FINAL ENVIRONMENTAL ASSESSMENT
FOR
ISSUANCE OF AN INCIDENTAL HARRASMENT AUTHORIZATION FOR THE ANTIOCH BRIDGE SEISMIC RETROFIT PROJECT

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Abstract: The National Marine Fisheries Service (NMFS) proposes to issue an Incidental Harassment Authorization (IHA) to the California Department of Transportation for the incidental taking of small numbers of marine mammals in the wild, pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 et seq.). The IHA would be valid for one year from the date of issuance and would authorize the take, by Level B harassment, of marine mammals incidental to pile driving associated with the Antioch Bridge Seismic Retrofit Project, California.

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CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

1.1 DESCRIPTION OF ACTION

On March 25, 2009, NMFS received a request from Caltrans for the incidental harassment of harbor seals (*Phoca vitulina richardii*) and California sea lions (*Zalophus californianus*) incidental to the Antioch Bridge Seismic Retrofit Project. After receipt of supplemental information, NMFS determined the application complete on August 29, 2009. As such, NMFS proposes to issue an Incidental Harassment Authorization (IHA) pursuant to Section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1371 et seq.) and the regulations governing the taking and importing of marine mammals (50 CFR Part 216).

1.1.2 Purpose and Need

The purpose and need of the action is to ensure compliance with the MMPA and its implementing regulations for the activities associated with the Antioch Bridge Seismic Retrofit Project. The MMPA prohibits takes of all marine mammals in the U.S. (including territorial seas) with a few exceptions. Sections 101(a)(5)(A) and (D) of the MMPA direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional taking of marine mammals by U.S. Citizens who engage in a specified activity (other than commercial fishing) if certain findings are made and regulations are issued or, if the taking is limited to harassment, notice of a proposed authorization is provided to the public for review.

Authorization for incidental takings may be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for certain subsistence uses, and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such taking are set forth. NMFS has defined "negligible impact" in 50 CFR 216.103 as: an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

NMFS' decision of whether or not to issue an incidental take authorization to Caltrans is a major Federal action that requires an analysis of its effect on the human environment pursuant to the National Environmental Policy Act (NEPA). This Environmental Assessment (EA) contains that analysis and is intended to support NMFS' issuance of an IHA authorizing the incidental take of small number of marine mammals associated with the Antioch Bridge Seismic Retrofit Project.

1.1.3 Objectives of the Antioch Bridge Seismic Retrofit Project

As described in the application, the Antioch Bridge, located in southern San Francisco Bay (Bay), was designed in the late 1970s based on the design standards that Caltrans established in 1971. Since that time, upgraded standards have been issued, particularly Caltrans' Seismic

Design Criteria of 1999, which the bridge does not meet. The Antioch Seismic Retrofit Project would provide a seismic upgrade of the Antioch Bridge to meet these current requirements.

1.2 OTHER EA/EIS THAT INFLUENCE SCOPE OF THIS EA

On September 2, 2009, Caltrans prepared an Environmental Assessment (EA) and associated Finding on No Significant Impact (FONSI) for its Antioch Bridge Seismic Retrofit Project (#35-0038). The EA identified and addressed impacts to the human environment. In summary, the analysis determined that the proposed action would not have significant adverse impacts on the human environment. However, NMFS found its analysis on marine mammal impacts lacking; hence, NMFS has prepared this EA to adequately address impacts to marine mammals. All other impacts to the human environment (e.g., social and economic environment, non-marine mammal species) are incorporated, by reference, from Caltrans' 2009 EA.

NMFS has also prepared, supplemented, or adopted numerous EAs leading to Findings of No Significant Impact (FONSIs) for pile driving activities in general, including ones for larger Caltrans projects which involved pile driving large piles in the northern section of the Bay where pinniped and cetacean species are more abundant. The analysis of pile driving impacts to marine mammals and their environment under NEPA have been conducted to facilitate issuance of other IHAs. Examples of such EAs include:

1. *Environmental Assessment on the Authorization for the Harassment of Marine Mammals Incidental to the Seismic Retrofit of the Richmond-San Rafael Bridge, San Francisco Bay, CA Under Section 101(a)(5) of the Marine Mammal Protection Act* (1997);

2. *Environmental Assessment on the Authorization for the Harassment of Marine Mammals Incidental to Construction of the East Span of The San Francisco-Oakland Bridge Under Section 101(a)(5) of the Marine Mammal Protection Act* (2003); and

3. *Environmental Assessment on the Authorization for the Harassment of Marine Mammals Incidental to Retrofitting Three Bridges at Humbolt Bay in Humbolt County, CA by the California Department of Transportation Under Section 101(a)(5) of the Marine Mammal Protection Act* (2005).

1.3 SCOPING SUMMARY

The purpose of scoping is to identify the issues to be addressed and the significant issues related to the proposed action, as well as identify and eliminate from detailed study the issues that are not significant or that have been covered by prior environmental review. An additional purpose of the scoping process is to identify the concerns of the affected public and Federal agencies, states, and Indian tribes.

Under 50 CFR 216.104(b) of NMFS' implementing regulations for the MMPA, NMFS must, after deeming the application adequate and complete, publish in the *Federal Register* a notice of proposed IHA or receipt of a request for the implementation or re-implementation of

regulations governing the incidental taking. Information gathered during the associated comment period is considered by NMFS in ensuring adequacy of preliminary determinations and proposed mitigation measures for IHAs. In accordance, a notice of proposed issuance of an IHA was published in the *Federal Register* on December 4, 2009 (74 FR 63724). The application and proposed IHA notice was made available for public review and comment for 30 days and provided to the Marine Mammal Commission.

1.4 APPLICABLE LAWS AND NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action, as well as who is responsible for obtaining them. Even when it is the applicant's responsibility to obtain such permissions, NMFS is obligated under NEPA to ascertain whether the applicant is seeking other federal, state, or local approvals for their action.

1.4.1 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) was enacted in 1969 and is applicable to all "major" federal actions significantly affecting the quality of the human environment. A major federal action is an activity that is fully or partially funded, regulated, conducted, or approved by a federal agency. NMFS issuance of incidental take authorizations represents approval and regulation of activities. While NEPA does not dictate substantive requirements for permits, licenses, etc., it requires consideration of environmental issues in federal agency planning and decision making. The procedural provisions outlining federal agency responsibilities under NEPA are provided in the Council on Environmental Quality's implementing regulations (40 CFR Parts 1500-1508).

NMFS has, through NOAA Administrative Order (NAO) 216-6, established agency procedures for complying with NEPA and the implementing regulations issued by the Council on Environmental Quality. This EA is prepared in accordance with NEPA, its implementing regulations, and NOAA 216-6.

1.4.2 Endangered Species Act (ESA)

Section 7 of the ESA and implementing regulations require consultation with the appropriate federal agency (either NMFS or the U.S. Fish and Wildlife Service) for federal actions that "may affect" a listed species or adversely modify critical habitat. NMFS issuance of an authorization affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these Section 7 consultation requirements. Section 7 requires federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. NMFS is further required to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse

modification of habitat for such species. Regulations specify the procedural requirements for these consultations (50 Part CFR 402)

1.4.3 Marine Mammal Protection Act (MMPA)

The MMPA prohibits takes of all marine mammals in the U.S. (including territorial seas) with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 et seq.) direct the Secretary of Commerce (Secretary) to allow, upon request, the incidental, but not intentional, taking of marine mammals by U.S. Citizens who engage in a specified activity (other than commercial fishing) if certain findings are made and regulations are issued or, if the taking is limited to harassment, notice of a proposed authorization is provided to the public for review.

Authorization for incidental takings may be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for certain subsistence uses, and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such taking are set forth. NMFS has defined "negligible impact" in 50 CFR 216.103 as: an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

Under the MMPA, harassment is defined as any act of pursuit, torment, or annoyance which has the potential to: (i) injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment). An IHA may be issued, except for activities that have the potential to result in serious injury or mortality (i.e., it may only authorize harassment), for a period of no more than one year, following a 30-day public review period. Alternatively, an incidental take authorization may be granted for a period of 5-years under section 101(a)(5)(A) and may include serious injury and takes by mortality. For both an IHA and regulations, authorization shall be granted if the Secretary finds that the taking will have a negligible impact on a species or stock, and if the IHA or regulations set forth the permissible methods of taking, the means of effecting the least practicable adverse impact, and requirements pertaining to monitoring and reporting.

1.4.4. Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA)

Under the MSFCMA Congress defined Essential Fish Habitat (EFH) as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 U.S.C. 1802(10)). The EFH provisions of the MSFCMA offer resource managers means to accomplish the goal of giving heightened consideration to fish habitat in resource management. NMFS Office of Protected Resources is required to consult with NMFS Office of Habitat Conservation for any action it authorizes (e.g., research permits), funds, or undertakes, or proposes to authorize, fund, or undertake that may adversely affect EFH. This includes renewals, reviews or substantial revisions of actions.

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the range of potential actions (alternatives) determined reasonable with respect to achieving the stated objective. This chapter also summarizes the expected outputs and any related mitigation of each alternative. One alternative is the "No Action" alternative where the proposed permit would not be issued. The No Action alternative is the baseline for rest of the analyses. The Proposed Action alternative represents a description of the specified activity, as proposed in the application, with standard authorization mitigation measures specified by NMFS.

2.1 ALTERNATIVE 1 – NO ACTION

Under the No Action alternative, no authorization would be authorized to take marine mammals incidental to the specified activity. Caltrans would still be authorized to conduct the activity, as allowed for under their Section 404 Army Corps of Engineers permit; however, any marine mammal takes from the activity would be a violation of the MMPA.

2.2 ALTERNATIVE 2 – PROPOSED ACTION (Issuance of an IHA with Proposed Conditions)

Under the Proposed Action alternative, an IHA would be issued for activities as proposed by the applicant, with the mitigation, monitoring, and reporting conditions contained within Caltrans' application and NMFS' proposed IHA *Federal Register* notice.

2.2.1 Action Area

The Antioch Bridge is located 5.4 miles east of the confluence of the Sacramento and San Joaquin Rivers. It is 9,437-ft long, accommodates one lane of traffic in either direction, and includes narrow accommodation for bicyclists and pedestrians. The bridge supports SR 160 and connects the City of Antioch on the south bank of the San Joaquin River to Sherman Island on the north. It spans the 3,600 ft width of the river and over 4,000 ft of Sherman Island. The San Joaquin River is relatively shallow on the south side, with depths of less than 10 ft out to pier 11. The main channel extends between piers 12 and 20 with deep water passage between piers 19 and 20 near the northern shore. The Antioch Bridge currently does not meet Caltrans' seismic design criteria. The retrofit project would provide a seismic upgrade of the bridge to meet these current requirements.

2.2.2 Specified Activity

Proposed retrofit elements to the Antioch Bridge include installation of steel bracings; replacement of the existing elastometric bearings with isolation bearings; and removal of the existing curtain walls and retrofit of all the columns within the slab span structure. Retrofitting itself would not result in harassment to marine mammals; however, to access the shallow water

piers which would be retrofitted (out to Pier 11), a temporary trestle would be constructed via pile driving. Marine mammals exposed to certain levels of pile driving noise may be harassed.

The temporary marine trestle would be constructed approximately 5-ft above the mean higher-high water (MHHW) from the south shore of the San Joaquin River; out approximately 910-ft into the river along the west side of the existing bridge structure. This is where water depths are less than 10-ft below mean lower-low water (MLLW) and are too shallow to be accessed by barge. The trestle will be 25 ft wide with two 24-in diameter hallow, steel shell piles for every 25 ft of trestle. In total approximately 160 piles will be installed primarily with a vibratory hammer with a source level of approximately 166 dB rms. Vibrating a single 24-in pile into place requires, at the most, ten minutes of noise generating vibration. Caltrans estimates four to six piles would be driven with a vibratory hammer per day resulting in 40- 60 minutes of pile driving. In addition, Caltrans will "proof" or test one pile per day using an impact hammer to ensure the pile can sustain the required load. Proofing the piles will require approximately 20 blows per day, generating sound pressure for about one minute per day. The entire project is expected to take 2.5 years to complete; however, installation of the temporary trestle is expected to take approximately 4 months and is planned for August 1- November 1, 2010; this in-water work window was established in NMFS' 2009 BiOp prepared for this action. At the completion of the project, the trestle and all associated piles will be removed. All pile driving will be conducted during daylight hours only.

2.2.3 Mitigation Measures

In order to issue an IHA under Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses. Caltrans has proposed mitigation both in their application and supplemental communication to reduce impact to environmental resources. Measures set in place to protect birds and fish (e.g., using the vibratory hammer at all times except for load bearing tests) also protect marine mammals. The following proposed mitigation measures are designed to eliminate potential for injury and reduce harassment levels to marine mammals.

(1) Limited use of Impact Hammer

As a result of Section 7 consultation discussions with NMFS (to reduce impacts to ESA-listed fish species), Caltrans has agreed to drive all temporary piles with a vibratory hammer with the exception of one pile per day being ''proofed'' with an impact hammer which has a higher source level. Proofing requires approximately 20 blows per pile which equates to approximately 15–20 seconds of impact hammering per day.

(2) Establishment of safety and zones and shut down requirements

The isopleth for the Level A harassment (injury) threshold (190 dB re: 1 microPa) is modeled to be within 55 ft (16.8 m) of the impact pile hammer; however, Caltrans has proposed to delay impact pile driving should a marine mammal come within or approach 100 ft (30 m) of

the pile being driven. Vibratory pile driving does not elicit source levels at or above NMFS' harassment threshold for Level A harassment (190 dB re 1 microPa); however, Caltrans will also employ the 100 ft (30 m) safety zone to protect animals against physical harm from the equipment. That is, should a marine mammal be observed within or on a path toward the 100 ft (30 m) zone around the pile hammer, Caltrans will delay commencement or shut down pile driving. Sound source verification tests will be conducted upon commencement of pile driving to verify acoustic models (see Acoustic Monitoring below).

(3) Soft Start Procedures

A ''soft start'' technique would be used at the beginning of each pile installation to allow any marine mammal that may be in the immediate area to leave before vibratory piling reaches full energy. The soft start requires contractors to initiate noise from vibratory hammers for 15 seconds at reduced energy followed by 1-minute waiting period. The procedure would be repeated two additional times. Due to the short duration of impact pile driving (20 seconds), the general ramp-up requirement for impact pile driving does not apply as it would actually increase the duration of noise emitted into the environment and monitoring should effectively detect marine mammals within or near the designated safety zone of 100 ft (30 m). If any marine mammal is sighted within or approaching this shut down zone prior to pile-driving, Caltrans would delay pile-driving until the animal has moved outside and on a path away from such zone or after 15 minutes have elapsed since the last sighting of the marine mammal.

(4) Vessel Operations

Although small support vessels (e.g., tugs, barges) are necessary to carry out the project, operation of these vessels are not expected to result in harassment as these vessels are slow moving or stationary and pinnipeds in the area are often exposed to vessel traffic and therefore have likely habituated to vessel presence. However, all vessels would abide by NMFS' Southwest Regional Viewing Guidelines (http://swr.nmfs.noaa.gov/psd/rookeryhaulouts/CASEALVIEWBROCHURE.pdf) to the greatest extent possible while still maintaining safe control of the vessel.

2.2.4 Monitoring and Reporting Measures

In order to issue an IHA for an activity, Section 101(a)(5)(D) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking". The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for IHAs must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present.

(1) Visual Monitoring

Marine mammal monitoring would be conducted 30 minutes prior to, during, and 30 minutes post all in-water pile driving by NMFS approved protected species observers (PSOs). Impact pile driving would not begin until the initial 100 ft safety zone is clear of marine

mammals and would be stopped in the event that marine mammals enter the safety zone. For all pile driving, PSOs would begin monitoring at least 30 minutes prior to the commencement of pile driving and could conduct monitoring from small boats, as observation from a higher vantage point may not be practical. PSOs would remain 50 yards from swimming pinnipeds in accordance with NMFS marine mammal viewing guidelines (http://swr.nmfs.noaa.gov/psd/rookeryhaulouts/CASEALVIEWBROCHURE.pdf). This would prevent additional harassment to pinnipeds from the vessel. If a land based monitoring point can be found, PSOs would be stationed here.

Monitoring of marine mammals will be conducted using high quality binoculars (e.g., Zeiss, 10 x 42 power). When possible, digital video or 35 mm still cameras will also be used to document the behavior and response of marine mammals to construction activities or other disturbances. Each monitor will have a radio for contact with other researchers or work crews if necessary, a GPS unit for determining observation location, and an electronic range finder to determine distance to marine mammals, boats, buoys and construction equipment. Data collection will consist of: (1) a count of all pinnipeds and cetaceans sighted by species, age and sex class, where able to be determined; (2) a description of behavior (based on the Richmond Bridge Harbor Seal Survey classification system); (3) location; (4) direction of movement; (5) type of construction that is occurring; (6) any acoustic or visual reactions to specified activities; and (7) time of the observation; (8) time that pile driving begins and ends; and (9) environmental conditions such as wind speed, wind direction, visibility, temperature, tide level, current, and sea state (described using the standard Beaufort sea scale).

(2) Acoustic Monitoring

Hydroacoustic monitoring would be conducted by a NMFS approved bioacoustician upon commencement of pile driving to empirically establish injurious (190 dB) and behavioral (160 dB- impact; 120 dB-vibratory) harassment isopleths. Details will be developed during work plan preparation, but might include monitoring one pile in every set of 3 piles during installation of the temporary trestles. Measurements would be taken at two depths: one in mid water column and one near the bottom but at least 3 feet above the bottom, unless obstructions such as land force a variation in depth or number of measurements. Marine mammal safety and harassment zones may be adjusted, pending NMFS approval.

(3) Reporting

A final report summarizing all marine mammal monitoring data, including those parameters listed above, and construction activities will be submitted to NMFS 90 days after the IHA expires. In addition, a final acoustic report summarizing pipe and sheet pile driving noise footprints will be submitted to NMFS within 90 days after expiration of the IHA.

CHAPTER 3 AFFECTED ENVIRONMENT

This chapter presents baseline information necessary for consideration of the alternatives, and describes the resources that would be affected by the alternatives, as well as environmental components that would affect the alternatives if they were to be implemented. The effects of the alternatives on the environment are discussed in Chapter 4.

3.1 SOCIAL AND ECONOMIC ENVIRONMENT

Economic and social factors are listed in the definition of effects in the NEPA regulations. However, the definition of human environment states that "economic and social effects are not intended by themselves to require preparation of an EIS." An EA must include a discussion of a proposed action's economic and social effects when these effects are related to effects on the natural or physical environment. Caltrans' 2009 EA prepared for the Antioch Bridge Seismic Retrofit Projects discusses the social and economic environment potentially affected by the project; this information is incorporated here by reference. In summary, Caltrans' EA identified importance of the bridge for vehicular use and the recreational use of the adjacent Antioch/Oakley Regional Shoreline Park.

3.2 PHYSICAL ENIVORNMENT

3.2.1 Sanctuaries, Parks, Historic Sites, etc.

Caltrans' 2009 EA identifies important landmarks, or lack thereof, within the action area. The information contained within that EA is incorporated here by reference. In summary, no historic sites, sanctuaries, or parks exist within the action area. However, two public fishing piers lie just south of the Antioch Bridge. The western pier, referred to as the Ravenswood Pier, is closed to the public because of safety issues. The eastern pier, referred to as the Antioch Pier, is inside the Don Edwards San Francisco Bay National Wildlife Refuge. This pier is currently open to the public.

3.2.2 Essential Fish Habitat

Essential Fish Habitat (EFH) means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of EFH, "waters" include aquatic areas that are used by fish and their associated physical, chemical, and biological properties and may include 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 a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' entire life cycle. EFH was addressed in Caltans' 2009 EA; this information is incorporated by reference and summarized below.

According to Caltrans' EA, the southern portion of San Francisco Bay is an Essential Fish Habitat (EFH) under the Magnuson-Stevens Fisheries Conservation and Management Act

(MSFCMA) and serves as habitat for 14 species (see project NES, March 2009) of commercially important fish and sharks. These are federally managed under two fisheries management plans (FMP): the Pacific Groundfish FMP and the Coastal Pelagic FMP. This portion of the Bay is an EFH for the species of coastal pelagic, Pacific groundfish, and Chinook salmon. Activities that have been shown to affect EFH include disturbance or destruction of habitat from stationary fishing gear, dredging and filling, agricultural and urban runoff, direct discharge, and the introduction of exotic species.

3.2.3 Critical Habitat

As described in Caltrans' 2009 EA, no ESA-listed marine mammals occur with in the action and therefore, no marine mammal critical habitat has been designated within the action area. However, Central California Coast steelhead has designated critical habitat in the south Bay. A proposed critical habitat designation for North American green sturgeon southern distinct population segment (September 8, 2008; 73 FR 52084); however, to date none has been established.

3.3. BIOLOGICAL ENVIRONMENT

The Antioch Bridge is surrounded by open bay, salt ponds, salt marshes, mudflats, vernal pools and, on the eastern end, the Don Edwards San Francisco Bay National Wildlife Refuge. These habitats are home to a variety of important species, including birds, fish, and marine mammals, that are protected by a variety of environmental regulations. Caltrans' 2009 EA identifies and describes a variety of biologically important and protected species inhabiting the action area. The descriptions of these species, including various ESA-listed birds, plants, and fish, are incorporated here by reference. However, because the proposed action involves harassment to marine mammals, this EA is intended to expand upon Caltrans' marine mammal analysis. Therefore, NMFS provides a more thorough description of marine mammals here.

At least 35 marine mammal species can be found off the coast of California; however, few venture into the Bay and only Pacific harbor seals and California sea lions inhabit the southern portion of the Bay regularly. Gray whales are sighted in the Bay during their yearly migration, though most sightings tend to occur in the central Bay. Humpback whales (*Megaptera noveangliae*), while sometimes present in the central Bay, are rare in the south and are not expected to be present within the action area. Therefore, humpback whales will not be considered further in this analysis and no take authorization is requested or proposed for this action.

3.3.1. Harbor Seals

The Pacific harbor seal impacted by this project belong to the California stock which is not listed as depleted under the MMPA or endangered or threatened under the Endangered Species Act (ESA). The most current stock assessment report estimates a population of 34,233 (Carretta et al., 2005). A recent marine mammal study conducted before and during seismic retrofit work on the Richmond–San Rafael Bridge (RSRB) in the northern Bay included extensive monitoring of marine mammals at points throughout the Bay, including the Central and

South Bay areas. This study concluded that at least 500 seals populate the Bay, an estimate which closely agrees with previous seal counts, which ranged from 524 to 641 seals from 1987 to 1999 (Goals Project 2000); however, specific to the project site, presence of harbor seals is limited.

Harbor seals generally do not migrate and display year-round site fidelity, though they have been known to swim several hundred miles to find food or suitable habitat. Seals within the Bay engage in limited seasonal movements associated with foraging and breeding activities (Kopec and Harvey 1995), and seals in the South Bay may make daily northward foraging excursions.

Although generally solitary in the water, harbor seals come ashore at communal sites known as "haul-outs," which are used for resting, thermoregulation, birthing, and nursing pups (see figure 4-1. in the application for haul-out sites in the Bay). Haul-out locations are relatively consistent from year to year (Kopec and Harvey, 1995), and females have been recorded returning to their own natal haul-out when breeding (Green et al., 2006). Bay harbor seals haul out in groups ranging in size from a few individuals to several hundred seals. The area of the Delta where the bridge is located falls within the limits of the harbor seal range; however, the closest harbor seal haulouts are Castro Rocks (45.5 miles), Corte Madera (45.75 miles), and Yerba Buena Island (53.5 miles). Any harbor seals located around the Antioch Bridge, and therefore would have the potential to be taken, would likely be transient individuals in search of food upstream into the San Joaquin River.

Pinnipeds produce a wide range of hearing social signals, most occurring at relatively low frequencies (Southall et al., 2007), suggesting hearing is keenest at these frequencies. Pinnipeds communicate acoustically both on land and in the water suggesting they possess amphibious hearing and have difference hearing capabilities dependant upon the media (air or water). Based on numerous studies, as summarized in Southall et al. (2007), pinnipeds are more sensitive to a broader range of sound frequencies in water than in air. In-water, pinnipeds can hear frequencies from 75 Hz to 75 kHz. In-air, the lower limit remains at 75 Hz but the highest audible frequencies are only around 30 kHz (Southall, et al., 2007).

3.3.2. California Sea Lions

California sea lions are endemic to the Northern Pacific Ocean, breeding in southern California and along the Channel Islands during the spring. They are not listed as depleted under the MMPA or as endangered or threatened under the ESA. The most current stock assessment report estimates there are approximately 238,000 sea lions in the U.S (Carretta, 2007). In the Bay, sea lions haul out primarily on floating docks at Pier 39 in the Fisherman's Wharf area of the San Francisco Marina (approximately 54 miles from the Antioch Bridge) and on buoys and similar structures throughout the Bay. However, no known haulout sites occur within the vicinity of the bridge. During the designated August 1- November 30 during the designated work window for installing the temporary marine trestle (a Term and Condition of NMFS' BiOp for this project), California sea lions will likely be absent from August-September, as they are still in the breeding season around the Channel Islands (CDFG 1990). Beginning in September, juvenile and adult male seal lions begin to travel from the Islands and enter the San Joaquin

River Delta in search of food (CDFG, 1990). California sea lion diet consists primarily of pacific herring, northern anchovy, and sardines. Sea lions do not tend to haul-out in the southern Bay.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter represents the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives. Regulations for implementing the provisions of NEPA require consideration of both the context and intensity of a proposed action (40 CFR Parts 1500-1508).

4.1 EFFECTS OF ALTERNATIVE 1: NO ACTION

Under the No Action Alternative, NMFS would deny Caltrans' an authorization to harass marine mammals incidental to the Antioch Bridge Seismic Retrofit Project. This would essentially require Caltrans to shut down pile driving operations whenever a marine mammal was sighted, resulting in costly time delays, or risk causing illegal take of marine mammals.

4.2 EFFECTS OF ALTERNATIVE 2: PROPOSED ACTION (ISSUANCE OF AN IHA WITH PROPOSED CONDITIONS)

Exposure to noise from pile driving has the potential to harass marine mammals present in the action area. As stated in Chapter 1, in addition to Caltrans' 2009 EA, NMFS has prepared numerous EAs addressing the impacts of pile driving on marine mammals. The information contained within those EAs is incorporated here by reference. In addition, this EA summarizes impacts from noise exposure specific to marine mammals affected by the proposed action.

Marine mammals produce sounds in various contexts and use sound for various biological functions including, but not limited to, (1) social interactions; (2) foraging; (3) orientation; and (4) predator detection. Interference with producing or receiving these sounds may result in adverse impacts. Impacts from noise exposure are expected to be both auditory and behavioral, as described below. The following impacts are relevant to both harbor seals and California sea lions, as described in Chapter 3.

Auditory Impacts

Hearing impairment is a possibility when marine mammals are exposed to very loud sounds. For purposes of issuing an IHA under the MMPA, hearing impairment is characterized in two ways: temporary threshold shift (TTS) and permanent threshold shift (PTS). There are no empirical data for onset of PTS in any marine mammal; therefore, PTS- onset must be estimated from TTS-onset measurements and from the rate of TTS growth with increasing exposure levels above the level eliciting TTS-onset. PTS is presumed to be likely if the hearing threshold is reduced by ≥ 40 dB (i.e., 40 dB of TTS). Due to proposed mitigation measures and source levels, NMFS does not expect that marine mammals will be exposed to levels that could elicit PTS; therefore, it will not be discussed further.

TTS is the mildest form of hearing impairment that can occur during exposure to a loud sound (Kryter, 1985). While experiencing TTS, the hearing threshold rises and a sound must be louder in order to be heard. TTS can last from minutes or hours to, in cases of strong TTS, days.

For sound exposures at or somewhat above the TTS-onset threshold, hearing sensitivity recovers rapidly after exposure to the noise ends. TTS is not considered an injury as hearing ability recovers after exposure ends. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals. Southall et al. (2007) considers a 6 dB TTS (i.e., baseline thresholds are elevated by 6 dB) sufficient to be recognized as an unequivocal deviation and thus a sufficient definition of TTS-onset. Because it is non-injurious, NMFS considers TTS as Level B harassment that is mediated by physiological effects on the auditory system; however, NMFS does not consider onset TTS to be the lowest level at which Level B harassment may occur.

Sound exposures that elicit TTS in pinnipeds underwater have been measured in harbor seals, California sea lions, and northern elephant seals from broadband or octaveband (OBN) non-pulse noise ranging from approximately 12 minutes to several hours and pulse noise (Kastak and Schusterman, 1996; Finneran et al., 2003; Kastak et al., 1999; Kastak et al., 2005). Collectively, Kastak et al. (2005) analyzed these data to indicate that in the harbor seal, a TTS of ca. 6 dB occurred with 25 minute exposure to 2.5 kHz OBN with SPL of 152 dB re:1 microPa; the California sea lion showed TTS-onset at 174 dB re: 1 microPa (as summarized in Southall et al., 2007). Underwater TTS experiments involving exposure to pulse noise is limited to a single study. Finneran et al. (2003) found no measurable TTS when two California sea lions were exposed to sounds up to 183 dB re: 1 microPa (peak-to-peak). Pile driving would not occur for more than 2 hours per day at intermittent intervals. Therefore, seals would not be exposed to long durations of pile driving. Some seals may experience TTS if they remain in the area; however, full hearing recovery is likely to occur quickly after pile driving ceases or seals leave the area.

Behavioral Impacts

Caltrans would primarily use vibratory driving to install the temporary piles. There are limited data available on the effects of non-pulse noise (e.g., vibratory pile driving) on pinnipeds in-water; however, field and captive studies to date collectively suggest that pinnipeds do not strongly react to exposures between 90-140 dB re: 1 microPa; no data exist from exposures at higher levels. Jacobs and Terhune (2002) observed wild harbor seal reactions to high frequency acoustic harassment devices (ADH) around nine sites. Seals came within 44 m of the active ADH and failed to demonstrate any behavioral response when received SPLs were estimated at 120-130 dB. In a captive study (Kastelein, 2006), a group of seals were collectively subjected to data collection and communication network (ACME) non-pulse sounds at 8-16 kHz. Exposures between 80-107 dB did not induce strong behavioral responses; however, a single observation at 100-110 dB indicated an avoidance response at this level. The group returned to baseline conditions shortly following exposure. Southall et al. (2007) notes contextual differences between these two studies noting that the captive animals were not reinforced with food for remaining in the noise fields, whereas free-ranging subjects may have been more tolerant of exposures because of motivation to return to a safe location or approach enclosures holding prey items. While most of the pile driving will be vibratory, a small portion of piles will be driven using an impact hammer (pulse noise). Southall et al. (2007) reviewed relevant data from studies involving pinnipeds exposed to pulse noise and concluded that exposures to 150 to 180 dB generally have limited potential to induce avoidance behavior.

Seals and sea lions exposed to harassment threshold level sounds in water (160 dB for pulse sounds (e.g., impact pile driving) or 120 dB for non-pulse sounds (e.g., vibratory pile driving)) may elicit temporary avoidance behavior around the bridge which may affect the routes of seals under the bridge or temporarily inhibit them from foraging near the bridge. However, limiting pile driving to two hours per day would allow for minimal disruption of harbor seal foraging or dispersal habitat under or near the bridge. Even more limited impacts to foraging or haul-out for sea lions are anticipated because very few sea lions use the South Bay for foraging. No known harbor seal or sea lion haulouts exist in the South Bay; therefore, pupping, nursing, and resting behaviors are not likely to be affected.

Installation of the trestle would not present any physical barrier to marine mammals that may move between the haul-out sites and foraging areas. The trestle would extend out to 914 ft along the west side of the existing bridge structure only, leaving approximately 2,686 ft of the 3,600 ft wide river without physical barriers. In addition, piles would be spaced 25 ft apart, leaving ample room for seals and sea lions to navigate through if necessary when searching for food. Some marine mammals are known to use man-made structures to help facilitate prey capture (e.g., beluga whales are known to corral fish against rip-rap docks); therefore, the presence of piles may actually aid in foraging efficiency.

Estimated Take by Harassment

NMFS typically proposes threshold sound levels to establish appropriate mitigation. Current NMFS practice regarding exposure of marine mammals to anthropogenic noise is that in order to avoid injury (Level A harassment) of marine mammals (e.g., PTS), pinnipeds should not be exposed to impulsive sounds at or above190 dB rms. This level is considered precautionary as it is likely that more intense sounds would be required before injury would actually occur (Southall et al., 2007). As such, Caltrans has proposed safety zones based on hydroacoustical modeling for the pile sizes and type of hammers used for the Antioch Bridge project and water depth. The model simulates practical spreading and uses a transmission constant of 15. Potential for behavioral harassment (Level B) is considered to have occurred when pinnipeds are exposed to sounds at or above 160 dB rms for impulse sounds (e.g., impact pile driving) and 120dB rms for non-pulse noise (e.g., vibratory pile driving), but below the aforementioned injury threshold. Estimated distances to NMFS current threshold sound levels from pile driving during the Antioch Bridge Seismic Retrofit Project are outlined in Table 1 below (see Chapter 7 and Appendix A in the IHA application for further detail how these distances were derived).

Table 1: Underwater distances to NMFS harassment threshold levels during pile driving.

Pile Type	Hammer Type	Sound Levels (rms)		
		190 dB	160 dB	120 dB
24” steel	Impact	16.8 m (55 ft)	1,000 m (3,280 ft)	n/a
24” steel	Vibratory	n/a	n/a	16.4 km (10.2 miles)

Current NMFS practice regarding in-air exposure of pinnipeds to noise generated from human activity is that the onset of Level B harassment for harbor seals and all other pinnipeds is 90 dB and 100 dB re: 20 micoPa, respectively. In-air noise calculations from pile driving for this project predict that noise levels will be reduced to approximately 83 dB re: 20 microPa at 800 m. Harbor seals or California sea lions are not known to haul-out close to the bridge; therefore, pinnipeds at haulouts are not expected to be affected from in-air pile driving noise.

The Antioch Bridge is located outside the range of most marine mammals; however, harbor seals and California sea lions have been known to sporadically venture into the nearby estuaries and rivers in search of food. The California Department of Fish and Game (CDFG) indicates that the ranges of these two species encompasses the region of the Delta in which the bridge is located (CDFG 1990, 2005). Potential occurrences of harbor seals would be limited to individuals in search of food foraging upstream into the San Joaquin River. Because the action area is located on the extreme of pinniped habitat, NMFS is proposing to authorize the take, by Level B harassment only, of 10 harbor seals and 10 California sea lions.

4.3 SUMMARY OF COMPLIANCE WITH APPLICABLE LAWS, NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

As summarized below, NMFS has determined that the proposed action is consistent with the purposes, policies, and applicable requirements of the MMPA and NMFS regulations. In addition, NMFS has determined Caltrans has complied with all other applicable environmental federal, state, and local laws.

4.3.1 National Environmental Policy Act

In compliance with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.), NMFS has prepared an EA analyzing the effects of the proposed action (i.e., issuance of an IHA) on the human environment. Based on the analyses in the EA, NMFS determined that issuance of the authorization would not significantly impact the quality of the human environment and that preparation of an environmental impact statement was not required.

4.3.2 Endangered Species Act

No ESA-listed marine mammals are known to occur within the action area; therefore, therefore, ESA consultation on issuance of the proposed IHA was not required. However, other ESA-listed species under NMFS' jurisdiction do occur within the action area.

On January 12, 2009, NMFS received a request from the Federal Highway Administration (FHWA) to initiate consultation under section 7 of the ESA on Caltrans' proposed Antioch Bridge Seismic Retrofit Project as ESA-listed fish are present within the action area. NMFS issued a Biological Opinion (BiOp) on Caltran's Antioch Bridge Seismic Retrofit Project on August, 10, 2009. The BiOp concluded that the Antioch Bridge Seismic Retrofit project is not likely to jeopardize the continued existence of endangered Sacramento River Winter-run Chinook salmon, threatened CV Spring-run Chinook salmon, threatened CV

steelhead, or threatened Southern DPS of North American green sturgeon, and is not likely to destroy or adversely modify designated or proposed critical habitat for these species.

4.3.3 Marine Mammal Protection Act

The applicant submitted an application which included responses to all applicable questions in NMFS' MMPA implementing regulations. The specified activity is consistent with applicable issuance criteria in the MMPA and NMFS' implementing regulations. The views and opinions of scientists or other persons or organizations knowledgeable of the marine mammals that are the subject of the application or of other matters germane to the application were considered, and support NMFS' determinations regarding the application.

4.3.4 Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA)

Issuance of the IHA is not expected to cause substantial damage designated EFH. Impacts to EFH from the proposed project were analyzed in NMFS' 2009 BiOp prepared for this project. NMFS determined that although impacts to EFH for various life stages of fished listed under the Pacific Groundfish FMP and Coastal Pelagic FMP would occur, the mitigation and minimization measures proposed by Caltrans would avoid or offset any adverse effects to EFH.

4.4 MITIGATION AND MONITORING MEASURES

As required under the MMPA, NMFS considered the applicant's proposed mitigation to effect the least practicable adverse impact on marine mammals as well as monitoring and reporting procedures that would be required as part of its incidental harassment authorization. NMFS assessed Caltrans' proposed measures in preparation of the proposed IHA and considered comments received during the public comment period. NMFS has determined that Caltrans' proposed mitigation and monitoring measures are adequate to cause of negligible impact on affected marine mammal species and stock and effect the least practicable adverse impact. The mitigation measures described in Chapter 2 are designed to eliminate the potential for injury and mortality and minimize harassment. Monitoring and reporting measures also described in Chapter 2 are designed to ensure Caltrans is effectively detecting animals and implementing the required mitigation measures.

4.5 CUMULATIVE EFFECTS

Cumulative effects are defined those that result from incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time. Cumulative impacts to the social environment is addressed in Caltrans 2009 EA and incorporated here by reference. Here, NMFS addresses cumulative impacts to the affected marine mammal species.

The Bay provides a recreational, commercial, and industrial resource for the residents of California and is therefore heavily subjected to anthropogenic disturbance. These include recreational and commercial vessel traffic, vehicular traffic over bridges, and coastal construction and development. As described in Richardson et al. (1995), marine mammals are likely habituated and tolerant to a certain degree of anthropogenic disturbance, including noise. The Antioch Bridge project is not likely to add an increment of disturbance which would cumulatively, when combined with other actions, result in significant adverse impacts to marine mammals.

Issuance of the IHA is not related to other actions with individually insignificant, but cumulatively significant impacts. Currently, Caltrans holds two IHAs authorizing harassment to marine mammals from pile driving in San Francisco Bay. One is for repairs at the San Francisco Bay-Oakland Bay Bridge and the other is temporary trestle construction at the Dumbarton Bridge located in the southern portion of the Bay. While some individual harbor seals may frequent both the Antioch Bridge and SF-OB Bridge, the distance between the two bridges (50+ miles) and the fact that only a maximum of 2 hours of pile driving would occur daily at the Antioch Bridge, any temporary harassment from exposure to either bridge construction is not anticipated to result in significant cumulative impacts. Similarly, the Antioch and Dumbarton Bridge are approximately 70+ miles from each other. Therefore, exposure to pile driving at any of the locations in addition to exposure at the Antioch Bridge would not lead to cumulative significant impacts as there would be adequate recovery time between exposures.

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