, will probably experience moderate- to occasionally high-level ground shaking from the nearby faults.

The proposed bridge will be designed in accordance with the current Caltrans Seismic Design Criteria. This impact is considered less than significant.

6a-3: Less-than-Significant Impact

Soil liquefaction is a phenomenon primarily caused with the presence of very loose to medium dense cohesionless soil layers close to the ground surface under the presence of groundwater. During an earthquake event, the very loose to medium dense sands and silts are shaken developing excess pore pressures and thereby causing loss of shear strength. Liquefaction is dependent on grain size distribution, fines content, density, and plastic characteristics of the soils.

The draft LOTBs undertaken for the project indicate loose to very loose sandy layers at approximate 20 to 40 feet below ground surface. This layer is considered liquefiable. Based on Figure 6-3, the liquefaction hazard levels are very high at the project site. The structure will be designed in accordance with the current Caltrans Seismic Design Criteria; therefore, the impact due to seismic related ground failure including liquefaction will be less than significant.

6a-4: Less-than-Significant Impact

Landslides occur when soils or rocks cannot support the weight of overlying material due to steeper slopes. Landslides can be triggered by heavy rains and/or shaking triggered during a seismic event.

The proposed site is not located within the CGS landslide hazard zone. No significant slopes are present at the project site, and no evidence of previous landslide activity was observed in the project vicinity. The existing bridge consists of embankment slopes will be designed and engineered to reduce the risk of sliding. The impact due to landslides is therefore less than significant.

6b: Less-than-Significant Impact

Soil erosion occurs when soil material is transported from the ground surface due to various factors such as water runoff, wind, and high rainfall intensity. The proposed project includes construction of bridge piers and embankments over Corte Madera Creek. The onsite soils consist of sands and silts; considerable erosion of these materials is expected during construction. Standard construction practices for controlling soil erosion such as employing geosynthetics mats and re-vegetating disturbed areas will be implemented by the construction contractor. The impact due to soil erosion will be less than significant.

6c: Less-than-Significant Impact

As described under 6a-3, the site is located in the seismically active San Francisco Bay region. Based on the Figure 6-3, the project site is considered prone to liquefaction, and lateral spreading may occur since the liquefiable layer is adjacent to free face/open water. The structure will be designed in accordance with the current Caltrans Seismic Design Criteria; therefore, the impact related to liquefaction, lateral spreading, subsidence, liquefaction, or collapse will be less than significant.

6d: Less-than-Significant Impact

The project site consists of artificial fill and alluvium deposits which have moderate to high shrink-swell potential. Shrink-swell potential of on-site soils will be addressed in the bridge design and therefore the impact will be less than significant.

6e: No Impact

The proposed project would not include the addition or removal of septic tanks or alternative wastewater disposal systems. Therefore, there is no impact.

6f: No Impact

Based on the LOTBs, no traces or signs of any paleontological resources, fossils or unique geologic features were observed. The project is not expected to affect paleontological resources, fossils or unique geologic features.

Sources

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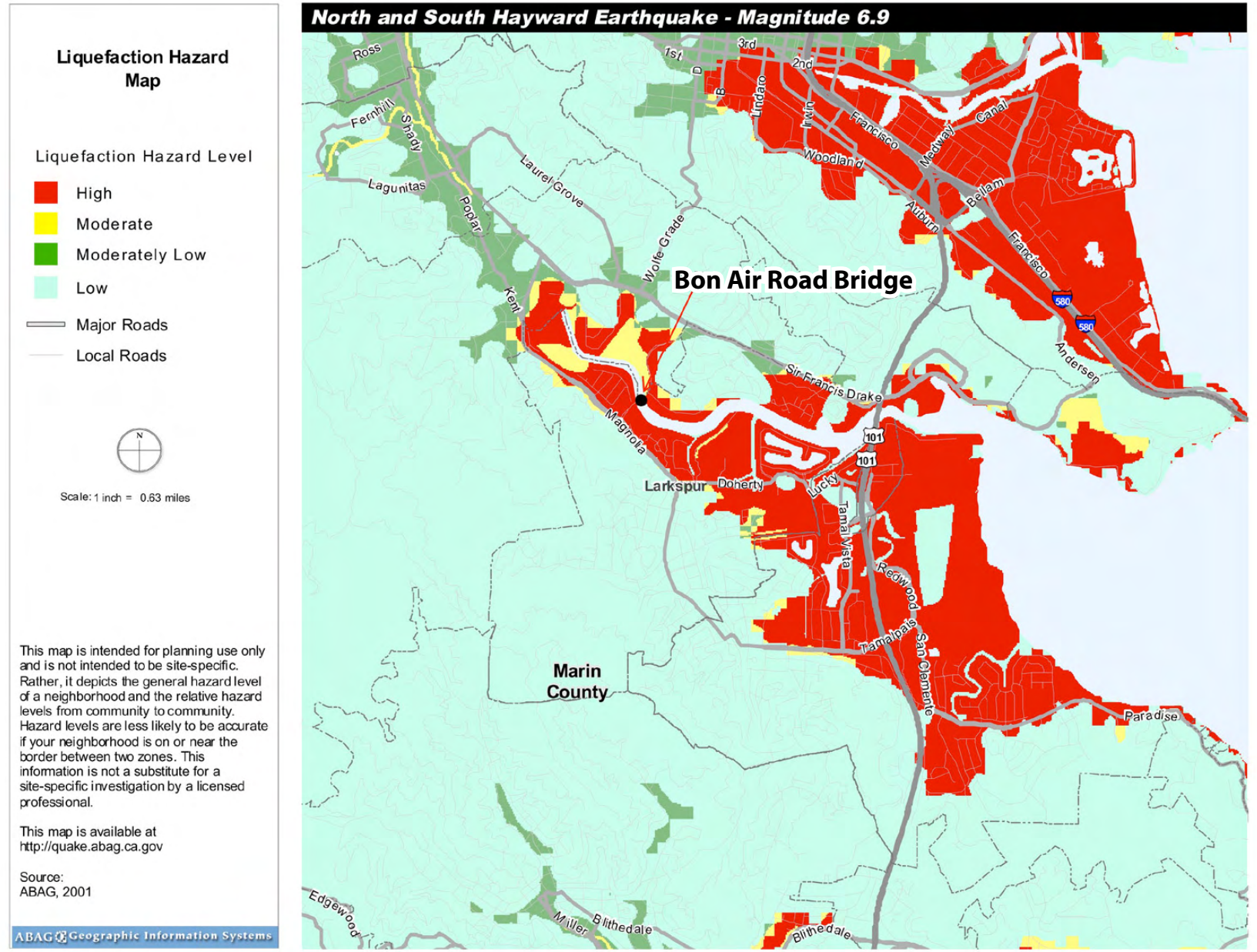

Source: Association of Bay Area Governments Web Based Interactive Hazard Maps and Information at http://quake.abag.ca.gov

Figure 6-3
Liquefaction Hazard Map, Bon Air Road Bridge Replacement Project

Parikh Consultants, Inc. Draft Log of Test Borings drilled in August 2005.

R. W. Graymer, B.C. Moring, G. J. Saucedo, C. M. Wentworth, E. E. Brabb, and K. L. Knudsen. 2006. Geology Map of the San Francisco Bay Region.

U.S. Geological Survey. Open File Report 97-745. San Francisco Bay Region Landslide Folio digital map. http://pubs.usgs.gov/of/1997/of97-745/.

7. Greenhouse Gas Emissions	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
When available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b. Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

This section is based on the Air Quality and Climate Change Analysis prepared for the proposed project (ICF International 2010).

Discussion

Global climate change is caused in large part by anthropogenic (man-made) emissions of greenhouse gases (GHGs) released into the atmosphere through the combustion of fossil fuels and by other activities such as deforestation and land-use change. Unlike criteria air pollutants, GHGs tend to persist in the atmosphere where they can trap infrared radiation emitted from the Earth's surface. This phenomenon, known as the "greenhouse effect," is necessary to keep the Earth's temperature warm enough for successful habitation by humans. Emissions of GHGs in excess of natural ambient concentrations; however, are responsible for the enhancement of the greenhouse effect. This trend of warming of the Earth's natural climate is termed "global warming."

The principle GHGs contributing to global warming carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluoridated compounds. CO_2 is the most important anthropogenic GHG, followed by CH_4 and N_2O. It is estimated that CO_2 accounts for more than 75% of all anthropogenic GHG emissions. Three quarters of anthropogenic CO_2 emissions are the result of fossil fuel burning (and to a very small extent, cement production), and approximately one quarter of emissions are the result of land-use change (Intergovernmental Panel on Climate Change 2007). CH_4 is the second largest contributor of anthropogenic GHG emissions and is the result of growing rice, raising cattle, combusting natural gas, and mining coal (National Oceanic and Atmospheric Administration 2005). N_2O, while not as abundant as CO_2 or CH_4, is a powerful GHG. Sources of N_2O include agricultural processes, nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions.

In order to simplify reporting and analysis, methods have been set forth to describe emissions of GHGs in terms of a single gas. The most commonly accepted method to compare GHG emissions is the "global warming potential" (GWP) methodology defined in the Intergovernmental Panel on Climate Change (IPCC) reference documents (Intergovernmental Panel on Climate Change 1996, 2001). The IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of CO_2 equivalents (CO_2e), which compares the gas in question to that of the same mass of CO_2 (CO_2 has a GWP of 1 by definition).

The California Air Resources Board (ARB) recently completed an inventory of California's 2006 GHG emissions. Their report states that 1990 emissions amounted to 433.3 million metric tons of CO_2e, while 2006 emissions levels rose to 483.9 million metric tons of CO_2e (California Air Resources Board 2009). To address rising GHG emissions, the State of California has established several programs to reduce and minimize greenhouse gas emissions. Climate change and GHG reduction is also a concern at the federal level; however, at this time, no legislation or regulations have been enacted specifically addressing GHG emissions reductions and climate change.

Comments

7a: Less-than-Significant Impact with Mitigation Incorporated

GHG emissions from transportation-related projects can be divided into those produced during construction and those produced during operations. Because the proposed project is not capacity increasing, there would be no long-term operational emissions. Consequently, this section only presents GHG emission associated with project construction.

GHG emissions from construction activities are primarily the result of fuel use by construction equipment, as well as from worker and vendor trips. Emissions were calculated using the using the construction activity estimates and equipment assumptions summarized above in Section 3, Air Quality.

The "bridge construction" setting in the SMAQMD's Road Construction Model was used to estimate CO_2 emissions associated with construction. Table 7-1 summarizes the annual GHG emissions from off-road diesel equipment and on-road worker and vendor commutes associated with construction of the proposed project.

As discussed above, specific thresholds of significance to evaluate impacts pertaining to GHG emissions have not been established by the state or federal governments. The draft BAAQMD guidelines discuss GHG emissions, but they do not propose a quantitative threshold for construction-related emissions. This absence of thresholds does not negate CEQA's mandate to evaluate all potentially significant impacts associated with the proposed project. Consequently, for this analysis, a significant impact related to GHG emissions is considered to be a long-term net increase in GHG emissions compared to baseline emissions.

Table 7-1. Summary of Construction Emissions (metric tons)

Off-Road Emissions[a]			On-Road Emissions[b]		
CO_2	CH_4	N_2O	CO_2	Other GHGs	Total (CO_2e)
1,347	0.07	0.04	30	1.57	1,391

Sources: Road Construction Model; California Climate Action Registry 2009; U.S. Environmental Protection Agency 2009.

[a] From construction equipment (diesel).

[b] From construction worker and vendor commutes (mix of fuels). Other GHGs include CH_4, N_2O, and HFCs, which represent 5% of total GHG emissions from on-road sources (calculated by diving CO_2 emissions by 0.95 and multiplying the resulting number by 0.05).

As indicated in Table 7-1, construction of the proposed project would generate 1,391 metric tons of GHG emissions. This is equivalent to adding approximately 927 typical passenger cars to the road

during the construction period (U.S. Environmental Protection Agency 2009). Although these emissions would be a net increase relative to existing conditions, they would be temporary and cease once construction activities are complete. As discussed in Section 3, Air Quality, above, the proposed project would not affect VMT and would therefore result in no long-term operational emissions. Consequently, this impact is considered less than significant. However, given the seriousness of global climate change, implementation of Mitigation Measure 7-1 is recommended by the BAAQMD to help reduce construction-related GHG emissions.

Mitigation Measure 7-1: Implement the Bay Area Air Quality Management District Best Practices for Greenhouse Gas Emissions (recommended)

The City may implement, to the extent feasible, the BAAQMD's BMPs outlined in their 2009 Draft CEQA Guidelines. BMPs include:

- Alternative-fueled (e.g., biodiesel, electric) construction vehicles/equipment of at least 15 percent of the fleet;
- Local building materials of at least 10 percent; and
- Recycle at least 50 percent of construction waste or demolition materials.

7b: Less-than-Significant Impact

The state has adopted several policies and regulations for the purpose of reducing GHG emissions. The most stringent is Assembly Bill (AB 32), which is designed to reduce statewide GHG emissions to 1990 levels by 2020. As discussed above, the proposed project would not result in any long-term operational-related GHG emissions. Any emissions from project construction will be mitigated to existing levels. Therefore, project-generated GHG emissions would not conflict with the state goals listed in AB 32 or in any preceding state policies adopted to reduce GHG emissions. This impact is considered less-than-significant. No mitigation is required.

Sources

Bay Area Air Quality Management District. 2009. California Environmental Quality Act. Air Quality Guidelines. San Francisco, CA. December.

California Air Resources Board. 2009. Greenhouse Gas Inventory Data- Graphs. Last Revised: May 22, 2009. Available: <http://www.arb.ca.gov/cc/inventory/data/graph/graph.htm>. Accessed: September 22, 2009.

California Climate Action Registry. 2009. Climate Action Registry General Reporting Protocol Version 3.1. Pages: 40, 48, 94, 95, 100, 101, and 103. January. Available: <http://www.climateregistry.org/resources/docs/protocols/grp/GRP_3.1_January2009.pdf>. Accessed: November 9, 2009.

ICF International. 2010. Air Quality and Climate Change Analysis for the Bon Air Road Bridge Replacement Project. Final. July 9. Sacramento, CA. Prepared for the City of Larkspur.

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National Oceanic and Atmospheric Administration. 2005. Greenhouse Gases: Frequently Asked Questions. Available: <http://lwf.ncdc.noaa.gov/oa/climate/gases.html>. Accessed: September 22, 2009.

U.S. Environmental Protection Agency. 2009. Emission Facts. Greenhouse Gas Emissions from a Typical Passenger Car. Last Revised: November 24, 2009. Available: <http://www.epa.gov/OMS/climate/420f05004.htm>. Accessed: January 13, 2010.

8. Hazards and Hazardous Materials	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐
c. Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☒	☐	☐
d. Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e. Be located within an airport land use plan area or, where such a plan has not been adopted, be within two miles of a public airport or public use airport, and result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f. Be located within the vicinity of a private airstrip and result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
h. Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

This section is based on two reports prepared for the proposed project, the Aerially Deposited Lead Investigation (Kleinfelder 2010a) and the Asbestos and Lead Building Materials Sampling (Kleinfelder 2010b).

Discussion

An initial screening of the project area found that there are no known hazardous materials and/or hazardous waste sites within 2000 feet of the bridge (State Water Resources Control Board 2010).

The original Bon Air Road Bridge was constructed in 1958 and could contain hazardous materials such as asbestos or lead-based paint. In addition, aerially deposited lead (ADL) can occur in soils adjacent to heavily traveled roads and highways as a result of the historical use of leaded gasoline and exhaust emissions.

Asbestos Containing Construction Materials

A California Certified Asbestos Consultant conducted a visual survey of the Bon Air Road Bridge and collected bulk samples of building materials that were suspected to contain asbestos. Sampling procedures included the visual observation and identification of bridge materials suspected of containing asbestos. Two samples were collected from the bridge structures for asbestos analysis and delivered to a certified analytical laboratory. Asbestos was not detected above laboratory reporting limits in the samples submitted to the laboratory for testing (Kleinfelder 2010b).

Lead-Based Paint

A certified lead inspector/assessor/supervisor conducted a visual survey of the bridge and collected a total of five paint chip samples in the substrate from the bridge that are suspected to contain lead. Each sample was submitted to an analytical laboratory. Based upon visual observations and subsequent analysis of the painted surface, lead was detected above laboratory reporting limits in one sample. The condition of each paint was identified in general accordance with the U.S. Housing and Urban Development Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, Chapter 7: Lead-Based Paint Inspection (revised 1997).

Paint identified through laboratory analysis as containing levels of lead at or above 5,000 milligram per kilogram (mg/kg, or 5,000 parts per million) is classified as lead-based paint. One sample of silver and orange paint, collected from the steel deck supports on the underside of the Bon Air Road Bridge contained160,000 mg/kg lead and was in poor condition. The remaining four paints sampled contained less than the laboratory reportable amount, which ranged from <60 mg/kg to <800 mg/kg (Kleinfelder 2010b).

Aerially Deposited Lead

Investigations for ADL in the project area in 2010 were conducted. Seven soil samples were collected from four boreholes located on the north, south, east, and west sides of the bridge. Soil data were compared to the California Hazardous Waste Criteria, as outlined in the California Code of Regulations, Title 22, to provide an evaluation of potential constraints associated with excavation and disposal of site soil.

Comments

8a and b: Less-than-Significant Impact with Mitigation Incorporated

Demolition of the existing bridge and soil excavations could expose construction workers to ADL and lead based paints. In addition, while not detected above laboratory reporting limits in the samples collected, asbestos containing construction materials could still be present. Construction workers engaged in demolition or excavation activities would have greatest potential for exposure, while the general public would be excluded from the construction zone. With implementation of

Mitigation Measures 8-1 through 8-4, these impacts would be reduced to a less-than-significant level.

Mitigation Measure 8-1: Sample Suspect Materials for Asbestos Containing Construction Materials

If suspect materials are discovered during construction work at the site, samples should be collected by a California Certified Asbestos Consultant prior to disturbance by construction personnel. If present, asbestos containing construction materials will be removed and disposed of by the California Certified Asbestos Consultant in accordance with all applicable laws and regulations.

Mitigation Measure 8-2: Provide Notification of Presence of ADL and Lead Based Paint

The City will notify employees, contractors, and subcontractors having access to the bridge as to the presence, location, and quantity of ADL and lead based paint prior to demolition activities.

Mitigation Measure 8-3: Minimize Disturbance of Soils Containing Lead, Lead Containing Paints, and Lead Based Paints

Demolition activities should be conducted by methods designed to minimize the disturbance of soils containing ADL, lead-containing paints and lead-based paints. Practices used should not cause airborne concentrations of lead to exceed the applicable California Occupational Safety and Health Administration standards for airborne lead. Personal air monitoring of demolition workers should be conducted to assess airborne lead concentrations during work activities that disturb soils containing ADL, the lead-containing paints and/or lead-based paints. All lead containing materials will be removed and disposed of in accordance with all applicable laws and regulations.

Mitigation Measure 8-4: Contain Lead Containing Paints and Lead Based Paints on Site during Demolition

Bon Air Road Bridge spans Corte Madera Creek which transports surface water to the bay and ocean. Special care should be taken to minimize the risk of paint chips falling into the water.

During construction, vehicles transporting hazardous materials could use the bridge and spills could occur, releasing hazardous materials into the environment. During construction, two lanes of traffic would be maintained over the bridge except for three temporary full closures of the bridge over two days on three weekends during the multi-year construction schedule. During bridge closures, a temporary detour (Figure 7) would be required that would increase travel time. The proposed project is not anticipated to increase the potential for vehicles carrying hazardous materials to use the bridge or increase the risk of spills as a result of the detour. This impact would be less than significant.

8c: Less-than-Significant Impact with Mitigation Incorporated

The closest school to the proposed project is Marin Catholic High School at 675 Sir Francis Drake Boulevard, located more than 0.25 mile from the bridge. Implementing the Mitigation Measures 8-1 through 8-4 would reduce this impact to less than significant.

8d: No Impact

The project is not located on or near a site included in a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 (State Water Resources Control Board 2010). There would be no impact.

8e and f: No Impact

No airports are located within two miles of the proposed project and no impacts would occur.

8g: Less-than-Significant Impact

As discussed above and in Section 14, a temporary detour would be required during full bridge closure. However, two lanes of traffic would be maintained over the bridge throughout most of the construction period, with the exception of three temporary full closures of the bridge. Each bridge closure would last for two days and would be scheduled to occur on weekends beginning Friday evening and ending Sunday morning. The weekend bridge closures would be scheduled at least six months apart and include one weekend each in September 2014, January 2016, and July 2016. A detour has been identified and a Traffic Management Plan will be prepared during the final design phase in coordination with the police and fire agencies to minimize the impacts of delays during construction. This impact would be less than significant.

8h: Less-than-Significant Impact

The Bon Air Road Bridge crosses Corte Madera Creek within the limits of the City. There are no wildlands or residences intermixed with wildlands adjacent to the bridge, and therefore, no impacts are expected.

Sources

Kleinfelder. 2010a. Aerially Deposited Lead Investigation. November. Oakland, CA. Prepared for Parsons Brinckerhoff, Inc.

———. 2010b. Asbestos and Lead Building Materials Sampling. November. Oakland, CA. Prepared for Parsons Brinckerhoff, Inc.

State Water Resources Control Board. 2010. Geotracker, LUFT and SLIC database search. Available: http://geotracker.waterboards.ca.gov/map. Accessed: June 7, 2010.

9. Hydrology and Water Quality	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation onsite or offsite?	☐	☐	☒	☐
d. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding onsite or offsite?	☐	☐	☒	☐
e. Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f. Otherwise substantially degrade water quality?	☐	☐	☒	☐
g. Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h. Place within a 100-year flood hazard area structures that would impede or redirect floodflows?	☐	☐	☒	☐
i. Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐
j. Contribute to inundation by seiche, tsunami, or mudflow?	☐	☐	☒	☐

This section is based on the Water Quality Assessment (ICF International 2012a) and the Location Hydraulic Study Report (WRECO 2011) prepared for the proposed project.

Discussion

The Bon Air Road Bridge Replacement Project is located on Corte Madera Creek in Larkspur, California. The Creek is located within the Corte Madera watershed (Figure 9-1), which drains a 28 square mile area of eastern Marin County and flows from the foothills of Mount Tamalpais, in the Coast Range, to the Central San Francisco Bay. The Corte Madera Creek is located less than 2 river miles upstream (to the west) of the mouth of the Central San Francisco Bay.

Comments

9a: Less-than-Significant Impact

Construction

Construction of the Bon Air Road Bridge would involve temporary trestle bridges, column and pile driving, demolition of the existing bridge structure and roadway approaches, dewatering, concrete pouring, and other related activities. Water quality impacts from these activities would be avoided or minimized because all construction activities within Corte Madera Creek would comply with a variety of permits and requirements from agencies, such as the San Francisco Bay Regional Water Quality Control Board (RWQCB), United States Army Corps of Engineers (USACE), DFG, Bay Conservation and Development Commission (BCDC), and Marin County Department of Public Works. Since the project is greater than one acre, it is required to be covered under the Construction General Permit issued by the San Francisco Bay RWQCB. Construction BMPs would be implemented based on guidance from several resources including Caltrans Construction Site Best Management Practices Manual (California Department of Transportation 2003) and the Marin County Stormwater Program and Marin County Stormwater Pollution Prevention Program (MCSTOPPP) (Marin County Department of Public Works 2005).

The potential for erosion and sedimentation from the proposed project into Corte Madera Creek is low because, as part of the project, sedimentation would be managed using effective construction and engineering BMPs. These practices include stabilizing the soil surface, reducing erosive energy of surface flow, filtering runoff, and capturing sediment-laden water. As part of Construction General Permit compliance, the project Stormwater Pollution Prevention Program (SWPPP) would require the construction contractor to implement, monitor, and maintain appropriate BMPs. In addition, an Erosion Control Plan would be implemented to comply with the City's grading ordinance and address BMPs to protect the creeks from sedimentation. BMPs can include minimizing or restricting earthwork during periods of rain, establishing a vegetative buffer between the construction area and the creeks, silt fencing, and straw bales to prevent runoff. In addition, the City would be required to implement performance standards set forth under the MCSTOPPP Action Plan.

Potential release or spillage of petroleum products such as diesel fuel, hydraulic fluid, and lubrication greases from a construction vehicle or piece of construction equipment during maintenance or fueling could affect water quality if these petroleum products infiltrate into soil or are washed into nearby storm drains or directly into Corte Madera Creek. However, given that the volume of petroleum released during an incidental spill on a construction site is typically small (less than 25 gallons) and can be cleaned up immediately, impacts associated with petroleum spills during the construction phase are considered minor. Nevertheless, the City of Larkspur would comply with the City of Larkspur stormwater ordinances, stormwater management plans, and BMPs

including standard construction procedures and precautions for working with petroleum and construction chemicals.

Implementation of the SWPPP, Erosion Control Plan, and the performance standards of Caltrans and the MCSTOPPP would minimize the potential for construction-related surface water pollution and would ensure that water quality in the Corte Madera Creek would not be compromised by erosion and sedimentation during construction. This impact would be less than significant.

Operation

The project design would incorporate permanent erosion control elements, primarily permanent vegetation, to ensure that stormwater runoff does not cause soil erosion. The proposed project would also adhere to Phase II Small Municipal General Permit requirements and ensure that stormwater pollution during the life of the project would be minimal by implementing MCSTOPPP and post-construction BMPs. Standard facilities used to handle stormwater onsite could include structural elements or facilities per the MCSTOPPP. According to information received from MCSTOPPP, no site-specific operational SWPPP is required because the City, and its related activities, operate under the Marin County Small MS4 Permit and the City of Larkspur's Urban Runoff Pollution Prevention Ordinance (City of Larkspur 2011). Regulatory compliance measures, as discussed above and that are part of the MS4, would minimize the potential for surface water degradation over the long term. This impact would be less than significant.

9b: Less-than-Significant Impact

The proposed project would not significantly affect groundwater resources because the required excavations would intersect only the shallow water table and dewatering would temporarily remove groundwater with only localized and inconsequential effects to the regional groundwater system. If groundwater levels are affected, regional groundwater production and existing water quality would not be detrimentally affected. Potential impacts to groundwater resources would be less than significant.

9c: Less-than-Significant Impact

The new Bon Air Road Bridge and roadway approaches would involve minor amount of additional impervious surface area once construction is completed. Therefore, no notable increase in storm runoff flow is anticipated and operational conditions on the bridge are expected to be similar to existing conditions. The proposed project could minimally alter onsite drainage patterns, but stormwater would continue to be discharged to Corte Madera Creek. The proposed project would be designed in accordance with the objectives of Marin County's Small MS4 General Permit, MCSTOPPP's Action Plan 2010, the City of Larkspur's Urban Stormwater Ordinances, and would include stormwater design measures to reduce runoff and the volume of entrained sediment. This impact would be less than significant.

9d: Less-than-Significant Impact

Stormwater drainage from the proposed project would either remain unchanged or be reduced through the proposed drainage plan and compliance with goals and objectives of the Marin County's Small MS4 General Permit, MCSTOPPP's Action Plan 2010, and the City of Larkspur's Urban Stormwater Ordinances. This impact would be less than significant.

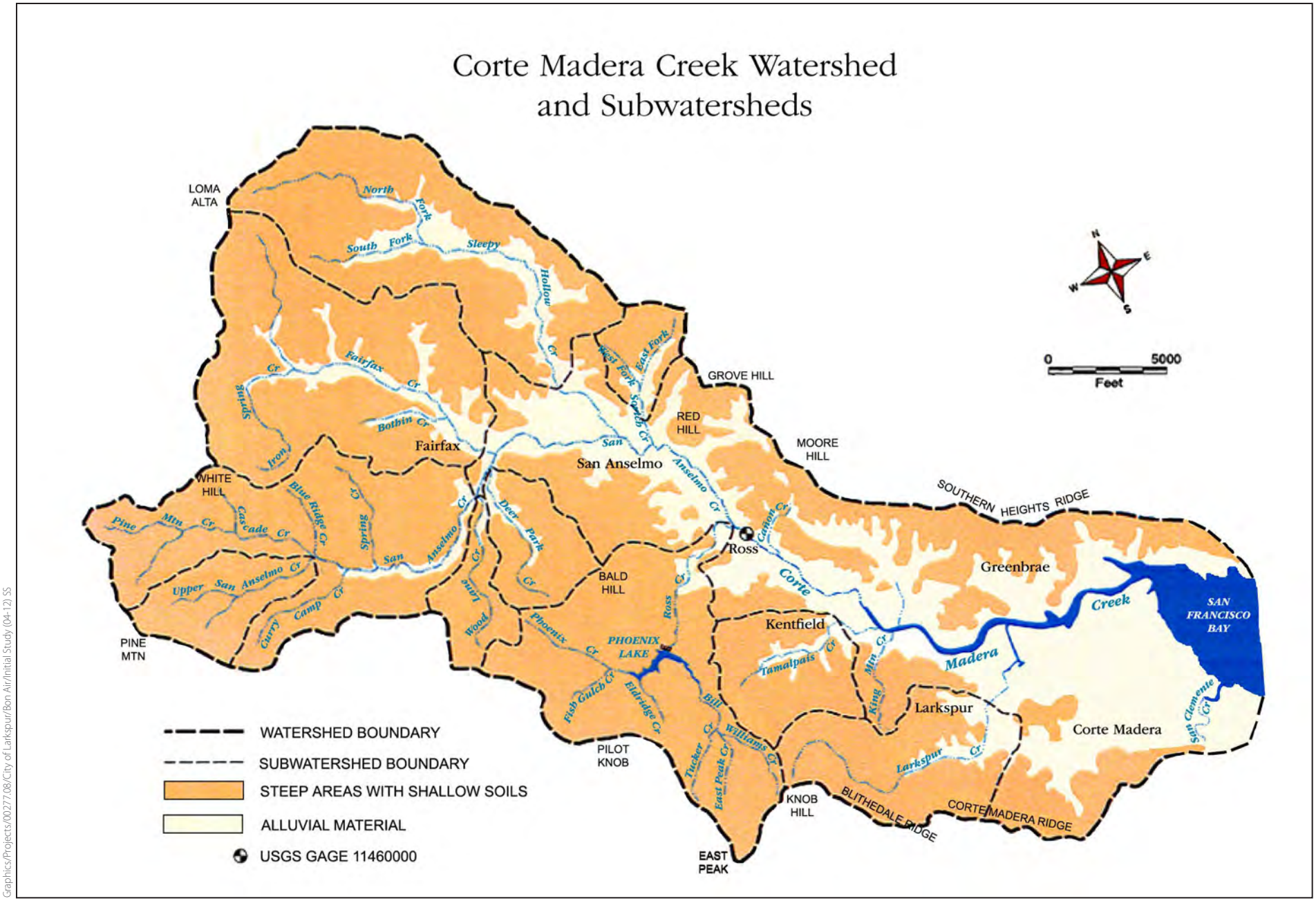

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Figure 9-1
Corte Madera Creek Watershed and Subwatersheds

9e: Less-than-Significant Impact

Storm runoff flow and quality are anticipated to be similar to existing conditions. The goals and objectives of the Marin County's Small MS4 General Permit, MCSTOPPP's Action Plan 2010, and the City of Larkspur's Urban Stormwater Ordinances will be adhered to and effective water quality measures will be incorporated into bridge design so as to minimize the discharge of polluted runoff to Corte Madera Creek. Water quality degradation associated with long-term operations is less than significant.

9f: Less-than-Significant Impact

As stated in 9a, 9c, 9d, and 9e, the proposed project has a low potential of degrading water quality of Corte Madera Creek since this project would implement operational BMPs required by the Marin County's Small MS4 General Permit, MCSTOPPP's Action Plan 2010, and the City of Larkspur's Urban Stormwater Ordinances. Therefore, water quality degradation related to construction and operation will be less than significant.

9g: No Impact

The proposed project is limited to replacement of an existing bridge, and does not include development of residential housing. Although the proposed project is located within a FEMA-designated 100-year floodplain (Figure 9-2), the new bridge structure would be designed so as not to cause flooding to neighboring residences. In addition, future phases of the USACE Corte Madera Creek Flood Control Project and the Marin County Capital Improvement Plan for flood damage reduction in Corte Madera Creek (Marin County Flood Control and Water Conservation District 2011) are intended for maintaining 100-year level of protection in the project area (Marin County Flood Control and Water Conservation District 2011; U.S. Army Corps of Engineers 2000). Proposed longer bridge spans would likely improve the existing channel flow conditions. The project would incorporate the conditions of permits and approvals required from federal and state resource and flood control agencies for project construction. Therefore there would be no potential flooding impacts on housing structures from the proposed project.

9h: Less-than-Significant Impact

As mentioned in 9g, the new bridge structure would be designed so as not impede or redirect 100-year flood flows, and the proposed design would likely improve the existing channel flow conditions. The project would also incorporate the conditions of permits and approvals required from federal, state, and local resource and flood control agencies for project construction. Therefore, the proposed project is not expected to redirect flows or impede the 100-year flood and is therefore considered less than significant.

9i: Less-than-Significant Impact

As mentioned in 9g and 9h, the new bridge structure would be designed so as not redirect or impede 100-year flood flows, and proposed design measures would likely improve the existing channel flow conditions. Corte Madera Creek is channelized for flood control from the Ross-San Anselmo border to the mouth of the Central San Francisco Bay. Corte Madera Creek has a potential risk associated with failure of the Phoenix Dam from a catastrophic rain and flooding event or earthquake (Association of Bay Area Governments 2003). However, the Phoenix Dam is located approximately 2.5 river miles upstream from the Bon Air Road Bridge, and therefore, the inundation area and flood

height in the project area would be minimal, if observable. The project would also incorporate the conditions of permits and approvals required from federal and state resource and flood control agencies for project construction. This impact would be less than significant.

9j: Less-than-Significant Impact

The proposed project would not expose people to a significant risk due to inundation by tsunami, mudflow, or seiche. The run-up from a seiche or tsunami would dissipate significantly before reaching the project area. Additionally, there is no risk of mudslides because the proposed project is on relatively flat ground. This impact would be less than significant.

Sources

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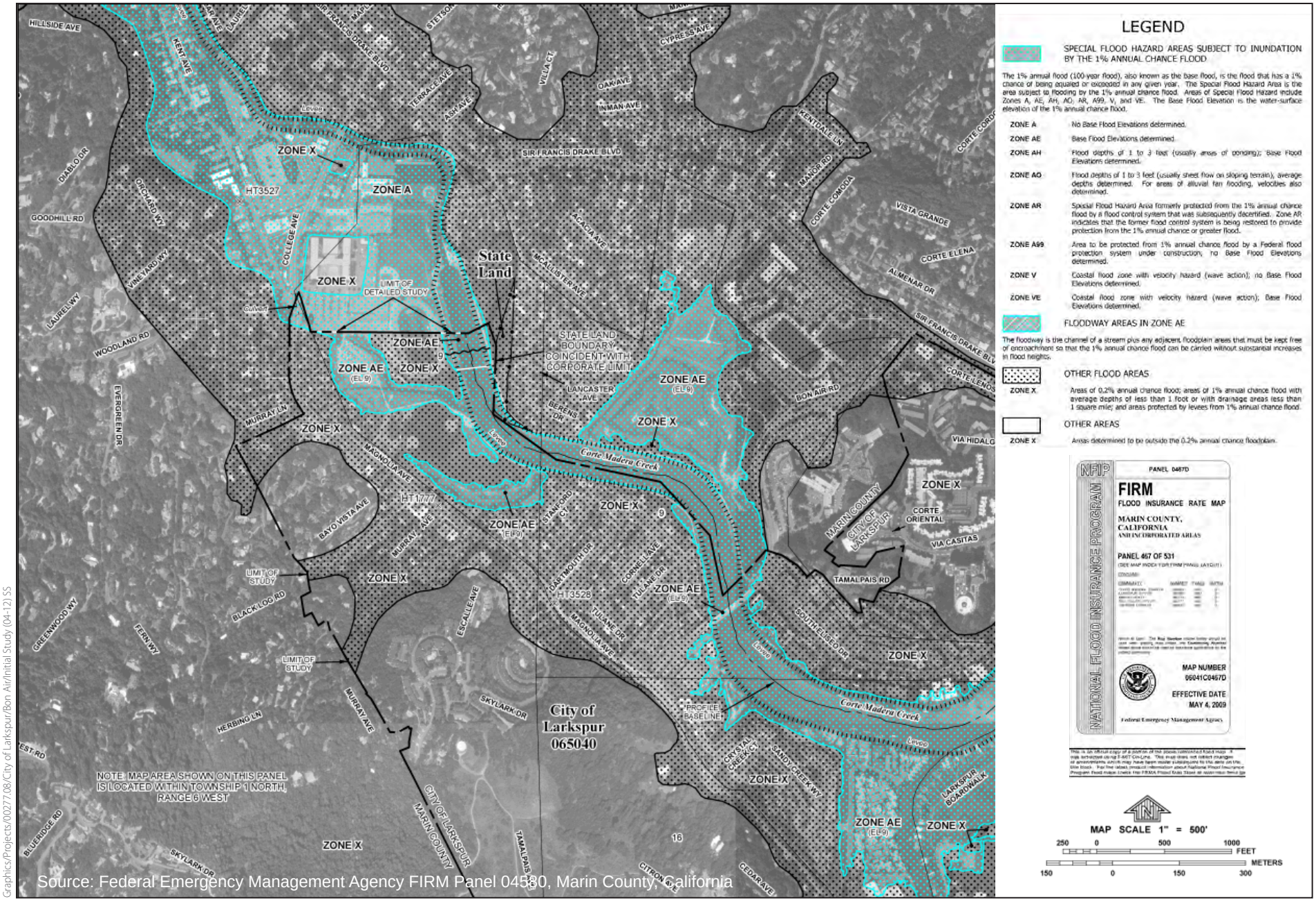

Source: Federal Emergency Management Agency FIRM Panel 04580, Marin County, California

Graphics/Projects/00277.08/City of Larkspur/Bon Air/Initial Study (04-12) SS

Figure 9-2
Flood Insurance Rate Map for the Project Area

10. Land Use and Planning	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Physically divide an established community?	☐	☐	☐	☒
b. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c. Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Discussion

Larkspur General Pla

Review of the 1990 Larkspur General Plan found the following land uses adjacent to the proposed project. The Bon Air Road Bridge spans Corte Madera Creek which is designated as Water in the Open Space element. The Bon Air Road Bike Path, a Class 1 bikeway is located on the north side of Bon Air Road extending from Magnolia Drive to Marin Catholic High School. On Bon Air Road Bridge, the existing bike path is 8 feet wide and is separated from the traffic lanes by a concrete barrier and rail.

- West of Bon Air Road Bridge:
  - North of Bon Air Road, the bridge is bound by the Hillview residential neighborhood and a Marin County Flood Control and Water Conservation District levee maintenance road on the west bank of Corte Madera Creek.
  - South of Bon Air Road, the bridge is bound by land designated Commercial in the Commercial/Industrial Element and Shoreline/Marsh Conservation in the Open Space element.
- East of Bon Air Road Bridge:
  - North of Bon Air Road, the bridge is adjacent to Corte Madera Creek Pathway, Creekside Park and land designated as Administrative & Professional in the Commercial/Industrial element.
  - South of Bon Air Road the bridge is bound by land designated as Administrative & Professional under the Commercial/Industrial element, Marin General Hospital and professional medical offices (Naphtali H. Knox & Associates, Inc. and DKS Associates 1990).

The City is in the process of updating the 1990 General Plan (City of Larkspur 2011a).

Municipal Code, Title 18: Zoning

The area immediately surrounding the proposed project on the west is zoned R-1First District Residential and PD Planned Development. The area east of the bridge is zoned Park and AP Administrative Professional (Marin County 2011; City of Larkspur 2008).

San Francisco Bay Plan

The proposed project is located within the Central Bay North area of the San Francisco Bay Plan under the jurisdiction of the San Francisco Bay Conservation and Development Commission (San Francisco Bay Conservation and Development Commission 2008).

Comments

10a: No Impact

The proposed project would replace the existing Bon Air Road Bridge on the same alignment. One of three existing crossings over Corte Madera Creek, Bon Air Road Bridge provides an important link to the Marin General Hospital and residential areas in the northeastern portion of Larkspur. The Hillview residential neighborhood is located west of the bridge north of Bon Air Road. The proposed project would not physically divide an established community and there would be no impact.

10b: Less-than-Significant Impact

The proposed project is consistent with the following relevant goals and policies included in the 1990 General Plan:

- Chapter 4, Circulation
  - Policy a: Develop a coordinated system of roads, bike paths, foot paths, public transit, and Transportation Demand Management (TDM) programs.
  - Policy b: Remove hazards from the traffic system.
- Chapter 8, Bicycle and Pedestrian Trails and Paths
  - Goal 1: Make it easier to travel around Larkspur by non-motorized transportation modes.
  - Goal 2: Provide safe bicycle and pedestrian routes for all users, to schools, shopping and business areas, recreation facilities, open space preserves, and other communities, and associated amenities.

Replacement of the Bon Air Road Bridge would correct structural deficiencies, provide 5-foot sidewalks and 6-foot Class 1 bike paths in each direction, improving access and safety for pedestrians and bicyclists. During construction, access would be maintained for bicyclists and pedestrians across the bridge with the exception of three temporary bridge closures. During bridge closure, pedestrians and bicyclists would not be able to use the bridge on Bon Air Road to cross Corte Madera Creek, but could use the detour (Figure 7). These closures would be scheduled to occur six months apart, on weekends beginning Friday night and ending Sunday morning. Advance notice of closures would be provided to residents. These impacts would be temporary during the construction period only. This impact is considered less than significant.

Acquisition of a sliver of right-of-way would be required from APN 022-06-018 located north of Bon Air Road for the westbound approach to the bridge. This parcel is located on the east bank of Corte Madera Creek and adjacent to the Corte Madera Creek Pathway. The parcel is owned by Marin County Flood 6ntrol and Water Conservation District (Figure 3).

During construction, temporary construction easements would be necessary to provide access on and off of the temporary trestle structures north and south of the bridge and on Magnolia Avenue (Figure 3). Temporary construction easements would be required from the parking lot of APN 020-122-06 and from APN 022-060-18 and APN 022-060-19 on the northeast end of the bridge. The width of the Corte Madera Creek Pathway would be temporarily narrowed from 10-feet to 8-feet during the first construction season, but use of the pathway would not be affected.

Approvals from the Bay 6nservation and Development Commission and State Lands Commission would be obtained during the final design phase of the project.

The proposed project would not require land use designation or zoning changes and would not conflict with local policies or plans; this impact would be less than significant.

10c: No Impact

The proposed project would not conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan because the proposed project is not located within an area covered by any of these types of plans. There would be no impact.

Sources

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11. Mineral Resources	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

Discussion

The proposed project would replace the existing bridge on Bon Air Road in essentially the same alignment.

Comments

11a and b: No Impact

There are eight designated mineral resource sites in Marin County and none of these areas are located within Larkspur or the vicinity of the proposed project (Marin County 2005). The proposed project does not include any activities that would increase the rate of loss of known mineral resources or require quarrying, mining, dredging, or extraction of locally important mineral resources. No impact would occur.

Sources

Marin County. 2005. Geology, Mineral Resources and Hazardous Materials Technical Background Report. Available at: <http://www.co.marin.ca.us/depts/CD/main/pdf/planning/Geology_Background_Report.pdf>. Accessed: April 17, 2012.

12. Noise	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Expose persons to or generate noise levels in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies?	☐	☒	☐	☐
b. Expose persons to or generate excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c. Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
d. Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
e. Be located within an airport land use plan area, or, where such a plan has not been adopted, within two miles of a public airport or public use airport and expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f. Be located in the vicinity of a private airstrip and expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

This section is based on the Noise Study Report prepared for the proposed project (ICF International 2012e).

Discussion

Noise Fundamentals

Sound pressure level is the most common descriptor used to characterize the loudness of an ambient (existing) sound level. Although the decibel (dB) scale, a logarithmic scale, is used to quantify sound intensity, it does not accurately describe how sound intensity is perceived by human hearing. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called "A-weighting," written as "dBA" and referred to as "A-weighted decibels". Table 12-1 provides definitions of sound measurements and other terminology used in this chapter, and Table 12-2 summarizes typical A-weighted sound levels for different noise sources.

Table 12-1. Definition of Sound Measurements

Sound Measurements	Definition
Decibel (dB)	A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
A-Weighted Decibel (dBA)	An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
Maximum Sound Level (L_{max})	The maximum sound level measured during the measurement period.
Minimum Sound Level (L_{min})	The minimum sound level measured during the measurement period.
Equivalent Sound Level (L_{eq})	The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy.
Percentile-Exceeded Sound Level (L_{xx})	The sound level exceeded "x" percent of a specific time period. L_{10} is the sound level exceeded 10 percent of the time.
Day-Night Level (L_{dn})	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.
Community Noise Equivalent Level (CNEL)	The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m to 7:00 a.m.
Peak Particle Velocity (Peak Velocity or PPV)	A measurement of ground vibration defined as the maximum speed (measured in inches per second) at which a particle in the ground is moving relative to its inactive state. PPV is usually expressed in inches/sec.
Frequency: Hertz (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure.

Table 12-2. Typical A-Weighted Sound Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	—110—	Rock band
Jet flyover at 1,000 feet		
	—100—	
Gas lawnmower at 3 feet		
	—90—	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	—80—	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower, 100 feet	—70—	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	—60—	
		Large business office
Quiet urban daytime	—50—	Dishwasher in next room
Quiet urban nighttime	—40—	Theater, large conference room (background)
Quiet suburban nighttime		
	—30—	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	—20—	
		Broadcast/recording studio
	—10—	
	—0—	

Source: California Department of Transportation 2009.

In general, human sound perception is such that a change in sound level of 1 dB cannot typically be perceived by the human ear, a change of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving the sound level.

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (L_{eq}), the minimum and maximum sound levels (L_{min} and L_{max}), percentile-exceeded sound levels (such as L_{10}, L_{20}), the day-night sound level (L_{dn}), and the community noise equivalent level (CNEL). L_{dn} and CNEL values differ by less than 1 dB. As a matter of practice, L_{dn} and CNEL values are considered to be equivalent and are treated as such in this assessment.

For a line source such as free flowing traffic on a freeway, sound attenuates at a rate of 3 dB per doubling of distance (California Department of Transportation 2009). Atmospheric conditions including wind, temperature gradients, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface such as grass attenuates at a greater rate than sound that travels over a hard surface such as pavement. The increased attenuation is typically in the range of 1 to 2 dB

per doubling of distance. Barriers such as buildings and topography that block the line of sight between a source and receiver also increase the attenuation of sound over distance.

Vibration

Operation of heavy construction equipment, particularly pile driving and other impacts devices such as pavement breakers create seismic waves that radiate along the surface of the earth and downward into the earth. These surface waves can be felt as ground vibration. Vibration from operation of this equipment can result in effects ranging from annoyance of people to damage of structures. Varying geology and distance will result in different vibration levels containing different frequencies and displacements. In all cases, vibration amplitudes will decrease with increasing distance.

Perceptible ground-borne vibration is generally limited to areas within a few hundred feet of construction activities. As seismic waves travel outward from a vibration source, they excite the particles of rock and soil through which they pass and cause them to oscillate. The actual distance that these particles move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or velocity (in inches per second) at which these particles move is the commonly accepted descriptor of the vibration amplitude, referred to as the peak particle velocity (PPV).

Table 12-3 summarizes typical vibration levels generated by construction equipment (Federal Transit Administration 2006).

Table 12-3. Vibration Source Levels for Construction Equipment

Equipment	PPV at 25 Feet
Pile driver (impact)	0.644 to 1.518
Pile drive (sonic/vibratory)	0.170 to 0.734
Vibratory roller	0.210
Hoe ram	0.089
Large bulldozer	0.089
Caisson drilling	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003

Source: Federal Transit Administration 2006.

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. The following equation can be used to estimate the vibration level at a given distance for typical soil conditions (Federal Transit Administration 2006). PPV_{ref} is the reference PPV from Table 12-3:

$$PPV = PPV_{ref} \times (25/Distance)^{1.5}$$

Table 12-4 summarizes guidelines vibration annoyance potential criteria suggested by Caltrans (California Department of Transportation 2004).

Table 12-4. Guideline Vibration Annoyance Potential Criteria

	Maximum PPV (in/sec)	
Human Response	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Source: California Department of Transportation 2004.

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Table 12-5 summarizes guideline vibration damage potential criteria suggested by Caltrans (California Department of Transportation 2004).

Table 12-5. Guideline Vibration Damage Potential Criteria

	Maximum PPV (in/sec)	
Structure and Condition	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: California Department of Transportation 2004.

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

City Noise Standards

The City of Larkspur General Plan Noise Element specifies land use compatibility standards for various types of land uses. The "normally acceptable" sound levels are as follows:

- Residential 55 L_{dn},
- Schools 60 L_{dn},
- Recreational 65 L_{dn}, and
- Commercial 70 L_{dn}.

City of Larkspur Municipal Code Chapter 9.54 (Noise Control Regulations) specifies exterior noise limits for various types of receiving land uses. Table 12-6 specifies the City's noise limits.

Table 12-6. City of Larkspur Exterior Noise Limits

Receiving Land Use	Time	Noise Level Not to be Exceeded for More than 30 Minutes per Hour (dBA)
Residential	7 AM – 10 PM	50
	10 PM – 7 AM	40
Commercial	Any time	60

These exterior noise limits are adjusted based on the conditions listed in Table 12-7.

Table 12-7. City of Larkspur Exterior Noise Limit Adjustments

Condition	Adjustment to Exterior Limit (dBA)
Noise contains a steady, audible tone such as a whine, screech, or hum	-5
Noise is repetitive or impulsive (e.g., hammering, riveting)	-5
Noise consists of speech or music	-5
Noise occurs more than fifteen but less than thirty minutes per hour	+5
Noise occurs more than five but less than fifteen minutes per hour	+10
Noise occurs more than one but less than five minutes per hour	+15
Noise occurs less than one minute per hour	+20

The code further states that noise sources associated with construction activities are exempt from the limits in Tables 12-6 and 12-7 during the following hours:

- Monday through Friday (excluding legal holidays) 7 AM to 6 PM
- Saturday, Sunday, and legal holidays 9 AM to 5 PM

This exception is granted provided that all powered construction equipment is equipped with intake and exhaust mufflers recommended by the manufacturers thereof; pavement breakers and jackhammers shall also be equipped with acoustical attenuating shields or shrouds recommended by the manufacturers thereof. The code further states that the Director of Public Works may allow an exception for work after 6 PM if certain conditions are met.

Occupational Safety and Health Administration Regulations

Table 12-8 summarizes permissible noise exposure levels specified in Section 1910.95(b)(2) of the Occupational Safety and Health Administration (OSHA) Regulations. OSHA regulations specify that when employees are subjected to sound exceeding those listed in Table 12-8, feasible administrative or engineering controls must be utilized. If such controls fail to reduce sound levels within the levels of Table 12-8, OSHA regulations require that personal protective equipment be provided and used to reduce sound levels within the levels of the table.

Table 12-8. OSHA Permissible Noise Exposures

Duration per Day (hours) Hours	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

Sensitive Land Uses

Noise sensitive land uses are land uses where people reside or locations where the presence of unwanted noise could adversely affect the use of the land. Noise-sensitive land uses typically include residences, hospitals, and schools. The following is a summary of land uses in the project area:

- West side of Corte Madera Creek north of Bon Air Road: This area includes single-family residences located along Harvard Drive and commercial buildings west of the residential area. The Marin County Flood Control District levee maintenance road is located along the west side of the creek.
- West side of Corte Madera Creek south of Bon Air Road: This area comprises medical office and commercial uses.
- East side of Corte Madera Creek north of Bon Air Road: This area is open space within Creekside Park and includes the Corte Madera Creek Pathway along the east side of the creek.
- East side of Corte Madera Creek south of Bon Air Road: This area comprises medical office uses.

Existing Ambient Noise Environment

The existing noise environment in the project area is governed primarily by vehicular traffic traveling on Bon Air Road. Short-term sound level measurements were taken in the project area on Friday November 5, 2010 at two locations (Figure 12-1). Table 12-9 summarizes the short-term noise monitoring results.

Table 12-9. Summary of Noise Short-Term Noise Monitoring Near Bon Air Road

			Duration	Measured Sound Level (dBA)				
Location	Measurement	Start Time	(minutes)	L_{eq}	L_{10}	L_{33}	L_{50}	L_{90}
ST-1	1	2:12 p.m.	15	52.0	54.1	52.0	51.1	48.5
	2	2:12 p.m.	15	52.6	54.6	52.8	51.6	49.3
ST-2	1	2:48 p.m.	15	52.6	54.7	49.9	48.1	43.8
	2	2:48 p.m.	15	53.0	54.9	50.5	48.6	44.4

Long-term monitoring location LT-1 was situated on the east side of Corte Madera Creek north of Bon Air Road (Figure 12-1). Table 12-10 summarizes the measured hourly L_{eq} values on the three days when there was no rain. The average L_{eq} value for all 3 days is also provided.

Table 12-10. Long-Term Noise Monitoring Data (Hourly L_{eq})

Time	Saturday 6–Nov	Friday 12–Nov	Saturday 13–Nov	Average
Midnight	42.9	45.9	48.3	45.7
1 a.m.	43.5	44.7	46.1	44.8
2 a.m.	42.1	42.8	43.2	42.7
3 a.m.	42.6	42.8	43.5	43.0
4 a.m.	41.9	44.1	43.2	43.1
5 a.m.	42.2	44.4	42.6	43.1
6 a.m.	45.7	47.8	44.6	46.0
7 a.m.	55.7	55.6	50.2	53.8
8 a.m.	51.3	55.6	52.8	53.2
9 a.m.	52.7	54.9	52.2	53.3
10 a.m.	51.9	52.8	50.5	51.7
11 a.m.	52.5	52.1	50.8	51.8
noon	52.7	52.8	50.8	52.1
1 p.m.	52.4	52.6	50.8	51.9
2 p.m.	51.0	52.4	51.5	51.6
3 p.m.	50.1	53.1	51.1	51.4
4 p.m.	51.3	53.8	53.8	53.0
5 p.m.	50.0	54.6	53.7	52.8
6 p.m.	49.9	53.4	52.8	52.0
7 p.m.	48.4	53.5	52.9	51.6
8 p.m.	47.3	52.2	51	50.2
9 p.m.	47.1	50.1	50.6	49.3
10 p.m.	46.9	49.8	51.1	49.3
11 p.m.	46.5	49.1	49.4	48.3
L_{dn}	52.7	54.9	54.4	53.9

Note: Highest hour noise levels are highlighted.

Comments

12a: Less-than-Significant Impact with Mitigation Incorporated

Legend

- LT Long-term monitoring location
- ST Short-term monitoring location
- R Receiver locations at which predicted noise levels were estimated (see Appendix A)

N

0 100 200 300

Feet

Image: Google Inc. 2010. Google Earth Pro, Version 5.2. Mountain View, CA. Accessed: September 2, 2011.

Graphics/Projects/00277.08/City of Larkspur/Bon Air/Initial Study (04-12) SS

Figure 12-1
Noise Monitoring and Modeling Positions

Construction

Construction of the project is proposed to occur over a 3.5-year period beginning in mid-2013 and completed in late 2016. Three full bridge closures are expected to be needed during construction. These bridge closures would likely be scheduled during three weekends beginning Friday at 10 p.m. and ending on Monday morning at 5 a.m. The first two weekend closures would be required during erection of the prefabricated girders on the bridge pier-caps. The third closure would be needed to place the roadway/bridge joints at each end of the bridge and for the closure pour to connect the north and south bridge segments. Night-time construction activities would be required for a total of approximately eight nights during the proposed weekend closures of the bridge to through traffic.

During construction of the project, noise from construction activities intermittently may dominate the noise environment in the immediate area of construction. Construction noise from Caltrans projects is controlled by Caltrans *Standard Specifications* Section 14-8.02, "Environmental Stewardship—Noise Control," which states that noise levels generated during construction shall comply with applicable local, state, and federal regulations and that all equipment shall be fitted with adequate mufflers according to the manufacturers' specifications (California Department of Transportation 2009). In addition, the specification states that construction noise levels from job site activities occurring between the hours of 9 p.m. and 6 a.m. should not exceed 86 dBA at 50 feet.

Table 12-11 summarizes noise levels produced by construction equipment that is commonly used on roadway construction projects. Construction equipment is expected to generate noise levels ranging from 70 to 90 dB at a distance of 50 feet, and noise produced by construction equipment would be reduced over distance at a rate of about 6 dB per doubling of distance.

Table 12-11. Construction Equipment Noise

Equipment	Maximum Noise Level (dBA at 50 feet)
Scrapers	84
Bulldozers	82
Heavy trucks	76
Backhoe	78
Pneumatic tools	85
Crane	81
Concrete pump truck	81
Impact pile driving	101

Source: Federal Highway Administration 2006.

Construction associated with the proposed project would result in a temporary increase in noise in the project area and could potentially result in noise that exceeds City of Larkspur exterior noise limits at nearby residences, Creekside Park, the Corte Madera Creek Pathway, and office/commercial uses. Noise from pile driving also could exceed OSHA noise standards within about 300 feet of pile driving. However, construction activities would be sporadic and short term in duration and implementation of Mitigation Measure 12-1 would reduce excessive construction noise impacts to a less than significant level.

Mitigation Measure 12-1: Employ Noise–Reducing Construction Practices

The City shall require the construction contractor(s) to implement the following construction noise control measures:

- The construction contractor shall coordinate the most noise producing construction activities including pile driving with the recreation managers of Creekside Park, and residents within 500 feet in order to limit disturbance to the park and nearby residents.
- With the exception of pile driving, construction activity shall be allowed only between the hours of 7:00 a.m. and 6:00 p.m. on Monday through Friday and 9:00 a.m. to 5:00 p.m. on Saturday. Given the very loud nature of pile driving, pile driving shall be limited to between the hours of 8:00 a.m. and 6:00 p.m. on Monday through Friday.
- All powered construction equipment shall be equipped with intake and exhaust mufflers recommended by the manufacturers and pavement breakers, pile drives, and jackhammers shall be equipped with acoustical attenuating shields or shrouds recommended by the manufacturers.
- Construction equipment shall have sound-control devices no less effective than those provided on the original equipment. No equipment shall have an un-muffled exhaust.
- The contractor will implement appropriate additional noise mitigation measures, as needed, including but not limited to changing the location of stationary construction equipment, turning off idling equipment, using temporary noise barriers, and notifying adjacent residents in advance of construction.
- The construction contractor's specifications will stipulate that night-time construction, in accordance with the City's noise control regulations, will only be allowed under special circumstances on a limited basis, as needed, *and* with prior approval from the City of Larkspur's Public Works Department staff.
- The contractor will prohibit the public from accessing areas where exposure to noise could exceed OSHA noise standards. Based on actual equipment to be used and noise control measures to be implemented, the contractor will determine the minimum distance from pile driving within which the public will be allowed. Warning signs will be posted at public access points warning recreationists of potential exposure to high noise levels during construction activities. Occupants of residences and other buildings located within 500 feet of impact pile driving will be notified in writing regarding the potential for high noise levels from pile driving.

Operation

The new bridge will have the same number of lanes as the existing bridge and will not change traffic operations relative to existing conditions. The travel lanes however will be realigned slightly to the north which will change traffic noise levels at nearby receptors. Table 12-12 summarizes traffic noise modeling results for existing conditions and future (2035) design year conditions with and without the project. The results in Table 12-12 indicate that existing noise levels at residential uses directly adjacent to Bon Air Road on the north side (R1 and R2 in Figure 12-1) exceed the City's noise compatibility standard for residential uses of 55 L_{dn}. The City's compatibility standards are not exceeded for other land uses in the area.

Table 12-12. Summary of Traffic Noise Modeling Results and Impact Conclusions

Receiver I.D.	Location	Type of Development	Existing Noise Level, L_{dn}	Predicted Noise Level in the Design Year No-Build Condition, L_{dn}	Predicted Noise Level in the Design Year Build Condition, L_{dn}	Design Year No-Build minus Existing	Design Year Build minus Design Year minus No-Build	Design Year Build minus Existing
R1	5 Harvard Drive	Residential	59	59	60	0	1	1
R2	1 Harvard Drive	Residential	58	59	61	1	2	3
R3	9 Harvard Drive	Residential	51	51	51	0	0	0
R4	15 Harvard Drive	Residential	45	45	46	0	1	1
R5	2 Harvard Drive	Residential	52	52	54	0	2	2
R6	14 Harvard Drive	Residential	48	49	50	1	1	2
R7	Commercial Building	Commercial	57	58	58	1	0	1
R8	Commercial Building	Commercial	59	60	59	1	-1	0
R9	Commercial Building	Commercial	59	59	58	0	-1	-1
R10	Commercial Building	Commercial	58	58	57	0	-1	-1
R11	Commercial Building	Commercial	59	60	59	1	-1	0
R12	Trail on east side of Corte Madera Creek	Trail	55	56	57	1	1	2

The comparison of future conditions with and without the project provides a measure of the direct affect of the project on noise. This comparison indicates that traffic noise levels will increase slightly (by as much as 2 dB) on the north side of the roadway and will reduce slightly (by 1 dB) on the south side as would be expected with the realignment of the roadway to the north. These changes are generally not expected to be noticeable because a 3-dB change is normally considered to be the threshold of a noticeable change. Existing noise levels at residences on the north side of Bon Air Road currently exceed the City's noise compatibility standard of 55 L_{dn} and noise levels in the future will continue to exceed this standard with or without the project. However, because the project-related change in noise is so small, this impact is considered to be less than significant and no mitigation is required.

12b: Less-than-Significant Impact

Table 12-13 summarizes a general estimation of ground vibration from construction at several distances based on methods specified by the Federal Transit Administration.

Table 12-13. Vibration from Construction Equipment

Equipment	PPV at 25 Feet	PPV at 50 Feet	PPV at 75 Feet	PPV at 100 Feet
Pile driver (impact)	1.518	0.5367	0.2921	0.1898
Piledriver (sonic/vibratory)	0.734	0.2595	0.1413	0.0918
Vibratory roller	0.210	0.0742	0.0404	0.0263
Hoe ram	0.089	0.0315	0.0171	0.0111
Large bulldozer	0.089	0.0315	0.0171	0.0111
Caisson drilling	0.089	0.0315	0.0171	0.0111
Loaded trucks	0.076	0.0269	0.0146	0.0095
Jackhammer	0.035	0.0124	0.0067	0.0044
Small bulldozer	0.003	0.0011	0.0006	0.0004

Source: Federal Transit Administration 2006.

The nearest structures include residences and office buildings that are as close as about 50 feet from potential pile driving locations. The data in Table 12-13 indicates that ground vibration (peak particle velocity) from pile driving could be as high as about 0.3 in/sec. at 50 feet indicating that there is potential for damage to nearby structures based on damage potential criteria Table 12-5. Vibration from pile driving may also be perceptible at adjacent residences based on annoyance potential criteria in Table 12-4. Because of the potential effects of pile driving on structures and people, this impact is considered to be significant.

Implementation of Mitigation Measure 12-2 would reduce this impact to a less-than-significant level by ensuring that nearby occupants of buildings will be notified when pile driving will occur and by conducting pre- and post-construction building condition surveys at nearby structures.

Mitigation Measure 12-2: Employ Vibration-Reducing Construction Practices

The construction contractor will, to the extent feasible, maintain a minimum distance of 150 feet between pile driving equipment and occupied or vibration-sensitive buildings or structures. To the extent feasible, a minimum distance of 50 feet will be maintained between other construction equipment and occupied or vibration-sensitive buildings or structures. For cases where this is not feasible, the resident or property owner will be notified in writing prior to construction activity that construction may occur in close proximity to their building. The City will inspect the potentially affected buildings prior to construction to inventory existing cracks in paint, plaster, concrete, and other building elements. The City will retain a qualified acoustical consultant or engineering firm to conduct vibration monitoring at potentially affected buildings to measure the actual vibration levels during construction. Following completion of construction, the City will conduct a second inspection to inventory changes in existing cracks and new cracks or damage, if any, that occurred as a result of construction-induced vibration. If new damage is found, then the City will promptly arrange to have the damaged repaired, or will reimburse the property owner for appropriate repairs.

In addition, if construction activity is required within 100 feet of residences or other vibration-sensitive buildings, a designated complaint coordinator will be responsible for handling and responding to any complaints received during such periods of construction. A reporting program will be required that documents complaints received, actions taken, and the effectiveness of these actions in resolving disputes.

12c: Less-than-Significant Impact

As discussed under Item 12a the alignment of the new bridge to the north will slightly increase traffic noise on the north side of the road. However, because the increase will be small, the project is not considered to result in a substantial permanent increase in noise.

12d: Less-than-Significant Impact with Mitigation Incorporated

With ambient noise levels typically in the range of about 45 to 55 dBA, the construction noise levels presented in Table 12-10 indicates that construction activities could result in a substantial temporary increase in noise in the project area at nearby residences, Creekside Park, the Corte Madera Creek Pathway, and office/commercial uses. However, construction activities would be sporadic and short term in duration, and implementation of Mitigation Measure 12-1 would reduce excessive construction noise impacts to a less than significant level.

12e: No Impact

The proposed project site is not located within two miles of an airport or a private airstrip and would not expose people to excessive airport noise. No impact would occur.

12f: No Impact

The proposed project site is not located within two miles of an airport or a private airstrip and would not expose people to excessive airport noise. No impact would occur.

Sources

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13. Population and Housing	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Induce substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)?	☐	☐	☐	☒
b. Displace a substantial number of existing housing units, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c. Displace a substantial number of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Discussion

The proposed project would replace the existing bridge on essentially the same alignment. The bridge currently carries one lane of traffic in each direction, as would the new bridge. However, the new bridge would be widened to accommodate pedestrian and bicycle travel on both sides. There would be no change in the number of traffic lanes or capacity in each direction.

The Corte Madera Creek Pathway, Creekside Park, professional medical offices, and Marin General Hospital are located east of the Bon Air Road Bridge. On the west, the Hillview residential neighborhood is north of Bon Air Road and a professional office area is located south of Bon Air Road.

Comments

13a: No Impact

Growth rates and patterns are influenced by various local, regional, and national forces that reflect ongoing social, economic, and technological changes. Ultimately, the amount and location of population growth and economic development that occurs in a specific area is controlled, to some extent, by local and county governments through zoning, land use plans and policies, and decisions regarding development applications. Local government and other regional, state, and federal agencies also make decisions about infrastructure (such as roads, water facilities, and sewage facilities) that may influence growth rates and the location of future development.

Transportation infrastructure is one component of the overall infrastructure that may serve to accommodate planned growth. This infrastructure may also serve to hasten or shift planned growth, or encourage and intensify unplanned growth in an area. Transportation projects may induce growth when they directly or indirectly promote, hasten, shift, or intensify planned growth or encourage unplanned growth in a community or region. Examples of growth-inducing transportation projects include construction of a new interchange on an existing freeway, which

could shift and encourage growth in the vicinity of the new interchange, or construction of a new roadway through an undeveloped area, which could promote unplanned growth.

The primary intent of the project is to correct structural deficiencies associated with the Bon Air Road Bridge including improving access for pedestrians and bicyclists across Corte Madera Creek. The proposed project would serve existing and planned population growth, but it would not induce population growth. Nor would the project introduce a new transportation facility to the area or provide new access to undeveloped areas. Thus, the project is not anticipated to hasten or shift planned or unplanned growth. There would be no impact.

13b and c: No Impact

The proposed project would not result in the displacement of people or homes; therefore there would be no impact.

Sources

No sources were referenced.

14. Public Services	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or a need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services:				
Fire protection?	☐	☐	☒	☐
Police protection?	☐	☐	☒	☐
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

Discussion

Fire Protection

The Larkspur Fire Department provides fire protection and emergency medical services for the City of Larkspur and portions of Greenbrae. The department operates out of two fire stations; Fire Station No. 15 located in downtown Larkspur at 420 Magnolia Avenue and Fire Station No. 16 at 15 Barry Way in Greenbrae at Sir Francis Drake Boulevard (City of Larkspur 2011). The proposed project is located approximately 1.0 mile north of Station 15 and approximately 1.3 miles northwest of Station 16.

The Larkspur Fire Department has a 17-person crew with five firefighters on duty each shift, including two firefighters at Fire Station 15 and three firefighters at Fire Station 16. An automatic aid agreement with the Corte Madera and Kentfield fire departments as well as a mutual aid agreement with all other Marin County fire agencies provides additional support as needed. Equipment at Fire Station 15 includes a front-line fire engine and water tanker vehicle. Equipment at Fire Station 16 includes a front-line fire engine, a reserve fire engine, and a grass and brush fire engine at Fire Station 16. The Larkspur Fire Department has a goal of maintaining a six minute response time.

Police Protection

The Twin Cities Police Authority provides police protection in the communities of Corte Madera and Larkspur. The two communities consolidated police services in 1980. There are two stations, Larkspur Facility -Station One at 250 Doherty Drive, in Larkspur and the Corte Madera Facility –

Station Two at 342 Tamalpais Drive in Corte Madera. Construction of the new Station One was completed in January 2012, and the department is in the process of moving into the new headquarters (City of Larkspur 2012). While the new facility was being built, temporary headquarters were located at 5725 Paradise Drive, in Corte Madera. The proposed project is located approximately 0.6 miles north of Station One and approximately 1.7 miles north of Station Two.

The Twin Cities Police Authority (TCPA) operates with 44 employees of which 33 are sworn officers (Twin Cities Police Authority 2011). The TCPA maintains a vehicle fleet of 20 vehicles and two trailers (for speed limit monitoring). During each of the two 12-hour shifts per day, the police department maintains a minimum staffing level of one sergeant and three beat officers. At full staffing, there would be one watch commander and five beat officers per shift. Approximately 21,680 calls for service are handled annually by the TCPA.

Public Schools

Three school districts provide public education for primary and secondary school students in the vicinity of the proposed project. The Larkspur School District boundary is south of Corte Madera Creek and currently operates two schools, the Neil Cummins Elementary School (kindergarten thru grade 4) in Corte Madera, and Henry C. Hall Middle School (grades 5 thru 8) in Larkspur (Larkspur School District 2011).

North of Corte Madera Creek primary school students attend schools in the Kentfield School District. The Kentfield Elementary School District operates Bacich Elementary School (kindergarten through grade 4) and Kent Middle School (grades 5 through 8) (Kentfield School District 2010).

The Tamalpais Union High School District operates Redwood High School in Larkspur, for grades 9 thru 12 (Tamalpais Union High School District 2010).

Parks

Corte Madera Creek Pathway and Creekside Park are located east of the bridge on the north and are owned by Marin County. Corte Madera Creek Pathway is under the jurisdiction of the Marin County Flood Control and Water Conservation District that has an agreement with the Marin County Department of Parks and Open Space to maintain the pathway (Curley pers. comm.).

Creekside Park (recently renamed Hal Brown Park at Creekside) was renovated in 2010 and the name was changed at that time (Marin County 2011). The park is owned and operated by Marin County Department of Parks and Open Space.

The City maintains more than 50 acres of public parkland including Piper Park and eleven neighborhood parks (Naphtali H. Knox & Associates, Inc and DKS Associates 1990 and 2010c). No City parks are located adjacent to the proposed project.

Comments

14a—Police and Fire Protection: Less-than-Significant Impact

The proposed project would not result in a population increase that could create an increase in demand for fire or police services.

During construction, response times for emergency services would be affected as a result of temporary bridge closures and other construction-related delays. The Marin General Hospital is located approximately 400 feet northeast of the proposed project. Bon Air Road is a primary route for police and fire protection vehicles as well as a key corridor for ambulance access to the hospital. Construction is anticipated to occur over a period of three construction seasons beginning in 2013 and completion in 2016. As described in the project description, two lanes of traffic would be maintained over the bridge throughout most of the construction period with the exception of three temporary full closures of the bridge. Each bridge closure would last for two days and would be scheduled to occur on weekends beginning Friday evening and ending Sunday morning. The weekend bridge closures would be scheduled at least six months apart and include one weekend each in September 2014, January 2016, and July 2016. During the bridge closures, a temporary detour would be required that would increase emergency response times. As shown on Figure 7, the detour would route traffic through Marin Community College via Magnolia Avenue, College Avenue, and Sir Francis Drake Boulevard. The detour would add a distance of approximately two miles or five minutes to the travel time. During the periods when traffic is maintained on the bridge, emergency vehicles would be expedited through the construction zone. The Fire Department and Twin Cities Police Authority were notified of the temporary closures and they asked to be informed in advance of the dates and times, so they could plan for alternative response routes.

A Traffic Management Plan will be prepared during the final design phase in coordination with the police and fire agencies to minimize the impacts of delays during construction. With implementation of the Traffic Management Plan during final design phase, this impact would be less than significant.

14a—Public Schools and Parks: No Impact

The proposed replacement and widening of Bon Air Road Bridge would improve pedestrian and bicycle travel by providing sidewalk and Class 1 bike lanes in each direction over the bridge. Replacement of the bridge would not increase the capacity of Bon Air Road nor would it increase the surrounding population resulting in an increased demand for public schools, parks or recreation facilities, there would be no impact.

Sources

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15. Recreation	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b. Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☒

Discussion

Creekside Park and Corte Madera Creek Pathway, facilities owned and maintained by Marin County, are located immediately east of the bridge, north of Bon Air Road. As described above in Section 14, Public Services, above, no City parks are located adjacent to the project area.

Recreational use of Corte Madera Creek occurs in the vicinity of Bon Air Road Bridge, including use by members of the Marin Rowing Association.

Comments

15a: Less-than-Significant Impact

Construction of the proposed project would not increase the capacity of Bon Air Road or increase the surrounding population that would result in an increase in the use of recreation facilities in the vicinity of the proposed project that could lead to physical deterioration.

A temporary construction easement would be required on County-owned land north and east of the bridge within the Corte Madera Creek Pathway right-of-way. In this area, the path would be narrowed in width from 10 feet to 8 feet affecting an area of approximately 240 square feet during the first construction season (Figure 3). The temporary construction easement would allow for construction access on and off of the temporary trestle, which facilitates construction in Corte Madera Creek. The temporary construction easement would not result in substantial physical deterioration of the pathway and any inadvertent damage that may occur would be repaired to a condition similar to that which existed prior to the construction activities or better. Access to and use of the Corte Madera Creek Pathway would be maintained at all times during the construction period. A par course station is located north of the area where the temporary construction easement would be located however the par course would not be affected.

As noted above, Corte Madera Creek is used for recreational purposes. During construction, passage beneath the bridge would be limited to the two temporary trestle spans in the middle of the creek. The width of the temporary trestle spans would be similar to that of the existing bridge spans and the elevation would also be similar to that of the existing bridge. Passage beneath the trestle bridges

would be maintained during construction, with the exception of the following approximate periods when passage beneath the trestle bridges could be closed:

- Construction of the north and south trestle bridges: up to seven working days for each trestle;
- Demolition of the north section of the bridge: up to three working days;
- Construction of the north section of the bridge: up to four working days;
- Demolition of the south section of the bridge: up to eight to ten working days;
- Construction of the south section of the bridge: up to four working days;
- Removal of the trestle bridges: up to three working days for each trestle.

The City sent the Marin Rowing Association a letter describing the project and activities that could affect the rowing club's use of the creek during construction. The Marin Rowing Association responded in writing, but did not express any specific concerns in the letter.

These impacts would be temporary and less than significant.

15b: No Impact

The proposed project does not include the construction of recreational facilities nor would it require expansion of existing recreational facilities, there would be no impact.

Sources

None referenced.

16. Transportation/Traffic	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation, including mass transit and non-motorized travel and relevant components of the circulation system, including, but not limited to, intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☒
b. Conflict with an applicable congestion management program, including, but not limited to, level-of-service standards and travel demand measures or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d. Substantially increase hazards because of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e. Result in inadequate emergency access?	☐	☐	☒	☐
f. Conflict with adopted policies, plans, or programs regarding public transit, bicycle or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☒	☐

This section is based in part on the Traffic Technical Memorandum and Detour Plan prepared for the project by Parsons Brinckerhoff, Inc.

Discussion

Bon Air Road is a major thoroughfare in Marin County. It links Magnolia Avenue in downtown Larkspur with Sir Francis Drake Boulevard in Greenbrae, both of which serve as major connections to U.S. 101. The bridge is located approximately 1.25 miles northwest of U.S. 101, 0.5 mile west of Sir Francis Drake Boulevard, and less than 0.25 mile east of Magnolia Avenue. West of the bridge, Bon Air Road has two lanes in either direction with turn lanes. The bridge carries one lane of traffic in each direction and has an 8-foot Class 1 bicycle path on the north side of the bridge and a 5-foot sidewalk on the south side of the bridge. East of the bridge Bon Air Road has one lane in each direction separated by a landscaped median. Bon Air Road is one of only three roads that cross Corte

Madera Creek. The bridge currently carries approximately 11,800 ADT, and ADT is expected to increase to 12,600 by 2036.

Comments

16a and b: No Impact

The City's General Plan Circulation Element does not specifically address the proposed project (Naphtali H. Knox & Associates, Inc and DKS Associates 1990). The bridge currently carries one lane of traffic in each direction, as would the new bridge. There would be no change in the number of traffic lanes or capacity over the bridge that would change the traffic volume or create a traffic impact. The project would not change the amount or type of traffic generated or conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system or a congestion management plan. No impact is anticipated.

16c: No Impact

The project proposes to widen and replace the existing bridge on Bon Air Road. There are no airports located in close proximity to the proposed project nor does it include activities or features that could potentially change air traffic patterns or increase safety risks related to air traffic. No impact would occur.

16d: No Impact

As noted above, the proposed project would replace the existing bridge on essentially the same alignment without adding new lanes or capacity. The proposed project would not introduce new design features or incompatible uses, but would correct the existing structural deficiencies of the bridge for vehicular travel as well as improve access and safety for pedestrians and bicyclists by accommodating travel over the bridge in both directions. The project would have no effect on hazards.

16e: Less-than-Significant Impact

See the discussion under 14a.

A Traffic Management Plan would be prepared during the final design phase of the proposed project, in coordination with the police and fire agencies. Appropriate construction area signage would be installed to direct traffic throughout the detour including advance warning signs for the detour. In addition, public outreach efforts would include informing first responders, local utility agencies, and residents. Flyers would be distributed to local residents in advance of the detours (Parsons Brinckerhoff, Inc. 2011). Implementation of the Traffic Management Plan, which is part of the proposed project, would reduce this impact to a level less than significant.

16f: Less-than-Significant

The proposed project would be consistent with the City's General Plan (1990) by improving access and safety for pedestrians and bicyclists over the bridge (see 10b). Replacement and widening of the Bon Air Road Bridge would provide 5-foot sidewalks and 6-foot Class 1 bike paths in each direction. These improvements would also be consistent with the 2004 City of Larkspur Bicycle & Pedestrian Master Plan. Public bus routes do not use the Bon Air Road Bridge (Parsons Brinckerhoff, Inc. 2011).

During construction, pedestrian and bicyclist travel over the bridge would be maintained for most of the construction period, although as discussed above, three bridge closures would occur. During bridge closure, pedestrians and bicyclists would not be able to use Bon Air Road Bridge to cross Corte Madera Creek, but could use the detour described above. Currently, no public bus routes use the Bon Air Road Bridge and construction is not likely to affect public transit in the area (Parsons Brinckerhoff, Inc. 2011). A Traffic Management Plan will be implemented as part of the proposed project. This impact is considered less than significant.

Sources

City of Larkspur. 2004. Bicycle & Pedestrian Master Plan. Prepared by the City of Larkspur. August. Available: <http://www.ci.larkspur.ca.us/211.html>. Accessed: February 15, 2010.

Naphtali H. Knox & Associates, Inc and DKS Associates. 1990. Larkspur General Plan 1990-2010. Larkspur, CA. Prepared for the City of Larkspur, Larkspur, CA.

Parsons Brinckerhoff, Inc. 2011. Traffic Technical Memorandum and Detour Plan. October. Sacramento, CA. Prepared for the City of Larkspur.

17. Utilities and Service Systems	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☒	☐
b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
c. Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or would new or expanded entitlements be needed?	☐	☐	☒	☐
e. Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
f. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g. Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐

Discussion

Marin Municipal Water District (MMWD) provides drinking water for south and central Marin County, including Larkspur (Marin Municipal Water District 2011). MMWD facilities in the project area include an 8-inch water main carried underneath the bridge along with the following:

- West of Bon Air Road Bridge:
  - Two 12-inch, one 8-inch and one 2-inch water mains north of Bon Air Road; and
  - 8 5/8-inch water main and 8-inch stub located south of Bon Air Road;
- East of Bon Air Road Bridge:
  - 6-inch stub and 2-inch water meter north of Bon Air Road;
  - 8-inch water main at intersection of Bon Air Road and South Eliseo Drive; and
  - 8 5/8-inch water main and three water stubs, one 6-inch and two of an unknown size.

Ross Valley Sanitary District Number 1 collects the wastewater in Larkspur. The Central Marin Sanitary Agency treats the wastewater collected by Ross Valley Sanitary District Number 1(Ross Valley Sanitary District 2010). Within the project area, there are two 6-inch sewer lines underground west of Bon Air Road Bridge. East of the bridge, there is an 8-inch line underground along South Eliseo Drive and a pump station (Pump Station 25) at the corner of Bon Air Road and South Eliseo Drive. In addition, an existing 36 inch sewer line runs parallel to Corte Madera Creek Pathway is being upgraded to a 42-inch force main. Construction on the new line began in 2010 with completion anticipated in December 2011 (Ross Valley Sanitary District 2011). Ross Valley Sanitary District has an existing easement with Marin County Flood Control and Water Conservation District for access to the Corte Madera Creek Pathway to maintain the sewer line adjacent to the pathway.

Larkspur City maintains 15 miles of storm drain pipes, five storm drain pump stations and more than 895 catch basin inlets (City of Larkspur 2010). There is a 15-inch drainage outfall pipe north of the bridge on the west bank of the Corte Madera Creek and a 15-inch drain inlet and outfall located south of the bridge on the west bank of the creek.

Marin Sanitary Service provides residential and commercial waste collection, recycling services and solid waste disposal in Larkspur. Recycling services are provided by the Marin Resource Recovery Center and the Marin Recycling Center, divisions of Marin Sanitary Services. Solid waste is transported to Redwood Sanitary Landfill in Novato (Marin Sanitary Service 2011a). Recycling has increased by 74% as a result of recycling and educational efforts provided by Marin Sanitary Services, which exceeds the 50% mandate required by Assembly Bill 939 (Marin Sanitary Service 2011b).

Redwood Landfill and Recycling Center reuses or recycles nearly 50 percent of all the material brought to the site and is responsible for one-third of all the recycling that occurs in Marin County. Only materials that cannot be recycled or reused are disposed of in the landfill (Redwood Sanitary Landfill 2011). The site is permitted to receive 2,130 tons per day with a maximum capacity of 19,100,000 cubic yards and is expected to operate through the year 2039 (Calrecycle 2011).

Gas and electrical services in Larkspur are provided by Pacific Gas and Electric Company. There are no gas lines on the Bon Air Road Bridge, but there are three gas lines west of the bridge, two north of and one south of Bon Air Road. East of the bridge there are two lines, one on South Eliseo Drive and one at the corner of South Eliseo Drive and Bon Air Road. Electrical lines are carried by the bridge and four lines are located east of the bridge.

Communication lines in the project area belong to Comcast and AT&T. There are three fiber optic cables carried by the bridge over the creek, two west of the bridge and one on the east. Of the four AT&T telephone lines in the project area, two are carried by the bridge and two are located east of the bridge north and south of Bon Air Road.

Comments

The City has coordinated with the utility providers described above regarding the proposed project and has confirmed the presence of the utilities in the vicinity of the bridge. During construction, utilities within City right-of-way or temporary construction easements would be temporarily relocated. All utilities carried by the bridge would be restored to the bridge after construction is completed. No disruptions of utility services are anticipated.

17a, b, d, and e: Less-than-Significant Impact

The primary intent of the project is to correct structural deficiencies associated with the Bon Air Road Bridge and this type of project would not generate wastewater or require water consumption. Existing utilities within City right-of-way or temporary construction easement areas would be temporarily relocated as necessary, but construction of new facilities or expansion of existing facilities would not be required. This impact would be less than significant.

17c: Less-than-Significant Impact

The increase in the impervious surface area compared to the existing bridge would be minimal and storm water runoff is anticipated to be similar to the existing conditions. As such, the proposed project would not result in storm water runoff that would require expansion of the existing storm water drainage facilities or require construction of new facilities. In addition, the minimal increase in the impervious surface area would not cause on- or off-site flooding and compliance with required permits described in Section 9, Hydrology and Water Quality, would minimize impacts from storm water pollution on Corte Madera Creek. Refer to Section 9 for additional discussion on these topics. This impact would be less than significant.

17f and g: Less-than-Significant Impact

While construction activities related to the proposed project could generate solid waste that may require disposal in the landfill, the amount of solid waste generated would not be great enough that it would reduce the capacity of Redwood Landfill through 2039. Any solid waste generated by the proposed project would be recycled, reused or disposed of by Marin Sanitary Service and Redwood Landfill, in compliance with federal, state and local regulations regarding solid waste. This impact would be less than significant.

Sources

Calrecycle. 2011. Solid Waste Information System, Facility/Site Summary Details: Redwood Sanitary Landfill (21-AA-0001). Available:< http://www.calrecycle.ca.gov/SWFacilities/Directory/21-AA-0001/Detail/>. Accessed: September 16, 2011.

City of Larkspur. 2010. Larkspur Public Works Maintenance Summary. Last revised: Not indicated. Available:< http://www.ci.larkspur.ca.us/3042-MaintenanceSummary.html>. Accessed: April 1, 2010.

Marin Municipal Water District. 2011. Marin Municipal Water District website. Last revised: Not indicated. Available:<http://www.marinwater.org/controller?action=menuclick&id=172>. Accessed: August 26, 2011.

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State Water Resources Control Board. 2011. Available at: <http://www.waterboards.ca.gov/waterboards_map.shtml>. Accessed: August 26, 2011.

18. Mandatory Findings of Significance	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b. Does the project have impacts that are individually limited but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☒	☐	☐
c. Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

18a: Less-than-Significant Impact with Mitigation Incorporated

The discussion under question 4a discusses impacts to natural communities and special-status species in detail. Mitigation Measures 4-1 through 4-19 will be implemented to reduce these impacts to less than significant. The discussion under questions 5a and 5b documents that the project would have no effect on important examples of the major periods of California history or prehistory.

18b: Less-than-Significant Impact with Mitigation Incorporated

As described in this environmental checklist, the project would incrementally contribute to environmental impacts related to aesthetics, air quality, biological resources, cultural resources, greenhouse gas emissions, hazards and hazardous materials, and noise. The mitigation measures that will be implemented related to these environmental resources will reduce these impacts to a less-than-cumulatively considerable level.

18c: Less-than-Significant Impact with Mitigation Incorporated

As described in this environmental checklist, the project would incrementally contribute to environmental impacts related to aesthetics, air quality, biological resources, cultural resources, greenhouse gas emissions, hazards and hazardous materials, and noise. The mitigation measures that will be implemented related to these environmental resources will reduce these impacts to a less-than-significant level.

Appendix A

U.S. Fish and Wildlife Service Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
81420-2010-F-0216-1

APR 12 2012

Mr. Boris Deunert, Ph.D.
Department of Transportation
Office of Local Assistance
111 Grand Avenue
P.O. Box 23660
Oakland, California 94623-0660

Subject: Biological Opinion on the Proposed Bon Air Road Bridge Replacement Project in the City of Larkspur, Marin County, California

Dear Mr. Deunert:

This is in response to the California Department of Transportation's (Caltrans) December 5, 2011, letter requesting initiation of formal consultation with the U.S. Fish and Wildlife Service (Service) for the proposed Bon Air Road Bridge Replacement Project (proposed project) in the City of Larkspur, Marin County, California (Caltrans file number BRLS 5166 (015)). Your request for consultation was received in our office on December 8, 2011. At issue are the potential effects of the proposed project on the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*) and endangered California clapper rail (*Rallus longirostris obsoletus*). This document represents the Service's biological opinion on the effects of the proposed project on the salt marsh harvest mouse and the California clapper rail. This document is issued under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

This document is based on: (1) your letter requesting consultation on the proposed project, dated December 5, 2011; (2) the November 2011 *Bon Air Road Bridge Replacement Project Biological Assessment, Marin County, City of Larkspur, BRLS-5166 (015)* prepared by ICF; (3) the letter dated February 23, 2012, from the Friends of Corte Madera Creek Watershed describing the proposed off-site tidal marsh restoration at Creekside Marsh; (4) electronic mail messages and conversations among staff from Caltrans, ICF, the City of Larkspur (City), Friends of Corte Madera Creek Watershed, and the Service; (5) site visits conducted on March 3, 2010 and April 27, 2010; and (6) other information available to the Service.

CONSULTATION HISTORY

December 14, 2009:	The Service received from ICF the habitat assessment for the California red-legged frog for the proposed project, and the request for the Service's conclusion about the potential for California red-legged frogs to occur within the proposed project area.
January 5, 2010:	The Service responded via electronic mail to ICF that the California red-legged frog is not likely to occur within the proposed project area.
March 3, 2010:	The Service attended a site visit along with staff from Caltrans, ICF, the City, and California Department of Fish and Game (CDFG).
April 27, 2010:	The Service attended a second site visit along with staff from Caltrans, ICF, the City, and CDFG.
December 7, 2010:	The Service received via electronic mail from ICF the analysis of noise impacts on the California clapper rail from the construction of the proposed project.
December 14, 2010:	The Service attended a meeting with staff from Caltrans, ICF, the City, and CDFG to discuss the effects of noise on the California clapper rail from the construction of the proposed project.
February 22, 2010:	The Service responded via electronic mail to Caltrans and the City that no construction activities would be allowed on the north (upstream) side of the bridge during the California clapper rail breeding season.
December 8, 2011:	The Service received from Caltrans the request for initiation of formal consultation and the Biological Assessment for the proposed project.
February 23, 2012:	The Service attended a meeting with staff from Caltrans, ICF, the City, and the Friends of Corte Madera Creek Watershed to discuss the proposed off-site tidal marsh restoration at Creekside Marsh.
February 29, 2012:	The Service received from ICF and the Friends of Corte Madera Creek Watershed the revised avoidance and minimization measures that would implemented by the Friends of Corte Madera Creek Watershed during tidal marsh restoration at Creekside Marsh.

BIOLOGICAL OPINION

Description of the Proposed Project

Bon Air Road Bridge Replacement

The City proposes to replace the Bon Air Road Bridge located over Corte Madera Creek in the City of Larkspur within Marin County, California. The purposes of the proposed project are to: (1) correct structural deficiencies of the Bon Air Road Bridge in the most cost-effective manner by replacing the bridge; (2) minimize traffic disruptions during construction; (3) provide an aesthetically-pleasing "signature" design for the bridge that makes a gateway statement; and (4) provide a bridge design that is sensitive to the natural Corte Madera Creek environment and the recreational uses of the creek.

The existing Bon Air Road Bridge is 420 feet long by 44 feet wide. The proposed project involves replacing the existing Bon Air Road Bridge with a new bridge that is 388 feet long and 62.5 feet wide. The proposed bridge design is based on public input as well as the site constraints. The existing roadway profile, limited right-of-way, and high water elevation in the creek largely dictate the bridge configuration and profile.

The proposed bridge would generally follow the alignment of the existing bridge with widening on the north side of the alignment by approximately 13 feet. The new bridge would reduce the number of spans and columns to less than half of the number that currently exists. Five spans and two columns (8 to 10 feet in diameter) per bent, for a total of eight columns are proposed, thereby improving the conveyance capacity of the creek. The structure would carry one 12-foot lane of traffic in each direction and have a 6-foot Class 1 bicycle path and 5-foot sidewalk in each direction. With wider sidewalks than currently exist, bicyclists and pedestrians would have safer access across the creek. The tangent alignment of the proposed bridge would also improve the overall operational safety of this bridge. In addition to construction activities on the bridge itself, construction activities would take place 60 feet north and 60 feet south of the Bon Air Road Bridge within the Corte Madera Creek right-of-way.

The design of the proposed bridge is intended to serve as a gateway to the community as created by ornamental "acorn" light post pedestals at the entries to the bridge and along the length of the bridge. The repetition of these light elements visually unifies the bridge as one passage and differentiates the bridge from the roadways leading to the bridge. Architectural details, such as the green wave form on the handrails and the detailing in the pavement patterning are also proposed to mimic the movement of the grass fields that surround the bridge.

The sequencing of the construction of the proposed project is outlined in Figure 1 and described below.

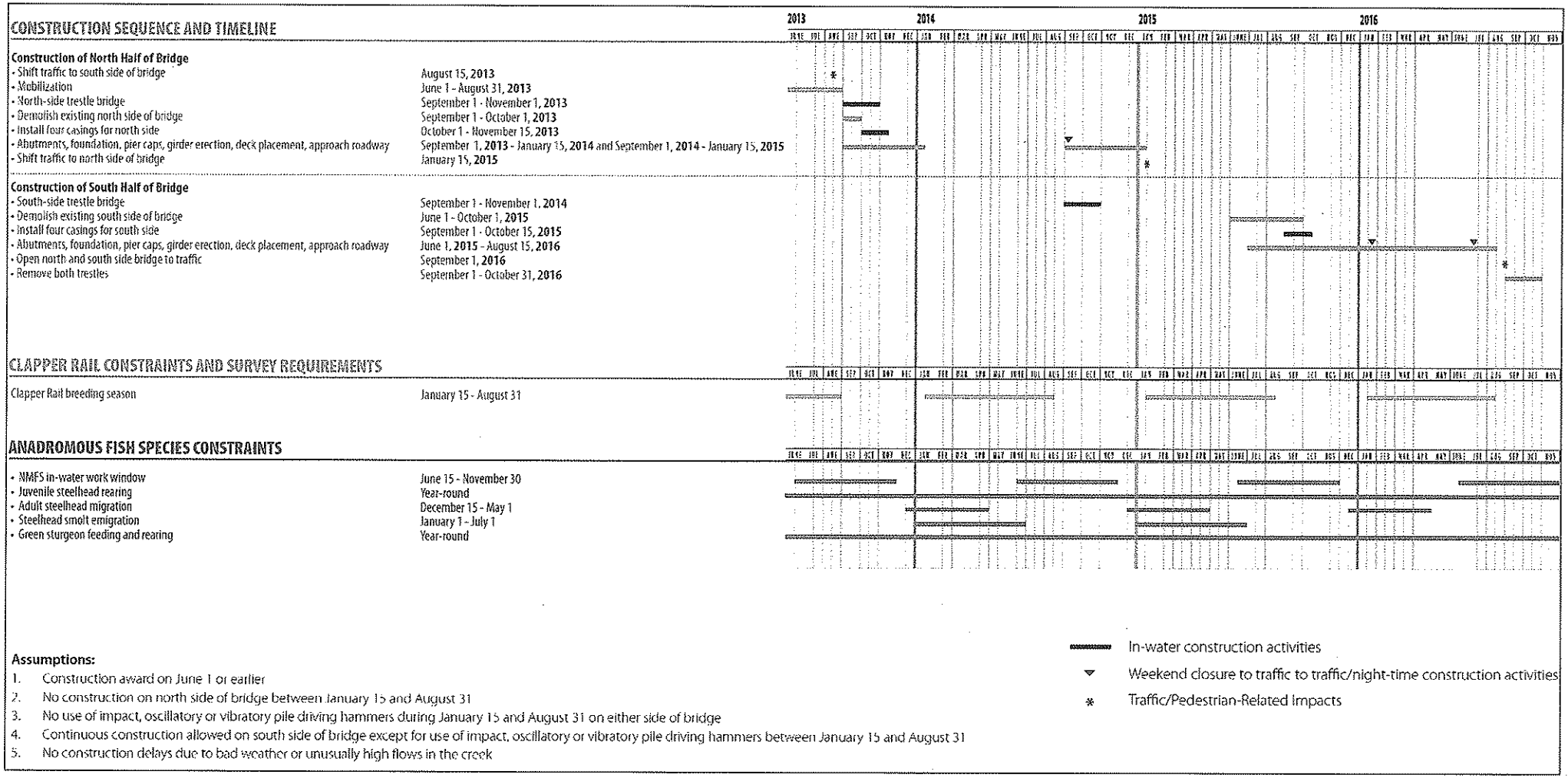

Figure 1. Construction sequence and timeline.

In-Water Construction Activities: Trestle Bridges and New Bridge Piles

To minimize impacts to vehicular and non-vehicular traffic during construction, the proposed bridge would be constructed using two temporary trestle bridges spanning across Corte Madera Creek: one constructed on the north side of the existing Bon Air Road Bridge, and a second constructed on the south side of the bridge. First, a temporary 30 to 50-foot wide trestle would be constructed on the north side of the existing bridge with a tie-in point to Bon Air Road. From the banks of the creek, approximately 64 12- to 14-inch steel "H" piles would be placed into the creek approximately 30 feet apart and 70 feet deep for the northern trestle. These piles would support the timber trestle deck. From the trestle, approximately 14 feet of the northern portion of the existing bridge would be demolished, and four new columns for the northern half of the new permanent bridge would be constructed.

To construct each of the four new bridge columns that would support the northern half of the bridge, a temporary 10-foot diameter steel casing would be placed into the creek to a depth of approximately 70 feet. After the 10-foot diameter casings are in place, an 8-foot diameter hole will be drilled inside each casing. A temporary 8-foot diameter casing may be utilized to keep the holes stable. The water in the casings would be pumped to settling tanks prior to discharge and disposed of following National Pollution Discharge Elimination System (NPDES) requirements. Concrete would then be poured into the dewatered 8-foot diameter holes. The same construction method would be used for construction of the southern portion of the bridge.

Both trestle bridges would be removed after the new bridge is completed. The approximately 128 temporary steel "H" piles for the northern and southern trestle bridges and the eight steel casings for the permanent piles would be driven to a depth of 70 feet using a vibratory and impact pile driver. It is anticipated that vibratory driving can effectively drive each pile/casing to a depth of 50 feet. An impact pile driver will likely be required to drive the remaining 20 feet.

The City would conduct all pile driving (in-water installation and removal of temporary trestle piles and steel casings) between September 1 and November 30 to avoid effects on listed wildlife and fish species with the goal of completing pile driving activities as early as possible during this three-month period of time (Figure 1).

Out-of-Water Construction Activities

Demolition of the north side of the bridge would involve removal of the bridge railing, pedestrian sidewalk, deck, and a portion of the girders and pier caps; approximately 15 feet of the bridge width would initially be removed. During construction of the south portion of the bridge, the remaining bridge width would be removed, and the existing bridge piles would be cut approximately 1 foot below the channel bottom.

Other above-water construction activities are related to construction of the bridge abutments, construction of a pier cap on each new bridge column, placement of pre-fabricated "girders" or beams would be placed over the new bridge pier-caps to provide horizontal support for the new bridge, construction of the new bridge deck, and pouring of concrete for the roadway that connects to the new deck.

As noted above, to construct each of the eight new bridge columns that would support the new bridge, concrete would be poured into the dewatered area created by eight 10-foot diameter casings.

Sequencing of Construction Activities

The sequencing of construction activities (Figure 1) have been scheduled to avoid any construction on the north side of the bridge between January 15 and August 31 to avoid the breeding season of the California clapper rail. Demolition and construction of the northern portion of the bridge would occur between September 1 and January 14, 2014 and between September 1 and January 14, 2015 to avoid the California clapper rail breeding season. All in-water work related to construction of the north side of the bridge would occur between September 1 and November 30, 2013 to avoid the California clapper rail breeding season and to avoid impacts to listed fish species. No construction activities would occur on the northern portion of the bridge between January 15 and August 31, 2014. Demolition and construction of the southern portion would occur between September 1 and November 1, 2014 and from June 2015 until the end of the construction period in October 2016. All in-water work related to construction of the south side of the bridge would occur between September 1 and November 30 to avoid impacts to listed fish species.

Traffic Management on the Bridge during Construction

A Traffic Management Plan would be prepared to ensure safe travel during construction. During construction of the northern portion of the new bridge, existing two-way vehicular traffic would be diverted south to the remaining 30 feet of bridge width, and a barrier would be used to separate traffic from the construction zone. The existing 5-foot-wide sidewalk on the southern half of the bridge would be used for bicycle and pedestrian travel during construction of the northern portion of the bridge. Traffic would then be shifted north to the new bridge during construction of the south portion of the bridge.

In general, with a few exceptions of short duration, travel across the bridge would be maintained throughout the bridge construction period. Three full bridge closures are expected to be needed during construction. These bridge closures would likely be scheduled during three weekends beginning Friday at 10 p.m. and ending on Monday morning at 5 a.m. The first two weekend closures would be required during erection of the prefabricated girders on the bridge pier-caps. The third closure would be needed to place the roadway/bridge joints at each end of the bridge.

Other Access Considerations during Construction

The trailhead to the Corte Madera Creek pathway (the area to the south of the parcourse, adjacent to Marin County's Creekside Marsh), would be narrowed to approximately 8 feet wide to provide enough room for the temporary construction easement. Use of the multi-use path and the parcourse (located on the west side of the path) would not be affected during construction.

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The Marin County Flood Control District levee maintenance road's connection to Bon Air Road would be slightly realigned to allow adequate space for construction activities and for the increased overall bridge width. However, access to the maintenance road would be maintained during and after construction of the proposed project.

Proposed Right-of-Way Acquisition, Temporary Construction Easements, and Staging Areas

A sliver of Assessor Parcel Number (APN) 022-060-18 would need to be acquired north of Bon Air Road for the westbound bridge approach right-of-way. Temporary construction easements would be required from the parking lot of APN 020-122-06 and from APN 022-060-18 and APN 022-060-19 on the northeast end of the bridge. The temporary construction easements would be used for construction of the temporary trestle bridge as described above. These areas may also be used for temporary utility relocations during construction. Excavation of these areas would not be required.

During demolition and construction on the northern portion of the bridge, the northern portion of the approach to the bridge would be used for staging, and the southern half would be used for bridge access. During demolition and construction of the southern portion of the bridge, the southern portion of the approach to the bridge would be used for staging, and the northern portion would be used for access. The paved shoulder of Magnolia Avenue, south of Bon Air Road, would also be used for construction staging (i.e., storage of equipment and for placement of construction trailers) during all phases of bridge construction.

Proposed Utility Work

The utilities that require relocation are located within the City right-of-way or within the temporary construction easement areas described above. Shallow excavations would be conducted (2–6 feet) for temporary utility relocation.

Construction Schedule

Construction of the proposed project is proposed to occur over a 3.5-year period beginning in mid-2013 and completing in late 2016. Night-time construction activities would be required for approximately eight nights during the delivery and construction of the bridge's new concrete girders. These activities would require truck deliveries of the girders at the bridge and operation

of a crane on the bridge. Night work (girder deliveries) would occur in approximately 2–3 day blocks in September 2014, January 2016, and July 2016.

Conservation Measures: Bon Air Road Bridge Replacement

The City will implement the following conservation measures during the replacement of the Bon Air Road Bridge to avoid and minimize the effects on the salt marsh harvest mouse and California clapper rail.

Conservation Measure 1: Install Fencing to Protect Biologically Sensitive Areas Adjacent to the Project Area

The City or its contractor will install construction barrier fencing (including sediment fencing) to prevent contaminants and debris from entering the saline emergent wetland, and other biologically sensitive areas in and adjacent to the proposed project area. Before construction begins, the City or its contractor will work with the project engineer and a resource specialist to identify the locations for the barrier fencing and will mark those locations with stakes or flagging. The protected area will be clearly identified as an environmentally sensitive area on the construction specifications. The construction barrier/sediment fencing will be in place before construction activities are initiated. The fencing will be maintained by the City or its contractor throughout the duration of the construction period. If the fencing is removed, damaged, or otherwise compromised during the construction period, construction activities will cease until the fencing is replaced.

Conservation Measure 2: Implement a Storm Water Pollution Prevention Plan

A Storm Water Pollution Prevention Plan (SWPPP) will be implemented as part of the NPDES and a General Construction Activity Storm Water Permit to minimize the potential for sediments or contaminants to be discharged into Corte Madera Creek. A toxic materials control and spill response plan will be implemented to regulate the use of petroleum-based products (fuel and lubricants) and other potentially toxic materials associated with project construction.

The following measures will be implemented to minimize or avoid potential increases in sediment inputs to the creek:

1. Conduct all construction work according to site-specific construction plans that minimize the potential for sediment input to the aquatic system;

2. Minimize the extent of all areas requiring clearing, grading, revegetation, and recontouring;

3. Grade areas following construction to minimize surface erosion;

4. Avoid wetland vegetation wherever possible and install fencing to protect wetlands adjacent to the project area;

5. Revegetate and enhance riverine wetland areas where temporary impacts would occur during project construction; and

6. Minimize disturbance to the water column and river bottom by restricting heavy equipment to the temporary trestle.

The following measures will be implemented to minimize the risk of spills or discharges of toxic materials to the creek:

1. Establish a hazardous material spill prevention control and countermeasure plan before construction begins that will minimize the potential for, and the effects of, spills of hazardous or toxic substances during construction. The plan will include storage and containment procedures to prevent and respond to spills, and will identify the parties responsible for monitoring the spill response.

2. Prevent raw cement, concrete or concrete washings, asphalt, paint or other coating material, oil or other petroleum products, or any other substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses.

3. Prevent discharge of turbid water to the stream during dewatering activities by filtering the discharge first using a filter bag, diverting the water to a settling tank, and/or treating the water in a manner to ensure compliance with water quality requirements prior to discharging water back to the creek.

4. Clean up all spills immediately according to the spill prevention and countermeasure plan.

5. Provide areas located outside the ordinary high water mark (OHWM) for staging and storing equipment, materials, fuels, lubricants, solvents, and other possible contaminants.

6. Remove vehicles from the normal high-water area of the waterway before refueling and lubricating or ensure that stormwater runoff in areas where equipment is refueled or lubricated below the OHWM is storm-proofed to prevent contaminants from being discharged to the stream. Contaminated water would be pumped to a holding tank for proper disposal; and

7. Limit operation of vehicles and equipment in flowing water.

The City will review and approve the contractors' toxic materials spill prevention control and countermeasure plan before allowing construction to begin. The City will routinely inspect the construction site to verify that best management practices (BMPs) specified in the plan are properly implemented and maintained. The City will notify the contractor immediately if there is a noncompliance issue and will require compliance. The City also will obtain a 401 Water Quality Certification from the San Francisco Bay Regional Water Quality Control Board, which may contain additional BMPs and water quality measures to ensure the protection of water quality.

Conservation Measure 3: Develop and Implement a Revegetation/Enhancement Plan for Temporary Impacts on Riverine Wetland

The City will retain a qualified restoration ecologist to develop a revegetation plan to revegetate and enhance the riverine wetland areas where temporary impacts would occur during project construction activities. The revegetation plan would be implemented upon completion of project construction activities at such time as deemed appropriate according to the planting schedule in the plan. The revegetation plan will specify the native planting stock appropriate for riverine wetlands subject to brackish conditions and tidal influence. The plan will employ the most successful techniques available at the time of planting. Success criteria will be established as part of the plan. Plantings will be maintained for a minimum of five years, including invasive weed removal and herbivory protection. Replanting will be necessary if success criteria are not met. The riverine wetland revegetation/enhancement will be considered successful when the native vegetation established meets the success criteria, the habitat no longer requires active management, and vegetation is arranged in groups that, when mature, replicate the area, natural structure, and species composition of similar riverine wetland habitats in the region.

Conservation Measure 4: Implement the Bay Area Air Quality Management District's Control Measures to Control Construction-Related Dust

In accordance with the Bay Area Air Quality Management District's (BAAQMD) current California Environmental Quality Act guidelines (1999), the project applicant shall implement the following BAAQMD-recommended basic control measures to reduce particulate matter emissions from construction activities. Enhanced and optional control measures are recommended and will be implemented to the extent feasible: as feasible, traffic speeds on unpaved roads shall be limited to 15 miles per hour.

Conservation Measure 5: Conduct Environmental Awareness Training for Construction Crews and Provide Biological Monitoring

The City or its contractors will conduct environmental awareness training for construction crews before project implementation. The awareness training will be provided to all construction personnel to brief them on the need to avoid impacts on the California clapper rail and salt marsh

harvest mouse. The education program will include a brief review of the life histories, habitat requirements, and photographs of these species. The training will identify the portions of the study area in which these species may occur, as well as their legal status and protection under the Act, California Endangered Species Act, and California Fish and Game Code. The program will also cover the restrictions and guidelines that must be followed by all construction personnel to reduce or avoid effects on these species during project implementation. This will include the steps to be taken if a listed species is found within the construction area (i.e., notifying the crew foreman who will call a designated biological monitor). The crew foreman will be responsible for ensuring that crew members adhere to the guidelines and restrictions. Education programs will be conducted for appropriate new personnel as they are brought on the job during the construction period. A Service- and CDFG-approved biological monitor will be designated for the proposed project and will visit the site periodically to ensure that fencing around environmentally sensitive areas are intact and that activities are being conducted in accordance with the agreed upon project schedule. The monitor will provide the City with a monitoring log for each site visit, who will submit it to the Service and CDFG.

Conservation Measure 6: Specify and Implement Survey Requirements in Construction Contract if Work on the North Side of the Bridge Occurs during the California Clapper Rail Breeding Season

Pile driving associated with construction of the proposed project is not proposed within the Bon Air Bridge Replacement project area during the February 1–August 31 California clapper rail breeding season. Construction activities are also not proposed to occur on the north (upstream) side of the bridge during the breeding season. Construction activities, other than pile driving, are proposed on the south (downstream) side of the bridge during the breeding season.

The construction contract will specify that if construction on the north side of the bridge occurs during the breeding season (February 1–August 31), then implementation of the following measures would be required:

1. Full protocol-level surveys (conducted mid-January through mid-April) will be conducted during the same year as construction activities that are proposed to be implemented during the breeding season.

2. Surveys will be initiated in mid-late January following a minimum two-week cessation of any on-going construction work along the upstream side of the bridge.

3. Construction on the upstream side of the bridge will not be allowed to begin until the protocol-level surveys have been completed, and the Service and CDFG have reviewed the results and given approval for construction along the upstream side of the bridge to begin.

4. If, based on the protocol-level survey results, the Service and/or CDFG determine that construction along the upstream side of the bridge may disturb nesting California clapper rails, then construction in this area will not be allowed to begin until September 1.

5. If construction on the north side of the bridge is necessary for more than one year, the previous four conditions will be implemented prior to each year of construction.

Surveys will generally follow the Service's December 2009 draft survey protocol for the California clapper rail (enclosed). The specific methodology for the surveys will be submitted to the Service and CDFG for approval prior to the start of the surveys. The surveyor(s) will possess the required permits from the Service and CDFG for conducting the surveys.

Conservation Measure 7: Halt Work if a Federally Listed Species is Observed in the Work Area

The resident engineer shall halt work in the immediate vicinity and immediately contact the City, the designated biological monitor, the Service, and CDFG in the event that a California clapper rail or salt marsh harvest mouse is found within 10 feet of any at-grade construction activities. The resident engineer shall suspend all construction activities within 10 feet of the detected California clapper rail or salt marsh harvest mouse until the species leaves the area voluntarily.

Conservation Measure 8: Care for Injured Federally Listed Species

Injured California clapper rails or salt marsh harvest mice shall be cared for by a licensed veterinarian or other qualified person, such as the designated biological monitor. Dead individuals shall be preserved according to standard museum techniques and held in a secure location. The Service and CDFG shall be notified within one working day of the discovery of the death or injury of a listed species.

Conservation Measure 9: Implement Lighting Specifications to Minimize Potential Light Pollution Effects on Animals

To minimize the potential negative effects of artificial light on animals, including the California clapper rail and salt marsh harvest mouse, the following criteria will be identified in the lighting plans and specifications.

Acorn style lights that are International Dark Sky Association approved "Dark Sky Friendly" will be installed. This type of lighting ensures 0 percent light above 90 degrees, directs light toward the bridge, and minimizes the amount of backward and side lighting, thereby reducing light pollution on habitat and animals in the surrounding area, and the air space above the lights. One possible model is Holophane Utility Washington Postlite LED luminaire WFL 070 4K AS L3 B. This model or an equivalent model, approved by the City, will be specified. The lowest luminaire wattage that still provides safe conditions for vehicular traffic, bicyclists, and

pedestrians will be used. If possible, correlated color temperature (an indication of how "warm" or "cool" the light source appears) range of the light source will be between 3,800 and 4,000 Kelvins. This range corresponds to "warm" light that would be less disturbing to animals in adjacent areas than "cool" (brighter white) light.

Conservation Measure 10: Remove Vegetation in Salt Marsh Harvest Mouse Habitat by Hand and Install Exclusion Fencing

Before construction activities begin in the riverine wetland area in the northeast quadrant of the bridge, the construction contractor will remove all vegetation in this area by hand, including areas that will be used for construction access. Vegetation clearing will be performed methodically from the Corte Madera Creek channel toward the upland area. Once vegetation within the exclusion zone areas is cleared and the areas are graded to remove any attractive habitat, non-climbable exclusion fencing will be installed around these areas to prevent potential re-entry of salt marsh harvest mice into these areas. The exclusion fencing will be a minimum of 2 feet tall with the bottom 4 inches of the fence buried. A Service-approved biologist will monitor the vegetation removal activities to ensure that no adjoining habitat is disturbed.

Conservation Measure 11: Biological Monitor during Extreme High Tides

Pile driving and jack hammering will be scheduled to avoid extreme high tides (i.e., no pile driving or jackhammering will occur near the salt marsh within two hours before or after extreme high tides 6.5 feet National Geodetic Vertical Datum (NGVD) or above, as measured at the Golden Gate Bridge, or adjusted to the timing of local extreme high tide events in which the marsh plain is flooded), because protective cover for salt marsh harvest mice and California clapper rails is limited, and activities during high tides could prevent them from reaching available cover. The designated biological monitor will be present to monitor all other construction activities that are scheduled to occur during extreme high tides.

Creekside Marsh Tidal Marsh Restoration

The Friends of Corte Madera Creek Watershed (Friends of Corte Madera Creek Watershed *in litt.* 2012) propose to enhance 0.5459 acre of tidal marsh/upland refugia habitat at Hal Brown Park at Creekside Marsh (formerly known as Creekside Park) for unavoidable impacts to suitable California clapper rail and salt marsh harvest mouse habitat resulting from the replacement of the Bon Air Road Bridge across Corte Madera Creek (proposed project) and the replacement of Doherty Drive Bridge across Larkspur Creek (Service file number 81420-2010-F-0444, Service in prep.). The proposed habitat enhancement is located along the southwestern edge of Creekside Marsh about 1,000-1,700 feet upstream (north) of Bon Air Road Bridge (Figure 2). The Friends of Corte Madera Creek Watershed propose to revegetate tidal marsh and upland refugia habitat for the California clapper rail and salt marsh harvest mouse at Creekside Marsh by

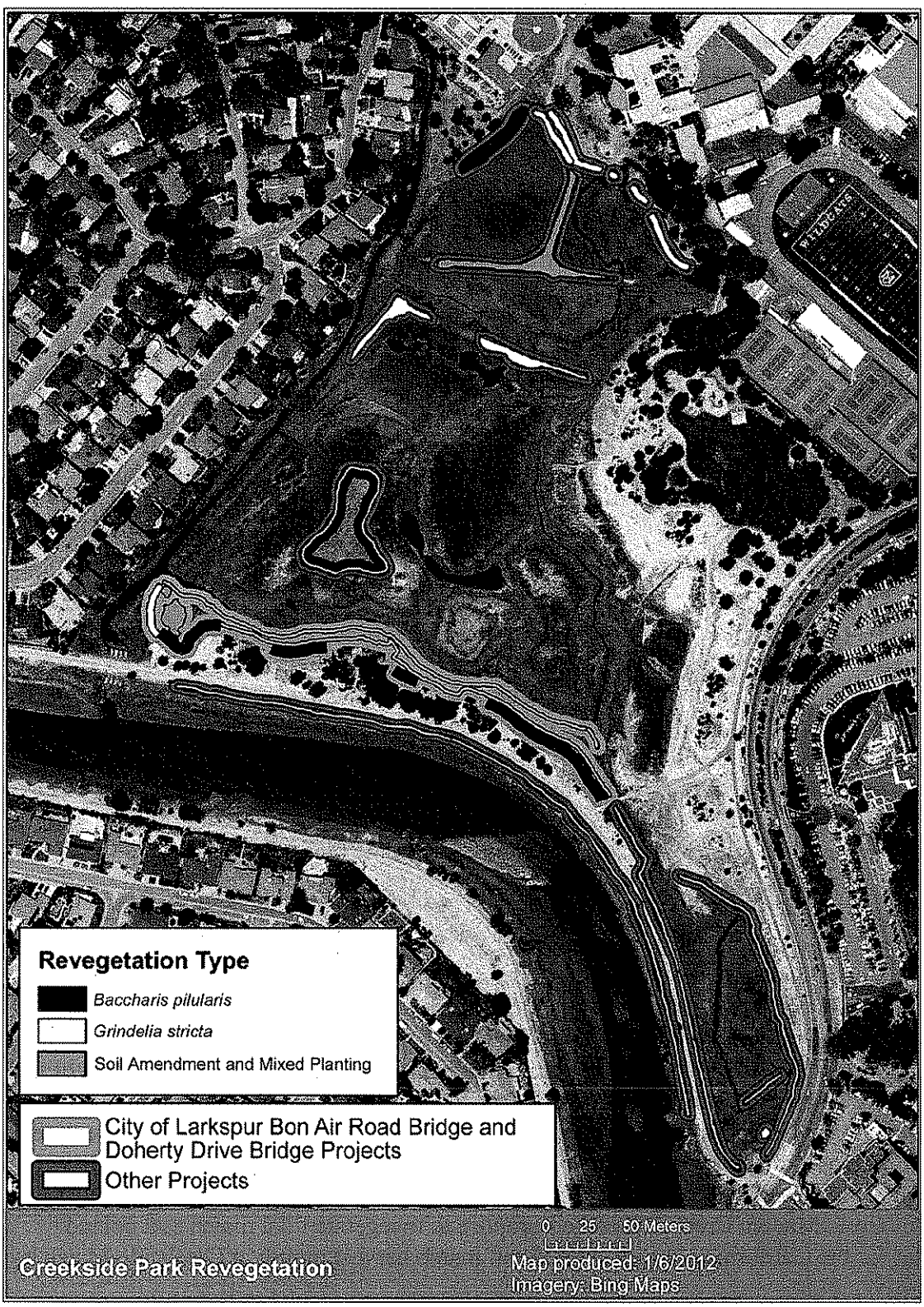

Figure 2. Map of proposed revegetation at Creekside Marsh.

planting gumplant (*Grindelia stricta*), coyote brush (*Baccharis pilularis*), and mixed high marsh plain vegetation.

The map in Figure 2 shows the location of three types of proposed planting: gumplant (yellow), coyote brush (purple), and mixed high marsh plain vegetation (green). The areas proposed for planting as compensation for the Bon Air Road Bridge and Doherty Drive Bridge replacement projects are outlined in turquoise in Figure 2 and are the subject of this biological opinion. Revegetation proposed by the Friends of Corte Madera Creek Watershed at Creekside Marsh as compensation for other projects (i.e., the Transportation Authority of Marin's Central Marin Ferry Connector Multiuse Pathway Phase 1 Project, Service file number 81420-2011-F-0376) are outlined in red in Figure 2; these areas outlined in red on the map in Figure 2 are not the subject of this biological opinion but will be covered under other biological opinions (i.e., the Service's biological opinion for the Transportation Authority of Marin's Central Marin Ferry Connector Multiuse Pathway Phase 1 Project (Service 2011) which covers the effects of enhancement of 1.42 acres of tidal marsh/upland refugia habitat at Creekside Marsh as compensation for effects to California clapper rails and salt marsh harvest mice in the Central Marin Ferry Connector Multiuse Pathway Phase 1 Project).

The two bridge replacement projects (Bon Air Road and Doherty Drive bridges) will compensate by restoring a total of 0.5459 acre of suitable habitat for the salt marsh harvest mouse and California clapper rail at Creekside Marsh, as described below:

1. The Bon Air Road Bridge Replacement Project will result in the permanent loss of 0.153 acre of suitable habitat for the salt marsh harvest mouse and California clapper rail. Assuming a compensation ratio of 3:1, 0.459 acre will need to be restored at Creekside Marsh.

2. The Doherty Drive Bridge Replacement Project will result in the temporary loss of 0.079 acre of suitable habitat for the salt marsh harvest mouse and California clapper rail. Assuming a compensation ratio of 1.1:1 ratio, 0.0869 acre will need to be restored at Creekside Marsh.

3. A total of 0.5459 acre of suitable salt marsh harvest mouse and California clapper rail habitat will need to be restored to compensate for potential impacts associated with the two bridge replacement projects.

The funding will be provided to the Friends of Corte Madera Creek Watershed. The City's responsibility under this proposal will be limited to the contribution of $45,475 for the initial planting and reporting and $2,175 for each year of subsequent monitoring required in the Service's biological opinion. The plants will be grown by The Watershed Nursery and installed by EcoLogiCal Solutions. The budget includes five years of monitoring. If additional

monitoring is required to document that the performance criteria have been met, it will be done by the Friends of Corte Madera Creek Watershed.

Implementation of all aspects of the proposal, including monitoring and any reporting requirements stipulated by the Service in its biological opinion, will be the responsibility of the Friends of Corte Madera Creek Watershed.

Background

Creekside Marsh comprises a 21-acre restored wetland. It has a breeding population of California clapper rails and provides suitable habitat for the salt marsh harvest mouse. The area was originally tidal wetland; the U.S. Army Corps of Engineers filled it and many other tidal wetlands in the watershed with dredge spoils in the late 1960s when the earthen channel for the Corte Madera Creek Flood Control Project was constructed. The marsh at Creekside Park (as it was known until recently) was restored in the early 1970s, at which time two invasive cordgrasses, *Spartina densiflora* and *S. anglica*, were planted. Although both spread within Creekside Marsh, the *S. densiflora* is by far the more aggressive, and it had formed meadows within the central portion of Creekside Marsh and hedges along some of the interior channels. Much smaller numbers of non-native cordgrass plants were found on the perimeter of the marsh and in the extreme northern part of the marsh. In addition to *S. densiflora* and *S. anglica*, hybrids between the native *S. foliosa* and both *S. alterniflora* and *S. densiflora* were observed at Creekside Marsh.

The Invasive Spartina Project has been battling invasive cordgrasses in the Corte Madera Creek watershed for about 10 years. Progress has been made in controlling the invasive cordgrasses, and the Invasive Spartina Project has begun a revegetation program at Creekside Marsh in areas most affected by the removal of invasive cordgrasses. This proposal by Friends of Corte Madera Creek Watershed includes planting along the perimeter of Creekside Marsh where very little invasive cordgrass has been removed and where there are abundant opportunities to provide high-tide refugia and buffering from intensively used recreational areas.

Rationale for Proposed Enhancement

Heavily used recreational facilities are on three sides of Creekside Marsh: commuters cycling to the Larkspur Ferry Terminal, Marin General Hospital, and other businesses; students from four nearby schools; residents exercising and walking dogs; and families using the playgrounds and picnic areas at the park provide heavy traffic. Although dogs are supposed to be leashed, there is limited enforcement and many dogs run free; it is common for them to chase birds in the creek and to run into the edge of Creekside Marsh. There is a visible need for planting around the marsh to reduce the impacts of people and their pets on wildlife in Creekside Marsh.

The project has three goals:

1. Promote gumplant along the top of the banks immediately above existing native cordgrass. Once the plants are established, they have the potential to provide nesting habitat for California clapper rail and high-tide refugia for the salt marsh harvest mouse and California clapper rail. Saltgrass and perennial pickleweed lining the channels provide shelter for California clapper rails in the channels.

2. Provide high-tide refugia: Gumplant is appropriate for planting along the high marsh transition zone/lower edge of the upland ecotone. Coyote brush enhances high tide refugia. Creekside Marsh is surrounded by a higher marsh edge.

3. Expand high marsh plain vegetation into bare areas that are the appropriate elevation for saltgrass, pickleweed, and other high marsh plain plants, but the soil is compacted and has no vegetation.

For the City, the following revegetation acreages have been designated at Creekside Marsh as compensation for the Bon Air Road Bridge and Doherty Drive Bridge replacement projects:

Gumplant	0.315 acre
Coyote brush	0.273 acre
High marsh plain mix	0.057 acre
Total	**0.645 acre**

The total revegetation acreage stated above (0.645 acre) is higher than the 0.5459 acre required as compensation for the City's Bon Air Road Bridge and Doherty Drive Bridge replacement projects. This acreage allows for reduced planting in some areas. For example, along the edges of Channel A (the channel adjacent to and immediately north of the City's proposed revegetation area), there may be some areas where the native cordgrass is dense enough to skip planting gumplant.

Planting along Channels

Channel A, sub-parallel to Corte Madera Creek, is used by California clapper rails. Along its south side, the vegetation in the tidally influenced area is dominated by saltgrass and perennial pickleweed, with lesser amounts of jaumea, alkali heath, and marsh rosemary. Currently, in this area of Creekside Marsh there are virtually no plants present that are suitable for California clapper rail nesting. This proposal calls for planting gumplant along the south side of Channel A where there is little or very sparse native cordgrass. This area did not have significant infestations of invasive cordgrasses and will not be planted by the Invasive Spartina Project.

Plant High-tide Refugia

The entire northeastern, eastern, and southern boundaries of Creekside Marsh lack buffers to shelter wildlife in the marsh from unleashed dogs and human activity. The high marsh edge will be planted with gumplant. The Friends of Corte Madera Creek Watershed propose to plant nodes of coyote brush in open areas between the paved path and Channel A.

Plant Unvegetated Areas

Some tidally influenced areas near the perimeter of Creekside Marsh are bare, compacted soil. For this project, the Friends of Corte Madera Creek Watershed propose to plant one of these, located in the marsh east of the four-bore culverts. It will be cultivated using hand tools and planted with plugs taken from dense stands of high marsh plain vegetation from along the main channel upstream of Creekside Marsh.

Planting Protocols

Gumplant will be planted at a density of four plants per square meter (one plant per about 2.5 square feet); each area planted with gumplant will be at least 3.3 feet wide and 16.4 feet long. Other planting will be at a density of 1.2 plants per square meter (one plant per about 9 square feet). The Friends of Corte Madera Creek Watershed estimate planting 5,400 gumplants, 1,350 coyote brush plants, and 450 plugs of high marsh plain vegetation.

All planting will be done by hand. A biologist familiar with the take-avoidance measures and with experience recognizing California clapper rails will be present during the work. No grading will be done, and no heavy equipment will be used. To speed the planting process, holes the diameter of the tubes in which the plants are grown will be dug using a one-man gasoline auger, using a 2- to 3-inch bit. This technique minimizes disturbance of the marsh and reduces the time required for the planting. The noise produced by one-man gas augers is less than that produced by mowers and blowers used on a regular basis by Marin County Parks maintenance crews around the perimeter of the park.

Access to the work areas proposed for the City will be from adjacent paved recreational paths. It will not be necessary to enter areas with *S. foliosa* except in a few areas along the south side of Channel A where the cordgrass is very sparse and the Friends of Corte Madera Creek Watershed propose to inter-plant gumplant on the channel edge.

Performance Criteria

If after three years survival in each group of plants is not at least 50 percent, replanting will be done. Individual gumplant and coyote brush plants will be counted. For the pickleweed,

coverage will be calculated by area. If coverage is not 50 percent of the planted area, more pickleweed will be planted. Surveys will continue until the performance criteria have been met.

Schedule

Planting will be done in January. If a contract can be in place by the end of March 2012, then gumplant and coyote brush can be grown in time to plant in January 2013. Otherwise, planting will take place in January 2014.

Work Plan

The work plan is divided into four tasks.

Task 1. Prepare for Planting

This task includes ordering plants, acquiring planting supplies and tools, flagging planting areas, digging up the bare area, and staging the plants. The Watershed Nursery will grow the plants.

Task 2. Install Plants

An efficient process for planting is to make a hole the size of the planting container and slip the plant into it with minimal surface disturbance. Gumplant will be supplied in stubbies; coyote brush in D-16 containers.

Task 3. Conduct Surveys and Replant if Needed

Photographs will be taken from fixed monitoring points before planting, immediately after planting, and annually in September. At the same time, surveys will be conducted to document survival. This will be done for at least three years or until performance criteria have been met. Individual gumplants and coyote brush plants will be counted; the area covered by pickleweed and other high marsh plain plants will be measured. If after three years, less than 50 percent of any one plant group has survived, replanting will be done. For pickleweed, if less than 50 percent of the area planted is covered, more pickleweed will be planted.

Task 4. Prepare Reports

The Invasive Spartina Project has provided the preliminary mapping for this proposal. The Friends of Corte Madera Creek Watershed will assume the mapping responsibility for recording the planting and for subsequent reporting, using the ArcInfo and metadata files supplied by the Invasive Spartina Project. An annual report will be prepared and submitted electronically to the City, Marin County Parks Department, Marin County Department of Public Works, the Service, and CDFG by October 31 of each year until the planting criteria are met.

Conservation Measures: Creekside Marsh Tidal Marsh Restoration

The Friends of Corte Madera Creek Watershed will implement the following conservation measures during the restoration of tidal marsh/upland refugia habitat at Creekside Marsh to avoid and minimize the effects on the salt marsh harvest mouse and California clapper rail.

Conservation Measure 12: Tidal Marsh/Upland Refugia Restoration at Creekside Marsh

The permanent removal of 0.027 acre and long-term temporary disturbance (two years) of 0.126 acre of lower quality foraging and dispersal habitat for the salt marsh harvest mouse and California clapper rail in the Bon Air Road Bridge Replacement Project will be compensated at a 3:1 ratio. Based on this ratio, 0.459 acre of suitable tidal marsh/upland refugia habitat for the salt marsh harvest mouse and California clapper rail will be restored at Creekside Marsh to compensate for the effects of the Bon Air Road Bridge Replacement Project on the salt marsh harvest mouse and California clapper rail. Compensation for impacts to salt marsh harvest mouse and California clapper rail habitat will occur through restoration of the same site since these species share similar habitat.

The following measures will be implemented during revegetation, revegetation management, seed collection, and vegetation monitoring activities at Creekside Marsh to minimize the potential for disturbing the salt marsh harvest mouse and California clapper rail:

1. All of the proposed tidal marsh enhancement work will occur outside of the February 1 through August 31 California clapper rail breeding season.

2. A qualified biologist will supervise all planting and vegetation monitoring activities and access into the marsh.

3. A one-man auger will be used to drill individual holes for placement of plants. All other equipment used for tidal marsh enhancement work will be handtools.

4. All work within the marsh at Creekside Marsh will occur on foot. No motorized vehicles will be allowed within the marsh. Foot travel through the marsh will be minimized.

5. When digging holes for planting or removing non-native vegetation, effects to existing native vegetation will be minimized.

6. Activities will not occur during extreme high tides (within two hours before or after extreme high tides 6.5 feet NGVD or above, as measured at the Golden Gate Bridge, or adjusted to the timing of local extreme high tide events in which the marsh plain is flooded) because the protective cover for salt marsh harvest mice and California clapper rails is limited, and crew activities could prevent the mice and rails from reaching available cover.

7. Vegetation monitoring will be conducted by one to two trained biologists in September.

8. If California clapper rail adults are encountered during any activities, biologists and crews will carefully move away from the rails.

Analytical Framework for the Jeopardy Analysis

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on three components: (1) the *Status of the Species and Environmental Baseline*, which evaluates the salt marsh harvest mouse's and California clapper rail's range-wide conditions, the factors responsible for that condition, and their survival and recovery needs; and evaluates the condition of these listed species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of these listed species; (2) the *Effects of the Proposed Project*, which determines the direct and indirect effects of the proposed Federal action and the effects of any interrelated or interdependent activities on these species; and (3) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on them.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the salt marsh harvest mouse's and California clapper rail's current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of these listed species in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the salt marsh harvest mouse and California clapper rail and the role of the action area in the survival and recovery of these listed species as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Action Area

The Service defines the action area as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 Code of Federal Regulations [CFR]). For the purposes of the effects assessment, the 3.311-acre action area for the Bon Air Road Bridge Replacement Project is defined as the proposed project area (i.e., where project-related ground-disturbing construction, staging, or access activities would occur), as well as all tidal marsh habitats within 250 feet of the proposed project footprint. The action area also includes the 0.645-acre tidal marsh/upland refugia restoration site at Creekside Marsh.

Status of the Species

Salt Marsh Harvest Mouse

The status of the salt marsh harvest mouse and information about its biology, ecology, distribution, and current threats is available in the *Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (Draft Recovery Plan; Service 2010a). The Draft Recovery Plan is scheduled to be finalized in 2012. The Draft Recovery Plan features the salt marsh harvest mouse along with four other endangered species. Supplemental or updated information is provided in the Service's February 2010 five-year review for the salt marsh harvest mouse (Service 2010b). The five-year review recommended the salt marsh harvest mouse remain listed as endangered due to the continuation of threats from habitat loss due to filling, diking, subsidence, changes in water salinity, non-native species invasions, sea level rise associated with global climate change, and contamination. Habitat suitability of many marshes is further limited by small size, fragmentation, and lack of other vital features such as sufficient refugial habitat. None of the recovery units have met the Draft Recovery Plan's downlisting criteria for the protection, management, and restoration of suitable tidal marsh habitat.

California Clapper Rail

Listing Status: The California clapper rail was listed as endangered on October 13, 1970 (35 **FR** 16047). Critical habitat has not been designated for this species. The California clapper rail is a Fully Protected Species under California law (See California Fish and Game Code Section 3511).

Description: This subspecies is one of three subspecies in California listed as endangered under the Act. The other subspecies include the light-footed clapper rail, which is found in tidal marshes in southern California and northwestern Baja California, and the Yuma clapper rail, which is restricted to the Colorado River basin. The California clapper rail is distinguishable from other clapper rails by its large body size of 13 to 19 inches from bill to tail, and weighs approximately 8.8 to 12.3 ounces. It has an orange bill, a rufous breast, black and white barred flanks, and white undertail coverts (Albertson and Evens 2000). Clapper rails are sexually dimorphic; the males are slightly larger than females (Garcia 1995). Juveniles have a pale bill and dark plumage. Clapper rails are capable of producing several vocalizations, most common of which are a series of keks or claps (Massey and Zembal 1987).

Natural History and Distribution: The California clapper rail is endemic to tidally influenced salt and brackish marshes of California. Historically, the California clapper rail occurred in tidal marshes along California's coast from Morro Bay, San Luis Obispo County, to Humboldt Bay, Humboldt County. Currently, California clapper rails are known to occur in tidal marshes in the San Francisco Bay Estuary (Estuary) (San Francisco, San Pablo, Grizzly, Suisun and Honker bays) (Olofson Environmental, Inc. 2011; CDFG 2011). California clapper rails are typically

found in the intertidal zone and sloughs of salt and brackish marshes dominated by pickleweed, Pacific cordgrass, *Grindelia*, saltgrass, jaumea, and adjacent upland refugia. They may also occupy habitats with other vegetative components, which include, but are not limited to, bulrush, cattails, and Baltic rush.

In northern San Francisco Bay, California clapper rails also occur in tidal brackish marshes that vary significantly in vegetation structure and composition, ranging from salt-brackish marsh to fresh-brackish marsh transitions (Service 2010a). Use of brackish marshes by California clapper rails is largely restricted to major sloughs and rivers of San Pablo Bay and western Suisun Marsh, and along portions of Coyote Creek in the South Bay (Service 2010a). California clapper rails were also found in nearly pure stands of alkali bulrush along Guadalupe Slough in 1990 and 1991 (H. T. Harvey & Associates 1990a, 1990b and 1991). On rare occasions, California clapper rails have been recorded even further upstream, in brackish/freshwater transition marshes, particularly during the non-breeding season. Although it has been suggested that habitat quality may be lower in brackish marshes than in salt marshes (Shuford 1993), further studies comparing reproductive success in different marsh types are necessary to determine the value of brackish marshes to California clapper rails.

The breeding period of the California clapper rail is prolonged. Pair bonding and nest building are generally initiated by mid-February. Nesting may begin as early as late February or early March (Evens and Page 1983), and extend through July in the South Bay, and into August in the North Bay (DeGroot 1927, Service unpubl. data). The end of the breeding season is typically defined as the end of August, which corresponds with the time when eggs laid during re-nesting attempts have hatched and young are mobile.

California clapper rails require an intricate network of sloughs to provide abundant invertebrate populations (Grinnell *et al.* 1918, DeGroot 1927, Harvey 1988, Collins *et al.* 1994) and escape routes from predators, particularly for vulnerable flightless young (Taylor 1894, Adams 1900, DeGroot 1927, Evens and Page 1983, Foerster *et al.* 1990, Evens and Collins 1992). In addition, the small natural berms along tidal channels with relatively tall vegetation, such as *Grindelia stricta*, provide elevated nesting substrate. Harvey (1988) and Foerster *et al.* (1990) reported mean clutch sizes of 7.27 and 7.47 eggs for California clapper rails, respectively. The California clapper rail builds a bowl shaped platform nest of marsh vegetation and detritus (DeGroot 1927; Harvey 1988; Foerster *et al.* 1990). The California clapper rail typically feeds on benthic invertebrates, but its diet is wide ranging, and includes seeds, and occasionally small mammals such as the salt marsh harvest mouse.

Dispersal or movements by clapper rails in California occurs between and outside of marshes (Orr 1939; Zembal *et al.* 1985; San Francisco Bay Bird Observatory 1986; Page and Evens 1987; Albertson 1995). Post-breeding dispersal has been documented during the fall and early winter (Lindsdale 1936, Orr 1939, Service unpubl. data, Albertson 1995). There is no clear evidence of

migratory behavior in the California clapper rail. However, infrequent long distance dispersal does occur.

Threats: An estimated 40,191 acres of tidal marshes remained in 1988 of the 189,931 acres of tidal marsh that historically occurred in the Estuary; this represents a 79 percent reduction from historical conditions (Goals Project 1999). The suitability of many remaining marshes for California clapper rails is limited, and in some cases precluded, by their small size, fragmentation, and lack of tidal channel systems and other micro-habitat features. These limitations render much of the remaining tidal marsh acreage unsuitable or of low value for the species. Habitat loss has dramatically slowed since the California clapper rail was listed in 1970, but ongoing disturbance and degradation precludes or reduces occupation of much of the remaining potential habitat by California clapper rails. Remaining habitat has been fragmented by levee systems that reduce and isolate patches of habitat, reduce/eliminate high marsh and refugial habitat, and make habitat accessible to predators and human disturbance. Habitat has been filled, subjected to many contaminants, converted to less suitable vegetation conditions by fresh wastewater discharges, and submerged by land subsidence caused by agricultural practices and groundwater overexploitation.

Loss of upper marsh vegetation has greatly reduced available habitat throughout the range of the California clapper rail. Most marshes in the South Bay are adjacent to steep earthen levees that have all but eliminated upper marsh vegetation and reduced available cover for California clapper rails during winter flood tides. In Suisun Marsh, high marsh vegetation has been eliminated by diking and livestock grazing. In addition to the problems associated with landscape alteration caused by development, California coastal wetlands are expected to be subject to the effects of global sea level rise and climate change due to global warming. The effects of past subsidence of marsh plain relative to mean tidal level, particularly in the South Bay (Atwater *et al.* 1979), are likely to be amplified by rising tidal levels.

Other than outright habitat loss due to marsh reclamation, significant historic degradation to California clapper rail habitat quality in remaining tidal marshes is caused by numerous human-caused physical and biological changes in the San Francisco Bay Estuary tidal marshes, including: construction and maintenance of dikes in tidal wetlands; replacement of tidal refugia along landward marsh edges with unbuffered urban edges; conversion of salt marsh to brackish-fresh marsh by urban fresh wastewater discharges; structural habitat change caused by non-native plant invasions (such as perennial pepperweed (*Lepidium latifolium*), ice plant, and mustard in high marsh); increased predation by attracted avian and mammalian predators due to availability of man-made structures (e.g., electrical towers, buildings, and boardwalks); increased disturbance from recreational access, including humans and dogs; reduced habitat quality and increased predation pressure from litter and debris; and contamination of marsh sediments, which may impact California clapper rails directly or indirectly (potential direct effects include toxicity to adults, chicks, or embryos, and potential indirect effects include reduced prey quality, quantity, and availability, and altered vegetation structure/composition for nesting and sheltering). Few of

these causes of habitat degradation are independent of one another; they interact and mutually amplify (Service 2010a).

Wastewater discharges that alter natural salinity levels in tidal waters can adversely affect California clapper rail populations and other species. Since about 1970, freshwater discharges on the order of 120 million gallons/day from the San Jose Water Pollution Treatment Plant have led to the conversion of approximately 300 acres of former salt marsh to fresh and brackish marsh at the southern end of San Francisco Bay along Coyote Creek and adjoining sloughs of the Santa Clara Valley (H.T. Harvey and Associates 1997). Marsh conversion may lower the habitat quality and carrying capacity of tidal marshes to support California clapper rails, as evidenced by lower population and nesting densities recorded in brackish marshes than salt marshes (H.T. Harvey and Associates 1989).

California clapper rails vary in their sensitivity to human disturbance, both individually and between marshes. California clapper rails have been documented nesting in areas with high levels of disturbance, including areas adjacent to trails, dikes, and roads heavily used by pedestrian and vehicular traffic (J. DiDonato pers. comm., Baye *in litt.* 2008). In contrast, Albertson (1995) documented a California clapper rail abandoning its territory in the Laumeister Tract, shortly after a repair crew worked on a nearby transmission tower.

California clapper rail reactions to disturbance may vary with season; however, both breeding and non-breeding seasons are critical times. California clapper rail mortality is greatest during the winter, primarily due to predation during extreme winter high tides (Eddleman 1989; Albertson 1995). Human-related disturbance may increase the California clapper rail's vulnerability to predators. During high tides, California clapper rails and other wildlife hide within any available cover in the transition zone and high marsh. As people approach, the birds may flush and attract predators. The presence of people and their pets in or near the high marsh plain or upland areas during marsh inundation may even prevent California clapper rails from leaving the lower marsh plain to seek cover, which also leaves them vulnerable to predation (Evens and Page 1983; Evens and Page 1986). Public trails that run along a narrow marsh transition zone may be particularly hazardous to California clapper rails that depend on this habitat for refuge during high tides.

Throughout the Estuary, the remaining California clapper rail population is impacted by a suite of mammalian and avian predators. At least 12 native and three non-native predator species are known to prey on various life stages of the California clapper rail (Albertson 1995). Artificially high local populations of native predators, especially raccoons, skunks, and common ravens occur due to the presence of landfills and other sources of human food waste adjacent to marshes. Feral cats also represent another predation threat on adult and young California clapper rails near residential areas and landfills (Albertson 1995). Non-native Norway rats have long been known to be effective predators of California clapper rail nests (DeGroot 1927; Harvey 1988; Foerster *et al.* 1990). According to Harvey (1988) and Foerster *et al.* (1990), predators, especially rats,

accounted for California clapper rail nest losses of 24 to 29 percent in certain South Bay marshes. Placement of shoreline riprap, levees, buildings, and landfills favor rat populations, which results in greater predation pressure on California clapper rails in certain marshes. Encroaching development displaces lower order predators from their natural habitat and adversely affects higher order predators, such as coyotes, which will normally limit population levels of lower order native and non-native predators, especially red foxes (Albertson 1995).

These predation impacts are exacerbated by a lack of high marsh and natural high tide cover in most remaining marshes. DeGroot (1927) noted that clapper rails were extremely vulnerable to predation by raptors during high tide events when they were forced to seek refuge in exposed locations. Similarly, Johnston (1956 and 1957) and Fisler (1965) observed heightened predator activity in marshes coinciding with extreme high tides. Evens and Page (1986) also documented the susceptibility of California black rails to predation during extreme high tides. More recently, California clapper rail predation was noted in west Marin during extreme high tides in 2005 (G. Block, pers. comm.). There is an abundance of falcons, raptors, egrets, and herons during high tides that opportunistically take advantage of prey during this vulnerable period.

The proliferation of non-native red foxes into tidal marshes of the South Bay since 1986 has had a profound effect on California clapper rail populations. As a result of the rapid decline and almost complete elimination of California clapper rail populations in certain marshes, the Don Edwards San Francisco Bay National Wildlife Refuge implemented a predator management plan in 1991 (Foerster and Takekawa 1991) with an ultimate goal of increasing California clapper rail population levels and nesting success through management of red fox predation. This program was successful in increasing the South Bay California clapper rail populations from an all-time low.

Mercury accumulation in eggs is perhaps the most significant contaminant problem affecting California clapper rails in the Estuary, with the South Bay containing the highest mercury levels. Mercury is extremely toxic to embryos and has a long biological half-life. Schwarzbach *et al.* (2006) found high mercury levels and low hatching success (due both to predation and, presumably, mercury) in California clapper rail eggs throughout the Estuary. California clapper rail habitat is also at risk of contamination due to oil spills (Baker *et al.* 2009).

The population viability analysis for California clapper rails identified changes in adult survivorship as the factor with the largest influence on population growth rates (M. Johnson, pers. comm.). Another model also indicates that adult survivorship of California clapper rails is the primary demographic variable for maintaining a stable population or causing the population to either increase or decline (Foin *et al.* 1997). These models indicate that survival of adult birds have the strongest effect on the perpetuation or extinction of the overall population.

Population Status and Trends: The California clapper rail population was first estimated at 4,200 to 6,000 birds between 1971-1975, of which 55 percent occurred in the South Bay and 38 percent in the Napa Marshes (Gill 1979). Although the population was estimated at only 1,500 between 1981-1987 (Harvey 1988), the difference between these two estimates is believed to be partially due to survey intensity. Breeding season density data indicate that populations remained stable during the 1970s (Gill 1979, Harvey 1980), but reached an estimated all-time historical low of about 500 birds in 1991, with about 300 California clapper rails in the South Bay (Harding *et al.* 1998). California clapper rail numbers have rebounded between the 1990s and 2007. However, substantial increases in population may be difficult to achieve due to the current disjunct distribution of their habitat (Albertson and Evens 2000).

Bay-wide California clapper rail numbers have been declining overall since 2007, and the decline is highly correlated with efforts to eradicate invasive *Spartina* in the San Francisco Estuary. U.S. Geological Survey data suggest that Bay-wide California clapper rail call count numbers declined by as much as 50 percent between 2007 and 2011. PRBO Conservation Science conducted Estuary-wide surveys of the San Francisco Bay for California clapper rail between 2005 and 2010. Results of the 2008 survey indicated only 543 rails, compared to 938 rails detected in 2007 (PRBO Conservation Science 2009a). In both years, the South Bay accounted for the majority of California clapper rails. Between 2005 and 2008, the estimated Estuary-wide total population of California clapper rails decreased by about 21 percent (Liu *et al.* 2009). The South Bay population of California clapper rails decreased by 54 percent between 2007 and 2008 (Liu *et al.* 2009). Invasive Spartina Project California clapper rail survey data collected at 30 sites from 2004-2010 also shows an overall decline in California clapper rails. The population increased by 25 percent between 2005 and 2006 and by 25 percent again between 2006 and 2007. Count numbers then decreased by 35 percent between 2007 and 2008, by 32 percent from 2008 to 2009 and by 13 percent from 2009 to 2010.

Data collected by the Invasive Spartina Project from 2004 to 2010 at 30 sites within the San Leandro Bay, the Hayward region, the San Francisco Peninsula, and the Newark region, showed a decline in California clapper rail numbers from 519 in 2007 to 202 in 2010. U.S. Geological Survey data suggests that, Estuary-wide California clapper rail call count numbers declined by approximately 50 percent between 2007 and 2011. According to the *California Clapper Rail Population Monitoring Report: 2005-2008*, the Estuary-wide California clapper rail population showed an overall negative trend (-20.6 percent, $P < 0.0001$) from 2005 to 2008, which can be mostly attributed to the 57 percent decline seen in the South Bay from 2007 to 2008 (PRBO Conservation Science 2009b). This decrease in the population of California clapper rails in 2008 is highly correlated with large scale *Spartina* eradication during this period which resulted in the loss of cover. No new cover was created or enhanced for California clapper rail to compensate for this loss. In 2010, PRBO Conservation Science detected an increase of California clapper rails in San Pablo Bay and South San Francisco Bay, while the Invasive Spartina Project detected a decline at other locations. This difference suggests that mature marshes (surveyed by PRBO Conservation Science) which received a high degree of hybrid *Spartina* control still provided

enough native habitat to support stable California clapper rail population, while young marshes (surveyed by the Invasive Spartina Project), where hybrid *Spartina* was a more significant component of marsh vegetation cover, no longer provided habitat for California clapper rails because California clapper rails in these marshes were dependent on the hybrid *Spartina* for cover. It is unknown if the increased number of California clapper rails detected at some locations is due to high breeding success or is a result of immigration from marshes where *Spartina* treatment resulted in a loss of high tide refugia habitat. In addition, high tide surveys conducted by East Bay Regional Parks District showed decreases in California clapper rail numbers in San Leandro Bay since 2007. An extreme decline on East Bay Regional Parks District land occurred at Arrowhead Marsh which decreased from 112 California clapper rails in 2007 to 35 in 2010.

Recovery Actions: The *Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (Draft Recovery Plan; Service 2010a) is an expansion and revision of *The California Clapper Rail and Salt Marsh Harvest Mouse Recovery Plan* (Service 1984). The Draft Recovery Plan is scheduled to be finalized this year. The Draft Recovery Plan features the California clapper rail along with four other endangered species. The Draft Recovery Plan identifies high priority areas for tidal marsh and ecotone restoration including restoring many of the salt ponds and other diked baylands along San Francisco Bay to tidal action. Thousands of acres of former salt ponds and other diked baylands along San Francisco Bay have been restored or are proposed to be restored to tidal action (Service file number 81420-2008-F-0621; Service 2008); however, it may take decades before many of the heavily subsided areas within the former salt ponds accumulate enough sediment to become suitable tidal marsh habitat for California clapper rails. The Don Edwards San Francisco Bay National Wildlife Refuge with assistance from the U.S. Department of Agriculture Wildlife Services currently manages mammalian and avian predators within California clapper rail habitat on its refuge lands in the South Bay and on CDFG lands; however, the Predator Management Program is underfunded. The Invasive Spartina Project was thought to be an important recovery action, but it has not been implemented as envisioned.

Environmental Baseline

Bon Air Road Bridge Replacement Project Site

The 3.311-acre action area for the Bon Air Road Bridge Replacement Project includes the proposed project area (i.e., where project-related ground-disturbing construction, staging, or access activities would occur), as well as all tidal marsh habitats within 250 feet of the proposed project footprint. The action area encompasses the Bon Air Bridge, portions of Bon Air Road and South Eliseo Drive, Corte Madera Creek, and a small portion of the most southeastern part of the 21-acre Creekside Marsh. Land uses adjacent to the action area include residential, commercial, recreational, and natural/open space. Habitats within the action area include: ruderal/annual grassland (0.185 acre); landscaped ornamental (0.227 acre); riverine wetland

(0.153 acre); saline emergent wetland (0.291 acre); riverine/open water (1.283 acres); and developed areas, including roads, sidewalks, and road shoulders (1.172 acres).

The distribution of ruderal/annual grassland in the action area is limited to narrow swaths located adjacent to Bon Air Road and the paved paths (Marin County Flood Control District levee maintenance road on the west and Corte Madera Creek Pathway on the east) on both sides of Corte Madera Creek north of the Bon Air Road Bridge. The ruderal annual grassland is characterized by a high proportion of non-native plant species, including naturalized annual grasses. Annual grasses observed in the ruderal annual grassland were wild oat, foxtail barley, rattlesnake grass, soft chess, and ripgut brome. Forbs observed in the ruderal annual grassland were fennel, prickly lettuce, and bristly ox-tongue. The ruderal annual grassland in the study area is subject to regular maintenance (e.g., mowing).

The landscaped/ornamental portions of the action area are associated with the neighborhood located north of the bridge on the west side of Corte Madera Creek and the commercial development located south of the bridge on both sides of the creek. As indicated, these areas are vegetated with ornamental species planted for landscaping purposes. Oleander, pepper tree, English ivy, and Monterey pine occur within the landscaped/ornamental areas.

A narrow fringe of riverine wetland occurs below the high tide line along both banks of Corte Madera Creek on each side of the bridge. The high tide line refers to the intersection of the land with the water's surface at the maximum height reached by a rising tide. The riverine wetlands contain a mixture of native and non-native plants. Native species observed in the riverine wetlands were alkali heath, pickleweed, saltgrass, gumweed, and western marsh-rosemary. Non-native species present were dense-flowered cord grass and alkali Russian thistle.

The saline emergent wetland is located within the most southeastern section of Creekside Marsh northeast of the bridge in the low area between Bon Air Road and Corte Madera Creek Pathway. The saline emergent wetland is considered estuarine because it is a tidally influenced wetland adjacent to Corte Madera Creek that is semi-enclosed by land. Plant species observed in the saline emergent wetland were saltgrass, alkali heath, pickleweed, western marsh-rosemary, arrowgrass, Mojave seablite, and big bulrush. The saline emergent wetland is known to contain a breeding population of California clapper rails and contains suitable habitat for the salt marsh harvest mouse.

The riverine/open water community type consists of Corte Madera Creek which is approximately 337 feet wide within the action area. Riverine wetlands are associated with the banks of the creek. The substrate is silt and sand. Corte Madera Creek is tidally influenced and consequently has a high salinity level. Corte Madera Creek is considered a water of the United States based on its hydrological connection with San Francisco Bay.

The developed cover type consists of the Bon Air Road Bridge, portions of Bon Air Road and South Eliseo Drive, and the sidewalks and road shoulders adjacent to these areas. These areas are essentially unvegetated and do not provide habitat for wildlife.

Creekside Marsh Restoration Site

The proposed 0.645-acre tidal marsh/upland refugia revegetation site at Creekside Marsh is located along about 700-feet of the southwestern edge of Creekside Marsh about 1,000-1,700 feet upstream (north) of the Bon Air Road Bridge (areas outlined in turquoise in Figure 2). The proposed tidal marsh restoration occurs within a larger approximately 21-acre tidal marsh at Creekside Marsh that is surrounded by dense residential development and a large hospital within the City of Larkspur. A pedestrian trail/maintenance road forms the southern edge of Creekside Marsh separating the tidal marsh from Corte Madera Creek; this trail runs parallel to the proposed tidal marsh tidal marsh/upland refugia revegetation site. Heavily used recreational facilities are on three sides of Creekside Marsh: commuters cycling to the Larkspur Ferry Terminal, Marin General Hospital, and other businesses; students from four nearby schools; residents exercising and walking dogs; and families using the playgrounds and picnic areas at the park provide heavy traffic. Although dogs are supposed to be leashed, there is limited enforcement and many dogs run free; it is common for them to chase birds in the creek and to run into the edge of Creekside Marsh. There is a visible need for planting around the marsh to reduce the impacts of people and their pets on wildlife in Creekside Marsh.

Creekside Marsh supports a known breeding population of California clapper rails and contains suitable habitat for the salt marsh harvest mouse and an historic occurrence of the mouse. Creekside Marsh has a limited amount of upland refugia cover for the salt marsh harvest mouse and California clapper rail. With limited upland refugia cover available, salt marsh harvest mice and California clapper rails at Creekside Marsh are vulnerable to predation during high tide events when the mice and the rails escape the flooded marsh to seek cover in the adjacent upland areas. The Friends of Corte Madera Creek Watershed are currently proposing the restoration of an additional 1.42 acres of tidal marsh/upland refugia habitat at Creekside Marsh as compensation for the effects of the Transportation Authority of Marin's Central Marin Ferry Connector Multi-use Pathway Phase 1 Project on the salt marsh harvest mouse and California clapper rails (areas outlined in red in Figure 2) (Service file number 81420-2011-F-0376, Service 2011).

Salt Marsh Harvest Mouse

The action areas for the proposed Bon Air Road Bridge Replacement Project and Creekside Marsh tidal marsh restoration are both located within the Draft Recovery Plan's Central/South San Francisco Bay Recovery Unit within the range of the southern subspecies of the salt marsh harvest mouse (*R. r. raviventris*) (Service 2010a). The population status of the southern subspecies is more precarious than that of the northern subspecies (*R. r. halicoetes*). Few major,

resilient, or secure populations persist. The current populations are very small and isolated compared with the historical pattern of distribution and abundance of the subspecies. All major population centers of the southern subspecies are remote from one another based on dispersal distances known for the species. The small populations and higher degree of isolation of the southern subspecies in Marin County indicate a high probability of local extirpation due to inability to recolonize following local extinction (Service 2010a).

There are nine California Natural Diversity Database (CNDDB) occurrences of the salt marsh harvest mouse within 5 miles of the action area (CDFG 2011). The closest occurrence (from 1959) is within the action area immediately upstream of the Bon Air Road Bridge at Creekside Marsh (CNDDB occurrence number 39, CDFG 2011). The salt marsh harvest mouse has also been observed about 1.6 miles downstream of the Bon Air Road Bridge at the Corte Madera Ecological Reserve south of the mouth of Corte Madera Creek (CNDDB occurrence number 6, CDFG 2011). Below is a summary of the salt marsh harvest mouse trapping data from the Corte Madera Ecological Reserve from the 1970s and 1980s (http://legacy.sfei.org/ecoatlas/smhm/):

1. Three salt marsh harvest mice captured in tidal marsh habitat at the Corte Madera Ecological Reserve during 100 trapping nights in 1971 (capture efficiency (CE) = 3.00) (site number 3; Schaub, CDFG, unpubl. data);

2. Six salt marsh harvest mice captured in tidal marsh habitat at the Corte Madera Ecological Reserve during 100 trapping nights in 1974-1975 (CE = 6.00) (site number 29; Schaub, CDFG, unpubl. data);

3. Two salt marsh harvest mice captured in tidal marsh habitat at the Corte Madera Ecological Reserve during 200 trapping nights in 1980 (CE = 1.00) (site number 121; Simons, CDFG, unpubl. data); and

4. Nineteen salt marsh harvest mice captured in tidal marsh habitat at the Corte Madera Ecological Reserve during 672 trapping nights in 1981 (CE = 2.83) (site number 138; CH2M Hill, unpubl. data).

The saline emergent wetland within the action area to the northeast of the Bon Air Road Bridge provides suitable habitat for salt marsh harvest mouse. Salt marsh harvest mice also likely use the ruderal/annual grassland and other upland areas adjacent to the saline emergent wetland when the wetland is inundated during extreme high tides or storm events. Although the habitat immediately adjacent to the bridge is lower quality than the adjacent saline emergent wetland, salt marsh harvest mice could occasionally occur in the area adjacent to the bridge, particularly during extreme high tides when the marsh plain is flooded. Due to the occurrence of suitable habitat within the action area and the proximity to a known occurrence of the species, the Service believes the salt marsh harvest mouse to be present within all suitable marsh, upland refugia, and riverine wetland habitats within the action area.

The action area for the proposed tidal marsh restoration at Creekside Marsh provides suitable habitat for the salt marsh harvest mouse but has limited upland refugia cover. Salt marsh harvest mice within Creekside Marsh are subjected to frequent disturbance by dogs and people due its location near high-traffic pedestrian areas. Due to the occurrence of suitable habitat within the action area and the proximity to a known occurrence of the species, the Service believes the salt marsh harvest mouse to be present within all suitable tidal marsh and upland refugia habitats at Creekside Marsh.

California Clapper Rail

The action areas for the proposed Bon Air Road Bridge Replacement Project and Creekside Marsh tidal marsh restoration are both located within the Draft Recovery Plan's Central/South San Francisco Bay Recovery Unit (Service 2010a). Surveys conducted for the Invasive Spartina Project confirmed the presence of breeding California clapper rails in the tidal marsh of Creekside Marsh immediately upstream of the Bon Air Road Bridge (Olofson Environmental, Inc. 2008, 2011). Between 10 and 28 California clapper rails were estimated to be in the 21-acre tidal marsh at Creekside Marsh near the proposed project during breeding season surveys in 2008 including two California clapper rails observed within 250 feet north (upstream) of the Bon Air Road Bridge (Olofson Environmental, Inc. 2008). Breeding season surveys conducted in 2010 confirmed the presence of between four and six California clapper rails at Creekside Marsh including one California clapper rail observed about 250 feet north (upstream) of Bon Air Road Bridge (Olofson Environmental, Inc. 2011). No California clapper rails were observed immediately south (downstream) of Bon Air Road Bridge during breeding season surveys conducted in 2008 and 2010 (Olofson Environmental, Inc. 2008, 2011). However, two pairs of California clapper rails were observed along Larkspur Creek downstream of the Doherty Drive Bridge about 3,700 feet southeast of Bon Air Road Bridge during breeding season surveys in 2011 (WRA, Inc. 2011). Breeding season surveys conducted in 2008 also confirmed the presence of between 18 and 28 California clapper rails at the Corte Madera Ecological Reserve near the mouth of Corte Madera Creek about 1.5 miles downstream of Bon Air Road Bridge (Olofson Environmental, Inc. 2008).

Breeding habitat for the California clapper rails occurs within the action area northwest of Bon Air Road Bridge within the approximately 190-foot wide saline emergent marsh of southeastern Creekside Marsh between the Corte Madera Creek Pathway and Bon Air Road. Breeding California clapper rails within the saline emergent marsh are likely exposed to substantial levels of noise disturbance due its location between the high-traffic Bon Air Road and the heavily used pedestrian pathway/maintenance road along the other side of the marsh. California clapper rails also likely use the ruderal/annual grassland and other upland areas adjacent to the saline emergent wetland when the wetland is inundated during extreme high tides or storm events. Suitable dispersal and foraging habitat for the California clapper rail occurs within the riverine wetlands and creek bank along Corte Madera Creek both upstream and downstream of the Bon Air Road Bridge. Due to the occurrence of suitable habitat within the action area and the recent

observations of California clapper rails within and near the action area, the Service believes the California clapper rail to be present within all suitable marsh, upland refugia, and riverine wetland habitats within the action area.

The action area for the proposed tidal marsh restoration at Creekside Marsh provides suitable habitat for the California clapper rail but has limited upland refugia cover. California clapper rails are known to breed near the proposed restoration site at Creekside Marsh. California clapper rails at Creekside Marsh are subjected to frequent disturbance by dogs and people due to its location near high-traffic pedestrian areas. Due to the occurrence of suitable habitat within the action area and the recent observations of California clapper rails within and near the action area, the Service believes the California clapper rail to be present within all suitable tidal marsh and upland refugia habitats at Creekside Marsh.

Effects of the Proposed Action

Salt Marsh Harvest Mouse and California Clapper Rail

Bon Air Road Bridge Replacement

Direct Effects

Construction of the proposed project could result in the harassment or harm of individual salt marsh harvest mice and California clapper rails during construction activities and the removal and disturbance of suitable habitat. Noise, vibrations, and work at night will result in the harassment of individual salt marsh harvest mice and California clapper rails and expose the mice and rails to predation if they were flushed from cover or prevented from seeking available cover. Trash left within the work area may also attract predators to the action area resulting in increased levels of predation of salt marsh harvest mice and California clapper rails. The eight days of night work would subject individual salt marsh harvest mice and California clapper rails to artificial light conditions, which could affect their ability to forage or increase their risk of predation. Night work (girder deliveries) would occur in approximately 2–3 day blocks in September 2014, January 2016, and July 2016.

The City will minimize the potential for injury and mortality of the salt marsh harvest mouse and California clapper rail during construction of the proposed project by having a Service-approved biologist monitor the removal of all vegetation within the work area by hand, installing temporary exclusion fencing around all work areas, and conducting environmental awareness training for all construction personnel. Individual salt marsh harvest mice and California clapper rails, however, will still be harassed by construction activities conducted within and near suitable habitat for these species. Also, salt marsh harvest mice and California clapper rails could be killed by predators if construction personnel left trash at the work site attracting predators to the area.

Any construction activities conducted near suitable breeding habitat for the California clapper rail during the rail's breeding season could result in the loss of breeding activity or nest abandonment and the mortality of all the chicks in the nest. The City will minimize the potential for disturbing breeding California clapper rails by avoiding all pile driving within the action area during the rail's February 1 through August 31 breeding season. Additionally, no construction activities will occur on the north (upstream) side of the bridge (i.e., the side of the bridge closest to breeding habitat at Creekside Marsh) during the rail's breeding season. Construction activities, other than pile driving, will occur on the south (downstream) side of the bridge (i.e., the side of the bridge further away from breeding habitat) during the rail's breeding season. Therefore, the potential for disturbing breeding California clapper rails will be minimized. Breeding California clapper rails within the action area appear to be accustomed to current levels of human recreational activity along the adjacent Corte Madera Creek Pathway. Thus, construction activities (other than pile driving) conducted on the downstream side of the bridge during the breeding season are not likely to disturb any breeding California clapper rails within the action area.

Construction of the proposed project could result in the contamination of the riverine wetlands or saline emergent marsh within the action area if fuel other hazardous materials were spilled into the creek or adjacent wetlands. The City will minimize the potential for the degradation of the wetlands by implementing a spill prevention plan, SWPPP, and BMPs.

Construction activities will result in the permanent removal of 0.027 acre and long-term temporary disturbance (two years) of 0.126 acre of lower quality foraging and dispersal habitat for the salt marsh harvest mouse and California clapper rail within the riverine wetlands along Corte Madera Creek. This habitat is located immediately adjacent to the bridge. There will be no permanent loss or temporary disturbance of suitable breeding habitat for the salt marsh harvest mouse and California clapper rail; the larger saline emergent wetland within Creekside Marsh will be avoided. The disturbance of a total of 0.153 acre of lower quality foraging and dispersal habitat for the salt marsh harvest mice and California clapper rail will be offset by the restoration of 0.459 acre of suitable tidal marsh/upland refugia habitat for the salt marsh harvest mouse and California clapper rail at Creekside Marsh. The restored tidal marsh/upland refugia habitat will provide breeding, feeding, or sheltering commensurate with or better than habitat lost as a result of the effects from the construction of the proposed project.

Indirect Effects

Potential indirect effects that could disturb salt marsh harvest mice and California clapper rails include traffic-related impacts, including traffic noise; increased disturbance from humans and dogs; increased predation by cats and other predators; degradation of upland refugia cover due to increased cover of highly invasive plant species; and increased lighting.

The two-lane bridge currently carries approximately 11,800 vehicles a day and serves primarily local traffic for the Cities of Larkspur and Kentfield. The proposed bridge replacement would not increase the number of travel lanes or the capacity of the bridge to accommodate additional vehicular traffic. Therefore, the proposed project would not increase the volume of traffic on the bridge. Population growth in the area over the next 25 years is expected to increase by approximately 7 percent (Parsons Brinckerhoff 2011), and this growth is expected to increase traffic volumes on the bridge by a commensurate amount, but this growth would occur even without implementation of the proposed project. The local area in which the bridge is located is nearly built out, and there are no plans for new roadways that would bring outside traffic to the bridge. Therefore, increased capacity and the resulting increase in traffic noise would not occur, other than under normal growth conditions, and would not be an indirect effect of the proposed project.

The riverine wetland and saline emergent wetland are located within Creekside Marsh, which has a popular recreational path along the east side of Corte Madera Creek. People use this path for walking, jogging, bicycling, and dog walking. The salt marsh harvest mice and California clapper rails that breed within Creekside Marsh appear to be accustomed to the human activity that regularly occurs along the recreational path. Pedestrians and bicyclists that use this path may access it across the Bon Air Road Bridge. There is an existing 8-foot Class 1 bicycle path (a protected lane separated from traffic by a barrier) on the north side of the bridge and a 5-foot sidewalk on the south side of the bridge. The new structure will have a 6-foot Class 1 bicycle path and 5-foot sidewalk in each direction. These changes would improve safety, but would not change travel patterns or provide new connections to newly developed areas. The proposed project, when complete, would not affect access to the trail or otherwise result in increased use of the trail. Therefore, increased disturbance of salt marsh harvest mice and California clapper rails from pedestrians, bicyclists, and dogs would not occur and is not an indirect effect of the proposed project.

Potential increased predation by common city mammals (skunks, raccoons) and cats can be an indirect effect if the proposed project results in an increase of human presence. Increased inhabitance of people may result in an increase in the number of cats in an area. An increased presence or use by people can result in an increase in garbage, which can in turn attract potential predators to an area. The proposed project, when complete, would not result in an increase of humans inhabiting the area, nor would it affect access to the Corte Madera Creek Pathway or otherwise result in increased use of the trail (as discussed above). Therefore, increased predation of salt marsh harvest mice by cats or common city mammals as a result of increased human inhabitance or presence would not occur and is not an indirect effect of the proposed project. However, salt marsh harvest mice and California clapper rails could be killed by predators if construction personnel left trash at the work site attracting predators to the area.

Another potential indirect effect of the proposed project is an increase in the cover of invasive plant species including non-native perennial pepperweed in all areas temporarily disturbed and

adjacent areas. Perennial pepperweed provides poor upland refugia cover for the salt marsh harvest mouse and California clapper rail because it is leafless in the winter when the mouse and rail most require upland refugia cover during the frequent winter extreme high tides and storm events. Without suitable upland refugia cover, the salt marsh harvest mouse and California clapper rail are more susceptible to predation during extreme high tide events. Perennial pepperweed displaces higher quality upland refugia cover such as gumplant and may also displace essential salt marsh plant species such as pickleweed. The City will minimize the potential for the spread of invasive plant species within the action area by implementing a revegetation and monitoring plan.

The existing bridge structure contains five acorn style lights with 70 watt clear high pressure sodium bulbs on the north side of the bridge. The current illumination of these lights is not known. The proposed project includes the installation of a total of 12 acorn style lights, six on the north side of the bridge, and six on the south side of the bridge. If the same light fixtures and bulbs are used, there would be an increase in the amount of light emitted from existing conditions. Additionally, the illuminated area could be larger than existing conditions because of the increased number of lights. These conditions could result in disturbance of salt marsh harvest mice and California clapper rail activities by disrupting activity cycles and the internal circadian system (Rich and Longcore 2006). Disruption of the circadian clock from artificial night lighting can result in changes to foraging efficiency, risk of predation, and parental care, which could have adverse effects on the salt marsh harvest mouse and California clapper rail. These individuals would be out of sync with their neighbors living in a natural light-dark cycle, and could affect mating success (Rich and Longcore 2006). Artificial night lighting has been shown to affect nocturnal rodents. Several species of small rodents harvested an average of 21 percent less seed in response to a single fluorescent or gasoline camping lantern. Although small mammals can respond to bright moonlight by shifting foraging activities to darker conditions, this is not an option for animals subjected to artificially increased illumination throughout the night. Unless they leave the lighted area, they are either at greater risk of predation from foraging in the lighted area, or reduce their food consumption to avoid increased predation risk (Rich and Longcore 2006). The potential indirect effects of increased artificial night lighting on salt marsh harvest mice and California clapper rails will be minimized by installing lighting that minimizes spillover into the adjacent marsh.

Creekside Marsh Tidal Marsh Restoration

Direct Effects

Revegetation activities associated with tidal marsh/upland refugia restoration at Creekside Marsh may result in the harassment of all salt marsh harvest mice and California clapper rails within the 0.645-acre revegetation area. The Friends of Corte Madera Creek Watershed will minimize the level of harassment and avoid the potential for injury or mortality of the salt marsh harvest mouse and California clapper rail during revegetation activities by using only hand tools; having a

qualified biologist present during revegetation activities; avoiding work during extreme high tide events when the mouse and the rail are most vulnerable to disturbance; avoiding work during the California clapper rail's breeding season; and minimizing the disturbance of the marsh.

Indirect Effects

The indirect effects of the revegetation activities at Creekside Marsh are all expected to be beneficial to the salt marsh harvest mouse and California clapper rail. The restoration of upland refugia cover at Creekside Marsh will reduce the potential for predation of salt marsh harvest mice and California clapper rails during extreme high tide events. The Friends of Corte Madera Creek Watershed will ensure sufficient upland refugia vegetation survives by implementing a 50 percent success criterion.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. 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 Act. The potential for project-generated effects to contribute to cumulative effects on listed species would arise if any additional project not involving a Federal action were to be constructed within the action area in the foreseeable future. Most of the projects near the action area that are known at this time would require a permit from the U.S. Army Corps of Engineers or Caltrans and/or would require consultation with the Service (e.g., Invasive Spartina Project, Doherty Drive Bridge Replacement Project, Corte Madera Creek culvert and outfall repair projects). However, other activities including sewer pipeline repair, road work, and vegetation management activities within and near the action area might not require a permit from the U.S. Army Corps of Engineers or Caltrans and/or would not require consultation with the Service. The Service is currently working with Caltrans, the City, and the Ross Valley Sanitary District to minimize the effects of local construction activities on nesting California clapper rails within and near the action area by avoiding conducting construction activities near suitable breeding habitat during the rail's breeding season (e.g., Kentfield Force Main Replacement Project, Doherty Drive Improvement Project).

Climate Change

The global average temperature has risen by approximately 0.6 degrees Centigrade during the 20th Century (International Panel on Climate Change [IPCC] 2001, 2007a, 2007b; Adger *et al.* 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (IPCC 2001, 2007a, 2007b; Adger *et al.* 2007), and that it is "very likely" that it is largely due to man-made emissions of carbon dioxide and other greenhouse gases (Adger *et al.* 2007). Ongoing climate change (Inkley *et al.* 2004; Adger *et al.* 2007; Kanter

2007) likely imperils the salt marsh harvest mouse and California clapper rail, and the resources necessary for their survival, since climate change threatens to disrupt annual weather patterns, it may result in a loss of their habitats and/or prey, and/or increased numbers of their predators, parasites, diseases, and non-native competitors. Where populations are isolated, a changing climate may result in local extinction, with range shifts precluded by lack of habitat. Sea level rise associated with climate change particularly threatens the salt marsh harvest mouse and California clapper rail by inundating their salt marsh and coastal habitats. Residential and urban development near the current shoreline may preclude the landward transgression of the tidal marsh with sea level rise resulting in the loss of a significant amount of habitat for the salt marsh harvest mouse and California clapper rail.

Conclusion

After reviewing the current status of the salt marsh harvest mouse and the California clapper rail, the environmental baseline for these species within the action area, the effects of the proposed project and the cumulative effects, it is the Service's biological opinion that the proposed project is not likely to jeopardize the continued existence of these species. We based this determination on the following: (1) successful implementation of the conservation measures described in this biological opinion will minimize the adverse effects on individual salt marsh harvest mice and California clapper rails; (2) the City will avoid the disturbance of breeding habitat for the salt marsh harvest mice and California clapper rail; (3) construction activities near suitable breeding habitat for the California clapper rail will be conducted outside of the rail's breeding season; (4) the relatively small acreage of marginal quality dispersal and foraging habitat that will be disturbed during construction of the proposed project; and (5) the restoration of about 0.459 acre of suitable tidal marsh/upland refugia habitat for these species at a Service-approved location within the same recovery unit.

INCIDENTAL TAKE STATEMENT

Section 9 of the Endangered Species Act and Federal regulations pursuant to section 4(d) of the Act, prohibit take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. The Service defines harassment as an intentional or negligent act or omission that creates the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. The Service defines harm to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), take that is incidental to and not intended as part of the agency action is not considered to be prohibited, provided such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are nondiscretionary, and must be implemented by Caltrans so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption under section 7(o)(2) to apply. Caltrans has a continuing duty to regulate the activity that is covered by this incidental take statement. If Caltrans: (1) fails to require the applicant or any of its contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

Salt Marsh Harvest Mouse and California Clapper Rail

The Service anticipates incidental take of individual salt marsh harvest mice and California clapper rails will be difficult to detect or quantify because of the variable, unknown size of any resident population over time, their elusive and cryptic behavior, and the difficulty of finding killed or injured animals. Due to the difficulty in quantifying the number of salt marsh harvest mice and California clapper rails that will be taken as a result of the proposed project, the Service is quantifying take incidental to the proposed project as the following:

1. The harassment and harm of all salt marsh harvest mice and California clapper rails within the 0.153 acre of foraging/dispersal habitat disturbed during construction of the Bon Air Road Bridge Replacement Project.

2. The harassment of all California clapper rails within 250 feet of the construction footprint for the Bon Air Road Bridge Replacement Project.

3. The harassment of all salt marsh harvest mice within 50 feet of the construction footprint for the Bon Air Road Bridge Replacement Project.

4. The harassment of all salt marsh harvest mice and California clapper rails within the 0.645 acre of tidal marsh/upland refugia habitat revegetated at Creekside Marsh.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the salt marsh harvest mouse or California clapper rail.

Reasonable and Prudent Measures

The Service has determined that the following reasonable and prudent measures are necessary and appropriate to minimize the effects of the proposed project on the salt marsh harvest mouse and California clapper rail:

1. Caltrans through the applicant will implement the Conservation Measures in the *Description of the Proposed Project* in this biological opinion.

2. Caltrans through the applicant will ensure compliance with this biological opinion.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, Caltrans must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. The following Terms and Conditions implement Reasonable and Prudent Measure Number One (1):

    a. All food and food-related trash items shall be enclosed in sealed trash containers and removed completely from the site at the end of each day.

    b. All suitable tidal marsh and upland refugia vegetation within the proposed project footprint and within a 2-foot buffer around the project footprint shall be removed by hand using only non-mechanized hand tools (i.e., trowel, hoe, rake, and shovel) prior to the initiation of work within these areas. Vegetation shall be removed to bare ground or stubble no higher than 1 inch. Vegetation shall be removed under the supervision of the Service-approved biologist. Vegetation removal may begin when no mice are observed and shall start at the edge farthest from the salt marsh or the poorest habitat and work its way towards the salt marsh or the better salt marsh habitat.

    c. To prevent salt marsh harvest mice from moving through the proposed project site during construction, temporary exclusion fencing shall be placed around a defined work area prior to the start of construction activities. The temporary exclusion fencing shall be installed immediately after the hand removal of all vegetation (as described above) from the work area and a 2-foot buffer around the work area. The fence shall be made of a heavy plastic sheeting material that does not allow salt marsh harvest mice to pass through or climb, and the bottom shall be buried to a depth of 4 inches so that the listed mouse cannot crawl under the fence. Fence height shall be at least 12 inches higher than the highest adjacent vegetation with a maximum height of

4 feet. All supports for the exclusion fencing shall be placed on the inside of the work area.

d. Caltrans shall ensure that the applicant minimizes the effects of nighttime work on salt marsh harvest mice and California clapper rails by using only lighting that directs light toward the bridge and away from the marsh and minimizes the amount of backward and side lighting.

e. The tidal marsh/upland refugia restoration at Creekside Marsh shall be initiated prior to the initiation of construction of the proposed project.

f. The tidal marsh/upland refugia restoration at Creekside Marsh shall achieve a minimum success criterion of 60 percent for each plant species planted instead of the proposed 50 percent success criterion.

2. The following Term and Condition implements Reasonable and Prudent Measure Number Two (2):

   a. Caltrans shall ensure that the applicant complies with the reporting requirements of this biological opinion, including a post construction report outlining how the Conservation Measures were implemented for this project.

Reporting Requirements

The Service must be notified within 24 hours of the finding of any injured or dead salt marsh harvest mouse or California clapper rail, or any unanticipated damage to their habitats associated with the proposed project. Injured salt marsh harvest mice and California clapper rails shall be cared by a licensed veterinarian or other qualified person, such as the Service-approved biologist for the proposed action. Notification must include the date, time, and precise location of the specimen/incident, and any other pertinent information. Dead animals should be sealed in a zip lock bag containing a piece of paper indicating the location, date and time when it was found, and the name of the person who found it; and the bag should be frozen in a freezer in a secure location. The Service contact persons are Coast Bay/Forest Foothills Division Chief, Endangered Species Program, at the Sacramento Fish and Wildlife Office at telephone (916) 414-6600 and Resident Agent-in-Charge of the Service's Law Enforcement Division at telephone (916) 414-6660.

The applicant shall submit a post-construction compliance report prepared by the on-site biologist to the Sacramento Fish and Wildlife Office within sixty (60) calendar days of the date of the completion of construction activity. This report shall detail (i) dates that construction occurred; (ii) pertinent information concerning the success of the project in meeting the avoidance and minimization measures; (iii) an explanation of failure to meet such measures, if

any; (iv) known project effects on the salt marsh harvest mouse and California clapper rail, if any; (v) occurrences of incidental take of these listed species, if any; (vi) documentation of employee environmental education; and (vii) other pertinent information.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and databases. For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations. We propose the following conservation recommendations to Caltrans:

1. Assist the Service in implementing recovery actions identified within the Draft Recovery Plan for the salt marsh harvest mouse and California clapper rail.

2. Avoid conducting construction activities near suitable breeding habitat for the California clapper rail during the rail's breeding season (February 1 through August 31).

3. Assist the Service and U.S. Geological Survey in constructing and monitoring nesting platforms for the California clapper rail.

4. Encourage or require the use of appropriate California native species in revegetation and habitat enhancement efforts associated with projects authorized by Caltrans.

5. Develop and implement measures to minimize the spread of non-native perennial pepperweed and other highly invasive plants that threaten upland refugia and tidal marsh habitat for the salt marsh harvest mouse and California clapper rail.

6. Restore upland refugia habitat for the salt marsh harvest mouse and California clapper rail near suitable tidal marsh habitat for these species.

7. Assist in the management of predators within tidal marsh habitat occupied by the salt marsh harvest mouse and California clapper rail.

8. Decommission trails or require that dogs be kept on a leash near breeding habitat for the California clapper rail.

9. Sightings of any listed or sensitive animal species should be reported to the CNDDB of the CDFG. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed also should be provided to the Service.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the proposed Bon Air Road Bridge Replacement Project in Marin County, California. As provided in 50 CFR 402.16, reinitiating 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 take 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 to the listed species or critical habitat that was not considered in this biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must immediately cease, pending reinitiating.

If you have any questions regarding this biological opinion on the Bon Air Road Bridge Replacement Project, please contact Joseph Terry, Senior Biologist, or Ryan Olah, Coast Bay/Forest Foothills Division Chief, at (916) 414-6600, if you have any questions regarding this response.

Sincerely,

Susan K. Moore
Field Supervisor

Enclosure

cc:
Tim Dodson, California Department of Fish and Game, Napa, California
Joe Heublein, National Marine Fisheries Service, Santa Rosa, California

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Personal Communications

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Johnson, Dr. Mike. Ecotoxicology Lead Campus Program. University of California, Davis.

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

SURVEY PROTOCOL

California Clapper Rail (*Rallus longirostris obsoletus*)

December 7, 2009

Below is a description of the standard methodology used to detect presence or absence of California clapper rail breeding activity.

Once a survey proposal using this survey methodology has been developed, it should be mailed to the U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, 2800 Cottage Way, Suite W-2605, Sacramento, California 95825. The Service will review the survey proposal and determine if it is adequate for implementation. The qualifications of all observers proposed for a survey should be included in the proposal and provided to the Service for review and approval. (Note: Submit a hard copy of the survey proposal with maps identifying the location of listening stations to the Service at least three (3) weeks prior to the scheduled initiation of the surveys.) After the surveys are completed, the survey results should be compiled and submitted to the Service for review to determine if work or any other activities proposed in the survey area may proceed.

Methodology

1. Surveys should be initiated sometime between January 15 and February 1. A minimum of four (4) surveys should be conducted. The survey dates should be spaced at least two (2) to three (3) weeks apart and should cover the time period from the date of the first survey through the end of March or mid-April. This will allow for the surveys to encompass the optimum time period when the highest frequency of calls is likely to occur.

2. Listening stations should be established no more than 200 meters apart along transects in or adjacent to marsh areas. Stations should be established so that the entire marsh is covered by 75- to 100-meter radius circular plots. Listening stations should be placed near marsh features, such as sloughs, but not along slough edges to minimize disturbance to rails. No surveyors should enter the marshes or other potential habitat areas. Surveys should be conducted from levee crowns or boardwalks to minimize disturbances to marsh areas. A detailed map depicting sloughs and other marsh landmarks or features in relation to the proposed listening stations should be developed.

3. Surveys should be conducted at sunset or sunrise. Surveys conducted at sunrise should begin 45 minutes before sunrise and continuing until 1 1/4 hours after sunrise. Surveys

conducted at sunset should begin 1 1/4 hours before sunset and continue until 45 minutes after sunset.

4. Surveys should not be conducted when tides greater than 4.5 feet NGVD as predicted at the Golden Gate occur at the marsh during the survey period or during full moon periods.

5. An observer should be assigned to each listening station for the duration of each survey. Observers should locate key marsh landmarks or features on a map in relation to teach listening station location.

6. All rail vocalizations should be recorded, noting the call type, location, and time on a detailed map of the marsh. The call types are coded as C = clapper, D = duet, K = kek, B = kek-burr with a V representing a visual sighting. Other unusual calls also should be noted. The calls of one bird or pair should be marked by circling the calls together. If a rail is moving during the survey, several locations may be noted for the same bird(s). Attention should be focused on accurately mapping the birds that are nearby, especially between observers or towards the edge of the marsh if the station is positioned at the marsh's edge.

7. At the end of each survey, observers should compare maps to determine overlap in detections and to create a master map showing all pairs and individuals located during the survey. Another master map should be developed once all surveys are completed, showing the dates and locations of detections.

8. Weather information, including wind velocities and direction, should be recorded. Call count surveys should not be conducted when wind velocities exceed 10 mph or wind gusts exceed 12 mph, or during moderate to heavy rains. Information on disturbances (e.g., dogs or cats in marsh and aircraft flyovers) occurring during the surveys should be recorded.

9. If a survey of a marsh is conducted over more than one night, observers should be assigned to stations adjacent to their previous night's station if at all possible.

10. New observers should be trained by an experienced observer. Trainees should familiarize themselves with various calls and with estimating distances to calls before training in the field. In-field training should include ways to minimize disturbance to rails and marsh vegetation. Trainees should be stationed with a permitted or experienced observer for a minimum of two (2) surveys to assess the trainee's ability to accurately detect and map calls in the field. (Note: More than two (2) surveys may be necessary if no rail calling occurs.) The Palo Alto Baylands is a marsh with many rails typically calling in the evening and easy access via a boardwalk, thus providing a favorable training opportunity for new observers and their instructors.

Appendix B

National Marine Fisheries Service Biological Opinion

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

March 30, 2012

In response, refer to:
2011/06233

Bijan Sartipi
District Director
California Department of Transportation, District 4
111 Grand Avenue
Oakland, California 94623

Dear Mr. Sartipi:

Thank you for your agency's letter of December 7, 2011, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Effective July 1, 2007, the Federal Highway Administration (FWHA) assigned, and the California Department of Transportation (Caltrans) has assumed all responsibilities for ESA consultation and approval on most highway projects in California. Therefore, Caltrans is now considered the federal action agency for ESA consultations with NMFS for federally funded projects. This letter transmits NMFS' biological opinion for Caltrans' proposed Bon Air Bridge Replacement Project (Project) on Corte Madera Creek in Marin County, California. The enclosed biological opinion describes NMFS' analysis of the effect of implementing the proposed Project on threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and threatened southern Distinct Population Segment (DPS) of the North American green sturgeon (*Acipenser medirostris*); and designated critical habitat for CCC steelhead, southern DPS green sturgeon, and CCC coho salmon (*Oncorhynchus kisutch*), in accordance with section 7 of the ESA. In the enclosed biological opinion, NMFS concludes that the Project is not likely to jeopardize the continued existence of CCC steelhead and southern DPS green sturgeon; and not likely to adversely modify designated critical habitat for CCC steelhead, southern DPS green sturgeon, and CCC coho salmon. However, NMFS anticipates take of green sturgeon as a result of the Project. An incidental take statement with non-discretionary terms and conditions is included with the enclosed biological opinion.

This letter also serves as consultation under the authority of, and in accordance with, the Essential Fish Habitat (EFH) provisions of the Magnuson Stevens Fishery Conservation and Management Act (MSA). The Bon Air Bridge location includes areas identified as EFH for various life stages of species managed under the Pacific Fishery Management Council. The MSA requires all Federal agencies to consult with NMFS on all actions, or proposed

actions, permitted, funded, or undertaken by the agency, that may adversely affect EFH. Only species managed under a Federal fishery management plan are covered by the Magnuson-Stevens Act. EFH for salmons, groundfish, and coastal pelagic species could be affected by the project. Because these species are managed under the Pacific Fishery Management Council, NMFS has included EFH Conservation Recommendations to avoid, minimize, or otherwise offset potential adverse effects to EFH.

Please contact Joe Heublein at (707) 575-1251 or joe.heublein@noaa.gov if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

Kevin Chu

for Rodney R. McInnis
Regional Administrator

Enclosures

cc: Chris Yates, NMFS, Long Beach, California
Eric Chavez, NMFS, Long Beach, California
Boris Deunert, Caltrans District 4
Hamid Shamsapour, City of Larkspur, California
Greg Martinelli, CDFG, Yountville, California
Joseph Terry, USFWS, Sacramento, California
Copy to File Administrative File: 151422SWR2012SR00008

Enclosure 1

BIOLOGICAL OPINION

ACTION AGENCY:	California Department of Transportation
ACTION:	Bon Air Bridge Replacement Project, Marin County, California.
CONSULTATION CONDUCTED BY:	National Marine Fisheries Service, Southwest Region
FILE NUMBER:	2011/06233
DATE ISSUED:	**March 30, 2012**

I. CONSULTATION HISTORY

The California Department of Transportation (Caltrans) currently acts as the Federal action agency for Endangered species Act (ESA) consultations as per the agreement with the Federal Highways Administration (FHWA) in accordance with Section 6005 (a) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (PL-109-59) to assume the FHWA Secretary's responsibilities under the National Environment Policy Act of 1969 (42 USC § 4351, *et seq.*) and all or part of the FHWA Secretary's responsibilities for environmental review, consultation, or other action required under any environmental law with respect to one or more Federally funded highway projects within the state.

A site visit between staff from ICF International (applicant's environmental consultant) and NOAA's National Marine Fisheries Service (NMFS) at the Bon Air Bridge was held on March 3, 2010. During this site visit, staff from ICF International and NMFS discussed the potential effects of the project on Central California Coast (CCC) steelhead, CCC coho salmon, North American green sturgeon, designated critical habitat, and potential avoidance, minimization, and compensation measures for these species.

In addition to the site visit described above, an agency coordination meeting was held on December 14, 2010, in Larkspur to discuss construction timing and noise issues relative to the clapper rail (*Rallus longirostris*) breeding season and steelhead migration season. In attendance were NMFS, US Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDFG), Caltrans, City of Larkspur (City), and ICF International. On January 13, 2011, NMFS' staff sent an email to Caltrans requesting additional information and outlining recommended measures to avoid and minimize project impacts on listed fish species.

On December 8, 2011, NMFS received Caltrans' Biological Assessment and December 7, 2011, letter requesting initiation of formal consultation under section 7 of the ESA for the Bon Air Bridge Replacement Project (Project). Caltrans requested formal consultation because the proposed Project was likely to adversely affect CCC steelhead and green sturgeon, and designated critical habitat for CCC steelhead, green sturgeon, and CCC coho salmon. After reviewing the Biological Assessment, NMFS found the initiation package complete and initiated formal consultation on December 12, 2011.

II. PROPOSED ACTION

Caltrans proposes to use FHWA's funds to work with the City to replace the aging, structurally deficient Bon Air Bridge. The bridge is located where Bon Air Road crosses Corte Madera Creek, two kilometers west of Highway 101 and approximately three kilometers west of the confluence of Corte Madera Creek and San Pablo Bay, in Marin County, California. The Bon Air Road Bridge was constructed in 1958, was lengthened in 1965, and seismically retrofitted and widened in1994. The proposed bridge will involve less than half the spans and columns of the existing bridge, thereby improving the conveyance capacity of the creek. The Project will be implemented by the City and will involve the use of heavy equipment (excavator, pile driver, *etc.*) to construct the new bridge and temporary trestle foundations and superstructure, and demolish the old bridge. Construction of the temporary trestles and new bridge, and demolition of the old bridge and removal of temporary trestles will occur in four sequential years between mid-2013 and late-2018; during this time, all in-water work will occur during the in-water work season (September 1 to November 30) to avoid the clapper rail breeding season and impacts to federally listed fish species.

A. Description of Project Activities

The bridge currently consists of ten spans and is 128 meters long by 13.4 meters wide; it carries one lane of traffic in each direction with a 2.4-meter bicycle path on the north side of the bridge and a 1.5-meter sidewalk on the south side of the bridge. The new bridge will be five-spans founded on four column pairs (eight total columns) with two abutments, totaling 118 meters long by 19 meters wide. The proposed bridge will generally follow the alignment of the existing bridge but will lack a curve on the northeast end (allowing a shorter length) and involve widening on the north side by approximately 4 meters. The new structure will carry one 3.6-meter lane of traffic in each direction and have a 1.8-meter bicycle path and 1.5-meter sidewalk in each direction. Proposed construction activities will take place 19 meters north and 19 meters south of the existing bridge.

Replacement of Bon Air Bridge will involve the following sequential activities: 1) construction of a temporary northern trestle and demolition of the north side of the existing bridge; 2) construction of the northern half of the bridge (*i.e.* abutments, foundation [four columns], and superstructure); 3) construction of a temporary southern trestle and demolition of the south side of the existing bridge; 4) construction of the southern half of the bridge (*i.e.* abutments, foundation [four columns], and superstructure); and 5) removal of the temporary trestles.

Construction of the new five-span bridge will require two temporary trestle bridges spanning across Corte Madera Creek. First, a temporary 9- to 15-meter wide trestle will be constructed on the north side of the existing bridge with a tie-in point to Bon Air Road. From the banks of the creek, approximately 64 12- to 14-inch steel "H" piles will be placed into the creek bed approximately 9 meters apart and 21 meters deep for the northern trestle. These piles will support the timber trestle deck, and demolition of the northern half of existing bridge and construction of the northern half of the new bridge will be accomplished from this trestle. The northern half of the existing bridge will be demolished with heavy equipment and rubble and debris will be contained and disposed of off-site; existing concrete piles will be cut approximately one foot below the channel bottom. Four new columns for the northern half of the new permanent bridge will then be constructed from the trestle. To construct each of the four new bridge columns, four temporary 10-foot diameter steel casing will be driven into the creek bottom to a depth of approximately 21 meters. After the 10-foot diameter casings are in place, an 8-foot diameter hole will be drilled inside each casing. A temporary 8-foot diameter casing may be utilized to keep the holes stable. The water in the casings will be pumped to settling tanks prior to discharge and disposed of following National Pollution Discharge Elimination System (NPDES) requirements. Concrete will then be poured into the dewatered 8-foot diameter holes. The same construction method will be used for construction of the southern portion of the bridge (*i.e.* trestle construction, existing bridge demolition, new bridge construction). Both trestle bridges will be removed after the new bridge is completed.

B. Pile Driving

The City anticipates using vibratory and impact hammers to drive all piles to a depth of 21 meters. A vibratory hammer will be used to drive piles associated with the temporary trestles (128 12- to 14-inch steel H piles) and the bridge foundation (eight 10-foot diameter steel casings) to a depth of 15 meters. An impact hammer with a bubble curtain for sound attenuation is proposed to drive all piles the remaining 6 meters. Pile driving of trestle piles and steel casings will occur on separate days in four in-water work seasons (September 1 to November 30) 2013-2018.

1. Temporary Trestle Piles

Vibratory hammer driving of individual 12- to 14-inch steel H piles (128 H-piles in total) to a depth of 15 meters will take approximately eight minutes. Approximately 550 impact hammer strikes will be required to drive each of these trestle piles an additional 6 meters. Six trestle piles will be installed per day (3,300 strikes per day), and trestle pile installation will occur over 10-12 days between September 1 and November 1 in the first and second years of construction (2013 and 2014). Extraction of trestle piles will be accomplished with a vibratory hammer, and may take between 40 minutes and several hours per pile. Approximately ten piles will be extracted per day. Caltrans expects that trestle pile extraction will occur over approximately 12 days between September 1 and October 31 of 2016.

2. Temporary Steel Casings

Vibratory hammer driving of individual 10-foot diameter steel casings (eight casings in total) to a depth of 15 meters will take approximately 16 minutes. Approximately 700 impact hammer strikes will be required to drive each of these piles an additional 6 meters. A maximum of one steel casing will be installed per day (700 strikes per day). Caltrans expects casing installation will occur over 4-8 days between September 1 and November 15 in year one (2013) and September 1 and October 15 in year three (2015). Extraction of steel casings will be accomplished with a vibratory hammer, and may take between one hour and several days per pile; this will occur subsequent to casing installation and prior to November 15.

C. Description of the Action Area

Bon Air Bridge is located on Corte Madera Creek in southeastern Marin County, California, approximately three kilometers east of the confluence of Corte Madera Creek and San Pablo Bay. San Pablo Bay is positioned between the Golden Gate and Sacramento-San Joaquin Delta ("Delta") in the San Francisco Bay region ("Bay"). Corte Madera Creek is approximately 100 meters wide at mean higher high water and flows roughly north to south at the existing bridge. Waters in this area are brackish and, due to close proximity to San Pablo Bay, subject to tidal influence and associated changes in surface elevation. During low tides, the wetted channel beneath the bridge can be narrow (less than 2 meters wide) with wide mud flat margins. Riverine and saline emergent wetlands are located along the adjacent shorelines, and mixed ruderal/landscaped vegetation occupies a small upland portion between wetland habitat and residential and commercial properties.

For the purposes of this consultation, the action area consists of the estuarine water column, substrate, and shoreline areas around the Bon Air Bridge. Until new information indicates otherwise, NMFS believes a 150 decibel (dB) root-mean-square pressure (RMS) threshold for behavioral responses for salmonids and green sturgeon is appropriate. As described below in the Effects of the Action section, the action area extends the entire width of Corte Madera Creek from approximately 500 meters upstream to approximately 500 meters downstream of the Bon Air Bridge. This area encompasses the area NMFS anticipates will experience elevated sound pressure levels greater than 150 dB RMS referenced to one micropascal (re: 1 μPa) during pile driving, and encompasses all other effects of the action.

III. ANALYTICAL FRAMEWORK

A. Jeopardy Analysis

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on four components: (1) the Status of the Species, which evaluates each species' range-wide conditions, the factors responsible for that condition, and the species' likelihood of both survival and recovery; (2) the Environmental Baseline, which evaluates the condition of the listed species in the action area, the factors responsible for that condition, and the relationship of the action area to the likelihood of both survival and recovery of the listed species; (3) the Effects of the Action, which determines the direct and indirect effects of the proposed Federal action and the

effects of any interrelated or interdependent activities on the species in the action area; and (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the species.

The jeopardy determination is made by adding the effects of the proposed Federal action and any Cumulative Effects to the Environmental Baseline and then determining if the resulting changes in species status in the action area are likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the listed species in the wild.

The jeopardy analysis in this biological opinion places an emphasis on the range-wide likelihood of both survival and recovery of the listed species and the role of the action area in the survival and recovery of the listed species. The significance of the effects of the proposed Federal action is considered in this context, taken together with cumulative effects, for purposes of making the jeopardy determination. We use a hierarchical approach that focuses first on whether or not the effects on salmonids in the action area will impact their respective populations. If the populations will be impacted, we assess whether this impact is likely to affect the ability of the populations to support the survival and recovery of the Distinct Population Segment (DPS) or Evolutionary Significant Unit (ESU).

B. Adverse Modification Determination

This biological opinion does not rely on the regulatory definition of destruction or adverse modification of critical habitat at 50 CFR §402.02.[1] Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

The adverse modification analysis in this biological opinion relies on four components: (1) the Status of Critical Habitat, which evaluates the range-wide and watershed-wide condition of critical habitat in terms of primary constituent elements (PCEs – sites for spawning, rearing, and migration), the factors responsible for that condition, and the resulting conservation value of the critical habitat overall; (2) the Environmental Baseline, which evaluates the condition of critical habitat in the action area, and the factors responsible for that condition; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs in the action area and how that will influence the conservation value of affected critical habitat units; and (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how that will influence the conservation value of affected critical habitat units.

For purposes of the adverse modification determination, we add the effects of the proposed Federal action on critical habitat in the action area, and any Cumulative Effects, to the Environmental Baseline and then determine if the resulting changes to the conservation value of critical habitat in the action area are likely to cause an appreciable reduction in the conservation value of critical habitat range-wide. If the proposed action will negatively affect PCEs of critical habitat in the action area we then assess whether or not this reduction will impact the value of the DPS or ESU critical habitat designation as a whole.

[1] This regulatory definition has been invalidated by Federal Courts.

C. Use of Best Available Scientific and Commercial Information

To conduct the assessment, NMFS examined an extensive amount of information from a variety of sources. Detailed background information on the biology and status of the listed species and critical habitat has been published in a number of documents including peer-reviewed scientific journals, primary reference materials, and governmental and non-governmental reports. Additional information regarding the effects of the Project's actions on the listed species in question, their anticipated response to these actions, and the environmental consequences of the actions as a whole was formulated from the aforementioned resources, the biological assessment for this Project, and Project meeting notes if applicable. For information that has been taken directly from published, citable documents, those citations have been referenced in the text and listed at the end of this document. A complete administrative record of this consultation is on file at the NMFS North Central Coast Office (NCCO) (Administrative Record Number 151422SWR2012SR00008).

IV. STATUS OF THE SPECIES AND CRITICAL HABITAT

This biological opinion analyzes the effects of the Project on the following Federally-listed species and designated critical habitat:

Central California Coast steelhead (*Oncorhynchus mykiss*) DPS
Threatened (71 FR834; January 5, 2006)
Critical habitat (70 FR 52488; September 2, 2005)
North American green sturgeon (*Acipenser medirostris*) southern DPS
Threatened (April 7, 2006; 71 FR 17757)
Critical habitat (September 8, 2008; 74 FR 52300)
California Central Coast coho salmon (*Oncorhynchus kisutch*) ESU
Critical habitat (64 FR 24049; May 5, 1999)

CCC coho salmon have been extirpated from the Corte Madera Creek watershed, but CCC coho salmon critical habitat is still present in the watershed. Thus, CCC coho salmon will not be affected by the proposed project and are omitted from the discussion below. However, since designated critical habitat for CCC coho salmon occurs within the action area, effects to this critical habitat are discussed where appropriate.

A. Species Description and Life History

1. Steelhead

Steelhead are anadromous forms of *O. mykiss*, spending some time in both freshwater and saltwater. Steelhead young usually rear in freshwater for one to three years before migrating to the ocean as smolts, but rearing periods of up to seven years have been reported. Migration to the ocean usually occurs in the spring. Steelhead may remain in the ocean for one to five years (one to three years is most common) before returning to their natal streams to spawn (Busby *et*

al. 1996). The distribution of steelhead in the ocean is not well known. Coded wire tag recoveries indicate that most steelhead tend to migrate north and south along the continental shelf (Barnhart 1986).

Steelhead can be divided into two reproductive ecotypes, based upon their state of sexual maturity at the time of river entry and the duration of their spawning migration: stream maturing and ocean maturing. Stream maturing steelhead enter fresh water in a sexually immature condition and require several months to mature and spawn, whereas ocean maturing steelhead enter fresh water with well-developed gonads and spawn shortly after river entry. These two reproductive ecotypes are more commonly referred to by their season of freshwater entry (*i.e.*, summer [stream maturing] and winter [ocean maturing] steelhead). The timing of upstream migration of winter steelhead is correlated with higher flow events, such as freshets or sandbar breaches. Adult summer steelhead migrate upstream from March through September. In contrast to other species of *Oncorhynchus*, steelhead may spawn more than one season before dying (iteroparity); although one-time spawners represent the majority.

Survival to emergence of steelhead embryos is inversely related to the proportion of fine sediment in the spawning gravels. However, steelhead are slightly more tolerant than other salmonids, with significant reductions in survival when fine materials of less than 0.25 inches in diameter comprise 20 to 25 percent of the substrate. Fry typically emerge from the gravel two to three weeks after hatching (Barnhart 1986).

Upon emerging from the gravel, fry rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Older fry establish territories which they defend. Cover is an important habitat component for juvenile steelhead, both as a velocity refuge and as a means of avoiding predation (Meehan and Bjornn 1991). Steelhead, however, tend to use riffles and other habitats not strongly associated with cover during summer rearing more than other salmonids. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. In winter, juvenile steelhead become less active and hide in available cover, including gravel or woody debris. Suspended sediment concentrations, or turbidity, can influence the distribution and growth of steelhead (Bell 1973, Sigler *et al.* 1984, Newcombe and Jensen 1996). Bell (1973) found suspended sediment loads of less than 25 milligrams per liter (mg/L) were typically suitable for rearing juvenile steelhead

Water temperature can influence the metabolic rate, distribution, abundance, and swimming ability of rearing juvenile steelhead (Barnhart 1986, Bjornn and Reiser 1991, Myrick and Cech 2005). Optimal temperatures for steelhead growth range between 10 and 20 degrees (°) Celsius (C) (Hokanson *et al.* 1977, Wurtsbaugh and Davis 1977, Myrick and Cech 2005). Fluctuating diurnal water temperatures are also important for the survival and growth of salmonids (Busby *et al.* 1996). Because rearing juvenile steelhead can reside in freshwater all year, adequate flow and temperature are important to the population at all times.

Outmigration of steelhead appears to be more closely associated with size than age. In Waddell Creek, Shapovalov and Taft (1954) found steelhead juveniles migrating downstream at all times of the year, with the largest numbers of young-of-year (YOY) and age 1+ steelhead moving downstream during spring and summer.

2. Green Sturgeon

The North American green sturgeon ranges from the Bering Sea, Alaska, to Ensenada, Mexico. Presently, spawning has been confirmed to occur in the Klamath and Rogue Rivers (Northern DPS) and the Sacramento and Feather Rivers[2] (Southern DPS). Adults spawn in large rivers during the spring and early summer and eggs are laid in turbulent areas on the river bottom and settle into the interstitial spaces between cobble and gravel (Adams *et al.* 2007). Like salmonids, green sturgeon require cool water temperatures for egg and larval development, with optimal temperatures ranging from 11 to 17°C (Van Eenennaam *et al.* 2005). Eggs hatch after 6–8 days, and larval feeding begins 10–15 days post-hatch; metamorphosis of larvae into juveniles typically occurs after a minimum of 45 days (post-hatch) when fish have reached 60–80 mm total length (TL) (Beamesderfer *et al.* 2007). After rearing in freshwater or the estuary of their natal river for one to four years, young green sturgeon move into coastal waters (Nakamoto *et al.* 1995, Adams *et al.* 2002). Juvenile green sturgeon captured in the Klamath River estuary ranged from 320 to 660 mm TL (Nakamoto *et al.* 1995). Records of juvenile green sturgeon in San Francisco estuary are limited, but juveniles captured in the Delta are typically greater than 200 mm TL, suggesting Southern DPS green sturgeon also spend several months rearing in freshwater before entering the estuary. Laboratory studies, conducted by Allen and Cech, Jr. (2007), indicated juveniles approximately 6 months old (approximately 34 cm TL) were tolerant of saltwater, but approximately 1.5 year old (approximately 75 cm TL) green sturgeon appeared more capable of successful osmoregulation in salt water. Furthermore, green sturgeon observed from coastal marine waters in limited entry groundfish bottom trawl and California halibut commercial fisheries between 2007 and December 2010 (n=88) were greater than 60 cm fork length (or greater than approximately 65 cm TL) (WCGOP 2011, unpublished data). Green sturgeon are one of the most marine-oriented and widely distributed of the sturgeons; sexually immature fish that have entered coastal marine waters ("subadults ") spend several years at sea before reaching reproductive maturity and returning to freshwater to spawn for the first time (Nakamoto *et al.* 1995).

Green sturgeon do not mature until they are at least 15–17 years of age at a size of 1.4–2.2 m in length (Beamesderfer *et al.* 2007). The length at first maturity is estimated to be 152 cm TL (14-16 years) for males and 162 cm TL (16-20 years) for females in the Klamath River (Van Eenennaam *et al.* 2006), and 145 cm TL for males and 166 cm TL for females in the Rogue River (Erickson and Webb 2007). Adult green sturgeon are iteroparous and believed to spawn every 2-4 years (Moyle 2002, Erickson and Webb 2007). Although males are capable of spawning annually, female sturgeon typically require two years to complete vitellogenesis. Green sturgeon fecundity (50,000–115,000 eggs; Van Eenennaam *et al.* 2008) is reportedly lower than other sturgeons, but the egg size is larger.

Mature green sturgeon enter their natal river in the spring and, in the Northern DPS, typically leave the river during the subsequent autumn when water temperatures drop below 10°C and flows increase (Erickson and Webb 2007). Recent telemetry studies by Heublein *et al.* (2009)

[2] Spawning was recently confirmed in the Feather River downstream of Oroville Dam (Seesholtz 2011)

revealed adults typically enter the Bay and begin their upstream spawning migrations between late February and early May. Based on egg capture and upstream migration of tagged fish, peak spawning is estimated to occur in deep turbulent sections of the Sacramento River between April and mid-June (Poytress *et al.* 2011, Heublein *et al.* 2009). CDFG (2002) report Southern DPS green sturgeon spawning occurs above Hamilton City and possibly as far upstream as Keswick Dam on the Sacramento River. Incidental capture of green sturgeon post-larvae in salmon out-migrant traps indicates successful spawning can occur in the Sacramento River both upstream and downstream of Red Bluff Diversion Dam (Rkm 391) (Israel and Klimley 2008). More specifically, green sturgeon eggs have been captured in egg mats in the Sacramento River from below the confluence of Antelope Creek (Rkm 377) up to the confluence of Ink's Creek (Rkm 426) (Poytress *et al.* 2011). In the Southern DPS, tagged adult green sturgeon displayed two outmigration strategies; presumably after spawning, green sturgeon emigrated from Sacramento River during summer months, or remained in the river until the onset of winter flows (Heublein *et al.* 2009).

Subadult and adult green sturgeon move between coastal waters and various estuaries along the U.S. West Coast between San Francisco Bay, CA, and Grays Harbor, WA (Lindley *et al.* 2008, Lindley *et al.* 2011). Multiple rivers and estuaries are visited by dense aggregations of green sturgeon in summer months (Moser and Lindley 2007, Lindley *et al.* 2011). Notably, capture of green sturgeon in San Pablo Bay and detections of tagged green sturgeon indicated adult and subadult green sturgeon can be present in the Bay during all months of the year (Kelly *et al.* 2007; Heublein *et al.* 2009; Lindley *et al.* 2011). Relatively little is known about how green sturgeon use habitats in the coastal ocean and in estuaries, or the purpose of their episodic aggregations there at certain times (Lindley *et al.* 2008; Lindley *et al.* 2011). Genetic studies examining the stock composition of estuarine aggregations (Israel *et al.* 2009) indicate that almost all green sturgeon in the San Francisco Bay system belong to the Southern DPS. This is corroborated by tagging and tracking studies which found that no green sturgeon tagged in the Klamath or Rogue rivers (*i.e.*, Northern DPS spawning rivers) were detected in San Francisco Bay (Lindley *et al.* 2011). However, green sturgeon in coastal waters adjacent to San Francisco Bay may include Northern DPS green sturgeon. Genetic analysis of tissue samples collected from observed green sturgeon bycatch in coastal waters adjacent to San Francisco Bay indicated that approximately 17% (*i.e.*, 3 out of 18) of the green sturgeon encountered and sampled belonged to the Northern DPS and approximately 83% (*i.e.*, 15 out of 18) belonged to the Southern DPS (Israel 2010).

Green sturgeon feed on benthic invertebrates and fish (Adams *et al.* 2002). Radtke (1966) analysed stomach contents of juvenile green sturgeon captured in the Delta and found the majority of their diet was benthic invertebrates such as mysid shrimp and amphipods (*Corophium spp*). Manual tracking of acoustically-tagged green sturgeon in the San Francisco Bay estuary indicates they are generally demersal but make occasional forays to surface waters, perhaps to assist their migration (Kelly *et al.* 2007). Recent telemetry data in coastal ocean habitats suggest that green sturgeon spent a longer duration in areas with high seafloor complexity, especially where a greater proportion of the substrate consists of boulders (Huff *et al.* 2011). However, while presumably feeding on benthic invertebrates in estuaries green sturgeon do not appear to utilize hard substrates (Dumbauld *et al.* 2008). Preliminary data from mapping surveys conducted in Willapa Bay, WA, showed densities of "feeding pits"

(depressions in the substrate believed to be formed when green sturgeon feed) were highest over shallow intertidal mud flats, while harder substrates (*e.g.*, gravel) had no pits (M. Moser, unpublished data). In their natal rivers, telemetry data indicates mature green sturgeon prefer deep pools, presumably for the purposes of spawning and conserving/restoring energy (Erickson and Webb 2007; Heublein *et al.* 2009). Similar tracking studies involving juvenile green sturgeon have not been conducted, and their behavior and habitat preferences in rivers and estuaries are largely unknown.

B. Status of Species and Critical Habitat

In this opinion, NMFS assesses four population viability parameters to help us understand the status of CCC steelhead and southern DPS green sturgeon and their populations' ability to survive and recover. These population viability parameters are: abundance, population growth rate, spatial structure, and diversity (McElhany *et al.* 2000). NMFS has used existing information to determine the general condition of each population and factors responsible for the current status of each DPS or ESU.

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

1. CCC Steelhead

Historically, approximately 70 populations[3] of steelhead existed in the CCC steelhead DPS (Spence *et al.* 2008). 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 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). Near the end of the 20th Century, McEwan (2001) estimated the wild run population in the Russian River Watershed was between 1,700-7,000 fish. 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, Soquel, and Aptos creeks) of individual run sizes of 500 fish or less (62 FR 43937). For more

[3] 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).

detailed information on trends in CCC steelhead abundance, see: Busby *et al.* 1996, NMFS 1997, and NMFS 2005.

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). Reduced population sizes and fragmentation of habitat in San Francisco streams has likely also led to loss of genetic diversity in these populations.

CCC steelhead have experienced a serious decline 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 have maintained a wide distribution throughout the DPS, roughly approximating the known historical distribution, CCC steelhead likely possess a resilience that is likely to slow their decline relative to other salmonid DPSs or ESUs in worse condition. Data from the 2008/09 and 2009/2010 adult CCC steelhead returns indicate a decline in returning adults across their range compared to other recent returns (*e.g.,* 2006/2007, 2007/2008) (Jeffrey Jahn, NMFS, personal communication, August 2011). The most recent status update concludes that steelhead in the CCC steelhead DPS remain "likely to become endangered in the foreseeable future" (Williams *et al.* 2011), as new and additional information available since the previous status review (Good *et al.* 2005) does not appear to suggest a change in extinction risk. On August 15, 2011, NMFS chose to maintain the threatened status of the CCC steelhead DPS (76 FR 50447).

2. Southern DPS Green Sturgeon

To date, little population-level data have been collected for green sturgeon. In particular, there are no published abundance estimates for either Northern DPS or Southern DPS green sturgeon in any of the natal rivers based on survey data (Israel *et al.* in prep). As a result, efforts to estimate green sturgeon population size have had to rely on sub-optimal data with known potential biases, including monitoring designed for white sturgeon (*Acipenser transmontanus*) populations, harvest time series, or entrainment from water diversion and export facilities (Adams *et al.* 2007). Of these sources, only the water diversion data indicate a possible trend, suggesting Southern DPS green sturgeon abundance or recruitment has declined since 1986 in the Sacramento River (Adams *et al.* 2007).

More recent genetic techniques and monitoring surveys are beginning to clarify questions about green sturgeon population size. Genetic data collected from incidental captured larval green sturgeon in salmon out-migrant traps suggest that the number of adult green sturgeon in the upper Sacramento River (Southern DPS green sturgeon) remained roughly constant between 2002 and 2006 in river reaches above Red Bluff (Israel and May 2010). Recently developed surveys using dual frequency identification sonar have estimated 175 to 250 sturgeon (±50) in the mainstem Sacramento River during the spawning season in 2010 and 2011 (pers. comm. with Ethan Mora, UC Davis, on January 10, 2012). However, this estimate includes considerable uncertainty; all sturgeon detections were assumed to be green sturgeon and a small number of white sturgeon were potentially misidentified as green sturgeon. Furthermore, spawning

population estimates assumed individual fish did not move in and out of survey areas throughout the season (*i.e.* observations of multiple individuals moving in and out of an area could be recorded as one individual). Given these uncertainties, caution must be taken in using these estimates to infer the spawning run size for the Sacramento River, until further analyses are completed.

Recruitment data for Southern DPS green sturgeon are essentially nonexistent. Incidental catches of larval green sturgeon in the mainstem Sacramento River and of juvenile green sturgeon at the state and Federal pumping facilities in the South Delta suggest that green sturgeon are successful at spawning, but that annual year class strength may be highly variable (Beamesderfer *et al.* 2007; Adams *et al.* 2007). Successful recruitment into the population is unclear. Because green sturgeon are long-lived and spawn multiple times throughout their lifetime, spawning failure in one year can be made up for in another spawning year. In general, sturgeon year class strength appears to be episodic with overall abundance dependent on a few successful spawning events (NMFS 2010b).

Recently, Erickson *et al.* (unpublished) estimated spawning run sizes for Northern DPS rivers ranging from 426 to 734 adult green sturgeon using mark-recapture methods (Israel *et al.* in prep). These estimates appear to be inconsistent with harvest data indicating that 200 to 450 Northern DPS green sturgeon were harvested each year in the Klamath River tribal fishery from 1985 to 2003, with no evidence of declining catches (Adams *et al.* 2007). The inconsistencies may be due to error in the population estimates and/or because the recent population estimates were based on data collected from a different time period compared to the tribal harvest data. Adams *et al.* (2007) concluded that the abundance of mature green sturgeon in the Southern DPS is much smaller than in the Northern DPS (Adams *et al.* 2007), but the absolute and relative abundance of the two DPS remain highly uncertain. Carefully designed studies remain needed to provide absolute estimates of abundance for the species.

Recently enacted fishing regulations and conservation measures have reduced current fishery impacts to green sturgeon throughout its range (http://www.nmfs.noaa.gov/pr/species/fish/greensturgeon.htm). For example, commercial and sport fisheries in California, Oregon, Washington (United States), and British Columbia (Canada) now ban retention of green sturgeon.

Green sturgeon face a variety of threats in the freshwater, estuarine, and marine environments within which they move throughout their life history. Threats to this species include: reduction/loss of spawning areas, insufficient freshwater flow rates in spawning areas, contaminants (*e.g.*, pesticides), harvest bycatch, poaching, entrainment by water projects, influence of exotic species, small population size, impassable barriers, and elevated water temperatures (Adams *et al.* 2007). The most recent status review update concluded the southern DPS green sturgeon is likely to become endangered in the foreseeable (NMFS 2005); a principal factor in NMFS' conclusion was the reduction of potential spawning habitat to a single area in the Sacramento River due to migration barriers (*e.g.*, dams). Historical spawning habitat may have extended up into the three major branches of the upper Sacramento River above the current location of Shasta Dam; however, those habitats have been made inaccessible or altered by dams (Mora *et al.* 2009; Adams *et al.* 2007). The reduction of spawning habitat to a single system

increases the vulnerability of the spawning population to catastrophic events and of early life stages to variable environmental conditions within the system. Severe threats to the single remaining spawning population, coupled with the inability to alleviate those threats using current conservation measures, led to the decision to list the species as threatened on April 7, 2006 (71 FR 17757).

3. Status of Critical Habitat

The condition of CCC steelhead and CCC coho salmon critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable populations. NMFS has determined that currently depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat: logging, agriculture, mining, urbanization, stream channelization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation). Impacts of concern include impairment or loss of PCEs and essential features such as altered stream bank and channel morphology, elevated water temperature, lost spawning and rearing habitat, habitat fragmentation (lost migration PCEs), impaired gravel and wood recruitment from upstream sources, degraded water quality, lost riparian vegetation, and increased erosion into streams from upland areas (Weitkamp *et al.* 1995; Busby *et al.* 1996; 64 FR 24049; 70 FR 37160; 70 FR 52488). Furthermore, diversion and storage of river and stream flow has dramatically altered the natural hydrologic cycle degrading migration and rearing PCEs in many of the streams within the DPS and ESU. Altered flow regimes can delay or preclude migration, dewater aquatic habitat, and strand fish in disconnected pools, while unscreened diversions can entrain juvenile fish.

The current condition of critical habitat for the southern DPS of green sturgeon is degraded over its historical conditions. It does not provide the full extent of conservation values necessary for the recovery of the species, particularly in the upstream riverine habitat of the Sacramento River. In particular, passage and water flow PCEs have been impacted by human actions, substantially altering the historical river characteristics in which the southern DPS of green sturgeon evolved. In addition, the alterations to the Delta may have a particularly strong impact on the survival and recruitment of juvenile green sturgeon due to their protracted rearing time in the Delta and estuary.

C. Factors Responsible for Steelhead and Green Sturgeon Stock Declines

NMFS cites many reasons (primarily anthropogenic) for the decline of steelhead (Busby *et al.* 1996; Good *et al.* 2005) and southern DPS of green sturgeon (Adams *et al.* 2002; NMFS 2005). The foremost reason for the decline in these anadromous populations is the degradation and/or destruction of freshwater and estuarine habitat, including critical habitat, caused by (as described briefly above) anthropogenic disturbances such as urban development, agriculture, logging, water resource development, and dams. Additional factors contributing to the decline of salmonid populations (and, where applicable, green sturgeon populations) include: poor estuary/lagoon management (Smith 1990, Bond 2006; Hayes *et al.* 2008; Hayes *et al.* 2011), commercial and recreational bycatch and harvest, artificial propagation (Waples 1991), natural stochastic events , marine mammal predation (Hanson 1993, NMFS 1999), reduced marine-derived nutrient transport (Bilby *et al.* 1996; Bilby *et al.* 1998; Gresh *et al.* 2000), and most recently poor ocean conditions (Lindley *et al.* 2009).

D. Global Climate Change

Our changing climate is likely to affect listed species in the future. Modeling of climate change impacts in California suggests average summer air temperatures are expected to increase (Lindley *et al.* 2007). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe *et al.* 2004). Total precipitation in California may decline; critically dry years may increase (Lindley *et al.* 2007; Schneider 2007). The Sierra Nevada snow pack is likely to decrease by as much as 70 to 90 percent by the end of this century under the highest emission scenarios modeled (Luers *et al.* 2006). Wildfires are expected to increase in frequency and magnitude, by as much as 55 percent under the medium emissions scenarios modeled (Luers *et al.* 2006). Vegetative cover may also change, with decreases in evergreen conifer forest and increases in grasslands and mixed evergreen forests. The likely change in amount of rainfall in Northern and Central Coastal streams under various warming scenarios is less certain, although as noted above, total rainfall across the state is expected to decline. For the California North Coast, some models show large increases (75 to 200 percent) while other models show decreases of 15 to 30 percent (Hayhoe *et al.* 2004). Many of these changes are likely to further degrade salmonid habitat by, for example, reducing stream flows during the summer and raising summer water temperatures. Estuaries may also experience changes detrimental to green sturgeon. Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia *et al.* 2002). In marine environments, ecosystems and habitats important to sub adult and adult salmonids are likely to experience changes in temperatures, circulation and chemistry, and food supplies (Feely *et al.* 2004; Brewer 2008; Osgood 2008; Turley 2008). The projections described above are for the mid to late 21st Century. In shorter time frames natural climate conditions are more likely to predominate (Cox and Stephenson 2007; Smith *et al.* 2007).

V. ENVIRONMENTAL BASELINE

The environmental baseline is the current status of species and critical habitat in the action area based on analysis of the effects of past and ongoing human and natural factors. 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 impacts of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

Corte Madera Creek originates in the foot hills of Mount Tamalpais and flows east to meet San Pablo Bay. Bon Air Bridge is located approximately three kilometers west of the confluence of Corte Madera Creek and San Pablo Bay, in Marin County, California. A small run of CCC steelhead persist in the Corte Madera Creek watershed (Leidy *et al.* 2005). Juvenile (pre-smolt) steelhead are not physiologically capable of rearing in lower Corte Madera Creek; saltwater tolerant steelhead smolts are believed to rapidly emigrate from Corte Madera Creek to more productive ocean waters. Therefore, the lower tidal portion of Corte Madera Creek functions primarily as a migratory corridor for steelhead. With regard to the larger steelhead DPS, the

habitat within the action area represents a very small portion of the available migratory habitat. However, without this migratory habitat steelhead would not be able to access spawning habitat, and higher quality rearing habitat upstream and within tributaries such as San Anselmo Creek.

There are no known records of green sturgeon in Corte Madera Creek and the creek is too small to support spawning of green sturgeon. The tidal portions of Corte Madera Creek, however, provide accessible rearing and foraging habitat for juvenile, subadult, and adult green sturgeon, which may be present in the Bay and tidal creeks and sloughs draining to the Bay year-round. Available fisheries data from tidal creeks and sloughs draining into the Bay (ongoing monitoring studies, fish relocation reports, *etc.*) shows very few green sturgeon have been found in sampling efforts. Based on this, NMFS concludes small tidal creeks or sloughs (like lower Corte Madera Creek) are unlikely to contain an abundance of green sturgeon. Within the Bay, concentrations of subadult and adult green sturgeon are only known to exist in open water. Juvenile green sturgeon are occasionally caught as bycatch in the commercial herring fishery near Paradise Cove in San Pablo Bay, approximately 6 kilometers south of the mouth of Corte Madera Creek (pers. Comm. Mike Holm).

A. Status of Listed Species and Habitat in the Action Area

The tidal waters of Corte Madera Creek include designated critical habitat for CCC steelhead, southern DPS green sturgeon, and CCC coho salmon, and contains rearing and migration habitat PCE's. Salmonid rearing habitat, however, is likely to be limited to areas upstream of the tidal portion of Corte Madera Creek. At Bon Air Bridge, Corte Madera Creek is approximately 100 meters wide and flows roughly north to south with perennial brackish water, receiving freshwater runoff from upstream and tidal influences from San Pablo Bay. Open water, shallow mudflats, and marsh habitats exist within the action area. Lower Corte Madera Creek is relatively sinuous within the action area and flows in an open "z" path; 300 meters upstream of Bon Air Bridge, the creek curves approximately 70 degrees (from east to south), and then curves approximately 70 degrees (from south to east) 200 meters downstream of the bridge. During low tides, the wetted channel beneath the bridge can be narrow (less than 2 meters wide) with wide mud flat margins. The bed is composed mostly of clay with an occasional layer of silty sand. Within the action area, a raised pedestrian pathway (levee) and shoreline development separate all but a narrow fringe of wetland habitat from Corte Madera Creek, with some tidally influenced saline emergent wetland located northeast of the bridge adjacent to Corte Madera Creek. Approximately one kilometer upstream of the bridge Corte Madera Creek exists in a narrow, trapezoidal, and concrete-lined flood control channel for approximately 1.5 kilometers before returning to more natural stream bed and bank conditions

Very little fisheries data is available for lower Corte Madera Creek or the action area. Records of juvenile *O. mykiss* presence in August and September of 2005, approximately 2.5 kilometers upstream of the action area, indicate available salmonid rearing habitat exists upstream of the tidal portion of Corte Madera Creek (Rich and Assoc. 2006). In fall 2011, no salmonids or sturgeon were collected during dewatering and fish relocation activities conducted approximately 500 meters upstream of Bon Air Bridge (Martin 2011). Steelhead smolts, however, were not

likely to be migrating through the action area when relocation activities took place (October). As described previously, there are no known records of green sturgeon in Corte Madera Creek.

B. Factors Affecting Species Environment within the Action Area

The dominant factors affecting habitat within the action area are shoreline development, fill of wetlands, and reduction or modification of freshwater inflow, which have resulted in loss of estuarine and wetland habitat ..

C. Previous Section 7 Consultations and Section 10 Permits in the Action Area

Pursuant to section 7 of the ESA, NMFS has conducted one interagency consultation that affected the action area of this project. In June 2011, the Corps completed consultation with NMFS on the Kentfield Sewage Force Main Replacement and Berens/McAllister Sloughs Culverts Replacement Project. The project included the construction of three 36-inch diameter culverts to replace the existing single 36-inch diameter culvert connecting McAllister Slough to Corte Madera Creek approximately 500 meters upstream of Bon Air Bridge (NMFS administrative record #151422SWR2011SR00275). This consultation concluded that the project was not likely to adversely affect CCC steelhead, CCC coho salmon, or southern DPS green sturgeon. These improvements to the connection between Berens/McAllister Sloughs and Corte Madera Creek could provide habitat benefit at the northern edge of the Action Area by potentially increasing tidal action and fish accessibility to off-channel wetland and shallow water habitats.

Activities related to NMFS' Section 10(a)(1)(A) research and enhancement permits and section 4(d) limits or exceptions could potentially occur in the Corte Madera Creek watershed. Salmonid monitoring approved under these programs includes carcass surveys, smolt outmigration trapping, and juvenile density surveys. In general, these activities are closely monitored and require measures to minimize take during the research activities. NMFS has analyzed the effects of these activities and determined that they are unlikely to jeopardize listed salmonids or green sturgeon, or adversely modify the critical habitats of these species.

VI. EFFECTS OF THE PROPOSED ACTION

The purpose of this section is to identify the direct and indirect effects of the proposed action, and any interrelated or interdependent activities, on threatened CCC steelhead and green sturgeon. Our approach was based on knowledge and 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 what stressors (physical, chemical, or biotic), directly or indirectly caused by the proposed action, that steelhead and green sturgeon are likely to be exposed to. Next, we evaluate the likely response of steelhead and green sturgeon to these stressors in terms of changes to survival, growth, and reproduction, and changes to the ability of PCEs to support the value of critical habitat in the action area. PCEs 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 CCC steelhead and their critical habitat were limited or not available our assessment of effects focused mostly on qualitative identification of likely stressors and responses.

Construction activities associated with the Bon Air Bridge Replacement are expected to affect green sturgeon and steelhead and their critical habitats primarily through underwater noise during pile driving and, to a lesser extent, temporary degradation of water quality. Pile driving activities associated with the replacement of Bon Air Bridge are expected to take place over four in-water work seasons (September 1 to November 30). Steelhead are not likely to be present in the action area during the project's in-water activities. Green sturgeon can be present in the Bay year-round, and a small number of green sturgeon may intermittently utilize waters of the action area to forage or rear; therefore, a small number of green sturgeon could be exposed to the project's in-water activities in fall. The potential effects of these activities are presented in detail below.

A. Species Effects

1. Sound Pressure Impacts on Fish from Pile Driving

a. Overview of Pile Driving Impacts

Pile driving activities may affect listed salmonids and green sturgeon through exposure to high underwater sound levels produced during pile driving and degradation of water quality during pile driving activities. The underwater sound pressure waves that have the potential to adversely affect listed salmonids and green sturgeon originate with the contact of the hammer with the top of the pile. The impact of the hammer on the top of the pile causes a wave to travel down the pile and the pile to resonate radially and longitudinally like a gigantic bell. Most of the acoustic energy is a result of the outward expansion and inward contraction of the walls of the pile as the compression wave moves down the pile from the hammer to the end of the pile buried in the waterway's bottom materials. Water is virtually incompressible and the outward movement of the pile (by a fraction of an inch) followed by the pile walls pulling back inward to their original shape, sends an underwater pressure wave propagating outward from the pile in all directions. The pile resonates, sending out a succession of waves even as it is pushed several inches deeper into the bottom. Piles can be composed of wood, steel, or concrete. Different types of piles result in different levels of underwater noise. For the proposed project, steel piles will be used for construction.

Available information indicates that fish may be injured or killed when exposed to elevated underwater sound pressure waves generated by steel piles installed with impact hammers. Pathologies associated with very high sound levels are collectively known as *barotraumas*. Barotraumas are pathologies associated with exposure to drastic changes in pressure. These include hemorrhage and rupture of internal organs, including the swim bladder and kidneys in fish. Death can be instantaneous, occur within minutes after exposure, or occur several days later. An important characteristic of the underwater sound that causes injury is the frequency. During pile installation, most energy is contained within the frequency range (100-1,000 Hertz) which results in reverberation of the swim bladder.

Exposure to sound for longer periods of time can also injure and kill fish (Hastings 1995). Hastings (1995) found death rates of 50 percent and 56 percent for gouramis (*Trichogaster sp.*) when exposed to continuous sounds at 192 dB referenced to one micropascal squared second (re: $1\mu Pa^2$-s) at 400 Hz and 198 dB re: $1\mu Pa^2$-s at 150 Hz, respectively, and 25 percent for goldfish (*Carassius auratus*) when exposed to sounds of 204 dB re: $1\mu Pa^2$-s at 250 Hz for two hours or less. Hastings (1995) also reported that acoustic "stunning," a potentially lethal effect resulting in a physiological shutdown of body functions, immobilized gourami within eight to thirty minutes of exposure to the aforementioned sounds. These sound pressure levels can also result in hearing damage to fish (Enger 1981; Hastings *et al.* 1995, 1996). Additional detrimental effects on fish from sound levels such as those noted above include stress, increasing risk of mortality by reducing predator avoidance capability, and interfering with communication necessary for navigation and reproduction (Scholik and Yan 2001; Shin 1995; and Popper 1997).

In the *Compendium of Pile Driving Sound Data* (Illingworth & Rodkin 2007) the most recent pile driving case studies are compiled in order to provide information regarding the underwater sound pressure levels generated with the installation of steel and concrete piles by different hammer types. Several pile driving case studies conducted within the San Francisco Bay region are included in the compendium. A dual metric criteria of 206 dB re: $1\mu Pa$ peak (sound pressure level) SPL for any single strike and an accumulated sound exposure level (SEL) of 187 dB re: $1\mu Pa^2$-s are currently used by the Fisheries Hydroacoustic Working Group (FHWG[4]) to correlate physical injury to fish greater than 2 grams in size from underwater sound pressure produced during the installation of piles with impact hammers. As distance from the pile increases, sound attenuation reduces sound pressure levels and the potential harmful effects to fish also decrease. Disturbance and noise associated with construction at the pile driving site may also startle fish and result in dispersion from the action area.

A study in Puget Sound, Washington suggests that pile driving operations disrupt juvenile pink and chum salmon (*Oncorhynchus spp.*) behavior (Feist *et al.* 1992). Though no underwater sound measurements are available from that study, comparisons between juvenile salmon schooling behavior in areas subjected to pile driving/construction and other areas where there was no pile driving/construction indicate that there were fewer schools of fish in the pile-driving areas than in the non-pile driving areas. The results are not conclusive but may indicate that pile-driving operations affect the distribution and behavior of juvenile anadromous salmonids.

Currently, there is very little data available regarding effects of pile driving directly focused on green sturgeon. Like the juvenile salmonids described in the above study, juvenile green sturgeon utilize estuarine environments as foraging habitat and migration routes to the ocean; therefore, it is reasonable to assume pile driving operations may affect the estuarine distribution and behavior of juvenile green sturgeon as well. There is uncertainty as to the behavioral response of fish to underwater sound produced when driving piles in or near water. Until new information indicates otherwise, NMFS believes a 150 dB RMS re: $1\mu Pa$[5] pressure threshold for behavioral responses for salmonids and green sturgeon is appropriate.

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[4] Member agencies of the FHWG include Caltrans, FHWA, NMFS (Northwest and Southwest Regions), USFWS, CDFG, and Oregon and Washington Departments of Transportation.

[5] Throughout the remainder of this document, sound pressure metrics are referenced to the following pressures: peak

b. Project Specific Considerations

The results of the above pile driving projects and information available in the literature are helpful in assessment of the potential effects of pile driving associated with the proposed project, but considerable uncertainty remains. Effects on an individual fish during pile driving at the Bon Air Bridge will be dependent on a number of variables associated with environmental conditions at the project site and variables associated with the specific construction schedule.

As stated above, a dual metric criteria of 206 dB peak SPL for any single strike and an accumulated SEL of 187 dB are currently used by NMFS and the FHWG as thresholds to correlate physical injury to fish greater than 2 grams in size from underwater sound produced during the installation of piles with impact hammers. As distance from the pile increases, sound attenuation reduces sound pressure levels and the potential harmful effects to fish also decrease.

Water depth at the pile driving site will also influence the rate of sound attenuation. In deep water areas high sound pressure waves are likely to travel farther than in shallow waters. Within shallow water, much of the acoustic energy is expected to be absorbed by the bottom and reflected off the surface back down to the bottom and even backwards towards the pile. The rate of attenuation is much higher in shallower water; reducing the expected area of adverse effects as compared to deeper water. Water depths during pile driving for the proposed project will vary with tide and pile location, and range from 0 to approximately 3 meters. The relatively narrow and curved creek channel bordered by shallow mudflat and marsh within the action area should provide some sound transmission loss as sound travels outward from the piles.

Methods may be used during construction to aide sound attenuation. Encapsulating the piles within an air bubble curtain attenuates the sound, thereby decreasing the area in which the adverse sound-related impacts occur. Bubble curtains reduce the area of sound impedance from the pile and, therefore, reduce the area of potential noise impacts on fish. The City proposes to use a bubble curtain to attenuate under water sound levels and minimize potential impacts during all impact hammer pile driving. Previous Caltrans projects in the Bay involving pile driving indicate the use of a bubble curtain is capable of providing 10 dB of attenuation during impact hammer pile driving of 12-inch steel H-pile and 126-inch steel pipe piles (Illingworth and Rodkin, Inc. 2007). For the impact hammer pile driving of the proposed 14-inch H and 10-foot steel pipe pilings the bubble curtain is anticipated to reduce sound pressure levels by approximately 10 dB for (Illingworth and Rodkin, Inc. 2007). The assessment of acoustic impacts associated with this project will be based on an estimated minimum reduction in sound pressure that these measures provide.

The timing and duration in which pile driving will occur will influence the level of potential impact on steelhead and green sturgeon. In-water construction activities for the proposed project are expected to occur between September 1 and November 30 over four years; impact hammer pile driving will be completed by November 15, November 1, and October 15 in years one through three, respectively. Steelhead spawning and rearing is not believed to occur in the action area. Adult CCC steelhead migration and juvenile steelhead smoltification/emigration in lower

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dB SPL and RMS are both referenced to 1 μPa, accumulated or single strike SELs are referenced to 1 μPa^2-s.

Corte Madera Creek and neighboring watersheds is likely to occur between December and April and January and July, respectively (Fukushima and Lesh 1998; Rich 2000). Therefore, CCC steelhead are not likely to be migrating through lower Corte Madera Creek during pile driving activities. Juvenile, sub-adult, and adult green sturgeon may be present in the Bay and tidal creeks and sloughs draining to the Bay year-round. Therefore, green sturgeon could be present in the tidal portion of Corte Madera Creek during fall. It is unclear, however, if these fish will be present during pile driving (which is unlikely to occur during the entire work window –see below) and exposed to the elevated sound pressure levels in the action area. Until more specific information on green sturgeon distribution is available, NMFS expects a small number of green sturgeon (juvenile, sub-adult, and adult) will be present in lower Corte Madera Creek during the fall and may be subjected to harmful sound levels during pile driving.

c. Assessment of Pile Driving Effects

Vibratory hammer pile driving and pile extraction is not anticipated to generate sound levels necessary to adversely affect fish. Sound monitoring data collected from pile driving projects throughout the Bay indicate that sound pressure levels resulting from the proposed project's impact hammer pile driving activities will, in some instances, exceed the dual metric criteria and therefore likely result in injury to green sturgeon (Illingworth & Rodkin 2007). With the use of a bubble curtain, exceedance of the 206 dB peak threshold is only anticipated adjacent to the H-piles and steel casings (<10 meters and 14 meters, respectively). Additionally, the proposed pile driving is anticipated to exceed the 187 dB SEL threshold for physical injury within 35 meters of pile driving of H-piles, and 430 meters of steel casings. If an unimpeded open water sound propagation path was possible during impact hammer pile driving, the 150 dB RMS threshold for behavioral responses could extend into open waters, substrate, and shoreline of Corte Madera Creek that fall within a several kilometer radius of the Bon Air Bridge. This area, however, includes major bends and shallow water mud flats both upstream and downstream of the bridge (described in greater detail in the section "V. ENVIRONMENTAL BASELINE" above). These features will diffract and attenuate sound waves and sound levels above 150 dB RMS are not likely to extend significant distances beyond these major bends. Therefore, the proposed pile driving is anticipated to exceed the 150 dB RMS threshold for behavioral responses within approximately 500 meters of piles and casings.

Table 1: Summary of attenuated impact hammer pile driving impacts

Temporary Structure	Pile Sizes and Type	Maximum Number of Piles	Piles installed per day/strikes per day	Distances to Reach Sound Pressure Thresholds		
				206 dB Peak SPL	187 dB SEL cumulative	150 dB RMS
Temporary Trestle	12-to 14-inch steel H-piles	128	6/3,300	<10 meters	35 meters	~500 meters
Bridge Foundation Piles	10-foot diameter steel pipe casing	8	1/700	14 meters	430 meters	~500 meters
Total Piles For Project		**136**				

Impact Hammer Pile Driving: 14-inch-diameter H piles and 10-foot-diameter steel piles. As described above, piles driven with an impact hammer will produce the highest sound levels and have the largest area of impact, but will only persist for a short period of time over three fall work seasons (28-40 total days). A total of 3,300 strikes per day will be required to install up to six 14-inch H-piles per day for 20-24 days (128 H-piles over two fall work seasons). This will result in an accumulated SEL of greater than187 dB within 35 meters of the pile. Based upon this data, fish within a radial distance of 35 meters of pile driving could be subject to physical injury, and behavioral effects within a radial distance of 500 meters. A total of 700 strikes will be required to install up to one 10-foot diameter steel casings per day for 8-16 days (eight steel casings over two fall work seasons). This will result in an accumulated SEL of greater than187 dB within 430 meters of the pile. Based upon this data, fish within a radial distance of 430 meters of pile driving could be subject to physical injury, and behavioral effects within a radial distance of 500 meters. The sound pressure impacts associated with driving up to six H-piles or one steel casing per day would not occur continuously throughout a given day, as the majority of the piles will be installed with a vibratory hammer. These exposure estimates are based on maximum potential sound levels associated with the project including incorporation of sound attenuation measures. NMFS expects bubble curtains and the shallow sinuous creek channel could attenuate sound levels to a greater extent than those analyzed, and impact hammer pile driving could involve fewer strikes per day than the numbers described (thus reducing the distance to reach the onset of physical injury thresholds).

For the purposes of this analysis, the zone within the action area where there may be injury or mortality to green sturgeon extends the entire width of Corte Madera Creek upstream and downstream of Bon Air Bridge approximately 35 meters when H piles are being driven and 430

meters when steel casings are being driven. Green sturgeon could experience a range of barotraumas, including the damage to the inner ear, eyes, blood, nervous system, kidney, and liver. These injuries are expected to result in the delayed mortality of many of these fish. Beyond this range, NMFS estimates fish will generally survive during pile driving and not sustain permanent harm or injury. Fish within the range of 150 dB RMS (the entire width of Corte Madera Creek approximately 500 meters upstream and downstream of Bon Air Bridge) may demonstrate temporary abnormal behavior indicative of stress or exhibit a startle response. As described previously, a fish that exhibits a startle response may not be injured, but it is exhibiting behavior that suggests it perceives a stimulus indicating potential danger in its immediate environment, and startle responses are likely to diminish as fish leave the area.

Therefore, NMFS expects barotraumas resulting in injury or death to fish that persist in this zone that extends approximately the entire width of Corte Madera Creek upstream and downstream of Bon Air Bridge approximately 35 meters when H piles are being driven and 430 meters when steel casings are being driven. Smaller fish could be more vulnerable in this area as they are more likely to be entrained in tidal currents and unable to actively swim out of or away from this zone. Pile driving activities will be limited to a short time period (28-40 days) between September 1 and November 15 over three fall seasons; this time period precedes juvenile steelhead emigration and adult steelhead migration and, as explained above, NMFS does not expect juveniles will attempt to rear in the action area. Therefore, steelhead are not likely to be injured or killed by the proposed pile driving. Juvenile southern DPS green sturgeon present in Corte Madera Creek must initially emigrate from the Sacramento River watershed and pass through San Pablo Bay; these juveniles are likely to be growing on the way and relatively large (>300 millimeters)Upon reaching Corte Madera Creek. Therefore, juvenile green sturgeon present in Corte Madera Creek during pile driving are not likely to be passively entrained in tidal currents or unable to swim out of or away from this zone. In addition to a typical improvement in swimming performance with an increase in size, larger adult fish can usually tolerate higher sound pressure levels and experience lower mortality rates than juvenile fish (Yelverton *et al.* 1975; Popper and Hastings 2009). Subadult and adult sturgeon are relatively large fish and could, presumably, tolerate higher levels of sound pressure and be less affected by pile driving activities than smaller fish. However, they are vulnerable to injury or death from pile driving (especially if within close proximity), as demonstrated by SPLs generated from driving large piles (approximately 8 feet in diameter) during the construction of the Benicia-Martinez Bridge that resulted in the death of a 24-inch white sturgeon (Caltrans unpublished data, 2002).

Steel casings associated with this project are similar in size to those used in the Benicia-Martinez Bridge, and peak SPL greater than 206 dB could exist within 14 meters of steel casings during 4-8 days of pile driving in two seasons (total 8-16 days). The likelihood of green sturgeon exposure to this area of peak SPL is low due to the low density of green sturgeon in the entire action area and short duration of this impact hammer pile driving. The SEL "zone" described above is much larger and extends the entire width of Corte Madera Creek upstream and downstream of Bon Air Bridge approximately 35 meters when H piles are being driven and 430 meters when steel casings are being driven. Green sturgeon could be present in this zone at some point during impact hammer pile driving (three seasons, 28-40 total days). The action area, however, is not a known aggregation or foraging site for green sturgeon. The few green sturgeon exposed to this zone are likely to be actively moving and not exposed to impact hammer pile

driving for extended periods of time. Based on this information, NMFS believes few southern DPS green sturgeon will be injured by proposed pile driving and it is unlikely that any will be killed.

2. Construction Impacts on Fish

For the Bon Air Bridge Replacement Project, in-water construction activities consist of primarily installing new piles and removal of the existing bridge foundation. The potential impacts of construction activities include sub-lethal impacts from exposure to increased turbidity (Sigler 1988; Sigler *et al.* 1984; Kirn *et al.* 1986; Emmett *et al.* 1988; Servizi 1988); redistribution and/or release of contaminants, with increased potential for chronic or acute toxicity; introduction of toxic chemicals from construction equipment; and noise impacts from pile driving (discussed above).

a. Turbidity.

To minimize turbidity associated with project activities, the contractor will adhere to a maximum threshold for turbidity established by the Regional Water Quality Control Board. In addition, the contractor will be required to avoid in-water work at extreme high tides. Construction activities, however, are still expected to create temporary increases in turbidity in the adjacent water column. There is little direct information available to assess the effects of turbidity in San Francisco Bay estuary on juvenile or adult green sturgeon. NMFS assumes that green sturgeon will be affected by turbidity through interference with foraging and migratory behavior. Because they forage in bottom sediments, green sturgeon may be less affected by turbidity than non-demersal fish. The extent of turbidity plumes resulting from the proposed project will depend on the tide, creek flow, and wind conditions during these activities. Because fish tend to avoid areas of high turbidity and return when concentrations of suspended solids are lower, impacts to sturgeon are expected to be temporary. These localized elevated levels of turbidity will disperse from the project area with tidal circulation. Southern DPS green sturgeon in the San Francisco Bay estuary commonly encounter areas of minor increases in turbidity due to wind and wave action and benthic foraging activities of other aquatic organisms. NMFS expects green sturgeon that encounter relatively minor turbidity from this project may move to clearer waters nearby. The localized areas of turbidity associated with this project's in-water construction is not expected to result in harm or injury, or behavioral responses that impair migration or make green sturgeon more susceptible to predation.

b. Contaminants.

In the aquatic environment, most anthropogenic chemicals and waste materials, including toxic organic and inorganic chemicals, eventually accumulate in the sediment. Contaminated sediments may be directly toxic to aquatic life or can be a source of contaminants for bioaccumulation in the food chain (Ingersoll 1995). Fine sediments in the project areas increase the likelihood of a problem with contaminants, because this fraction consists of particles with relatively large ratios of surface area to volume, which increase the sorptive capacity (the likelihood of taking up) of sediments for contaminants.

Dillon and Moore (1990) reported that major pollutant sources for San Francisco Bay include the freshwater flow from the Sacramento-San Joaquin River systems, over 50 waste treatment plants, and about 200 industries which are permitted to discharge directly into the Bay (citing Luoma and Phillips 1988). Contaminants from these sources may have entered lower Corte Madera Creek due to tidal action. Environmental contaminants discharged into aqueous systems tend to associate with particulate material in the water column and with consolidated bedded sediments. The level of contaminants in the project site is unknown, but suspension of sediments associated with construction activities could increase contaminant levels in the water column. These potentially minor and localized elevations in contaminants should be quickly diluted to levels that are unlikely to adversely affect listed salmonids or green sturgeon by tidal circulation.

c. Toxic Chemicals.

Equipment refueling, fluid leakage, equipment maintenance, and construction activities near streams and tidally influenced areas pose some risk of contamination of aquatic habitat and subsequent injury or death to listed salmonids and green sturgeon. Oils and similar substances from construction equipment can contain a wide variety of polynuclear aromatic hydrocarbons (PAHs), and metals. Both can result in adverse impacts to salmonids. PAHs can harm the benthic prey items (Eisler 2000). Some of the effects that metals can have on fish are: immobilization and impaired locomotion, reduced growth, reduced reproduction, genetic damage, tumors and lesions, developmental abnormalities, behavior changes (avoidance), and impairment of olfactory and brain functions (Eisler 2000).

Fueling of equipment on or around the Bon Air Bridge will occur at designated staging areas. Spill containment and remediation material will be nearby, and spills will be cleaned up immediately. Fresh cement or concrete will be contained within temporary steel casings or otherwise isolated from waters of Corte Madera Creek. Due to these measures, NMFS expects that accidents will be minimized and toxic chemical contamination of the action area will be minimized to levels which are unlikely to adversely affect fish.

B. Impacts to Critical Habitat

The action area is located within the tidal waters of Corte Madera Creek, and is designated critical habitat for CCC steelhead, CCC coho salmon, and the southern DPS of green sturgeon. Upon completion of construction, NMFS anticipates the proposed project will result in impacts to salmonids and green sturgeon critical habitat in the action area. The potential effects of this project to designated critical habitat associated with construction activities include temporary impacts on water quality and a temporary reduction in migration and foraging areas from noise and turbidity during construction, including pile driving and removal of the current bridge. Benthic foraging areas occupied by the temporary trestle piles will be also be unavailable to fish for at least the 3-4 year construction period. Temporary impacts on water quality, migration space, and forage is not expected to permanently reduce the value of PCEs of salmonids and green sturgeon critical habitat, because water quality, migration space, and forage in the action area is expected to return to current conditions once the project is completed. In addition, forage resources are available nearby elsewhere in the Bay (Baxter *et al.* 1999) should green sturgeon seek food in the action area and be deterred during construction activities.

The proposed Bon Air Bridge will have less than half the spans and piers of the existing bridge; existing bridge piers will be removed to approximately one foot below the mud-line to avoid future exposure from scour. Even with a reduction in the number of spans and in-water structures, the new bridge is likely to occupy a larger in-water and overwater area due to the wider bridge deck and relatively large pier size. Thus, bridge construction is likely to result in a small net loss in benthic foraging habitat adjacent to the bridge. Following bridge construction, conveyance of flow and debris in Corte Madera Creek is anticipated to improve, and there will be an overall reduction in the number of in-water structures associated with the bridge. NMFS expects that these changes are unlikely to have a more than a minimal negative or positive effect on existing designated critical habitat in the action area due to their small size.

VII. CUMULATIVE EFFECTS

Cumulative effects are defined in 50 CFR § 402.02 as "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". 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.

NMFS does not anticipate any cumulative effects in the action area other than those ongoing actions already described in the Environmental Baseline above and climate change. Given current baseline conditions and trends, NMFS does not expect to see significant improvement in habitat conditions in the near future due to existing land and water development affecting the Bay. In the long term, climate change may produce temperature and precipitation changes that may adversely affect listed salmonids and green sturgeon habitat in the action area. Flow in Corte Madera Creek may be affected by precipitation changes, for example.

VIII. INTEGRATION AND SYNTHESIS OF EFFECTS

CCC steelhead and southern DPS green sturgeon have experienced serious declines in abundance and long-term population trends suggest a negative growth rate. Human-induced factors have reduced populations and degraded habitat, which in turn has reduced the population's resilience to natural events, such as droughts, floods, and variable ocean conditions. Global climate change presents another real threat to the long-term persistence of the population, especially when combined with the current depressed population status and human caused impacts. Within the action area, the effects of shoreline development and urbanization are evident. These activities have eliminated tidal marsh habitats, degraded water quality, and altered the hydrology and fish habitat of the action area. As a result, forage species that listed salmonids and green sturgeon depend on have been reduced, periodic sources of contaminants are introduced from stormwater runoff, and natural shoreline habitat areas have been eliminated.

Based on project timing and location as described above in the Effects of the Action section, CCC steelhead are unlikely to be adversely affected by the proposed project. Due in part to the

limited number of green sturgeon records in tidal creeks and sloughs of the Bay, NMFS assumes few green sturgeon will be present in the action area during in-water construction. NMFS is not aware of any records of green sturgeon in Corte Madera Creek, and general migration patterns of adult and subadult green sturgeon do not indicate the action area is a migration corridor or aggregation area for green sturgeon. However, a small number of green sturgeon may intermittently utilize waters of the action area to forage or rear. These green sturgeon are likely to be impacted by construction activities. Turbidity, sediment, and contaminant effects will likely result in minor and temporary changes to fish behavior, and are not expected to injure or kill southern DPS green sturgeon.

Pile driving activities are expected to occur in four in-water construction seasons (September 1 to November 30) and adverse effects from high underwater sound pressure levels are anticipated during the impact hammer pile driving days as described above in the Effects section. Because steelhead are unlikely to be adversely affected, NMFS does not believe the project will appreciably diminish the numbers, reproduction, or distribution of CCC steelhead.

NMFS does not believe the project will appreciably diminish the numbers, reproduction, or distribution of the North American southern DPS green sturgeon. Any green sturgeon present in the action area during the construction window likely make up a small proportion of the southern DPS of green sturgeon; the small number of green sturgeon injured as a result of the project will not impact future adult returns, due to the large number of individual green sturgeon unaffected by the project compared to the small number of green sturgeon likely affected by the project.

The project will impact CCC steelhead, CCC coho salmon, and southern DPS green sturgeon critical habitat at the project site during the approximate three month in-water work window over four seasons. However, this area represents a small portion of Corte Madera Creek, and will become available to steelhead and green sturgeon again once the project is complete. NMFS expects that the minor or temporary impacts on estuarine habitat in the action area will have insignificant impacts on the value of migration and rearing PCEs in the action area. These impacts are unlikely to appreciably diminish the value of designated CCC steelhead, CCC coho salmon, and southern DPS green sturgeon critical habitat.

IX. CONCLUSION

After reviewing the best available scientific and commercial data, the current status of steelhead and green sturgeon (CCC steelhead and southern DPS green sturgeon), the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the Bon Air Bridge Replacement Project in Larkspur, California is not likely to jeopardize the continued existence of threatened CCC steelhead or threatened southern DPS green sturgeon.

After reviewing the best available scientific and commercial data, the current status of critical habitat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed Bon Air Bridge Replacement Project in Larkspur, California is not likely to adversely modify or destroy

designated critical habitat for CCC steelhead, CCC coho salmon, or southern DPS green sturgeon.

X. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without 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 NMFS as an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by Caltrans for the exemption in section 7(o)(2) to apply. Caltrans has continuing duty to regulate the activity covered by this incidental take statement. If Caltrans: (1) fails to assume and implement the terms and conditions, or (2) fails to require its designees to adhere to the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Caltrans or the City must report the progress of the actions and its impact on the species to NMFS as specified in the incidental take statement (50 CFR §402.14(I)(3)).

A. Amount or Extent of Take

NMFS anticipates that take of green sturgeon associated with the Bon Air Bridge Replacement Project will be in the form of injury through temporary impacts from construction activities associated with pile driving. The number of green sturgeon that may be incidentally taken during activities at the Bon Air Bridge Replacement Project is expected to be small. Because finding dead or injured fish will be difficult due to their size in relation to the size of the action area, the difficulty in observing dead or injured fish in the waters of the Corte Madera Creek due to depth and the presence of predators and scavengers such as birds, NMFS will use the area of sound pressure wave impact that extends into the water column from each pile, and the time period for pile driving, as surrogates for numbers of fish. For southern DPS green sturgeon, over three seasons between September 1 and November 15, those fish located within the following radial distances of impact hammer pile driving of 12- to14-inch H piles and 10-foot diameter steel casings may be injured:

- Attenuated H-piles - 206 dB peak SPL at <10 m, 187 dB accumulated SEL at 35 m, and 150 dB RMS at approximately 500 m;

- Attenuated steel casings - 206 dB peak SPL at 14 m, 187 dB accumulated SEL at 430 m, and 150 dB RMS at approximately 500 m.

If the City's monitoring indicates that sound pressure levels greater than 206 dB peak SPL or 187 dB SEL extend beyond these distances the amount of incidental take may be exceeded.

B. Effect of the Take

In the accompanying biological opinion, NMFS has determined that the anticipated take is not likely to jeopardize the continued existence of southern DPS green sturgeon.

C. Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of green sturgeon:

1. Undertake measures to minimize harm to green sturgeon from construction and degradation of aquatic habitat.

2. Ensure the fisheries and hydroacoustic monitoring plan minimizes harm and mortality of green sturgeon, and assists in the evaluation of project effects on green sturgeon.

3. Prepare and submit reports regarding the construction of the proposed project and the results of the fisheries and hydroacoustic monitoring program.

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, Caltrans and the City must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

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

    a. The permittees must allow any NMFS employee(s) or any other person(s) designated by NMFS, to accompany field personnel to visit the project sites during construction activities described in this opinion.

    b. Once construction is completed, all construction related material must be removed, leaving the area as it was before construction. Excess materials will be disposed of at an appropriate disposal site.

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

a. A fisheries and hydroacoustic monitoring plan must be implemented that includes the following:

   i. Underwater sound measurements at various distances and depths from pile driving operations;

   ii. Evaluation of fish mortality and injury rates through the use of visual observations and collections during pile driving events.

b. The permittees must prepare and submit to NMFS for review and approval the hydroacoustic monitoring plans for pile driving at least 60 days prior to construction. Monitoring must be designed to determine if underwater sound pressure levels exceed what has been analyzed in this biological opinion.

c. Preliminary daily biological and hydroacoustic monitoring reports are to be submitted by close-of-business (COB) the day following pile driving that provides real-time data regarding the distance (actual or estimated using propagation models) to the thresholds (206 dB Peak, 187 dB accumulated SEL, and 150 dB RMS) used in this biological opinion to determine adverse effects to listed species. If underwater sound exceeds these thresholds at the distances provided above from the piles being driven, then NMFS must be contacted within 24 hours before continuing to drive additional piles.

d. A final hydroacoustic monitoring summary must be submitted to NMFS, due 30 days following pile driving events for each season The reports must provide a review of the daily monitoring data and construction process, as well as any problems that were encountered. The report must be submitted to NMFS North Central Coast Office, Attention: Supervisor of Protected Resources Division, 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528.

   i. **Construction related activities** -- The report must include the dates construction began and was completed; a discussion of any unanticipated effects or unanticipated levels of effects on steelhead and green sturgeon, 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; and the number of fish killed or injured during the project action.

   ii. **Hydroacoustic and fisheries monitoring** -- The report must include the a description of the methods used to monitor sound, the dates that hydroacoustic monitoring was conducted; the locations (depths and distance from point of impact) where monitoring was conducted; the total number of pile strikes per pile, the interval between strikes, the peak/SPL, RMS and SEL per strike, and accumulated SEL per day for each hydroacoustic monitor deployed; a discussion of any unanticipated effects or unanticipated levels of effects on salmonids and green sturgeon.

e. If any salmonids or sturgeon are found dead or injured during visual observations, the biologist must contact NMFS biologist Joe Heublein by phone immediately at (707) 575-1251 or the NMFS North Central Coast Office at (707) 575-6050. All salmonid and sturgeon mortalities must be retained, placed in an appropriately-sized sealable plastic bag, labeled with the date and location of collection, fork length, and be frozen as soon as possible. Frozen samples must be retained by the biologist until specific instructions are provided by NMFS. The biologist may not transfer biological samples to anyone other than the NMFS Santa North Central Coast Office without obtaining prior written approval from the NMFS North Central Coast Office, Supervisor of the Protected Resources Division. Any such transfer will be subject to such conditions as NMFS deems appropriate.

XI. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, or to develop information. NMFS has the following conservation recommendation:

1. Caltrans or the City should improve or provide funding for the improvement of listed salmonid passage barriers located within or associated with Caltrans or City maintained facilities.

XII. REINITIATION NOTICE

This concludes formal consultation on the proposed Bon Air Bridge Replacement Project. As provided in 50 CFR §402.16, 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 take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, formal consultation must be reinitiated immediately.

XIII. REFERENCES CITED

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C. Personal Communications Cited

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Jeffrey Jahn, NMFS Biologist. August 2011 and January 2012. Personal communication with Joe Heublein, NMFS Biologist regarding recent CCC steelhead abundnace trends.

Ethan Mora. PhD candidate, UC Davis, Davis, CA. January 10, 2012. Personal communication, via phone call with Susan Wang (NMFS), regarding estimates of green sturgeon abundance in Southern DPS rivers in 2010 and 2011.

Enclosure 2

Bon Air Bridge Replacement Project
Corte Madera Creek, Marin County, California

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

I. STATUTORY AND REGULATORY INFORMATION

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, establishes a national program to manage and conserve the fisheries of the United States through the development of federal Fishery Management Plans (FMPs), and federal regulation of domestic fisheries under those FMPs, within the 200-mile U.S. Exclusive Economic Zone ("EEZ"). 16 U.S.C. §1801 *et seq*. To ensure habitat considerations receive increased attention for the conservation and management of fishery resources, the amended MSA required each existing, and any new, FMP to "describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 1855(b)(1)(A) of this title, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat." 16 U.S.C. §1853(a)(7). Essential Fish Habitat (EFH) is defined in the MSA as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" 16 U.S.C. §1802(10). The components of this definition are interpreted at 50 C.F.R. §600.10 as follows: "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

Pursuant to the MSA, each federal agency is mandated to consult with NMFS (as delegated by the Secretary of Commerce) with respect to any action authorized, funded, or undertaken, or proposed to be, by such agency that may adversely affect any EFH under this Act. 16 U.S.C. §1855(b)(2). The MSA further mandates that where NMFS receives information from a Fishery Management Council or federal or state agency or determines from other sources that an action authorized, funded, or undertaken, or proposed to be, by any federal or state agency would adversely affect any EFH identified under this Act, NMFS has an obligation to recommend to such agency measures that can be taken by such agency to conserve EFH. 16 U.S.C. §1855(4)(A). The term "adverse effect" is interpreted at 50 C.F.R. §600.810(a) as any impact that reduces quality and/or quantity of EFH and may include direct or indirect physical, chemical, or biological alterations 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 quantity and/or quality of EFH. In addition, adverse effects to EFH may result from

actions occurring within EFH or outside EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

If NMFS determines that an action would adversely affect EFH and subsequently recommends measures to conserve such habitat, the MSA proscribes that the Federal action agency that receives the conservation recommendation must provide a detailed response in writing to NMFS within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations. 16 U.S.C. §1855(b)(4)(B).

II. BACKGROUND AND CONSULTATION HISTORY

The December 7, 2011, letter from California Department of Transportation's (CalTrans) requested consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). However, the Bon Air Bridge location includes areas identified as EFH for various life stages of species managed under the Pacific Fishery Management Council. The MSA requires all Federal agencies to consult with NMFS on all actions, or proposed actions, permitted, funded, or undertaken by the agency, that may adversely affect EFH. Per agreement with the Federal Highways Administration (FHWA), the California Department of Transportation (Caltrans) will be acting as the Federal action agency. Because EFH for salmonids, groundfish, and coastal pelagic species could be affected by the project, NMFS provides the following EFH consultation and EFH Conservation Recommendation to avoid, minimize, or otherwise offset potential adverse effects to EFH.

A complete consultation history can be found in the preceding biological opinion (BO; see Section I).

III. PROPOSED ACTION

The proposed action involves replacement of the existing Bon Air Bridge. Two temporary trestles, approximately 400 ft x 35 ft each, are proposed alongside the north and south sides of the existing bridge to facilitate bridge replacement. Construction of the north trestle is proposed for fall of 2013, would be in place an estimated 2 years and the south trestle would occur fall of 2014 and be in place approximately 1.5 years. Construction of the trestles would require installation of 128 steel H-piles, driven by vibratory and impact hammer taking about 10-12 days for each trestle over a period of about 2 months for each trestle. Upon completion of the new bridge, trestles would be removed and pilings would be vibrated out with the goal of complete removal. However, if pilings cannot be extracted completely they will be cut a few feet below the channel bottom. Removal of each pile should take 30 minutes to several hours each unless cut, which is a shorter process. The contractor will be required to avoid extreme high tides. Besides this restriction, the timing for pile removal will be at the option of the contractor.

Caltrans has deemed full removal of existing concrete piles infeasible and proposes to cut the piles approximately one foot below the channel bottom. The contractor will be required to avoid

extreme high tides. Besides this restriction, the timing for pile removal will be at the option of the contractor.

New bridge foundation columns will be constructed within the creek bed sediment, requiring a total of 8 temporary 10-foot diameter steel casing driven into the channel bed to a depth of approximately 70 feet. Drilling of sediments will occur within the casing, which will act as a coffer dam to separate the work area from the creek and to control impacts to water turbidity. Tailings will be removed into a bucket or by slurry. After drilling, the bridge foundation columns will be constructed within the casings. Eight foot diameter steel casings for the upper piers will be inserted into the outer casing. The outer casings will be vibrated upon completion.

The existing bridge deck (420 feet x 44 feet) will be replaced with a larger single span (388 feet x 63 feet) with widening along the north side of about 13 feet, resulting in an increase of 5964 square feet of overwater structure. The new bridge will be built at the same height as the existing structure.

To minimize turbidity associated with project activities, Caltrans proposes turbidity monitoring and the contractor will adhere to a maximum threshold for turbidity established by the Regional Water Quality Control Board. In addition, the contractor will be required to avoid in-water work at extreme high tides.

IV. ACTION AREA

For purposes of this EFH consultation, the action area spans Corte Madera Creek, where the creek is approximately 337 feet wide. Subtidal habitat beneath the bridge is open water with depths varying from less than 10 feet to 15 feet deep in the middle of the channel under summer-fall flow conditions. During low tides, the wetted channel beneath the bridge can be narrow (less than 2 meters wide) with wide mud flat margins. The bed is composed mostly of clay with an occasional layer of silty-sand. Shorelines of each bank consist of a narrow fringe of riverine wetland with some tidally influenced saline emergent wetland located northeast of the bridge adjacent to Corte Madera Creek.

V. EFFECTS OF THE ACTION

The installation and removal of temporary trestles and the bridge dismantling and replacement could adversely affect EFH, including estuary HAPC due to: (1) temporary and permanent increase of shading of benthic and open water habitat from overwater structures, (2) temporary turbidity/suspended sediment effects, (3) temporary elevated levels of underwater sound, and (4) permanent increase of fill and temporary disturbance of benthic habitat.

The new bridge will result in at least 5,964 square feet (0.14 acre) of additional shading of benthic and open water channel habitat in the creek. Two trestles will be installed alongside the existing structure and will result in a temporary shading of 28,000 square feet (0.64 acres) of EFH. Shading is known to decrease primary productivity, alter predator-prey interactions, change invertebrate assemblages, and reduce the density of benthic invertebrates (Helfman 1981; Glasby 1999; Struck, Craft *et al.* 2004; Stutes, Cebrian *et al.* 2006); all of which lead to an overall reduction in the quality of EFH.

Installation and pulling of temporary piles will result in short-term localized increases in turbidity. Resuspension of bottom sediments into the water column can reduce light penetration and lower the rate of photosynthesis for subaquatic vegetation (Dennison 1987). If sediment loads remain high for an extended period of time, the primary productivity of an aquatic area may be reduced (Cloern 1987). Turbidity is expected to dissipate quickly in the project area. However, the cumulative impact may be significant as large numbers of pilings are proposed for installation and removal. Some fish may suffer reduced feeding ability (Benfield and Minello 1996) and be prone to fish gill injury (Nightingale and C.A. Simenstad 2001) if exposed to excessive high levels of turbidity. Fish are expected to move out of areas of high suspended sediment.

As described in the BO, pile driving can generate intense underwater sound pressure waves that have been shown to injure and kill fish. In addition, increased levels of noise at sublethal levels may adversely affect the ecological functioning of EFH and may cause fish to temporarily leave the area.

Approximately 200 square feet of permanent fill will result from the new bridge foundations. Trestles supported by H-piles will result in a relatively small area of temporary fill. Areas with temporary pilings will also experience additional disturbance upon piling removal. The fine grain sediment that is characteristic of the creek bottom in the project area is considered good foraging habitat for fish, providing a substrate for infaunal and bottom-dwelling organisms, such as polychaete worms, crustaceans, and other EFH prey types (NMFS 2007). Rates of recovery listed in the literature range from several months to several years for estuarine muds (McCauley 1976; Oliver 1977; Currie 1996; Tuck 1998; Watling 2001). Thus, forage resources for fish that feed on the benthos may be reduced during the 3-4 years of construction and recovery time. Some permanent fill may also occur below the mudline if temporary pilings or old bridge supports cannot be fully extracted. These piling fragments will be cut off below what is typically considered the biologically active surface zone of benthic mud.

VI. CONSERVATION RECOMMENDATION

To minimize the potential adverse impacts to EFH from increased levels of turbidity, NMFS recommends the following:

1. Whenever possible, perform in-water work at low tides, particularly the removal of pilings located within the wide mud flat margins of the creek that may be fully exposed at low tide.

VII. EFH CONCLUSION

As described in the above effects analysis, NMFS has determined that the proposed project would adversely affect EFH for various federally-managed species within the Pacific Groundfish, Coastal Pelagic, and Pacific Salmonid FMPs. With the additional EFH Conservation Recommendation provided here, potential adverse effects to EFH are expected to be adequately minimized.

This concludes EFH consultation for the proposed Bon Air Bridge Replacement Project in Corte Madera Creek, Marin County, California.

VIII. FEDERAL AGENCY STATUTORY REQUIREMENTS

Please be advised that regulations (50 CFR 600.920(k)) to implement the EFH provisions of the MSA require your office to provide a written response to this letter within 30 days of its receipt and prior to the final action. A preliminary response is acceptable if final response cannot be completed within 30 days. Your final response must include a description of how the EFH Conservation Recommendation will be implemented and any other measures that will be required to avoid, mitigate, or offset the adverse impacts of the activity. If your response is inconsistent with our EFH Conservation Recommendation, you must provide an explanation for not implementing this recommendation at least 10 days prior to final approval of the action.

Pursuant to 50 CFR 600.920(l), 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 Conclusion or Conservation Recommendation.

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