



BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XE671

Taking of Marine Mammals Incidental to Specified Activities; Construction of the East Span of the San Francisco-Oakland Bay Bridge

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorization; request for comments and information.

SUMMARY: NMFS has received a request from the California Department of Transportation (CALTRANS) for an incidental take authorization to take small numbers of seven species of marine mammals, by harassment, incidental to construction activities associated with the East Span of the San Francisco-Oakland Bay Bridge (SFOBB) in the San Francisco Bay (SFB), California. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an authorization to CALTRANS to incidentally take, by harassment, small numbers of marine mammals for a period of 1 year.

DATES: Comments and information must be received no later than [*INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER*].

ADDRESSES: Comments on the application should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910. The

mailbox address for providing email comments is *itp.guan@noaa.gov*. NMFS is not responsible for e-mail comments sent to addresses other than the one provided here. Comments sent via e-mail, including all attachments, must not exceed a 25-megabyte file size.

Instructions: All comments received are a part of the public record and will generally be posted to *http://www.nmfs.noaa.gov/pr/permits/incidental.htm* without change. All Personal Identifying Information (for example, name, address, *etc.*) voluntarily submitted by the commenter may be publicly accessible. Do not submit Confidential Business Information or otherwise sensitive or protected information.

A copy of the application may be obtained by writing to the address specified above or visiting the internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm*. Documents cited in this notice may also be viewed, by appointment, during regular business hours, at the aforementioned address.

FOR FURTHER INFORMATION CONTACT: Shane Guan, Office of Protected Resources, NMFS, (301) 427-8401.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

An authorization for incidental takings shall 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 subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings 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."

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the U.S. can apply for a one-year authorization to incidentally take small numbers of marine mammals by harassment, provided that there is no potential for serious injury or mortality to result from the activity. Section 101(a)(5)(D) establishes a 45-day time limit for NMFS review of an application followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of marine mammals. Within 45 days of the close of the comment period, NMFS must either issue or deny the authorization.

Summary of Request

On March 11, 2016, CALTRANS submitted a request to NMFS for the potential harassment of a small number of marine mammals incidental to the dismantling of the East Span of the original SFOBB in SFB, California, between July 16, 2016, and July 15, 2017. On May 16, 2016, CALTRANS submitted a revision of its IHA application based on NMFS comments. NMFS determined that the IHA application was complete on May

19, 2016. NMFS is proposing to authorize the Level B harassment of Pacific harbor seal, California sea lion, northern elephant seal, northern fur seal, harbor porpoise, gray whale and bottlenose dolphin.

Description of the Specified Activity

Overview

CALTRANS proposes removal of the East Span of the original SFOBB by mechanical dismantling and by use of controlled charges to implode the pier into its open cellular chambers below mudline. Activities associated with dismantling the original East Span potentially may result in incidental take of marine mammals. These activities include vibratory pile driving, vibratory pile extraction/removal, impact pile driving, and the use of highly controlled charges to dismantle the Pier E4 and Pier E5 marine foundations.

A one-year IHA was previously issued to CALTRANS for pile driving/removal and mechanical dismantling activities on July 17, 2015 (80 FR 43710; July 23, 2015), based on activities described on CALTRANS' IHA application dated April 13, 2013. This IHA is valid until July 16, 2016. On September 9, 2015, NMFS issued another IHA to CALTRANS for demolition of Pier E3 of the original SFOBB by highly controlled explosives (80 FR 57584; September 24, 2015). This IHA expired on December 30, 2015. Since the construction activities related with the original SFOBB dismantling will last for another two years, CALTRANS is requesting an IHA that covers take of marine mammals from both pile driving/removal and confined explosion.

Construction activities for the replacement of the SFOBB east span commenced in 2002 and are expected to be completed in 2016 with the completion of the

bike/pedestrian path and eastbound on ramp from Yerba Buena Island. The new east span is now open to traffic. On November 10, 2003, NMFS issued the first project-related IHA to CALTRANS, authorizing the take of small numbers of marine mammals incidental to the construction of the SFOBB Project. Over the years, CALTRANS has been issued a total of nine IHAs for the SFOBB Project to date, excluding the application currently under review.

Dates and Duration

The demolition of Piers E4 and E5 through controlled implosion are planned to occur in October, November, or December 2016, and pile driving and pile removal activities may occur at any time of the year. CALTRANS is requesting issuance of an IHA for a period of 1 year. To avoid a gap in IHA coverage, CALTRANS is requesting issuance of a new IHA no later than July 17, 2016. However, NMFS does not consider it feasible to issue an IHA by July 2016, and has notified CALTRANS that an IHA, if issued, would cover the period from August 2016 through August 2017.

Specified Geographic Region

The SFOBB project area is located in the central San Francisco Bay (SFB or Bay), between Yerba Buena Island (YBI) and the city of Oakland. The western limit of the project area is the east portal of the YBI tunnel, located in the city of San Francisco. The eastern limit of the project area is located approximately 1,312 ft (400 m) west of the Bay Bridge toll plaza, where the new and former spans connect with land at the Oakland Touchdown in the city of Oakland.

Detailed Description of CALTRANS East Span Removal Project

1. Vibratory and Impact Driving of Temporary Piles

CALTRANS anticipates temporary access trestles, in-water falsework, and cofferdams may be required to dismantle the existing bridge. Temporary access trestles, supported by temporary marine piles, and cofferdams may be needed to provide construction access. Temporary falsework supports will be necessary to provide stability for the portions of the structure not yet removed. Marine pile-supported falsework is anticipated to be necessary to facilitate removal of the superstructure. These temporary structures will be contractor-designed; therefore, their exact nature (e.g., size, type, number of piles), location, and timing of installation are not known at this point. As discussed in detail in the April 13, 2013 IHA application (79 FR 2421; January 14, 2014), a maximum of 2,540 temporary piles may be installed to support all temporary structures required for bridge dismantling.

CALTRANS estimates that a maximum of 200 temporary piles may be installed during the 1-year period of IHA coverage. Types of temporary piles to be installed may include sheet piles, 14-in (0.34-m) H-piles, and steel pipe piles, equal to or less than 36-in (0.91-m) in diameter. A maximum of 132 days of pile driving may be required to install and/or remove piles during the 1-year period of IHA coverage.

All H-piles would be installed with an impact hammer, without the use of a marine pile driving energy attenuator. Impact driving (with the exception of pile proofing) will be restricted to June 1 through November 30, to avoid the peak migration period for salmonids and spawning adult green sturgeon. Vibratory driving and proofing of piles may be performed year-round.

All pipe piles will be installed with a vibratory hammer. The vibratory hammer will be used to drive the majority of the total pile lengths. The remaining piles may be

impact-driven with the use of a marine pile-driving energy attenuator (*i.e.*, air bubble curtain system), or other equally effective sound attenuation method (*e.g.*, dewatered cofferdam). A maximum of 20 piles may be impact-driven per day.

In the event a pipe pile is installed entirely with a vibratory hammer, it still will be subject to final “proofing” with an impact hammer. “Proofing” will be accomplished by using a limited number of blows with an impact hammer, intended to test integrity and seating of the pile. A maximum of 10% of the piles installed completely with a vibratory hammer may be proofed with an impact hammer, without the use of a marine pile-driving energy attenuator. Proofing of piles will be limited to a maximum of two piles per day, for less than 1 minute per pile, administering a maximum of 20 blows per pile.

In addition to the temporary pipe piles and H-piles described above, sheet piles may be driven with a vibratory hammer to construct temporary cofferdams or other types of barriers. A cofferdam is a temporary enclosure, built within a body of water, usually composed of sheet piles welded together. The enclosures generally are watertight, allowing them to be fully or partially dewatered for construction access in the marine environment. Partially or un-dewatered cofferdams also may be used to isolate work areas; preventing water temporarily affected by construction activities from mixing with the surrounding waters of the Bay.

When no longer needed, all temporary piles will be retrieved or cut off 1.5 ft (0.46 m) below the mudline, in compliance with United States Coast Guard requirements. A vibratory pile extractor will be used to retrieve piles.

2. Removal of Piers E4 and E5

CALTRANS proposes the removal of Piers E4 and E5 of the original East Span by use of controlled charges to implode each pier into its open cellular chambers below the mudline. A Blast Attenuation System (BAS) will be used to minimize potential impacts on biological resources in the Bay. Both NMFS and CALTRANS believe that the results from the Pier E3 Demonstration Project support the use of controlled charges as a more expedient method of removal that will cause less environmental impact as compared to approved mechanical methods using a dry (fully dewatered) cofferdam. Piers E4 and E5 of the original East Span are located between the OTD area and YBI, and just south of the SFOBB new East Span. These piers are concrete cellular structures that occupy areas deep below the mudline, within the water column, and above the water line of the Bay.

The use of controlled charges would greatly reduce in-water work periods and shorten the overall duration of marine foundation removal compared with mechanical removal. Because of the similar structures for both Piers E4 and E5, each would be removed following the same five steps:

- Dismantling the fender system and removing the pier cap and concrete pedestals;
- Drilling bore holes into the marine foundation;
- Installing and testing the BAS;
- Installing charges, activating the BAS, and imploding the pier; and
- Managing and removing remaining dismantling debris.

Details of these steps are provided below.

2.1 Dismantling of Pier E4 and Pier E5 Fender Systems and Concrete Caps

Dismantling of the Piers E4 and E5 fender systems and pier caps is expected to start in June 2016. The fender systems include timber, metal framing, and concrete aprons, which will be removed and disposed offsite. The steel piles that support the fender system will be removed and recycled off-site. The support piles either will be vibrated out and removed whole or will be cut off a minimum of 1.5 ft (0.46 m) below the mudline and removed off-site.

Support barges will be used to move hydraulic excavators equipped with hoe rams, shearing attachments, drills, and other equipment, including cutting lances and torches that will be used during the mechanical dismantling. A barge-mounted crane will be used to move equipment onto and off each pier.

The concrete pedestals and pier cap will be removed by mechanical means, using tools including those listed above to break the concrete structure into pieces. Support platforms will be installed to provide a working surface for the excavators to dismantle the upper portion of the piers. All concrete rubble from the mechanical dismantling will be placed into exposed cells of the caisson and will fall below the mudline for disposal.

2.2 Pier E5 Lower-Chamber Pre-Cast Slab Removal

The lower caisson cells of Pier E5 on the east and west face of the lower segment of the pier are covered with pre-cast concrete slabs. To assure that the lower caisson chambers will be open to receive rubble during the controlled implosion of Pier E5, these slabs will be removed mechanically by breaking them with a modified steel pile that will be attached to and controlled by a barge-mounted crane. The controlled drop will bring the pile down on each slab. The weight of the modified pile will cause each concrete slab to shatter and fall into the caisson cells, to be entombed below the mudline.

2.3 Drill Boreholes

After the mechanical dismantling operations are complete, access platforms will be installed on top of each pier to support the drilling equipment. The exposed interior cell walls, buttress walls, and outside walls will be drilled from the top down, to remove concrete and create boreholes to just below the controlled blasting removal limit for each pier. Boreholes that are drilled in areas that are inundated with water (*i.e.*, to the buttress walls and concrete slabs) will be done using a drill bit working within a tubular casing for guidance and to provide containment during in-water work. Monitoring will be performed to minimize and avoid impacts on water quality during this activity.

For Pier E5, an overhanging template system will be installed to guide the drill below the waterline. For Pier E5, divers will be required to cut notches into the buttress walls to guide the drilling of underwater boreholes. Pier E4 does not have buttress walls; therefore, it will not require in-water notching, and all borehole drilling will occur out of the water.

2.4 Blast Attenuation System Installation and Deployment

The BAS that will be used at Piers E4 and E5 is the same system that was successfully used for the Pier E3 Demonstration Project. The BAS is a modular system of pipe manifold frames, placed around each pier and fed by air compressors to create a curtain of air. The BAS will be activated before and during implosion. As shown during the Demonstration Project last year (CALTRANS 2016), the BAS will help minimize noise and pressure waves generated during each controlled blast, to minimize potentially adverse effects on biological resources that may be nearby. Each BAS frame is approximately 50.5 ft (15.4 m) long by 6 ft (1.8 m) wide. The BAS to be used at Piers E4

and E5 will be same system that was used at Pier E3 and will meet the same specifications.

The complete BAS will be installed and tested during the weeks leading up to each controlled blast. Before installing the BAS, CALTRANS will move any existing debris on the Bay floor that may interrupt proper installation of the BAS. Existing debris identified as a risk to proper installation of the BAS will be moved outside the path of the BAS layout. Each BAS frame will be lowered to the bottom of the Bay by a barge-mounted crane and positioned into place. Divers will be used to assist frame placement, and to connect air hoses to the frames. Frames will be situated to contiguously surround the pier. Each frame will be weighted to negative buoyancy for activation. Compressors will provide enough pressure to achieve a minimal air volume fraction of 3 to 4 percent, consistent with the successful use of BAS systems in past controlled blasting activities, including Pier E3 (CALTRANS 2016). System performance is anticipated to provide approximately 80% sound and pressure attenuation, based on the results from the Demonstration Project (CALTRANS 2016).

2.5 Test Blasts

Before each pier implosion, test blasts may be conducted within the completely installed and operating BAS so that the hydroacoustic monitoring equipment will be properly triggered and functional before each pier implosion event. A key requirement of the implosion involves accurately capturing hydroacoustic information from the controlled blast. To accomplish this, a smaller test charge will be used to trigger recording instrumentation. Multiple test blast events may be required to verify proper instrument operation and calibrate the equipment for the implosion event. These same

instruments and others of the same type will use high-speed recording devices to capture hydroacoustic data at both near-field and far-field monitoring locations during the implosion.

The BAS will be in operation during all tests. Tests will use a charge weight of approximately 18 grains (0.0025 pound) or less. The test charge will be placed along one of the longer faces of the pier and inside the BAS while it is operating. Results from test blasts that occurred during the Pier E3 Demonstration Project indicate that these test blasts will have minimal impacts on fish and marine mammals (CALTRANS 2016).

2.6 *Acoustic Deterrent Devices*

Prior to controlled implosion of Pier E4 and E5 CALTRANS will deploy acoustic deterrent devices (ADD) to deter marine mammals from entering exclusion zones. Up to 20 ADDs will be attached to the buoys delineating the pinniped exclusion zone, and to monitoring boats or other bridge piers near Piers E4 or E5.

ADDs are commonly used in commercial fishing and at fish farms to scare marine mammals away from nets or structures (Gordon *et al.*, 2007; Brandt *et al.* 2013; Gotz and Janik 2013; Schakner and Blumstein 2013) and were used for the first time during the Pier E3 implosion to deter marine mammals from entering the exclusion zones. The pulse of ADDs used during the Pier E3 implosion had a frequency of 10 kHz, a source sound level of 132 dB re 1 μ Pa, with regular or random interpulse intervals of 4 seconds (Airmar Porpoise ADD, Milford, NH). Insufficient data exists to determine the effectiveness of the ADDs during the Pier E3 implosion. NMFS does not consider the ADDs would have take of marine mammals due to their low source level.

2.7 *Controlled Implosion of Piers E4 and E5*

Before pier removal via controlled blasting, the bore holes in the pier will be loaded with controlled charges. Individual cartridge charges, using electronic blasting caps versus pumpable liquid blasting agents, have been selected to provide greater control and accuracy in determining the individual and total charge weights. Use of individual cartridges will allow a refined blast plan that efficiently breaks concrete while minimizing the amount of charges needed.

Boreholes will vary in diameter and depth, and have been designed to provide optimal efficiency in transferring the energy created by the controlled charges to dismantle the pier. Individual charge weights will vary from 20 to 35 lbs (9 to 16 kg), and the total charge weight for each controlled blast event will be approximately 11,000 to 12,000 lbs (5,000 to 5,500 kg). Charges are arranged in different levels (decks) and will be separated in the boreholes by stemming. Stemming is the insertion of inert materials (*e.g.*, sand or gravel) to insulate and retain charges in an enclosed space. Stemming will allow more efficient transfer of energy into the structural concrete for fracture, and further reduce the release of potential energy into the surrounding water column. The blast events for Piers E4 and E5 will each consist of approximately 400 individual delays of varying charge weight. The entire detonation sequence, consisting of approximately 400 detonations, will last approximately 3 to 4 seconds for each pier; with a minimum delay time of 9 milliseconds (msec) between detonations.

2.8 *Debris Removal and Site Restoration*

Following the controlled implosion event and confirmation that the area is safe to work in, construction crews will begin to remove all associated equipment, including

barges, compressors, the BAS, and blast mats. CALTRANS expects that a small portion of rubble from each pier will fall outside its respective footprint and/or mound within the footprint of each pier, and will need to be managed after each controlled implosion. Concrete rubble resulting from the controlled implosions of Piers E4 and E5 that does not fall into the hollow caisson cells will be placed in the remaining caisson cells to be entombed below the mudline. The portions of each pier that do not break apart during controlled blasting and remain above the removal limits will be demolished by mechanical means. This may require the use of underwater mechanical equipment, including hydraulic crushing or grinding machinery or diver-operated jackhammers.

Rubble from the controlled implosion that does not fall into the hollow caisson cells will be picked up and disposed inside the remaining caisson cells, to be entombed below the mudline. Management of extraneous rubble will be done by a barge-mounted crane with a clam-shell bucket. Buckets used during this debris management phase will be equipped with a Global Positioning System unit, to accurately guide the location of the bucket in the water. The in-water site management operation is expected to take a few weeks following each implosion event and is anticipated to be completed by the end of December 2016.

Description of Marine Mammals in the Area of the Specified Activity

Seven species of marine mammals regularly inhabit or rarely or seasonally enter the San Francisco Bay (Table 1). The two most common species observed are the Pacific harbor seal (*Phoca vitulina richardii*) and the California sea lion (*Zalophus californianus*). Juvenile northern elephant seals (*Mirounga angustirostris*) seasonally enter the Bay (spring and fall), while harbor porpoises (*Phocoena phocoena*) may enter

the western side of the Bay throughout the year, but rarely occur near the SFOBB east span. Gray whales (*Eschrichtius robustus*) may enter the Bay during their northward migration in the late winter and spring. In addition, though rare, northern fur seals (*Callorhinus ursinus*) and bottlenose dolphins (*Tursiops truncatus*) have also been sighted in the Bay. None of these species are listed as endangered or threatened under the Endangered Species Act (ESA), or as depleted or a strategic stock under the MMPA.

Table 1. Marine Mammal Species Potentially Present in Region of Activity

Common Name	Scientific Name	Status	Occurrence	Seasonality	Range	Abundance
Harbor seal	<i>Phoca vitulina richardii</i>	-	Common	Year round	California	30,968
California sea lion	<i>Zalophus californianus</i>	-	Common	Year round	California	296,750
Northern fur seal	<i>Callorhinus ursinus</i>	-	Rare	Year round	California	12,844
Northern elephant seal	<i>Mirounga angustirostris</i>	-	Occasional	Spring & fall	California	179,000
Gray whale	<i>Eschrichtius robustus</i>	-*	Rare	Spring & fall	Mexico to the U.S. Arctic Ocean	20,990
Harbor porpoise	<i>Phocoena phocoena</i>	-	Rare	Year round	California	9,886
Coastal Bottlenose dolphin	<i>Tursiops truncatus</i>	-	Rare	Year round	California	323

* The E. North Pacific population is not listed under the ESA.

More detailed information on the marine mammal species found in the vicinity of the SFOBB construction site can be found in CALTRANS IHA application, and in NMFS stock assessment report (Caretta *et al.*, 2015), which is available at the following URL:

http://www.nmfs.noaa.gov/pr/sars/pdf/pacific_sars_2014_final_noaa_swfsc_tm_549.pdf.

Refer to these documents for additional information on these species.

Potential Effects of the Specified Activity on Marine Mammals

This section includes a summary and discussion of the ways that the types of stressors associated with the specified activity (*e.g.*, pile removal and pile driving) have been observed to impact marine mammals. This discussion may also include reactions that we consider to rise to the level of a take and those that we do not consider to rise to the level of a take (for example, with acoustics, we may include a discussion of studies that showed animals not reacting at all to sound or exhibiting barely measurable avoidance). This section is intended as a background of potential effects and does not consider either the specific manner in which this activity will be carried out or the mitigation that will be implemented, and how either of those will shape the anticipated impacts from this specific activity. The “Estimated Take by Incidental Harassment” section later in this document will include a quantitative analysis of the number of individuals that are expected to be taken by this activity. The “Analysis and Preliminary Determinations” section will include the analysis of how this specific activity will impact marine mammals and will consider the content of this section, the “Estimated Take by Incidental Harassment” section, the “Proposed Mitigation” section, and the “Anticipated Effects on Marine Mammal Habitat” section to draw conclusions regarding the likely impacts of this activity on the reproductive success or survivorship of individuals and from that on the affected marine mammal populations or stocks.

When considering the influence of various kinds of sound on the marine environment, it is necessary to understand that different kinds of marine life are sensitive

to different frequencies of sound. Based on available behavioral data, audiograms have been derived using auditory evoked potentials, anatomical modeling, and other data, Southall *et al.* (2007) designate “functional hearing groups” for marine mammals and estimate the lower and upper frequencies of functional hearing of the groups. The functional groups and the associated frequencies are indicated below (though animals are less sensitive to sounds at the outer edge of their functional range and most sensitive to sounds of frequencies within a smaller range somewhere in the middle of their functional hearing range):

- Low frequency cetaceans (13 species of mysticetes): functional hearing is estimated to occur between approximately 7 Hz and 25 kHz;
- Mid-frequency cetaceans (32 species of dolphins, seven species of larger toothed whales, and 19 species of beaked and bottlenose whales): functional hearing is estimated to occur between approximately 150 Hz and 160 kHz;
- High frequency cetaceans (eight species of true porpoises, seven species of river dolphins, Kogia, the franciscana, and four species of cephalorhynchids): functional hearing is estimated to occur between approximately 200 Hz and 180 kHz;
- Phocid pinnipeds in Water: functional hearing is estimated to occur between approximately 75 Hz and 100 kHz; and
- Otariid pinnipeds in Water: functional hearing is estimated to occur between approximately 100 Hz and 48 kHz.

As mentioned previously in this document, 7 marine mammal species (three cetacean and four pinniped species) are likely to occur in the vicinity of the proposed

SFOBB pile driving/removal and controlled pier detonation area. Of the 2 cetacean species, one belongs to low-frequency cetacean (gray whale), one mid-frequency cetacean (bottlenose dolphin), and one high-frequency cetacean (harbor porpoise). 2 species of pinniped are phocid (Pacific harbor seal and northern elephant seal), and 2 species of pinniped is otariid (California sea lion and northern fur seal). A species' functional hearing group is a consideration when we analyze the effects of exposure to sound on marine mammals.

Potential Effects from In-water Pile Driving and Pile Removal

The proposed CALTRANS SFOBB construction work using in-water pile driving and pile removal could adversely affect marine mammal species and stocks by exposing them to elevated noise levels in the vicinity of the activity area.

Exposure to high intensity sound for a sufficient duration may result in auditory effects such as a noise-induced threshold shift—an increase in the auditory threshold after exposure to noise (Finneran *et al.*, 2005). Factors that influence the amount of threshold shift include the amplitude, duration, frequency content, temporal pattern, and energy distribution of noise exposure. The magnitude of hearing threshold shift normally decreases over time following cessation of the noise exposure. The amount of threshold shift just after exposure is the initial threshold shift. If the threshold shift eventually returns to zero (*i.e.*, the threshold returns to the pre-exposure value), it is a temporary threshold shift (Southall *et al.*, 2007).

Threshold Shift (noise-induced loss of hearing) – When animals exhibit reduced hearing sensitivity (*i.e.*, sounds must be louder for an animal to detect them) following exposure to an intense sound or sound for long duration, it is referred to as a noise-

induced threshold shift (TS). An animal can experience temporary threshold shift (TTS) or permanent threshold shift (PTS). TTS can last from minutes or hours to days (*i.e.*, there is complete recovery), can occur in specific frequency ranges (*i.e.*, an animal might only have a temporary loss of hearing sensitivity between the frequencies of 1 and 10 kHz), and can be of varying amounts (for example, an animal's hearing sensitivity might be reduced initially by only 6 dB or reduced by 30 dB). PTS is permanent, but some recovery is possible. PTS can also occur in a specific frequency range and amount as mentioned above for TTS.

For marine mammals, published data are limited to the captive bottlenose dolphin, beluga, harbor porpoise, and Yangtze finless porpoise (Finneran *et al.*, 2000, 2002, 2003, 2005, 2007, 2010a, 2010b; Finneran and Schlundt, 2010; Lucke *et al.*, 2009; Mooney *et al.*, 2009a, 2009b; Popov *et al.*, 2011a, 2011b; Kastelein *et al.*, 2012a; Schlundt *et al.*, 2000; Nachtigall *et al.*, 2003, 2004). For pinnipeds in water, data are limited to measurements of TTS in harbor seals, an elephant seal, and California sea lions (Kastak *et al.*, 1999, 2005; Kastelein *et al.*, 2012b).

Lucke *et al.* (2009) found a threshold shift (TS) of a harbor porpoise after exposing it to airgun noise with a received sound pressure level (SPL) at 200.2 dB (peak-to-peak) re: 1 μPa , which corresponds to a sound exposure level of 164.5 dB re: 1 $\mu\text{Pa}^2 \text{ s}$ after integrating exposure. NMFS currently uses the root-mean-square (rms) of received SPL at 180 dB and 190 dB re: 1 μPa as the threshold above which permanent threshold shift (PTS) could occur for cetaceans and pinnipeds, respectively. Because the airgun noise is a broadband impulse, one cannot directly determine the equivalent of rms SPL from the reported peak-to-peak SPLs. However, applying a conservative conversion

factor of 16 dB for broadband signals from seismic surveys (McCauley, *et al.*, 2000) to correct for the difference between peak-to-peak levels reported in Lucke *et al.* (2009) and rms SPLs, the rms SPL for TTS would be approximately 184 dB re: 1 μ Pa, and the received levels associated with PTS (Level A harassment) would be higher. This is still above NMFS' current 180 dB rms re: 1 μ Pa threshold for injury. However, NMFS recognizes that TTS of harbor porpoises is lower than other cetacean species empirically tested (Finneran & Schlundt, 2010; Finneran *et al.*, 2002; Kastelein and Jennings, 2012).

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (*i.e.*, recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. Also, depending on the degree and frequency range, the effects of PTS on an animal could range in severity, although it is considered generally more serious because it is a permanent condition. Of note, reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.*, 2007), so one can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

In addition, chronic exposure to excessive, though not high-intensity, noise could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions (Clark *et al.*, 2009). Acoustic masking is when other noises such as from human sources interfere with animal detection of acoustic signals such as communication calls, echolocation sounds, and environmental sounds important to marine mammals. Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance fitness in survival and reproduction.

Masking occurs at the frequency band which the animals utilize. Therefore, since noise generated from vessels dynamic positioning activity is mostly concentrated at low frequency ranges, it may have less effect on high frequency echolocation sounds by odontocetes (toothed whales). However, lower frequency man-made noises are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey noise. It may also affect communication signals when they occur near the noise band and thus reduce the communication space of animals (e.g., Clark *et al.*, 2009) and cause increased stress levels (e.g., Foote *et al.*, 2004; Holt *et al.*, 2009).

Unlike TS, masking, which can occur over large temporal and spatial scales, can potentially affect the species at population, community, or even ecosystem levels, as well as individual levels. Masking affects both senders and receivers of the signals and could have long-term chronic effects on marine mammal species and populations. Recent science suggests that low frequency ambient sound levels have increased by as much as 20 dB (more than 3 times in terms of sound pressure level) in the world's ocean from pre-

industrial periods, and most of these increases are from distant shipping (Hildebrand 2009). For CALTRANS proposed SFOBB construction activities, noises from vibratory pile driving contribute to the elevated ambient noise levels in the project area, thus increasing potential for or severity of masking. Baseline ambient noise levels in the Bay are very high due to ongoing shipping, construction and other activities in the Bay.

Finally, exposure of marine mammals to certain sounds could lead to behavioral disturbance (Richardson *et al.*, 1995), such as: changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where noise sources are located; and/or flight responses (*e.g.*, pinnipeds flushing into water from haulouts or rookeries).

The onset of behavioral disturbance from anthropogenic noise depends on both external factors (characteristics of noise sources and their paths) and the receiving animals (hearing, motivation, experience, demography) and is also difficult to predict (Southall *et al.*, 2007). Currently NMFS uses a received level of 160 dB re 1 μ Pa (rms) to predict the onset of behavioral harassment from impulse noises (such as impact pile driving), and 120 dB re 1 μ Pa (rms) for continuous noises (such as vibratory pile driving). For the CALTRANS SFOBB construction activities, both of these noise levels are considered for effects analysis because CALTRANS plans to use both impact and vibratory pile driving, as well as vibratory pile removal.

The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences

of behavioral modification could be biologically significant if the change affects growth, survival, and/or reproduction, which depends on the severity, duration, and context of the effects.

Potential Effects from Controlled Pier Implosion

It is expected that an intense impulse from the proposed Piers E4 and E5 controlled implosion would have the potential to impact marine mammals in the vicinity. The majority of impacts would be startle behavioral and temporary behavioral modification from marine mammals. However, a few individuals of animals could be exposed to sound levels that would cause temporal hearing threshold shift (TTS).

The underwater explosion would send a shock wave and blast noise through the water, release gaseous by-products, create an oscillating bubble, and cause a plume of water to shoot up from the water surface. The shock wave and blast noise are of most concern to marine animals. The effects of an underwater explosion on a marine mammal depends on many factors, including the size, type, and depth of both the animal and the explosive charge; the depth of the water column; and the standoff distance between the charge and the animal, as well as the sound propagation properties of the environment. Potential impacts can range from brief effects (such as behavioral disturbance), tactile perception, physical discomfort, slight injury of the internal organs and the auditory system, to death of the animal (Yelverton *et al.*, 1973; DoN, 2001). Non-lethal injury includes slight injury to internal organs and the auditory system; however, delayed lethality can be a result of individual or cumulative sublethal injuries (DoN, 2001). Immediate lethal injury would be a result of massive combined trauma to internal organs as a direct result of proximity to the point of detonation (DoN, 2001). Generally, the

higher the level of impulse and pressure level exposure, the more severe the impact to an individual.

Injuries resulting from a shock wave take place at boundaries between tissues of different density. Different velocities are imparted to tissues of different densities, and this can lead to their physical disruption. Blast effects are greatest at the gas-liquid interface (Landsberg 2000). Gas-containing organs, particularly the lungs and gastrointestinal tract, are especially susceptible (Goertner 1982; Hill 1978; Yelverton *et al.*, 1973). In addition, gas-containing organs including the nasal sacs, larynx, pharynx, trachea, and lungs may be damaged by compression/expansion caused by the oscillations of the blast gas bubble. Intestinal walls can bruise or rupture, with subsequent hemorrhage and escape of gut contents into the body cavity. Less severe gastrointestinal tract injuries include contusions, petechiae (small red or purple spots caused by bleeding in the skin), and slight hemorrhaging (Yelverton *et al.*, 1973).

Because the ears are the most sensitive to pressure, they are the organs most sensitive to injury (Ketten 2000). Sound-related damage associated with blast noise can be theoretically distinct from injury from the shock wave, particularly farther from the explosion. If an animal is able to hear a noise, at some level it can damage its hearing by causing decreased sensitivity (Ketten 1995). Sound-related trauma can be lethal or sublethal. Lethal impacts are those that result in immediate death or serious debilitation in or near an intense source and are not, technically, pure acoustic trauma (Ketten 1995). Sublethal impacts include hearing loss, which is caused by exposures to perceptible sounds. Severe damage (from the shock wave) to the ears includes tympanic membrane rupture, fracture of the ossicles, damage to the cochlea, hemorrhage, and cerebrospinal

fluid leakage into the middle ear. Moderate injury implies partial hearing loss due to tympanic membrane rupture and blood in the middle ear. Permanent hearing loss also can occur when the hair cells are damaged by one very loud event, as well as by prolonged exposure to a loud noise or chronic exposure to noise. The level of impact from blasts depends on both an animal's location and, at outer zones, on its sensitivity to the residual noise (Ketten, 1995).

However, the above discussion concerning underwater explosion only pertains to open water detonation in a free field. CALTRANS' Pier E4 and E5 demolition project using controlled implosion uses a confined detonation method, meaning that the charges would be placed within the structure. Therefore, most energy from the explosive shock wave would be absorbed through the destruction of the structure itself, and would not propagate through the open water. Measurements and modeling from confined underwater detonation for structure removal showed that energy from shock waves and noise impulses were greatly reduced in the water column (Hempen *et al.*, 2007; CALTRANS 2016). Therefore, with monitoring and mitigation measures discussed above, CALTRANS Pier E4 and E5 controlled implosions are not likely to have the injury or mortality effects on marine mammals in the project vicinity. Instead, NMFS considers that CALTRANS' proposed Pier E4 and E5 controlled implosions in the San Francisco Bay are most like to cause Level B behavioral harassment and maybe TTS in a few individual of marine mammals, as discussed below.

Changes in marine mammal behavior are expected to result from an acute stress response. This expectation is based on the idea that some sort of physiological trigger must exist to change any behavior that is already being performed. The exception to this

rule is the case of auditory masking, which is not likely since the CALTRANS' controlled implosion is only two short, sequential detonations that last for approximately 3-4 seconds.

Potential Effects on Marine Mammal Habitat

The removal of the SFOBB East Span is not likely to negatively affect the habitat of marine mammal populations because no permanent loss of habitat will occur, and only a minor, temporary modification of habitat will occur. The original SFOBB area is not used as a haul-out site by pinnipeds or as a major foraging area. Therefore, demolition of the concrete marine foundations and pile installation and removal activities are unlikely to permanently decrease fish populations in the area and are unlikely to affect marine mammal populations.

Project activities will not affect any pinniped haul-out sites or pupping sites. The YBI harbor seal haul-out site is on the opposite side of the island from the SFOBB Project area. Because of the distance and the island blocking the sound, underwater noise and pressure levels from the SFOBB Project will not reach the haul-out. Other haul-out sites for sea lions and harbor seals are at a sufficient distance from the SFOBB Project area that they will not be affected. The closest recognized harbor seal pupping site is at Castro Rocks, approximately 8.7 mi (14 km) from the SFOBB Project area. No sea lion rookeries are found in the Bay.

The addition of underwater sound from SFOBB Project activities to background noise levels can constitute a potential cumulative impact on marine mammals. However, these potential cumulative noise impacts will be short in duration.

SPLs from impact pile driving and pier implosion have the potential to injure or kill fish in the immediate area. During previous pier implosion and pile driving activities, CALTRANS has reported mortality to marine mammals' prey species, including northern anchovies and Pacific herring (CALTRANS 2016). These few isolated fish mortality events are not anticipated to have a substantial effect on prey species population or their availability as a food resource for marine mammals.

Studies also suggest that larger fish are generally less susceptible to death or injury than small fish. Moreover, elongated forms that are round in cross section are less at risk than deep-bodied forms. Orientation of fish relative to the shock wave may also affect the extent of injury. Open water pelagic fish (*e.g.*, mackerel) seem to be less affected than reef fishes. The results of most studies are dependent upon specific biological, environmental, explosive, and data recording factors.

The huge variation in fish populations, including numbers, species, sizes, and orientation and range from the detonation point, makes it very difficult to accurately predict mortalities at any specific site of detonation. Most fish species experience a large number of natural mortalities, especially during early life-stages, and any small level of mortality caused by the CALTRANS' two controlled implosions will likely be insignificant to the population as a whole.

Proposed Mitigation Measures

In order to issue an incidental take authorization 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.

1. Proposed Mitigation Measures for In-water Pile Driving and Pile Removal

For the proposed CALTRANS SFOBB construction activities, CALTRANS worked with NMFS and proposed the following mitigation measures to minimize the potential impacts to marine mammals in the project vicinity. The primary purpose of these mitigation measures is to detect marine mammals within or about to enter designated exclusion zones corresponding to NMFS current injury thresholds and to initiate immediate shutdown or power down of the piling hammer, making it very unlikely potential injury or TTS to marine mammals would occur, and to reduce the intensity of Level B behavioral harassment.

Use of Noise Attenuation Devices

To reduce impact on marine mammals, CALTRANS shall use a marine pile driving energy attenuator (i.e., air bubble curtain system), or other equally effective sound attenuation method (e.g., dewatered cofferdam) for all impact pile driving, with the exception of pile proofing and H-piles.

Establishment of Exclusion and Level B Harassment Zones

Before the commencement of in-water construction activities, which include impact pile driving and vibratory pile driving, CALTRANS shall establish “exclusion zones” where received underwater sound pressure levels (SPLs) are higher than 180 dB (rms) and 190 dB (rms) re 1 μ Pa for cetaceans and pinnipeds, respectively, and “Level B behavioral harassment zones” where received underwater sound pressure levels (SPLs) are higher than 160 dB (rms) and 120 dB (rms) re 1 μ Pa for impulse noise sources

(impact pile driving) and non-impulses noise sources (vibratory pile driving), respectively. Before the sizes of actual zones are determined based on hydroacoustic measurements, CALTRANS shall establish these zones based on prior measurements conducted during SFOBB constructions, as described in Table 2 of this document.

Table 2. Temporary Exclusion and Level B Harassment Zones for Various Pile Driving Activities

Pile Driving / Dismantling Activities	Pile Size (m)	Distance to 120 dB re 1 μ Pa (rms) (m)	Distance to 160 dB re 1 μ Pa (rms) (m)	Distance to 180 dB re 1 μ Pa (rms) (m)	Distance to 190 dB re 1 μ Pa (rms) (m)
Vibratory Driving	24	2,000	NA	NA	NA
	36	2,000	NA	NA	NA
	Sheet pile	2,000	NA	NA	NA
Attenuated Impact Driving	24	NA	1,000	235	95
	36	NA	1,000	235	95
Unattenuated Proofing	24	NA	1,000	235	95
	36	NA	1,000	235	95
Unattenuated Impact Driving	H-pile	NA	1,000	235	95

Once the underwater acoustic measurements are conducted during initial test pile driving, CALTRANS shall adjust the size of the exclusion zones and Level B behavioral harassment zones, and monitor these zones accordingly.

NMFS-approved protected species observers (PSOs) shall conduct initial survey of the exclusion zones to ensure that no marine mammals are seen within the zones before impact pile driving of a pile segment begins. If marine mammals are found within the exclusion zone, impact pile driving of the segment would be delayed until they move out of the area. If a marine mammal is seen above water and then dives below, the contractor would wait 15 minutes for pinnipeds and small cetaceans (harbor porpoise), and harbor porpoise and 30 minutes for bottlenose dolphins and gray whales. If no marine mammals are seen by the observer in that time it can be assumed that the animal has moved beyond the exclusion zone. This 15-minute criterion is based on scientific

evidence that harbor seals in San Francisco Bay dive for a mean time of 0.50 minutes to 3.33 minutes (Harvey and Torok, 1994), and the mean diving duration for harbor porpoises ranges from 44 to 103 seconds (Westgate *et al.*, 1995).

If pile driving of a segment ceases for 30 minutes or more and a marine mammal is sighted within the designated exclusion zone prior to commencement of pile driving, the observer(s) must notify the Resident Engineer (or other authorized individual) immediately and continue to monitor the exclusion zone. Operations may not resume until the marine mammal has exited the exclusion zone.

Soft Start

In order to provide additional protection to marine mammals near the project area by allowing marine mammals to vacate the area prior to receiving a higher noise exposure, CALTRANS and its contractor will also “soft start” the hammer prior to operating at full capacity. This should expose fewer animals to loud sounds both underwater and above water. This would also ensure that, although not expected, any pinnipeds and cetaceans that are missed during the initial exclusion zone monitoring will not be injured.

Shut-down Measure

CALTRANS shall implement shutdown measures if a marine mammal is sighted approaching the Level A exclusion zone. In-water construction activities shall be suspended until the marine mammal is sighted moving away from the exclusion zone, or if a pinniped or harbor porpoise is not sighted for 15 minutes after the shutdown, or if a bottlenose dolphin or gray whale is not sighted for 30 minutes after the shutdown.

2. Proposed Mitigation Measures for Confined Implosion

For CALTRANS's proposed Piers E4 and E5 controlled implosion, CALTRANS worked with NMFS and proposed the following mitigation measures to minimize the potential impacts to marine mammals in the project vicinity. The primary purposes of these mitigation measures are to minimize sound levels from the activities, to monitor marine mammals within designated exclusion zones and zones of influence (ZOI). Specific proposed mitigation measures are described below.

Time Restriction

Implosion of Piers E4 and E5 would only be conducted during daylight hours and with enough time for pre and post implosion monitoring, and with good visibility when the largest exclusion zone can be visually monitored.

Installation of Blast Attenuation System (BAS)

Prior to the Piers E4 and E5 demolition, CALTRANS should install a Blast Attenuation System (BAS) as described above to reduce the shockwave from the implosion.

Establishment of Level A Exclusion Zone

Due to the different hearing sensitivities among different taxa of marine mammals, NMFS has established a series of take thresholds from underwater explosions for marine mammals belonging to different functional hearing groups (Table 3). Under these criteria, marine mammals from different taxa will have different impact zones (exclusion zones and zones of influence).

CALTRANS will establish an exclusion zone for both the mortality and Level A harassment zone (permanent hearing threshold shift or PTS, GI track injury, and slight lung injury) using the largest radius estimated harbor and northern elephant seals.

CALTRANS will use measured distances to marine mammal threshold distances from the implosion of Pier E3 as predicted distances to the thresholds for the implosions of Piers E4 and E5 (Table 4). The use of measured peak pressure, cumulative SEL, and impulse levels from the Pier E3 implosion provide a conservative estimate for the proposed implosions of Piers E4 and E5. The Piers E4 and E5 caisson structures are smaller than the Pier E3 caisson structure and will require fewer explosive charges to implode. The maximum charge weight for the implosions of Piers E4 and E5 is 35 pounds/delay, the same as used for the implosion of Pier E3. However, the total explosive weight, number of individual detonations, and total time of implosion event will be less for these smaller piers.

Table 3. NMFS Take Thresholds for Marine Mammals from Underwater Implosions

Group	Species	Level B harassment		Level A harassment	Serious injury		Mortality
		Behavioral	TTS	PTS	Gastro-intestinal tract	Lung	
Mid-freq cetacean	Bottlenose dolphin	167 dB SEL	172 dB SEL or 224 dB SPL _{pk}	187 dB SEL or 230 dB SPL _{pk}	237 dB SPL or 104 psi	$39.1M^{1/3}$ $(1+[D/10.081])^{1/2}$ Pa-sec where: M = mass of the animals in kg D = depth of animal in m	$91.4M^{1/3}$ $(1+[D/10.081])^{1/2}$ Pa-sec where: M = mass of the animals in kg D = depth of animal in m
High-freq cetacean	Harbor porpoise	141 dB SEL	146 dB SEL or 195 dB SPL _{pk}	161 dB SEL or 201 dB SPL _{pk}			
Phocidae	Harbor seal & northern elephant seal	172 dB SEL	177 dB SEL or 212 dB SPL _{pk}	192 dB SEL or 218 dB SPL _{pk}			
Otariidae	California sea lion & northern fur seal	195 dB SEL	200 dB SEL or 212 dB _{pk}	215 dB SEL or 218 dB SPL _{pk}			

* Note: All dB values are referenced to 1 μPa. SPL_{pk} = Peak sound pressure level; psi = pounds per square inch.

Table 4. Measured Distances to Underwater Blasting Threshold Criteria for Levels A and B Harassment and Mortality from the Pier E3 Implosion

Species	Level B Criteria		Level A Criteria			Mortality
	Behavioral Response	TTS Dual Criteria*	PTS Dual Criteria*	Gastro-intestinal Track	Lung Injury	
Harbor Seal	2,460 ft (750 m)	1,658 ft (505 m) 104 ft (32 m)	507 ft (155 m) 65 ft (20 m)	<100 ft (30 m)	<100 ft (30 m)	<100 ft (30 m)
California Sea Lion	387 ft (118 m)	261 ft (80 m) 104 ft (32 m)	80 ft (24 m) 65 ft (20 m)	<100 ft (30 m)	<100 ft (30 m)	<100 ft (30 m)
Northern Elephant Seal	2,460 ft (750 m)	1,658 ft (505 m) 104 ft (32 m)	507 ft (155 m) 65 ft (20 m)	<100 ft (30 m)	<100 ft (30 m)	<100 ft (30 m)
Northern fur seal	387 ft (118 m)	261 ft (80 m) 104 ft (32 m)	80 ft (24 m) 65 ft (20 m)	<100 ft (30 m)	<100 ft (30 m)	<100 ft (30 m)
Harbor Porpoise	8,171 ft (2,491 m)	5,580 ft (1,701 m) 400 ft (122 m)	1,777 ft (542 m) 249 ft (76 m)	<100 ft (30 m)	<100 ft (30 m)	<100 ft (30 m)
Bottlenose Dolphin	1,255 ft (383 m)	855 ft (261 m) 202 ft (62 m)	271 ft (83 m) 112 ft (34 m)	<100 ft (30 m)	<100 ft (30 m)	<100 ft (30 m)
Note: * For the TTS and PTS criteria thresholds with dual criteria, the largest criteria distances (i.e., more conservative) are shown in bold.						

Establishment of Level B Temporary Hearing Threshold Shift (TTS) Zone of Influence

As shown in Table 3, for harbor and northern elephant seals, this will cover the area out to 212 dB peak SPL or 177 dB SEL, whichever extends out the furthest. Hydroacoustic modeling indicates this isopleth would extend out to 1,658 ft (505 m) from the pier. For harbor porpoises, this will cover the area out to 195 dB peak SPL or 146 dB SEL, whichever extends out the furthest, to 5,580 ft (1,701 m) from the pier. As discussed previously, the presence of harbor porpoises in this area is unlikely but

monitoring will be employed to confirm their absence. For California sea lions, the distance to the Level B TTS zone of influence will cover the area out to 212 dB peak SPL or 200 dB SEL. This distance was calculated at 261 ft (80 m) from Pier E3, well within the exclusion zone previously described. Hearing group specific Level B TTS zone of influence ranges are provided in Table 4.

Establishment of Level B Behavioral Zone of Influence

As shown in Table 3, for harbor seals and northern elephant seals, this will cover the area out to 172 dB SEL. Hydroacoustic measurement indicates this isopleth would extend out to 2,460 ft (750 m) from the pier. For harbor porpoises, this will cover the area out to 141 dB SEL. Hydroacoustic measurement indicates this isopleth would extend out to 8,171 ft (2,941 m) from the pier. As discussed previously, the presence of harbor porpoises in this area is unlikely but monitoring will be employed to confirm their absence. For California sea lions, the distance to the Level B behavioral harassment ZOI will cover the area out to 195 dB SEL. This distance was calculated at 387 ft (118 m) from the pier, well within the exclusion zone previously described. Hearing group specific Level B TTS zone of influence ranges are provided in Table 4.

Communication

All PSOs will be equipped with mobile phones and a VHF radio as a backup. One person will be designated as the Lead PSO and will be in constant contact with the Resident Engineer on site and the blasting crew. The Lead PSO will coordinate marine mammal sightings with the other PSOs. PSOs will contact the other PSOs when a sighting is made within the exclusion zone or near the exclusion zone so that the PSOs within overlapping areas of responsibility can continue to track the animal and the Lead

PSO is aware of the animal. If it is within 30 minutes of blasting and an animal has entered the exclusion zone or is near it, the Lead PSO will notify the Resident Engineer and blasting crew. The Lead PSO will keep them informed of the disposition of the animal.

Mitigation Conclusions

NMFS has carefully evaluated the applicant's proposed mitigation measures and considered a range of other measures in the context of ensuring that NMFS prescribes the means of effecting the least practicable impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another:

- The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals.
- The proven or likely efficacy of the specific measure to minimize adverse impacts as planned.
- The practicability of the measure for applicant implementation.

Any mitigation measure(s) prescribed by NMFS should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed below:

(1) Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).

(2) A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to received levels of pile driving and

pile removal or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

(3) A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to received levels of pile driving and pile removal, or other activities expected to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

(4) A reduction in the intensity of exposures (either total number or number at biologically important time or location) to received levels of pile driving, or other activities expected to result in the take of marine mammals (this goal may contribute to a, above, or to reducing the severity of harassment takes only).

(5) Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time.

(6) For monitoring directly related to mitigation – an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on our evaluation of the applicant's proposed measures, as well as other measures considered by NMFS, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on marine mammals species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Proposed Monitoring and Reporting

In order to issue an incidental take authorization (ITA) 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 ITAs 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 in the proposed action area. CALTRANS has proposed marine mammal monitoring measures as part of the IHA application. It can be found at <http://www.nmfs.noaa.gov/pr/permits/incidental.htm>. The plan may be modified or supplemented based on comments or new information received from the public during the public comment period.

Monitoring measures prescribed by NMFS should accomplish one or more of the following general goals:

(1) An increase in the probability of detecting marine mammals, both within the mitigation zone (thus allowing for more effective implementation of the mitigation) and in general to generate more data to contribute to the analyses mentioned below;

(2) An increase in our understanding of how many marine mammals are likely to be exposed to levels of pile driving that we associate with specific adverse effects, such as behavioral harassment, TTS, or PTS;

(3) An increase in our understanding of how marine mammals respond to stimuli expected to result in take and how anticipated adverse effects on individuals (in different ways and to varying degrees) may impact the population, species, or stock (specifically

through effects on annual rates of recruitment or survival) through any of the following methods:

- Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict received level, distance from source, and other pertinent information);
- Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (need to be able to accurately predict received level, distance from source, and other pertinent information);
- Distribution and/or abundance comparisons in times or areas with concentrated stimuli versus times or areas without stimuli;

(4) An increased knowledge of the affected species; and

(5) An increase in our understanding of the effectiveness of certain mitigation

and monitoring measures.

Proposed Monitoring Measures

1. Monitoring for Pile Driving and Pile Removal

(1) Visual Monitoring

Besides using monitoring for implementing mitigation (ensuring exclusion zones are clear of marine mammals before pile driving begins and after shutdown measures), marine mammal monitoring will also be conducted to assess potential impacts from CALTRANS construction activities. CALTRANS will implement onsite marine mammal monitoring for 100% of all unattenuated impact pile driving of H-piles for 180- and 190-dB re 1 μ Pa exclusion zones and 160-dB re 1 μ Pa Level B harassment zone and attenuated impact pile driving (except pile proofing) for 180- and 190-dB re 1 μ Pa

exclusion zones. CALTRANS will also monitor 20% of the attenuated impact pile driving for the 160-dB re 1 μ Pa Level B harassment zone, and 20% of vibratory pile driving for the 120-dB re 1 μ Pa Level B harassment zone.

(2) Protected Species Observers (PSOs)

Monitoring of the pinniped and cetacean exclusion zones shall be conducted by a minimum of three qualified NMFS-approved PSOs. Observations will be made using high-quality binoculars (*e.g.*, Zeiss, 10 x 42 power). PSOs will be equipped with radios or cell phones for maintaining contact with other observers and CALTRANS engineers, and range finders to determine distance to marine mammals, boats, buoys, and construction equipment.

(3) Data Collection

Data on all observations will be recorded and will include the following information:

- Location of sighting;
- Species;
- Number of individuals;
- Number of calves present;
- Duration of sighting;
- Behavior of marine animals sighted;
- Direction of travel; and
- When in relation to construction activities did the sighting occur (*e.g.*, before, “soft-start”, during, or after the pile driving or removal).

1. Monitoring for Confined Implosion of Piers E4 and E5

Monitoring for implosion impacts to marine mammals will be based on the SFOBB pile driving monitoring protocol. Pile driving has been conducted for the SFOBB construction project since 2000 with development of several NMFS-approved marine mammal monitoring plans (CALTRANS 2004; 2013). Most elements of these marine mammal monitoring plans are similar to what would be required for underwater implosions. These monitoring plans would include monitoring an exclusion zone and ZOIs for TTS and behavioral harassment described above.

(1) Protected Species Observers (PSOs)

A minimum of 8-10 PSOs would be required during the Piers E4 and E5 controlled implosion so that the exclusion zone, Level B Harassment TTS and Behavioral ZOIs, and surrounding area can be monitored. One PSO would be designated as the Lead PSO and would receive updates from other PSOs on the presence or absence of marine mammals within the exclusion zone and would notify the Environmental Compliance Manager of a cleared exclusion zone to the implosion.

(2) Monitoring Protocol

Implosions of Piers E4 and E5 will be conducted only during daylight hours and with enough time for pre and post-implosion monitoring, and with good weather (i.e., clear skies and no high winds). This work will be completed so that PSOs will be able to detect marine mammals within the exclusion zones and beyond. The Lead PSO will be in contact with other PSOs. If any marine mammals enter an exclusion zone within 30 minutes of blasting, the Lead PSO will notify the Environmental Compliance Manager that the implosion may need to be delayed. The Lead PSO will keep the Environmental Compliance Manager informed about the disposition of the animal. If the animal remains

in the exclusion zone, blasting will be delayed until it has left the exclusion zone. If the animal dives and is not seen again, blasting will be delayed at least 15 minutes for pinnipeds and small cetacean (harbor porpoise), and 30 minutes for bottlenose dolphin. After the implosion has occurred, the PSOs will continue to monitor the area for at least 60 minutes.

(3) Data Collection

Each PSO will record the observation position, start and end times of observations, and weather conditions (i.e., sunny/cloudy, wind speed, fog, visibility). For each marine mammal sighting, the following will be recorded, if possible:

- Species.
- Number of animals (with or without pup/calf).
- Age class (pup/calf, juvenile, adult).
- Identifying marks or color (e.g., scars, red pelage, damaged dorsal fin).
- Position relative to Piers E4 or E5 (distance and direction).
- Movement (direction and relative speed).
- Behavior (e.g., logging [resting at the surface], swimming, spy-hopping [raising above the water surface to view the area], foraging).

(4) Post-implosion Survey

Although any injury or mortality from the implosions of Piers E4 and E5 is very unlikely, boat or shore surveys will be conducted for 3 days following the event, to determine whether any injured or stranded marine mammals are in the area. If an injured or dead animal is discovered during these surveys or by other means, the NMFS-designated stranding team will be contacted to pick up the animal. Veterinarians will

treat the animal or will conduct a necropsy to attempt to determine whether it stranded because of the Piers E4 and E5 implosions.

Proposed Reporting Measures

CALTRANS would be required to submit a draft monitoring report within 90 days after completion of the construction work or the expiration of the IHA (if issued), whichever comes earlier. This draft report would detail the monitoring protocol, summarize the data recorded during monitoring, and estimate the number of marine mammals that may have been harassed. NMFS would have an opportunity to provide comments on the draft report within 30 days, and if NMFS has comments, CALTRANS would address the comments and submit a final report to NMFS within 30 days. If no comments are provided by NMFS after 30 days receiving the report, the draft report is considered to be final.

Marine Mammal Stranding Plan

A stranding plan for the Pier E3 implosion was prepared in cooperation with the local NMFS-designated marine mammal stranding, rescue, and rehabilitation center. An updated version of this plan will be implemented during implosions of Piers E4 and E5. Although avoidance and minimization measures likely will prevent any injuries, preparations will be made in the unlikely event that marine mammals are injured. Elements of the plan will include the following:

1. The stranding crew will prepare treatment areas at an NMFS-designated facility for cetaceans or pinnipeds that may be injured from the implosions. Preparation will include equipment to treat lung injuries, auditory testing

equipment, dry and wet caged areas to hold animals, and operating rooms if surgical procedures are necessary.

2. A stranding crew and a veterinarian will be on call near the Piers E4 and E5 area at the time of the implosions, to quickly recover any injured marine mammals, provide emergency veterinary care, stabilize the animal's condition, and transport individuals to an NMFS-designated facility. If an injured or dead animal is found, NMFS (both the regional office and headquarters) will be notified immediately, even if the animal appears to be sick or injured from causes other than the implosions.
3. Post-implosion surveys will be conducted immediately after the event and over the following 3 days to determine whether any injured or dead marine mammals are in the area.
4. Any veterinarian procedures, euthanasia, rehabilitation decisions, and time of release or disposition of the animal will be at the discretion of the NMFS-designated facility staff and the veterinarians treating the animals. Any necropsies to determine whether the injuries or death of an animal was the result of an implosion or other anthropogenic or natural causes will be conducted at an NMFS-designated facility by the stranding crew and veterinarians. The results will be communicated to both the CALTRANS and to NMFS as soon as possible, followed by a written report within a month.

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to 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].

The distance to marine mammal threshold criteria for pile driving and blasting activities, and corresponding zones of influence (ZOI) have been determined based on underwater sound and pressure measurements collected during previous activities in the SFOBB Project area. The numbers of marine mammals by species that may be taken by each type of take were calculated based on distance to the marine mammal threshold criteria, duration of the activity, and the estimated density of each species in the ZOI.

Estimates of Species Densities of Marine Mammals

No systematic line transect surveys of marine mammals have been performed in the San Francisco Bay. Therefore, the in-water densities of harbor seals, California sea lions, and harbor porpoises were calculated based on 15 years of observations during monitoring for the SFOBB construction and demolition. The amount of monitoring performed per year varied depending on the frequency and duration of construction activities with the potential to affect marine mammals. During the 237 days of monitoring from 2000 through 2015 (including 15 days of baseline monitoring in 2003), 822 harbor seals, 77 California sea lions, and 9 harbor porpoises were observed within the waters of the SFOBB east span. Density estimates for other species were made from stranding data, provided by the Marine Mammal Center (MMC).

1. Pacific Harbor Seal Density Estimates

Harbor seal density was calculated from all observations of animals in water during SFOBB Project monitoring from 2000 to 2015, divided by the size of the project area. These observations included data from baseline, pre-, during and post-pile driving, mechanical dismantling, onshore blasting, and offshore implosion activities. During this time, the population of harbor seals in the Bay remained stable (Manugian 2013). Therefore, substantial differences in numbers or behaviors of seals hauling out, foraging, or in their movements are not anticipated. All harbor seal observations within a 1 km² area were used in the estimate. Distances were recorded using a laser range finder (Bushnell Yardage Pro Elite 1500; \pm 1.0 yard accuracy). Care was taken to eliminate multiple observations of the same animal, although this was difficult when more than three seals were foraging in the same area.

Density of harbor seals was highest near YBI and Treasure Island, probably because of the haul-out site and nearby foraging areas in Coast Guard and Clipper coves. Therefore, density estimates were calculated for a higher density area within 4,921 ft (1,500 m) west of Piers E4 and E5, which included the two foraging coves. A lower density estimate was calculated from the areas east of Piers E4 and E5, and beyond 4,921 ft (1,500 m) north and south of the bridge. Harbor seal densities in these two areas in spring-summer and fall-winter seasons are provided in Table 5.

2. California Sea Lion Density Estimates

Within the SFOBB Project area, California sea lion density was calculated from all observations of animals in water during SFOBB Project monitoring from 2000 to 2015, divided by the size of the project area. These observations included data from

baseline, pre, during, and post-pile driving, mechanical dismantling, onshore blasting, and offshore implosion activities. All sea lion observations within a 1 km² area were used in the estimate. Distances were recorded using a laser range finder (Bushnell Yardage Pro Elite 1500; ± 1.0 yard accuracy). Care was taken to eliminate multiple observations of the same animal, although most sea lion observations involve a single animal.

California sea lion densities in late spring-early summer and late summer-fall seasons are provided in Table 5.

3. Northern Elephant Seal Density Estimates

Northern elephant seal density in the project area was calculated from the stranding records of the MMC, from 2004 to 2014. These data included both injured or sick seals and healthy seals. Approximately 100 elephant seals were reported in the Bay during this time; most of these hauled out and likely were sick or starving. The actual number of individuals in the Bay may have been higher because not all individuals would necessarily have hauled out. Some individuals may have simply left the Bay soon after entering. Data from the MMC show several elephant seals stranding on Treasure Island, and one healthy elephant seal was observed resting on the beach in Clipper Cove in 2012. Elephant seal pups or juveniles also may have stranded after weaning in the spring and when they returned to California in the fall (September through November). Density of northern elephant seal is estimated as the number of stranded seals over the SFOBB project area, which is 0.03 animal/km² (Table 5).

4. Harbor Porpoise Density Estimates

Harbor porpoise density was calculated from all observations during SFOBB Project monitoring, from 2000 to 2015. These observations included data from baseline,

pre, during and post-pile driving, and onshore implosion activities. Over this period, the number of harbor porpoises that were observed entering and using the Bay increased. During the 15 years of monitoring in the SFOBB Project area, only nine harbor porpoises were observed, and all occurred between 2006 and 2015 (including two in 2014 and five in 2015). Density of harbor porpoise is estimated to be 0.021 animal/km² (Table 5).

5. Gray Whale Density Estimate

Gray whale density was estimated for the entire Bay as no observations have occurred of gray whales in the SFOBB Project area. Each year, two to six gray whales enter the Bay, presumably to feed, in the late winter through spring (February through April), per the MMC. Gray whales rarely occur in the Bay from October through December. The gray whale density was estimated based on a maximum of 6 whales occurring within the main area of San Francisco Bay, which yielded a density of 0.00004/km² (Thorson, pers. comm., 2014).

Table 5. Estimated In-Water Density of Marine Mammals in the SFOBB Project Area

Species	Main Season of Occurrence	Density West of Piers E4 and E5 within 1,500 m of SFOBB (animals/km²)	Density East of Piers E4 and E5 and/or beyond 1,500 m of SFOBB (animals/km²)
Harbor Seal	Spring–Summer	0.32	0.17
Harbor Seal	Fall–Winter	0.83	0.17
California Sea Lion	Late Summer–Fall (post breeding season)	0.09	0.09
California Sea Lion	Late Spring–Early Summer (breeding season)	0.04	0.04
Northern Elephant Seal	Late Spring–Early Winter	0.03	0.03
Harbor	All Year	0.021	0.021

Porpoise			
Gray Whale	Late Winter and Spring	0.00004	0.00004
<p>Note: Densities for Pacific harbor seals, California sea lions and harbor porpoises are based on monitoring for the east span of the SFOBB from 2000 to 2013. Gray whale and elephant seal densities are estimated from sighting and stranding data from the MMC.</p>			

Estimated Takes by Pile Driving and Pile Removal

The numbers of marine mammals by species that may be taken by pile driving were calculated by multiplying the ensonified area above a specific species exposure threshold by the days of the activity and by the estimated density of each species in the ensonified area. As discussed above threshold distances were determined based on previously measured distances to thresholds during the driving of 42-inch-diameter (1.07 meters) pipe piles. The same threshold distances have been applied to all types and sizes of piles proposed for installation and removal (i.e., sheet piles, H-piles, and pipe piles equal to or less than 36 inches [0.91 meter]). The take estimate is based on 132 days of pile driving to install 200 piles.

For rare species of which the density estimates are unknown, such as northern fur seal and bottlenose dolphin, NMFS worked with CALTRANS and allotted 20 northern fur seals and 10 bottlenose dolphin for incidental take by Level B behavioral harassment to cover the chance encounter in case these animals happen to occur in the project area.

A summary of estimated takes by in-water pile driving and pile removal is provided in Table 6.

Table 6. Estimated Take of Marine Mammals from Pile Driving and Pile Removal Activities

Species	Level B Harassment (Behavioral Response)	Level A Harassment
Pacific Harbor Seal	862	0
California Sea Lion	108	0
Northern Elephant Seal	13	0
Harbor Porpoise	13	0
Gray Whale	1	0
Northern fur seal	20	0
Bottlenose dolphin	10	0

The number of marine mammals by species that may be taken by implosion of Piers E4 and E5 were calculated based on distances to the marine mammal threshold for explosions (Table 4) and the estimated density of each species in the ensonified areas (Table 5). A summary of estimated and requested takes by controlled implosion is provided in Table 8.

Table 7. Estimated Exposures of Marine Mammals to the Pier E4 and E5 Implosions for Levels A and B, and Mortality

Species	Level B Exposures		Level A Exposures			Mortality
	Behavioral Response	TTS	PTS	Gastro-Intestinal Track Injury	Slight Lung Injury	
Pacific Harbor Seal	1	1	0	0	0	0
California Sea Lion	0	0	0	0	0	0
Northern Elephant Seal	0	0	0	0	0	0
Harbor Porpoise	0	0	0	0	0	0

However, the number of marine mammals in the area at any given time is highly variable. Animal movement depends on time of day, tide levels, weather, and availability and distribution of prey species. Therefore, to account for potential high animal density

that could occur during the short window of controlled implosion, NMFS worked with CALTRANS and adjusted the estimated number upwards for the requested takes. These adjustments were based on likely group sizes of these animals.

A summary of estimated takes by implosion of Piers E4 and E5 is provided in Table 8.

Table 8. Summary of requested takes of marine mammals for the Pier E4 and E5 Implosions

Species	Level B Behavioral	Level B TTS
Pacific harbor seal	12	6
California sea lion	3	2
Northern elephant seal	2	1
Harbor porpoise	6	3
Northern fur seal	1	1
Bottlenose dolphin	2	2

A summary of the request incidental takes of marine mammals for CALTRANS SFOBB construction activity, including from in-water pile driving/pile removal and controlled implosion for Piers E4 and E5 is provided in Table 9. These take estimates represent “instances” of take and are likely overestimates of the number of individual animals taken, since some individuals are likely taken on multiple days. The more likely the individuals are to remain in the action area for multiple days, the greater the overestimate of individuals.

Table 9. Summary of Requested Takes of Marine Mammals for CALTRANS SFOBB Project

Species	Level B Behavioral	Level B TTS	Population	% take population
Pacific harbor seal	874	6	30,968	2.84%
California sea lion	111	2	296,750	0.04%
Northern elephant seal	15	1	179,000	0.01%

Harbor porpoise	19	3	9,886	0.22%
Northern fur seal	21	1	12,844	0.17%
Gray whale	1	0	20,990	0.00%
Bottlenose dolphin	12	2	323	4.33%

Analysis and Preliminary Determinations

Negligible Impact

Negligible impact is “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” (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of Level B harassment takes, alone, is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be “taken” through behavioral harassment, NMFS must consider other factors, such as the likely nature of any responses (their intensity, duration, *etc.*), the context of any responses (critical reproductive time or location, migration, *etc.*), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, and effects on habitat.

To avoid repetition, this introductory discussion of our analyses applies to all the species listed in Table 9, given that the anticipated effects of CALTRANS’ SFOBB construction activities involving pile driving and pile removal and controlled implosions for Piers E4 and E5 on marine mammals are expected to be relatively similar in nature. There is no information about the nature or severity of the impacts, or the size, status, or

structure of any species or stock that would lead to a different analysis for this activity, or else species-specific factors would be identified and analyzed.

No injuries or mortalities are anticipated to occur as a result of CALTRANS' SFOBB construction activity associated with pile driving and pile removal and controlled implosion to demolish Piers E4 and E5, and none are proposed to be authorized. The relatively low marine mammal density and small Level A exclusion zones make injury takes of marine mammals unlikely, based on take calculation described above. In addition, the Level A exclusion zones would be thoroughly monitored before the proposed implosion, and detonation activity would be postponed if a marine mammal is sighted within the exclusion zone.

The takes that are anticipated and authorized are expected to be limited to short-term Level B harassment (behavioral and TTS). Marine mammals (Pacific harbor seal, northern elephant seal, California sea lion, northern fur seal, gray whale, harbor porpoise, and bottlenose dolphin) present in the vicinity of the action area and taken by Level B harassment would most likely show overt brief disturbance (startle reaction) and avoidance of the area from elevated noise level during pile driving and pile removal and the implosion noise. A few marine mammals could experience TTS if they occur within the Level B TTS ZOI. However, as discussed early in this document, TTS is a temporary loss of hearing sensitivity when exposed to loud sound, and the hearing threshold is expected to recover completely within minutes to hours. Therefore, it is not considered an injury. In addition, even if an animal receives a TTS, the TTS would be a one-time event from a brief impulse noise (about 5 seconds), making it unlikely that the TTS would involve into PTS. Finally, there is no critical habitat or other biologically

important areas in the vicinity of CALTRANS' proposed Pier E4 and E5 controlled implosion areas (Calambokidis *et al.*, 2015).

The project also is not expected to have significant adverse effects on affected marine mammals' habitat, as analyzed in detail in the “**Anticipated Effects on Marine Mammal Habitat**” section. There is no biologically important area in the vicinity of the SFOBB project area. The project activities would not permanently modify existing marine mammal habitat. The activities may kill some fish and cause other fish to leave the area temporarily, thus impacting marine mammals' foraging opportunities in a limited portion of the foraging range; but, because of the short duration of the activities and the relatively small area of the habitat that may be affected, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from CALTRANS's SFOBB construction activity and the associated Piers E4 and E5 demolition via controlled implosion will have a negligible impact on the affected marine mammal species or stocks.

Small Number

The requested takes represent less than 4.33% of all populations or stocks potentially impacted (see Table 9 in this document). These take estimates represent the percentage of each species or stock that could be taken by Level B behavioral harassment and TTS (Level B harassment). The numbers of marine mammals estimated to be taken are small proportions of the total populations of the affected species or stocks. In

addition, the mitigation and monitoring measures (described previously in this document) prescribed in the proposed IHA are expected to reduce even further any potential disturbance to marine mammals.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the mitigation and monitoring measures, NMFS preliminarily finds that small numbers of marine mammals will be taken relative to the populations of the affected species or stocks.

Impact on Availability of Affected Species for Taking for Subsistence Uses

There are no subsistence uses of marine mammals in the proposed project area; and, thus, no subsistence uses impacted by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Endangered Species Act (ESA)

NMFS has determined that issuance of the IHA will have no effect on listed marine mammals, as none are known to occur in the action area.

National Environmental Policy Act (NEPA)

NMFS prepared an Environmental Assessment (EA) for the take of marine mammals incidental to construction of the East Span of the SFOBB and made a Finding of No Significant Impact (FONSI) on November 4, 2003. Due to the modification of part of the construction project and the mitigation measures, NMFS reviewed additional information from CALTRANS regarding empirical measurements of pile driving noises for the smaller temporary piles without an air bubble curtain system and the use of

vibratory pile driving. NMFS prepared a Supplemental Environmental Assessment (SEA) and analyzed the potential impacts to marine mammals that would result from the modification of the action. A Finding of No Significant Impact (FONSI) was signed on August 5, 2009. In addition, for CALTRANS' Piers E4 and E5 demolition using controlled implosion, NMFS prepared an SEA and analyzed the potential impacts to marine mammals that would result from the modification. A Finding of No Significant Impact (FONSI) was signed on September 3, 2015. The proposed activity and expected impacts remain within what was previously analyzed in the EA and SEAs. Therefore, no additional NEPA analysis is warranted. A copy of the SEA and FONSI is available upon request (see **ADDRESSES**).

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to CALTRANS for conducting SFOBB activities involving pile driving and pile removal, as well as Piers E4 and E5 demolition via controlled implosion, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. The proposed IHA language is provided next.

1. This Authorization is valid from August 15, 2016, through August 14, 2017.
2. This Authorization is valid only for activities associated with the SFOBB activities and demolition activities in San Francisco Bay.
3. (a) The species authorized for incidental harassment takings, Level B harassment only, are: Pacific harbor seal (*Phoca vitulina richardii*), California sea lion (*Zalophus californianus*), northern elephant seal (*Mirounga angustirostris*), northern fur

seal (*Callorhinus ursinus*), gray whale (*Eschrichtius robustus*), harbor porpoise (*Phocoena phocoena*), and bottlenose dolphin (*Tursiops truncatus*).

(b) The authorization for taking by harassment is limited to the following acoustic sources and from the following activities:

- In-water pile driving and pile removal activities; and
- Piers E4 and E5 demolition via controlled implosion and associated test blasting.

(c) The taking of any marine mammal in a manner prohibited under this Authorization must be reported within 24 hours of the taking to the West Coast Administrator (206-526-6150), National Marine Fisheries Service (NMFS) and the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, at (301) 427-8401, or her designee (301-427-8418).

4. The holder of this Authorization must notify the Chief of the Permits and Conservation Division, Office of Protected Resources, at least 48 hours prior to the start of activities identified in 3(b) (unless constrained by the date of issuance of this Authorization in which case notification shall be made as soon as possible).

5. Prohibitions

(a) The taking, by incidental harassment only, is limited to the species listed under condition 3(a) above and by the numbers listed in Table 9 of this notice. The taking by Level A harassment, injury or death of these species or the taking by harassment, injury or death of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this Authorization.

(b) The taking of any marine mammal is prohibited whenever the required protected species observers (PSOs), required by condition 7(a), are not present in conformance with condition 7(a) of this Authorization.

6. Mitigation

(a) Time Restriction

In-water pile driving and pile removal activities and the controlled implosion of Piers E4 and E5 shall only be conducted during daylight hours and with enough time for pre and post activity monitoring, and with good visibility when the largest exclusion zone can be visually monitored.

(b) Installation of Sound Attenuation Systems

(i) For in-water pile driving, energy attenuator (such as air bubble curtain system or dewatered cofferdam) shall be used for all impact pile driving of pipe piles, with the exception of pile proofing and H-piles.

(ii) For controlled implosion of Piers E4 and E5, CALTRANS should install a Blast Attenuation System (BAS) prior to demolition to reduce the shockwave from the implosion.

(c) Establishment of Exclusion Zones and Zones of Influence

(i) For in-water pile driving and pile removal activities, CALTRANS shall establish exclusion zones where received underwater sound pressure levels (SPLs) are higher than 180 dB (rms) and 190 dB (rms) re 1 μ Pa for cetaceans and pinnipeds, respectively, and zones of influence (ZOIs) where received underwater sound pressure levels (SPLs) are higher than 160 dB (rms) and 120 dB (rms) re 1 μ Pa for impulse noise

sources (impact pile driving) and non-impulses noise sources (vibratory pile driving), respectively. The isopleth of these zones are provided in Table 2.

(ii) For Piers E4 and E5 controlled implosion and associated test blasting, CALTRANS shall established exclusions zones and ZOIs that are appropriate to specific marine mammal functional hearing group shall be established. The isopleth of these zones are provided in Table 3.

(d) Exclusion Zone Monitoring for Mitigation Measures.

(i) NMFS-approved protected species observers (PSOs) shall conduct initial survey of the exclusion for 30 minutes to ensure that no marine mammals are seen within the zones before impact pile driving and controlled implosion.

(ii) If marine mammals are found within the exclusion zones, impact pile driving and/or controlled implosion of the piers shall be delayed until they move out of the area. If a marine mammal is seen above water and then dives below, the contractor would wait 15 minutes for pinnipeds and small cetacean (harbor porpoise) and harbor porpoise and 30 minutes for gray whale and bottlenose dolphin. If no marine mammals are seen by the observer in that time it would be assumed that the animal has moved beyond the exclusion zone.

(iii) If the time between pile-segment driving is less than 30 minutes, a new 30-minute survey is unnecessary provided marine mammal monitors continue observations during the interruption. If pile driving ceases for 30 minutes or more and a marine mammal is sighted within the designated safety zone(s) prior to the commencement of pile-driving, the PSO(s) must notify the Resident Engineer (or other authorized individual) immediately and implement measures in condition 5(d)(ii).

(e) Soft Start

CALTRANS and its contractor shall implement soft start, i.e., starting the pile driving hammer at the lowest power setting and gradually ramp up to full power, prior to operating pile driving hammers at full capacity for both impact and vibratory pile driving.

(f) Shut-down

For pile driving activities, if a marine mammal is sighted within the exclusion zone or is approaching the exclusion zone after pile-driving has begun, pile driving shall be shut-down. CALTRANS may resume pile driving after a shut-down measure following condition 5(d)(ii).

(g) Communication

For controlled implosion, the Lead PSO shall be in constant contact with the Resident Engineer on site and the blasting crew to ensure that no marine mammal is within the exclusion zone before the controlled implosion.

7. Monitoring:

(a) Protected Species Observers.

(i) CALTRANS shall employ NMFS-approved PSOs to conduct marine mammal monitoring for its SFOBB construction activities that involve in-water pile driving and pile removal and controlled pier implosion.

(ii) Marine mammal monitoring shall begin at least 30 minutes prior to the start of the activities, through the entire activities, and continue to 30 minutes after the construction activities and 60 minutes after the implosion events.

(iii) Observations shall be made using high-quality binoculars (e.g., Zeiss, 10 x 42 power). PSOs shall be equipped with radios or cell phones for maintaining contact

with other observers and CALTRANS engineers, and range finders to determine distance to marine mammals, boats, buoys, and construction equipment.

(iv) For in-water pile driving and pile removal.

(A) CALTRANS shall implement onsite marine mammal monitoring for 100% of all unattenuated impact pile driving of H-piles for 180- and 190-dB re 1 μ Pa exclusion zones and 160-dB re 1 μ Pa Level B harassment zone, and attenuated impact pile driving of pipe piles (except pile proofing) for 180- and 190-dB re 1 μ Pa exclusion zones.

(B) CALTRANS shall also monitor 20% of the attenuated impact pile driving for the 160-dB re 1 μ Pa Level B harassment zone, and 20% of vibratory pile driving for the 120 dB re 1 μ Pa Level B harassment zone.

(C) Data on all observations would be recorded and shall include the following information:

- Location of sighting;
- Species;
- Number of individuals;
- Number of calves present;
- Duration of sighting;
- Behavior of marine animals sighted;
- Direction of travel;
- When in relation to construction activities did the sighting occur (*e.g.*, before, “soft-start”, during, or after the pile driving or removal); and
- Other human activities in the area.

(v) For controlled implosion of Piers E4 and E5:

(A) A minimum of 8-10 PSOs shall be required during the Piers E4 and E5 controlled implosion so that the exclusion zone, Level B Harassment TTS and Behavioral ZOIs, and surrounding area can be monitored.

(B) PSOs shall be positioned near the edge of each of the threshold criteria zones and shall utilize boats, barges, and bridge piers and roadway.

(C) The Lead PSO shall be in constant communication with the Environmental Compliance Manager that will be located with the CALTRANS Engineer and the Blasting Supervisor (or person that will be in charge of detonating the charges) during the implosion.

(D) Boat or shore surveys shall be conducted immediately after the event and for the three days following the event to determine if there are any injured or stranded marine mammals in the area.

(E) Monitoring Data Collection:

For each marine mammal sighting, the following shall be recorded, if possible:

- Species.
- Number of animals (with or without pup/calf).
- Age class (pup/calf, juvenile, adult).
- Identifying marks or color (scars, red pelage, damaged dorsal fin, etc.).
- Position relative to Pier E4 or E5 (distance and direction).
- Movement (direction and relative speed).
- Behavior (logging [resting at the surface], swimming, spyhopping [raising above the water surface to view the area], foraging, *etc.*)
- Duration of sighting or times of multiple sightings of the same individual

8. Reporting:

(a) CALTRANS shall submit a draft monitoring report within 90 days after completion of the construction work or the expiration of the IHA (if issued), whichever comes earlier. This report would detail the monitoring protocol, summarize the data recorded during monitoring, and estimate the number of marine mammals that may have been harassed.

(b) NMFS would have an opportunity to provide comments within 30 days after receiving the draft report, and if NMFS has comments, CALTRANS shall address the comments and submit a final report to NMFS within 30 days.

(c) If NMFS does not provide comments within 30 days after receiving the report, the draft report is considered to be final.

(d) In the unanticipated event that the construction activities clearly cause the take of a marine mammal in a manner prohibited by this Authorization (if issued), such as an injury, serious injury, or mortality, CALTRANS shall immediately cease all operations and immediately report the incident to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinators. The report must include the following information:

- (i) Time, date, and location (latitude/longitude) of the incident;
- (ii) Description of the incident;
- (iii) Status of all sound source use in the 24 hours preceding the incident;
- (iv) Environmental conditions (e.g., wind speed and direction, sea state, cloud cover, visibility, and water depth);

(v) Description of marine mammal observations in the 24 hours preceding the incident;

(vi) Species identification or description of the animal(s) involved;

(vii) The fate of the animal(s); and

(viii) Photographs or video footage of the animal (if equipment is available).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS shall work with CALTRANS to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance.

CALTRANS may not resume their activities until notified by NMFS via letter, email, or telephone.

(e) In the event that CALTRANS discovers an injured or dead marine mammal, and the lead PSO determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.*, in less than a moderate state of decomposition as described in the next paragraph), CALTRANS will immediately report the incident to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinators. The report must include the same information identified above. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with CALTRANS to determine whether modifications in the activities are appropriate.

(f) In the event that CALTRANS discovers an injured or dead marine mammal, and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), CALTRANS shall report

the incident to the Chief, Permits and Conservation Division, Office of Protected Resources, NMFS, and the West Coast Regional Stranding Coordinators, within 24 hours of the discovery. CALTRANS shall provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network. CALTRANS can continue its operations under such a case.

9. Marine Mammal Stranding Plan:

A marine mammal stranding plan shall be prepared in cooperation with the local NMFS-designated marine mammal stranding, rescue, and rehabilitation center. Elements of that plan would include the following:

(a) The stranding crew shall prepare treatment areas at the NMFS-designated facility for cetaceans or pinnipeds that may be injured from the implosion. Preparation shall include equipment to treat lung injuries, auditory testing equipment, dry and wet caged areas to hold animals, and operating rooms if surgical procedures are necessary. Equipment to conduct auditory brainstem response hearing testing would be available to determine if any inner ear threshold shifts (TTS or PTS) have occurred.

(b) A stranding crew and a veterinarian shall be on call near the Piers E4 and E5 sites at the time of the implosion to quickly recover any injured marine mammals, provide emergency veterinary care, stabilize the animal's condition, and transport individuals to the NMFS-designated facility. If an injured or dead animal is found, NMFS (both the regional office and headquarters) shall be notified immediately even if the animal appears to be sick or injured from other than blasting.

(c) Post-implosion surveys shall be conducted immediately after the event and over the following three days to determine if there are any injured or dead marine mammals in the area.

(d) Any veterinarian procedures, euthanasia, rehabilitation decisions and time of release or disposition of the animal shall be at the discretion of the NMFS-designated facility staff and the veterinarians treating the animals. Any necropsies to determine if the injuries or death of an animal was the result of the blast or other anthropogenic or natural causes will be conducted at the NMFS-designated facility by the stranding crew and veterinarians. The results shall be communicated to both CALTRANS and to NMFS as soon as possible with a written report within a month.

10. This Authorization may be modified, suspended or withdrawn if the holder fails to abide by the conditions prescribed herein or if the authorized taking is having more than a negligible impact on the species or stock of affected marine mammals, or if there is an unmitigable adverse impact on the availability of such species or stocks for subsistence uses.

11. A copy of this Authorization must be in the possession of each contractor who performs the in-water pile driving, pile removal, and Piers E4 and E5 controlled implosion work.

Dated: July 21, 2016.

Donna S. Wieting,
Director,
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