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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XE030

Taking of Marine Mammals Incidental to Specified Activities; San Francisco-Oakland Bay Bridge Pier E3 Demolition via Controlled Implosion

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 authorization to take small numbers of four species of marine mammals, by Level B harassment, incidental to proposed San Francisco-Oakland Bay Bridge (SFOBB) Pier E3 demolition via controlled implosion in San Francisco Bay (SFB or Bay). 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 its proposed controlled implosion.

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 3, 2015, CALTRANS submitted a request to NMFS for the potential harassment of a small number of marine mammals incidental to the dismantling of Pier

E3 of the East Span of the original SFOBB in SFB, California, in fall 2015. CALTRANS is proposing to remove the Pier E3 via highly controlled implosion with detonations. On April 16, 2015, CALTRANS submitted a revision of its request with an inclusion of a test implosion before the bridge demolition. NMFS determined that the IHA application was complete on May 1, 2015. NMFS is proposing to authorize the Level B harassment of Pacific harbor seal, California sea lion, northern elephant seal, and harbor porpoise.

Description of the Specified Activity

Overview

CALTRANS proposes removal of Pier E3 of the original SFOBB by use of controlled charges to implode the pier into its open cellular chambers below mudline. A Blast Attenuation System (BAS) will be used to minimize impacts to biological resources in the Bay. Given the complexity of removing the deep water caissons, CALTRANS is proposing the Demonstration Project to evaluate in-water controlled implosion techniques for the removal of marine foundations. CALTRANS' goal is to achieve a safe and efficient method for removing submerged foundations while avoiding and minimizing impacts to the Bay and natural communities and species within the project area.

The Demonstration Project expects to reduce environmental impacts as compared to currently permitted conventional dismantling methods which would employ large cofferdams with extensive amounts of associated pile driving and dewatering. The use of controlled charges is expected to greatly reduce in-water work periods and shorten the overall duration of marine foundation removal.

Dates and Duration

The controlled implosion and the pre-demolition test implosion are expected to occur in November 2015. Both pre-demolition implosion and the Pier E3 demolition via controlled implosion would last for about 5 seconds each. The IHA is proposed to be valid between October 1 and December 30, 2015, per discussion between CALTRANS and NMFS.

Specified Geographic Region

The location of the Pier E3 controlled implosion would occur within the Bay in the area around the east span of the SFOBB between Yerba Buena Island (YBI) and Oakland (Figure 16 of CALTRANS IHA application).

Detailed Description of CALTRANS Pier E3 Controlled Implosion

CALTRANS proposes to remove Pier E3 of the original SFOBB by implosion using highly controlled charges. The mean of using controlled implosion is proposed as an alternate method to the original permitted mechanical methods for dismantling Pier E3, as it is expected to result in fewer in-water work days, have fewer effects on aquatic resources of the Bay, and require a shorter time frame for completion.

In addition, to ensure that the Blast Attenuation System (BAS) for mitigation and the passive acoustic monitoring (PAM) for monitoring work properly during the implosion, CALTRANS is proposing a pre-implosion test charge using a small detonation three or four days before the actual SFOBB implosion. Detailed descriptions of CALTRANS' implosion activities are provided below.

Drilling Boreholes

Once the pier has been dismantled to the mechanical dismantling elevation, access platforms will be installed to support the drilling equipment while exposing the top of the

interior cells and outside walls. Boreholes will be drilled on the inner cell walls and exterior walls of the pier for charge placement. An overhanging template system will be installed to guide the drill below the waterline. Divers will be required to cut notches to guide the drilling of underwater boreholes. No marine mammal is expected to be affected from borehole drilling activities.

Blast Attenuation System Installation and Deployment

To minimize the potential impacts from shockwave generated from the bridge implosion, a Blast Attenuation System (BAS). The BAS to be used at Pier E3 is a modular system of pipe manifold frames that will be fed by 1,400 – 1,600 cubic feet per minute (cfm) air compressors to create a curtain of air bubbles around the entire pier during the controlled implosion. Proposed BAS design details and specifications are provided in Appendix B of CALTRANS' IHA application. 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.

Based on location around the pier, the BAS frame elements will be situated from approximately 25 ft (7.6 m) to 40 ft (12 m) from the outside edge of Pier E3. The frames will be situated to contiguously surround the pier; frame ends will overlap to ensure no break in the BAS when operational. Each frame will be weighted to negative buoyancy for activation. Each BAS frame will be fed by an individual compressor mounted on a barge. This will require 14 compressors on approximately 14 flexi-float barges situated around the pier. Each barge will be temporarily anchored to maintain their position around the pier. Compressors will be turned on and each section of the BAS will be tested for uniform air flow prior to the controlled implosion. Once the controlled

implosion event has been completed, the contractor will demobilize the BAS and all associated equipment. Compressors will provide enough pressure to achieve a minimal air volume fraction of 3 - 4%, consistent with the successful use of BAS systems in past controlled blasting activities (Kiewit-Mass, pers. comm. in: CALTRANS 2015).

System performance is anticipated to provide approximately 80% attenuation, or better, based on past experience with similar systems during controlled blasting. Previous implosions using similar BAS systems in Ontario, Canada showed 85%-95% attenuation, in Vancouver, Canada showed 84% - 88% attenuation, and in Manitoba, Canada showed 90 - 98% attenuation (Kiewit-Mason, pers. comm. in: CALTRANS 2015).

The installation of the BAS is not expected to effects marine mammals in the project vicinity.

Pre-implosion Test Charge

Acoustically capturing the implosion is critical for the determination of whether or not this technique can be used for future piers. A key factor in accurately capturing hydroacoustic information is to ensure triggering of the data acquisition/recording instrument used for high speed recording during near-field and far-field monitoring of the implosion. To this end, the pressure-time signature of a blast cannot be duplicated except with another blast. As such, release of a small test charge before the actual implosion is required to validate that all equipment is functional and to set the triggering parameters accurately for the implosion.

Release of the test charge will occur at least three to four days prior to the actual implosion and after the BAS is in place and functional. The BAS will be in operation

during the test. The test will use a charge weight of 18 grain (0.0025 lbs) or less. The charge will be placed along one of the longer faces of the Pier and inside the BAS while it is operating. The charge will be positioned near the center of the wider face of the pier to shield the areas on the opposite side as much as possible from sound. The charge will be placed approximately halfway between the face of the pier and the BAS. Note, the BAS may be located anywhere from 25 to 45 ft from the face of the Pier. Monitoring inside the BAS will be done at a distance of 20 to 30 feet from the blast. Outside the BAS, monitoring will occur at a distance of 100 feet from the charge.

Due to the small amount of charges to be used the test, no marine mammal is expected to be effected.

Controlled Implosion Dismantling of Remaining Pier

The controlled implosion event is scheduled to take place in November of 2015. Prior to the event, the bore holes in Pier E3 will be loaded with charges, as described in the Blast Plan (Appendix A of CALTRANS IHA application).

Individual cartridge charges, versus pump-able liquid blasting agents, have been chosen to provide greater accuracy in estimating the individual and total charge weights. Charges will be transported by boat to Pier E3. Security will be required for transporting, handling and processing of the charges.

Boreholes vary in diameter and depth and have been optimized for charge efficiency. Individual and total charge weight loads are provided in the Blast Plan. Charges are arranged in different levels (decks) separated in the boreholes by stemming. Stemming is the insertion of inert materials, like sand or gravel, to insulate and retain charges in an enclosed space. Stemming allows for more efficient transfer of energy into

the structural concrete for fracture, and further reduces the release of potential energy into the adjacent water column.

The blast event will consist of a total of 588 individual delays of varying charge weight; the largest is 35 pounds/delay and the smallest is 21 pounds/delay. The blasting sequence is rather complex. On the full height walls, 30 pound weights will be used for the portion below mud line, 35 pound weights will be used in the lower structure immediately above mud line, 29.6 pounds in the midstructure, and 21 pounds in the upper structure. Blasts will start in several interior webs of the southern portion of the structure followed by the outer walls of the south side. The blasts in the inner walls will occur just prior to the adjacent outer walls. The interior first, exterior second blast sequence will continue across the structure moving from south to north. The time for the 588 detonations is 5.3 seconds with a minimum delay time of 9 milliseconds (ms) between detonations. As the blasting progresses, locations to east, north, and west of the pier will be shielded from the blasting on the interior of the structure from the still-standing exterior walls of the pier. However, towards the conclusion of the blast, each direction will experience blasts from the outer walls that are not shielded.

Description of Marine Mammals in the Area of the Specified Activity

The marine mammal species under NMFS jurisdiction most likely to occur in the proposed construction area include Pacific harbor seal (*Phoca vitulina richardsi*), northern elephant seal (*Mirounga angustirostris*), California sea lion (*Zalophus californianus*), and harbor porpoise (*Phocoena phocoena*).

Table 1 Error! No text of specified style in document.**. Marine Mammal Species Potentially Present in Region of Activity**

Species	ESA Status	MMPA Status	Occurrence
Harbor Seal	Not listed	Non-depleted	Frequent
California Sea Lion	Not listed	Non-depleted	Occasional
Northern Elephant Seal	Not listed	Non-depleted	Occasional
Harbor Porpoise	Not listed	Non-depleted	Rare

General information on the marine mammal species found in the San Francisco Bay can be found in Caretta *et al.* (2014), which is available at the following URL: *http://www.nmfs.noaa.gov/pr/sars/pdf/po2013.pdf*. Refer to that document for information on these species. A list of marine mammals in the vicinity of the action and their status are provided in Table 1. Specific information concerning these species in the vicinity of the proposed action area is provided in detail in the CALTRANS's IHA application.

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, six 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, six 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 40 kHz.

As mentioned previously in this document, four marine mammal species (one cetacean and three pinniped species) are likely to occur in the proposed Pier E3 controlled implosion area. The only one cetacean species (harbor porpoise) in the area is classified as high-frequency cetaceans, 2 species of pinniped are phocid (Pacific harbor seal and norther elephant seal), and 1 species of pinniped is otariid (California sea lion). A species' functional hearing group is a consideration when we analyze the effects of exposure to sound on marine mammals.

We expect that an intense impulse from the proposed Pier E3 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).

Impacts from Underwater Detonations in Free Field Environment at Close Range

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).

Confined Detonation and Associated Level B Harassment

However, the above discussion concerning underwater explosion only pertains to open water detonation in a free field. CALTRANS' Pier E3 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). Therefore, with monitoring and mitigation measures discussed above, CALTRANS Pier E3 controlled implosion is not likely to have the injury or mortality effects on marine mammals in the project vicinity. Instead, NMFS considers that CALTRANS' proposed Pier E3 controlled implosion in the San Francisco Bay is 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 one short of sequential detonations that last for approximately 5 seconds.

Numerous behavioral changes can occur as a result of stress response. For each potential behavioral change, the magnitude in the change and the severity of the response needs to be estimated. Certain conditions, such as stampeding (i.e., flight response) or a response to a predator, might have a probability of resulting in injury. For example, a flight response, if significant enough, could produce a stranding event. Each disruption to a natural behavioral pattern (e.g., breeding or nursing) may need to be classified as Level B harassment. All behavioral disruptions have the potential to contribute to the

allostatic load. This secondary potential is signified by the feedback from the collective behaviors to allostatic loading.

Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Kastak *et al.* 1999; Schlundt *et al.* 2000; Finneran *et al.* 2002; 2005). TS can be permanent (PTS), in which case the loss of hearing sensitivity is unrecoverable, or temporary (TTS), in which case the animal's hearing threshold will recover over time (Southall *et al.* 2007). Since marine mammals depend on acoustic cues for vital biological functions, such as orientation, communication, finding prey, and avoiding predators, marine mammals that suffer from PTS or TTS will have reduced fitness in survival and reproduction, either permanently or temporarily. Repeated noise exposure that leads to TTS could cause PTS.

Experiments on a bottlenose dolphin and beluga whale (*Delphinapterus leucas*) showed that exposure to a single watergun impulse at a received level of 207 kPa (or 30 psi) peak-to-peak (p-p), which is equivalent to 228 dB re 1 μPa (p-p), resulted in a 7 and 6 dB TTS in the beluga whale at 0.4 and 30 kHz, respectively. Thresholds returned to within 2 dB of the pre-exposure level within 4 minutes of the exposure (Finneran *et al.* 2002). No TTS was observed in the bottlenose dolphin. Although the source level of pile driving from one hammer strike is expected to be much lower than the single watergun impulse cited here, animals being exposed for a prolonged period to repeated hammer strikes could receive more noise exposure in terms of SEL than from the single watergun impulse in the aforementioned experiment (Finneran *et al.* 2002).

Potential Effects on Marine Mammal Habitat

The proposed Pier E3 demolition using controlled implosion will not result in any permanent impact on habitats used by marine mammals, and potentially short-term to minimum impact to the food sources such as forage fish. There are no known haul-out sites, foraging hotspots, or other ocean bottom structures of significant biological importance to harbor seals, northern elephant seals, California sea lions, or harbor porpoises within San Francisco Bay. Therefore, the main impact associated with the activity will be the removal of an existing bridge structure.

Fish that are located in the water column, in close proximity to the source of the controlled implosion could be injured, killed, or disturbed by the impulsive sound and could leave the area temporarily. Continental Shelf Associates, Inc. (2002) summarized a few studies conducted to determine effects associated with removal of offshore structures (e.g., oil rigs) in the Gulf of Mexico. Their findings revealed that at very close range, underwater explosions are lethal to most fish species regardless of size, shape, or internal anatomy. In most situations, cause of death in fish has been massive organ and tissue damage and internal bleeding. At longer range, species with gas-filled swimbladders (e.g., snapper, cod, and striped bass) are more susceptible than those without swimbladders (e.g., flounders, eels).

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' one time controlled implosion 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.

For CALTRANS's proposed Pier E3 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 Pier E3 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 Pier E3 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 2). 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. Estimates are that the isopleth for PTS would extend out to a radius of 1,160 ft (354 m) for harbor and northern elephant seals to 5,800 ft (1,768 m) for harbor porpoise; covering the entire areas for both Level A harassment and mortality. As harbor porpoises are unlikely to be in the area in November, the exclusion zone boundaries would be set around the calculated distance to Level A harassment for harbor and northern elephant seals. However, real-time acoustic monitoring (i.e., active listening for vocalizations with hydrophones) also will be utilized to provide an additional level of confidence that harbor porpoises are not in the affected area.

Table 2. NMFS acoustic criteria for marine mammals in the SFOBB Pier E3 demolition area from underwater implosions

Group	Species	Level B harassment		Level A harassment	Serious injury		Mortality
		Behavioral	TTS	PTS	Gastro-intestinal tract	Lung	
High-freq cetacean	Harbor porpoise	141 dB SEL	146 dB SEL or 195	161 dB SEL or 201 dB SPL_{pk}	237 dB SPL or	$39.1M^{1/3}$ $(1+[D/10.081])^{1/2}$	$91.4M^{1/3}$ $(1+[D/10.081])^{1/2}$

			dB SPL_{pk}		104 psi	Pa-sec where: M = mass of the animals in kg D = depth of animal in m	Pa-sec where: M = mass of the animals in kg D = depth of animal in m
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	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.

Adherence to calculated distances to Level A harassment for pinnipeds indicates that the radius of the exclusion zone would be 1,160 ft (354 m). The exclusion zone will be monitored by protected species observers (PSOs) and if any marine mammals are observed inside the exclusion, the implosion will be delayed until the animal leaves the area or at least 30 minutes have passed since the last observation of the marine mammal. Hearing group specific exclusion zone ranges are provided in Table 3.

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

As shown in Table 1, 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 5,700 ft (1,737 m) from Pier E3. For harbor porpoises, this will cover the area out to 195 dB peak SPL or 146 dB SEL, whichever extends out the furthest. Hydroacoustic modeling indicates this isopleth would extend out to 26,500 ft (8,077 m) from Pier E3. As discussed previously, the presence of harbor porpoises in this area is unlikely but monitoring (including real-time acoustic 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 470 ft (143 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 3.

Establishment of Level B Behavioral Zone of Influence:

Table 3. Estimated distances to NMFS marine mammal explosion criteria for Level B harassment, Level A harassment, and mortality from the proposed Pier E3 implosion. A BAS with 80% efficiency in acoustic attenuation is assessed for the implosion. For thresholds with dual criteria, the larger distances (i.e., more conservative) are presented in bold and are used for take estimates.

Species	Level B Criteria		Level A Criteria			Mortality
	Behavioral Response	TTS Dual Criteria	PTS Dual Criteria	GI Track	Lung Injury	
Pacific Harbor Seal	9,700 ft (2,957 m)	**5,700 ft (1,737 m)** 440 ft (134 m)	**1,160 ft (354 m)** 70 ft (21 m)	35 ft (11 m)	450 ft (137 m)	205 ft (63 m)
California Sea Lion	800 ft (244 m)	470 ft (143 m) 440 ft (134 m)	**245 ft (75 m)** 97 ft (30 m)	35 ft (11 m)	450 ft (137 m)	205 ft (63 m)
Northern Elephant Seal	9,700 ft (2,957 m)	**5,700 ft (1,737 m)** 440 ft (134 m)	**1,160 ft (354 m)** 70 ft (21 m)	35 ft (11 m)	450 ft (137 m)	205 ft (63 m)
Harbor Porpoise	44,500 ft (13,564 m)	**26,500 ft (8,077 m)** 2,600 ft (792 m)	**5,800 ft (1,768 m)** 1,400 ft (427 m)	35 ft (11 m)	450 ft (137 m)	205 ft (63 m)

As shown in Table 1, for harbor seals and northern elephant seals, this will cover the area out to 172 dB SEL. Hydroacoustic modeling indicates this isopleth would extend out to 9,700 ft (2,957 m) from Pier E3. For harbor porpoises, this will cover the area out to 141 dB SEL. Hydroacoustic modeling indicates this isopleth would extend out to 44,500 ft (13,564 m) from Pier E3. As discussed previously, the presence of harbor porpoises in this area is unlikely but monitoring (including real-time acoustic 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 800 ft (244 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 3.

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 and the real time acoustic monitor. 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 submitted a marine mammal monitoring plan 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

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. In addition, CALTRANS shall implement passive acoustic monitoring. All monitoring would be conducted by NMFS-approved PSOs.

(1) Protected Species Observers:

A minimum of 8-10 PSOs would be required during the Pier E3 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 Blasting Supervisor of a cleared exclusion zone to the implosion.

(2) Monitoring Protocol:

PSOs shall be positioned near the edge of each of the thredhold criteria zones and shall utilize boats, barges, bridge piers and roadway, and sites on Yerba Buena Island and Treasure Island, as described in Figure 3 of the CALTRANS Marine Mammal Monitoring Plan. The Lead PSO shall be located with the Department Engineer and the Blasting Supervisor (or person that will be in charge of detonating the charges) during the implosion.

The Lead PSO will be in contact with other PSOs and the acoustic monitors. As the time for the implosion approaches, any marine mammal sightings would be discussed between the Lead PSO, the Resident Engineer, and the Blasting Supervisor. If any marine mammals enter the exclusion zone within 30 minutes of blasting, the Lead PSO will notify the Resident Engineer and Blasting Supervisor that the implosion may need to be delayed. The Lead PSO will keep them informed of 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 30 minutes. Once the implosion has occurred, the PSOs will continue to monitor the area for at least 60 minutes.

(3) Post-implosion Survey:

Although any injury or mortality from the implosion of Pier E3 is very unlikely, boat or shore surveys will be conducted for the three days following the event to determine if there are any injured or stranded marine mammals 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 conduct a necropsy to attempt to determine if it stranded was a result of the Pier E3 implosion.

(4) Monitoring Data Collection:

Each PSO will record their observation position, start and end times of observations, and weather conditions (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 (scars, red pelage, damaged dorsal fin, etc.)
- Position relative to Pier E3 (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

(5) Real Time Acoustic Monitoring for Harbor Porpoises:

While harbor porpoises are not expected to be within the CALTRANS' Pier E3 implosion Level B TTS ZOI (within 26,500 ft [8,077 ms]) in November, real time acoustic monitoring to confirm species absence is proposed as an avoidance measure in addition to active monitoring by trained visual PSOs. Harbor porpoises vocalize frequently with other animals within their group, and use echolocation to navigate and to locate prey. Therefore, as an additional monitoring tool, a real time acoustic monitoring system will be used to detect the presence or absence of harbor porpoises as a supplement to visual monitoring.

The system would involve two bio-acousticians monitoring the site in real time, likely near the north end of Treasure Island as most harbor porpoises appear to pass through the area north of Treasure Island before heading south toward the East Span of the SFOBB. A calibrated hydrophone or towed array would be suspended from a boat and/or several sonobuoys (acoustic information is sent via telemetry to the acoustic boat)

or a hydrophone moored offshore with a cable leading to a shore based acoustic station will be deployed outside of the monitoring area of Pier E3. All equipment will be calibrated and tested prior to the implosion to ensure functionality. This system would not be able to give an accurate distance to the animal but would either determine that no cetaceans are in the area or would provide a relative distance and direction so that PSOs could search for the cetaceans and determine if those animals have entered or may enter the Pier E3 implosion area. The bio-acousticians would be in communication with the Lead PSO and would alert the crew to the presence of any cetacean approaching the monitoring area. It would also provide further confirmation that there are no cetaceans around Pier E3 in addition to the visual observations documenting no observations.

(6) Hydroacoustic Monitoring for Underwater Implosion

The purpose of hydroacoustic monitoring during the controlled implosion of Pier E3 is twofold: 1) to evaluate distances to marine mammal impact noise criteria; and 2) to improve the prediction of underwater noise for assessing the impact of the demolition of the remaining piers through future controlled implosions.

Monitoring of the implosion is specific to two regions around Pier E3 with unique methods, approaches, and plans for each of these regions. These regions include the "near field" and the "far field". For Pier E3, the near field will comprise measurements taken within 500 ft of the pier while the far field will comprise measurements taken at 500 feet and all greater distances.

Measurements inside the BAS will be made with near and far field systems using PCB 138A01 transducers. At the 100-ft distance, the near field system will use another PCB 138A01 transducer while the far field system will use both a PCB 138A01

transducer and a Reson TC4013 hydrophone. Prior to activating the BAS, ambient noise levels will be measured. While the BAS is operating and before the test implosion, background noise measurements will also be made. After the test implosion, the results will be evaluated to determine if any final adjustments are needed in the measurement systems prior to the Pier E3 controlled implosion. Pressure signals will be analyzed for peak pressure and SEL values prior to the scheduled time of the Pire E3 controlled implosion.

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

In addition, a stranding plan will be prepared in cooperation with the local NMFS-designated marine mammal stranding, rescue, and rehabilitation center. Although mitigation measures would likely prevent any injuries, preparations will be made in the unlikely event that marine mammals are injured. Elements of that plan would include the following:

1. The stranding crew would prepare treatment areas at the NMFS-designated facility for cetaceans or pinnipeds that may be injured from the implosion. Preparation would 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 (Thorson *et al.* 1999).

2. A stranding crew and a veterinarian would be on call near the Pier E3 site 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) will be notified immediately even if the animal appears to be sick or injured from other than blasting.

3. Post-implosion surveys would 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.

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 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 will be communicated to both CALTRANS and to NMFS as soon as possible with 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].

Numbers of marine mammals within the Bay may be incidentally taken during demolition using controlled charges (impulse sound) related to the demolition of the original East Span of the SFOBB were calculated based on acoustic propagation models for each functional hearing group and the estimated density of each species in the project vicinity. Specifically, the takes estimates are calculated by multiplying the ensonified areas that are specific to each functional hearing group by the density of the marine mammal species.

Marine Mammal Density Estimates

There are no systematic line transect surveys of marine mammals within San Francisco Bay, therefore, the in water densities of harbor seals, California sea lions, and harbor porpoises were calculated from 14 years of observations during monitoring for the SFOBB construction and demolition. During the 210 days of monitoring (including 15 days of baseline monitoring in 2003), 657 harbor seals, 69 California sea lions and three harbor porpoises were observed within the waters of the east span of the SFOBB. Density estimates for other species were made from stranding data provided by the MMC (Sausalito, CA; Northern elephant seal).

(1) Pacific Harbor Seal

Most data on harbor seal populations are collected while the seals are hauled out. This is because it is much easier to count individuals when they are out of the water. In-water density estimates rely on haul-out counts, the percentage of seals not on shore based on radio telemetry studies, and the size of the foraging range of the population. Harbor seal density in the water can vary greatly depending on weather conditions or the availability of prey. For example, during Pacific herring runs further north in the Bay (near Richardson Bay, outside of the Pier E3 hydroacoustic zone) in February 2014, very few harbor seals were observed foraging near Yerba Buena Island (YBI) or transiting through the SFOBB area for approximately two weeks. Sightings went from a high of 16 harbor seal individuals foraging or in transit in one day to 0-2 seals per day in transit or foraging through the SFOBB area (CALTRANS 2014). Calculated harbor seal density is a per day estimate of harbor seals in a 1 km^2 area within the fall/winter or spring/summer seasons.

Harbor seal density for the proposed project was calculated from all observations during SFOBB Project monitoring from 2000 to 2014. These observations included data from baseline, pre, during and post pile driving and onshore implosion activities. During this time, the population of harbor seals within the Bay has remained stable (Manugian 2013), therefore, we do not anticipate significant differences in numbers or behaviors of seals hauling out, foraging or in their movements over that 15 year period. All harbor seal observations within a km2 area were used in the estimate. Distances were recorded using a laser range finder (Bushnell Yardage Pro Elite 1500; ± 1.0 yards 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 due to the haul-out site and nearby foraging areas in the Coast Guard and Clipper coves. Therefore, density estimates were calculated for a higher density area within 3,936 ft (1,200 m) west of Pier E3, which includes these two foraging coves. A lower density estimate was calculated from the area east of Pier E3 and beyond 3,936 ft (1,200 m) to the north and south of Pier E3.

These density estimates were then extrapolated to the threshold criteria areas delineated by the hydroacoustic models to calculate the number of harbor seals likely to be exposed.

(2) California Sea Lion

Most data on California sea lion populations are collected while the seals are hauled out as it is much easier to count individuals when they are out of the water. In-water density estimates rely on haul-out counts, the percentage of sea lions not on shore based on radio telemetry studies, and the size of the foraging range of the population. Sea lion density, like harbor seal densities, in the water can vary greatly depending on weather conditions, the availability of prey, and the season. For example, sea lion density increases during the summer and fall after the end of the breeding season at the Southern California rookeries.

For the proposed project, California sea lion density was calculated from all observations during SFOBB monitoring from 2000 to 2014. These observations included data from baseline, pre, during and post pile driving and onshore implosion activities.

During this time, the population of sea lions within the Bay has remained stable as have the numbers observed near the SFOBB (Manugian 2013). As a result, we do not anticipate significant differences in the number of sea lion or their movements over that 15 year period. All sea lion observations within a km^2 area were used in the estimate. Distances were recorded using a laser range finder (Bushnell Yardage Pro Elite 1500; ± 1.0 yards accuracy). Care was taken to eliminate multiple observations of the same animal, although most sea lion observations involve a single animal. Calculated California sea lion density is a per day estimate of sea lions in a one km^2 area within the fall/winter or spring/summer seasons.

(3) Northern Elephant Seal

Northern elephant seal density around Pier E3 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 within the Bay during this time, most of these hauled out and were likely sick or starving. The actual number of individuals within the Bay may be higher as 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 strand after weaning in the spring and when they return to California in the fall (September through November).

(4) Harbor Porpoise

Harbor porpoise density was calculated from all observations during SFOBB monitoring from 2000 to 2014. 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 fifteen years of observational data around the SFOBB Project, only four harbor porpoises were observed and all occurred from 2006 to 2014 (including two in 2014). All harbor porpoise observations within a km^2 area were used in the estimate. Distances were recorded using a laser range finder (Bushnell Yardage Pro Elite 1500; ± 1.0 yards accuracy).

A summary of marine mammal density information is provided in Table 4.

Table 4. Estimated in-water density of marine mammals that may occur in the vicinity of CALTRANS' proposed Pier E3 controlled implosion area.

Species	Main Season Of Occurrence	Density Within 1,200m of SFOBB (animals/km^2)	Density Beyond 1,200m of SFOBB (animals/km^2)
Pacific Harbor Seal	Spring – Summer (pupping/molt seasons)	0.30	0.15
Pacific Harbor Seal	Fall- Winter	0.77	0.15
Sea Lion	Late Summer – Fall (Post Breeding Season)	0.12	0.12
Sea Lion	Late Spring-Early Summer (Breeding Season)	0.06	0.06
Northern Elephant seal	Late Spring-Early Winter (Pups After First Trip To Sea)	0.03	0.03
Harbor Porpoise	All Year	Very Low estimated at 0.004	Very Low estimated at 0.004

Impact Zones Modeling

Since the proposed Pier E3 controlled implosion would be carried as a confined explosion, certain elements were taken into the modeling process beyond a simple open-water blast model. Confinement is a concept in blasting that predicts the amount of blast

energy that is expected to be absorbed by the surrounding structural material, resulting in the fracturing necessary for demolition. The energy beyond that absorbed by the material is the energy that produces the pressure wave propagating away from the source. NMFS has determined that modeling with confinement was appropriate for the proposed Pier E3 blast by evaluating blast results from case study data for underwater implosions similar to the proposed SFOBB Pier E3 implosion. In addition, the NMFS worked with CALTRANS and compared case study results to published blast models that incorporate a degree of confinement.

Data from 39 comparable underwater concrete blasts were used by CALTRANS to evaluate potential equations for modeling blast-induced peak pressures and subsequent effects to marine mammals (Kiewit-Mason, pers. Comm 2015 in CALTRANS 2015). All 39 blasts occurred in approximately 55 ft (16.8 m) of water, similar to the maximum water depth around Pier E3. In addition, all blasts had burdens (i.e., distance from the charge to the outside side of the material being fractured) of approximately 1.5 to 2 ft (0.5 to 0.6 m). Burdens for Pier E3 also are estimated to be in this range. Data provided included the charge weight, observed peak pressure, distance of peak pressure observation, and the modeled peak pressure using Cole's confined equation, Cole's unconfined equation, and Oriard's conservative concrete equation (Cole 1948; Oriard 2002).

Using these data, appropriate equations for modeling the associated hydroacoustic impacts are established for the Pier E3 controlled implosion. Cole's unconfined equation greatly overestimated peak pressures for all blasts while Cole's confined equation appeared to most accurately predict observed peak pressures. Oriard's conservative

concrete equation overestimated peak pressures, but not as dramatically as under Cole's unconfined equation. NMFS and CALTRANS have opted to use more conservative methods to ensure an additional level of safety when predicting the monitoring zone and potential impact areas to marine mammals from the proposed controlled implosion project.

The applicable metrics discussed are the peak pressure (P_{pk}) expressed in dB, the accumulated sound exposure level (SEL) also expressed in dB, and the positive acoustic impulse (I) in Pa-sec. The criteria for marine mammals are grouped into behavioral response, slight injury, mortality, and the specific acoustic thresholds depend on group and species. These are summarized in Table 1. The metrics for these are criteria defined as:

(1) Peak pressure level

$$L_{pk} = 20 \log_{10}\left(P_{pk} / P_{ref}\right) \quad (1)$$

where L_{pk} is the peak level in dB and P_{ref} is the reference pressure of 1μPa;

(2) SEL

$$SEL = 20 \log_{10}\left(\int_0^T \frac{P^2(t)dt}{P_{ref}^2 \cdot T_{ref}}\right) \quad (2)$$

where T is the duration of the event, $P^2(t)$ is the instantaneous pressure squared and T_{ref} is the reference time of 1 second;

(3) Impulse:

$$I = \int_0^T \left(P(t)dt / P_{ref}\right) \quad (3)$$

where T is the duration of the initial positive portion of $P(t)$. In order to calculate these quantities, $P(t)$ for the blast event is needed as a function of distance from the blast, or alternatively, empirical relationship can be used for L_{pk} and I.

General Assumptions

The blast event will consist of a total of 588 individual delays of varying charge weight; the largest is 35 pounds/delay and the smallest is 21 pounds/delay. The blasting sequence is rather complex. On the full height walls, 30 pound weights will be used for the portion below mud line, 35 pound weights will be used in the lower structure immediately above mud line, 29.6 pounds in the midstructure, and 21 pounds in the upper structure. Full details on the delay weights and locations can be found in the Blast Plan (CALTRANS 2015). Blasts will start in several interior webs of the southern portion of the structure followed by the outer walls of the south side. The blasts in the inner walls will occur just prior to the adjacent outer walls. The interior first, exterior second blast sequence will continue across the structure moving from south to north. The time for the 588 detonations is 5.3 seconds with a minimum delay time of 9 milliseconds (ms) between detonations. As the blasting progresses, locations to east, north, and west of the pier will be shielded from the blasting on the interior of the structure from the still-standing exterior walls of the pier. However, towards the conclusion of the blast, each direction will experience blasts from the outer walls that are not shielded.

To estimate P_{pk} and $P^2(t)$, several assumptions were made. For simplification, it was assumed that there is only one blast distance and it is to the closest point on the pier from the receiver point. In actuality for almost all explosions, distances from the blast will be greater as the pier is approximately 135 ft (41 m) across and 80 ft (24 m) wide.

Based on these dimensions, the actual blast point could be up to 135 ft (41 m) further from the receptor point used for the calculation. As a result, the calculated peak level is the maximum expected for one 35 pound blast while the other levels would be lower depending on the distance from the actual blast location to the calculation point and weight of the charge. In other words, the pressure received at the calculation point would not be 588 signals of the same amplitude, but would be from one at the estimated level for a 35 pound charge and 587 of varying lower amplitudes. Similarly, in the vertical direction, the location varies over a height of about 50 ft (15 m) and those blasts that are not at the same depth as the receiver would also be lower. This effect of variation in assumed blast to receiver distance will be most pronounced close to the pier, while at distances of about 1,000 ft (305 m) or greater, the effect would be less than 1 dB.

In the calculations, it was also assumed that there would be no self-shielding of the pier as the explosions progress. From the above discussion of the blast sequence, some shielding of the blasts along the interior of the pier will occur. However, the blasts that occur in outer wall (towards the end of the implosion) will not be shielded for all blasts. A blast in the outer wall that has a direct line of sight to the receptor calculation point will not be shielded and will generate the highest peak pressure relative to be compared to the L_{pk} criterion. The cumulative SEL and the root-mean-squared (RMS) levels; however, will be reduced to some degree by the outer walls until they are demolished as these metrics are defined by the pressure received throughout the entire 5.3 second event. However, due to the complexity of the blast sequence, this shielding effect was not considered in the calculated SEL and RMS levels.

Based on the Blast Plan (CALTRANS 2015), the delays are to be placed in 2¾ to 3 inch (7 to 7.6 cm) diameter holes drilled into the concrete pier structure. The outer walls of the pier are nominally 3 ft-11½ inch (1.5 m) thick and inner walls are nominally 3 ft (0.9 m) thick. Individual blasts should be not exposed to open water and some confinement of the blasts is expected. For confined blasts, the predicted pressures can be reduced by 65 to 95% (Nedwell and Thandavamoorthy 1992; Rickman 2000; Oriard 2002; Rivey 2011), corresponding to multiplication factors from 0.35 to 0.05, respectively. Based on a review of the available literature and recent data from similar explosive projects, CALTRANS and NMFS decided to use a conservative confinement factor of K=7500 which equates to a 65% reduction in pressure and by a multiplication factor of 0.3472 (Eq. 4).

Another assumption was to consider only the direct wave from an individual blast. In shallow water, the signal at the receiver point could consist of the direct wave, surface-relief wave generated by the water/air interface, a reflected wave from the bottom, and a wave transmitted through the bottom material (USACE 1991). For estimating P_{pk}, only the direct wave is considered as it will have the highest magnitude and will arrive at the receiver location before any other wave component. However, $P(t)$ after the arrival of the direct wave peak pressure will be effected. The surface-relief wave is negative so that when it arrives at the receiver location, it will reduce the positive pressure of the direct wave and can make the total pressure negative at times after the arrival of the initial positive peak pressure. Since the SEL is a pressure squared quantity, any negative pressure can also contribute to the SEL. However, the amplitude and arrival time of the surface-relief wave depends on the geometry of the propagation case, that is, depth of

water, depth of blast, and distance and depth of the receiver point. The effect of this assumption is discussed further in the section on SEL.

Estimation of Peak Pressure

Peak pressures were estimated by following the modified version of the Cole Equation for prediction of blasts in open, deep water (Cole 1948). The peak pressure is determined by:

$$P_{pk} = K(\lambda)^{-1.13} \quad (4)$$

where P_{pk} is peak pressure in pounds per square inch (psi), and λ is the scaled range given by $R/W^{1/3}$ in which R is the distance in feet and W is the weight of the explosive charge in pounds. A modified version of the Cole Equation has been documented in U.S. Army Corps of Engineer (USACE) Technical Letter No. 1110-8-11(FR) and is applicable to shallow water cases such as that of the Pier E3 demolition (USACE 1991). The constant K factor multiplier in the USACE calculation is 21,600 for an open-water blast instead of the 22,550 from the original Cole Expression. This factor is slightly less (~4%) than the original Cole. The decay factor (-1.13) used in the USACE modified equation remains the same as the original Cole Equation. To account for the confining effect of the concrete pier structure, a conservative K factor of 7,500 was used corresponding to multiplying USACE P_{pk} by a factor of 0.3472. With a minimum delay between of blast of 9 ms, the individual delays will be spaced sufficiently far in time to avoid addition of the peak pressures. In this case, the peak pressure is defined by that calculated for the largest charge weight of 35 pounds/delay. A BAS is specified in the Blast Plan. Based on the literature and recent results from similar projects, reductions in the pressure peak of 85% to 90% or more are expected. For determining P_{pk} in this analysis, a conservative

reduction of 80% has been used. Based on values of confinement, BAS performance, and the "General Assumptions" above, the calculated peak pressures are expected to be conservative.

Estimation of SEL Values

Estimating the weighted SEL values for the different groups/species is a multiple step process. The first step is to estimate SEL values as a function of distance from the blast pressure versus time histories for each of the six charge weights as a function of distance. The open-water equation used for this calculation was that modified by the USACE (1991) based on methods pioneered by Cole (1948). Pressure as a function of time is given by:

$$P(t) = P_{pk} e^{-\left(\frac{t-t_a}{\theta}\right)} \tag{5}$$

where t_a is given as R/5,000 and θ is:

$$\theta = 6.0 \times 10^{-5} W^{1/3} (\lambda)^{0.18} \tag{6}$$

These calculations were then extended to distances out to 160,000 ft (48.8 km).

As discussed previously, there are other wave components that could be considered in the SEL estimation, including the surface relief wave, reflection from the bottom, and transmission through and re-radiation from the bottom. Little or no contribution is expected from the bottom based on its sedimentary nature and previous experiences from measuring noise from underwater pile driving in the area around Pier E3. The negative surface relief wave could be a factor in the SEL estimation. This wave could either increase or decrease the SEL depending on its arrival time relative to the direct wave. For small differences in arrival time, the surface relief will decrease the total SEL as a portion of the positive direct wave is negated by the addition of the

negative surface relief wave. For closer distances and when the receptor and blast locations are near the bottom, the total SEL can become greater than the direct wave SEL, but only by less than 3 dB. However, whenever the source or receiver is near the surface, the direct wave SEL will be greater than the total SEL and can approach being 10 dB greater for distances beyond 1,000 ft (305 m). As a result, the surface relief wave is ignored in this analysis knowing that the surface relief wave would only tend to produce lower SEL values than the direct wave.

For each of the marine mammal groupings included in Table 2, specific filter shapes apply to each functional hearing group. To apply this weighting, the Fast Fourier Transform (FFT) was calculated for the time histories at each analysis distance. Each FFT was then filtered using the frequency weighted specified for each group. Filter factors were then determined for each distance by subtracting the filtered result from the unfiltered FFT data and determining the overall noise reduction in decibels. These filter factors were applied to the accumulated SEL determined for the entire blast event for each distance from the Pier.

The BAS of the Blast Plan will have an effect on the wave once a blast passes through it. In a research report by USACE in 1964, the performance of a BAS was examined in detail (USACE 1964). It has also been found that for an energy metric such as SEL, the reduction produced by the BAS was equal to or greater than the reduction of the peak pressure (USACE 1991; Rude 2002; Rude and Lee 2007; Rivey 2011). To estimate the reduction for SEL values due to the BAS proposed in the Blast Plan (CALTRANS 2015), SEL was reduced by 80%. Effectively, this was done by reducing the SEL by 20 Log (0.20), or 14 dB. Delays below the mudline, which will be located

below the BAS, were also reduced by 80% based on an assumption that the outside pier walls here (which will not be removed) and Bay mud sediments will provide a similar level of attenuation. These SEL values and those without the BAS were then compared to the appropriate criteria for each marine mammal group. Because the calculation of SEL is based on the peak pressure, these estimates for the direct wave component are expected to be conservative for the same reasons as described for the peak pressures.

Estimation of Positive Impulse

To estimate positive impulse values, the expression originally developed by Cole for open water was used (Cole 1948). This expression includes only contributions from the direct wave neglecting any contribution from the surface relief, bottom reflected, and bottom transmitted consistent with the assumptions used to estimate SEL. In this case, impulse is given by:

$$I = 2.18 \times W^{1/3} \times \left(\frac{W^{1/3}}{R} \right)^{1.05} \qquad (7)$$

with the variables defined in Equation 4. The impulse can also equivalently be calculated from wave forms. Equation 5 produces impulse values in psi-msec which were converted to Pa-sec by multiplying by 6.9 for comparison to the marine mammal criteria.

Unlike P_{pk} and SEL, no reduction by the BAS is assumed for the impulse calculation. The area under the $P(t)$ curve under goes little change after passing the BAS. The peak pressure is reduced as noted previously, however, since the $P(t)$ expands in duration, the area change is minimal. This behavior is well documented in the literature (Cole 1948; USACE 1964; USACE 1991; Rickman 2000). As discussed above, this is not the case for SEL which is determined by the area under the $P^2(t)$ curve.

Estimated Takes of Marine Mammals

The estimated distances (Table 5) to the marine mammal criteria for peak pressure, SEL, and impulse are based on established relationships between charge weight and distance from the literature. The estimated distances were determined assuming unconfined open water blasts from the original Cole equations or the Cole equations modified by USACE. The assumption of open water neglects several effects that could produce lower levels than estimated. These include no shielding by the pier structure prior a specific blast, confining of the individual delays in the holes drilled into the pier structure, and longer distances to individual blasts than assumed by closest distance between the pier and the receptor point. For SEL, the assumption of open water blasts neglects the surface relief wave which at longer distances from the pier, would tend to reduce the SEL due to interference with the direct wave. Although the estimated levels and distances may be conservative, there is sufficient uncertainty in the blast event and its propagation such that further, less conservative adjustments would not be appropriate.

Estimated exposure numbers are subsequently calculated based on modeled ensonified areas and marine mammal density information. However, since many marine mammals are expected to occur in groups, the estimated exposure numbers are adjusted upward by a factor of 2 to provide estimated take numbers. In addition, although modeling shows that no California sea lion would be exposure to noise levels that would result a take, its presence in the vicinity of SFOBB has been documented. Therefore, a take of 2 of California sea lion is assessed. A summary of estimated takes and exposures of marine mammals that could result from CALTRANS' Pier E3 controlled implosion is provided in Table 5.

Table 5. Summary of the estimated takes and exposures (in parenthesis) of marine mammals to the Pire E3 implosion.

Species	Level B take		Level A take	Mortality	Population	% take population
	Behavioral	TTS				
Pacific harbor seal	12 (6)	6 (3)	0 (0)	0 (0)	30.196	0.06%
California sea lion	2 (0)	0 (0)	0 (0)	0 (0)	296,750	0.00%
Northern elephant seal	2 (1)	0 (0)	0 (0)	0 (0)	124,000	0.00%
Harbor porpoise	2 (1)	0 (0)	0 (0)	0 (0)	9,886	0.02%

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 5, given that the anticipated effects of CALTRANS' Pier E3 controlled implosion 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, else species-specific factors would be identified and analyzed.

No injuries or mortalities are anticipated to occur as a result of CALTRANS' controlled implosion to demolish Pier E3, 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 an marine mammal is sighted within the exclusion.

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, and harbor porpoise) 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 form the implosion noise. A few Pacific harbor seals 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 just 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 and other biologically important areas in the vicinity of CALTRANS' proposed Pier E3 controlled implosion area (John 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. The project activities would not 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 Pier E3 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 0.06% of all populations or stocks potentially impacted (see Table 5 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) and a Supplemental Environmental Assessment (SEA) for the take of marine mammals incidental to construction of the East Span of the SF-OBB and made Findings of No Significant Impact (FONSIs) on November 4, 2003 and August 5, 2009. Due to the modification of part of the demolition of the original SFOBB using controlled implosion and the associated mitigation and monitoring measures, NMFS prepared a draft SEA and analyzed the potential impacts to marine mammals that would result from the modification. NMFS has released the draft SEA for public comment along with this proposed IHA.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to CALTRANS for conducting Pier E3 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 October 1 through December 30, 2015.

2. This Authorization is valid only for activities associated the original San Francisco-Oakland Bay Bridge Pier E3 demolition via controlled implosion and a pre-demolition test implosion in San Francisco Bay.

3. (a) The species authorized for incidental harassment takings, Level B harassment only, are: Pacific harbor seal (*Phoca vitulina richardsi*), California sea lion (*Zalophus californianus*), northern elephant seals (*Mirounga angustirostris*), and harbor porpoise (*Phocoena phocoena*).

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

- Pre-demolition test implosion;
- Pier E3 demolition via controlled implosion.

(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 5. 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

Implosion of Pier E3 shall 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.

(b) Installation of Blast Attenuation System (BAS)

Prior to the Pier E3 demolition, CALTRANS should install a Blast Attenuation System (BAS) to reduce the shockwave from the implosion.

(c) Establishment of Exclusion Zones and Zones of Influence

Before CALTRANS begins Pier E3 demolition via controlled implosion and the pre-demolition test implosion, exclusion zones and zones of influence (ZOIs) that are appropriate to specific marine mammal functional hearing group shall be established. The modeled isopleth of these zones are provided in Table 3.

(d) Exclusion Zone Monitoring for Mitigation Measures.

(i) The exclusion zone shall be monitored by protected species observers (PSOs) for at least 30 minutes before the implosion.

(ii) If any marine mammals are observed inside the exclusion, the implosion will be delayed until the animal leaves the area or at least 30 minutes have passed since the last observation of the marine mammal.

(e) Communication

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 Pier E3 demolition via controlled implosion.

(ii) A minimum of 8-10 PSOs shall be required during the Pier E3 controlled implosion so that the exclusion zone, Level B Harassment TTS and Behavioral ZOIs, and surrounding area can be monitored.

(b) Monitoring Protocol:

(i) PSOs shall be positioned near the edge of each of the thredhold criteria zones and shall utilize boats, barges, bridge piers and roadway, and sites on Yerba Buena Island and Treasure Island, as described in Figure 3 of the CALTRANS Marine Mammal Monitoring Plan.

(ii) The Lead PSO shall be located with the Department Engineer and the Blasting Supervisor (or person that will be in charge of detonating the charges) during the implosion.

(iii) The Lead PSO will be in contact with other PSOs and the acoustic monitors. As the time for the implosion approaches, any marine mammal sightings would be discussed between the Lead PSO, the Resident Engineer, and the Blasting Supervisor.

(iv) If any marine mammals enter the exclusion zone within 30 minutes of blasting, the Lead PSO shall notify the Resident Engineer and Blasting Supervisor that the implosion may need to be delayed. The Lead PSO shall keep them informed of the disposition of the animal.

(v) Once the implosion has occurred, the PSOs will continue to monitor the area for at least 60 minutes.

(c) Post-implosion Survey:

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

(ii) If an injured or dead animal is discovered during these surveys or by other means, the NMFS-designated stranding team shall be contacted to pick up the animal. Veterinarians will treat the animal or conduct a necropsy to attempt to determine if it stranded was a result of the Pier E3 implosion.

(d) Monitoring Data Collection:

(i) Each PSO shall record their observation position, start and end times of observations, and weather conditions (sunny/cloudy, wind speed, fog, visibility).

(ii) 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 E3 (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

(e) Real Time Acoustic Monitoring for Harbor Porpoises:

(i) Real time acoustic monitoring (PAM) system shall be used to detect the presence or absence of harbor porpoises as a supplement to visual monitoring.

(ii) Real time PAM shall involve two bio-acousticians monitoring the site near the north end of Treasure Island.

(iii) Real time PAM shall use a hydrophone or towed array suspended from a boat and/or several sonobuoys, or a hydrophone moored offshore with a cable leading to a shore based acoustic station outside of the monitoring area of Pier E3.

(iv) All equipment used for real time PAM shall be calibrated and tested prior to the implosion to ensure functionality.

(v) The bio-acousticians shall be in communication with the Lead PSO and shall alert the crew to the presence of any cetacean approaching the monitoring area. The bio-acousticians shall also provide further confirmation that there are no cetaceans around Pier E3 in addition to the visual observations documenting no observations.

(f) Hydroacoustic Monitoring for Underwater Implosion

(i) Hydroacoustic monitoring of sound field from the controlled implosion shall be conducted in near field and far field regions around Pier E3

(A) Near field measurements shall be taken within 500 ft of the Pier

(B) Far field measurements shall be taken at 500 feet and all greater distances from the Pier.

(ii) Near field and far field measurements protocols

(A) Measurements inside the BAS shall be made with near and far field systems using PCB 138A01 transducers. At the 100-ft distance, the near field system will use another PCB 138A01 transducer.

(B) Far field measurements shall be conducted using both a PCB 138A01 transducer and a Reson TC4013 hydrophone.

(iii) Ambient and background noise measurements

(A) Prior to activating the BAS, ambient noise levels shall be measured.

(B) While the BAS is operating and before the test implosion, background noise measurements shall also be made.

(C) After the test implosion, the results shall be evaluated to determine if any final adjustments are needed in the measurement systems prior to the Pier E3 controlled implosion.

(D) Pressure signals shall be analyzed for peak pressure and SEL values prior to the scheduled time of the Pier E3 controlled implosion.

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.

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 Pier E3 site 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 pre-demolition test implosion and Pier E3 controlled implosion work.

Dated: July 21, 2015.

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Perry F. Gayaldo,
Deputy Director,
Office of Protected Resources,
National Marine Fisheries Service.

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