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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XC607]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Construction Activities Associated with the Murray St. Bridge Seismic Retrofit Project in Santa Cruz, California

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

ACTION: Notice; proposed incidental harassment authorization; request for comments on proposed authorization and possible renewal.

SUMMARY: NMFS has received a request from the City of Santa Cruz for authorization to take marine mammals incidental to 2 years of construction activities associated with the Murray St. Bridge Seismic Retrofit Project in Santa Cruz, California. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue two consecutive 1-year incidental harassment authorizations (IHAs) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-time, 1-year renewal that could be issued under certain circumstances and if all requirements are met, as described in **Request for Public Comments** at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorization and agency responses will be summarized in the final notice of our decision.

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

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service and should be submitted via email to *ITP.taylor@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will generally be posted online at *www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act* without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

FOR FURTHER INFORMATION CONTACT: Jessica Taylor, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the "take" of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) direct the Secretary of Commerce (as delegated to NMFS) 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 proposed or, if the taking is limited to harassment, a notice of a proposed IHA is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as "mitigation"); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq*.) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed action (*i.e.*, the issuance of an IHA) with respect to potential impacts on the human environment.

This action is consistent with categories of activities identified in Categorical Exclusion B4 (IHAs with no anticipated serious injury or mortality) of the Companion Manual for NOAA Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has preliminarily determined that the issuance of the proposed IHA qualifies to be categorically excluded from further NEPA review.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA request.

Summary of Request

On April 19, 2022, NMFS received a request from the City of Santa Cruz (the City) for two consecutive 1-year IHAs to take marine mammals incidental to construction activities associated with the Murray St. Bridge seismic retrofit project in Santa Cruz, CA. Following NMFS' review of the application, the City submitted revised versions on August 25, 2022, October 25, 2022, and December 13, 2022, and a final revised version on January 12, 2023. The application was deemed adequate and complete on January 24, 2023. The City's request is for take of small numbers of California sea lions (*Zalophus californianus*) and harbor seals (*Phoca vitulina richardii*) by Level B harassment and take of small numbers of harbor seals by Level A harassment. Neither the City nor NMFS expect serious injury or mortality to result from this activity and, therefore, IHAs are appropriate.

Description of Proposed Activity

Overview

The City plans to conduct a seismic retrofit on the Murray St. Bridge which spans the Santa Cruz Small Craft Harbor. As part of the proposed project, the City would use vibratory pile extraction to temporarily remove docks and associated piles to accommodate construction access to the bridge. Impact pile driving would be used to install additional bridge support piles. In order to facilitate installation of bridge piles, vibratory extraction may be used to construct a temporary trestle. As an alternative to the trestle, a temporary barge may be constructed instead. The purpose of the project is to provide the bridge with additional vertical support and resistance to lateral seismic forces by installing additional pilings and structural support elements.

The City's proposed activity includes impact and vibratory pile driving and vibratory pile removal, which may result in the incidental take of marine mammals by Level A and Level B harassment. The Murray St. Bridge proposed project area includes

waters within the Santa Cruz Small Craft Harbor and adjacent lands managed by the Santa Cruz Port District. Construction activities would span the course of 2 years, with the first year beginning on July 1, 2023 and lasting through July 31, 2023. The second year of construction activities would begin on July 1, 2024 and last through September 15, 2024.

The City has requested an IHA for each of the 2 project years. However, given the City has applied for authorization for both project years concurrently and projects use similar activities, NMFS is issuing this single **Federal Register** notice to solicit public comments on the issuance of the two similar, but separate, IHAs.

Dates and Duration

The City anticipates that the bridge seismic retrofit will occur over 2 years. The in-work window during Year 1 would occur from July 1 to July 31, 2023 with approximately 14 in-water construction days consisting of vibratory pile removal of the FF dock (Table 1). The in-water work window during Year 2 would include approximately 98 in-water construction days spanning from July 1 to September 15, 2024 (Table 1), including approximately 97 days of in-water impact (37 days) and vibratory (60 days) pile installation and 1 day of in-water vibratory pile removal. All in-water construction activities would be limited to July 1 through mid-November each year due to timing restrictions to protect federally listed salmonids. An in-water work day assumes up to approximately 8 hours of pile driving or removal activities with only one pile being driven or extracted at a time.

Table 1-- Proposed In-Water Construction Activity Schedule

Activity	Pile Type	Method	Number of Piles	Piles/Day	Estimated Blow Count/Pile	Estimated Duration/Pile (min)	Total Estimated Days
Year 1							
Remove dock FF South	14" p/c concrete pile	Vibratory Extraction	30	10	n/a	48	14

Total days Year 1							14
Year 2							
Activity	Pile Type	Method	Number of Piles	Piles/Day	Estimated Blow Count/Pile	Estimated Duration/Pile	Total Estimated Days
Remove Dock FF temporary relocation	14" p/c concrete pile	Impact Install	30	4[1]	200	n/a	14
		Vibratory Extraction			n/a	240	
Relocate Dock BY	14” p/c concrete pile	Vibratory Extraction	5	5	n/a	96	1
Install new permanent bridge piles (bents 4-8) [2]	30" steel in CISS (bents 5-8) 30” steel in CIDH (bent 4)	Impact Install	18	0.67 [3]	2,500	n/a	23
		Vibratory Install			na	720	
Install temporary trestles	20" steel pipe pile [4]	Vibratory Install	72	3	n/a	160	60
Total days Year 2							98
Total project days							112

[1] Assumes two vibratory drivers
[2] Bent 4 is underwater at high tide
[3] 1.5 days to install each pile
[4] 20-inch piles represent the maximum size piles that may be used for the trestle.

Specific Geographic Region

The Murray St. Bridge retrofit project area includes waters within the Santa Cruz Small Craft Harbor (the Harbor) at the northern tip of Monterey Bay and adjacent lands managed by the Santa Cruz Port District (Figure 1). The project area includes open waters, docks, and other potential haul-out features of the Harbor from the Harbor Launch Ramp area, including the fuel dock and Vessel Assist dock, to 500 feet (152.4 meters (m)) upstream of the boundary of the Area of Impact (Figure 1). The Harbor intertidal environment is defined by shore bottom substrates, rocky shores, and substrate provided by floating docks. Bottom substrate is impacted by seasonal deposition of silt

from streams that flow into the Harbor. Project work will begin on the eastern side of Harbor and progress to the western side.

Ambient underwater noise levels in the proposed project area are likely similar to those measured in Monterey Harbor (Illingworth and Rodkin, 2012), which ranged from 110 to 120 dB. Illingworth and Rodkin (2012) found frequent acoustic events, such as boat traffic, to cause noise levels to exceed 120 dB during monitoring in Monterey Harbor, and the same is likely to occur in the proposed project area.

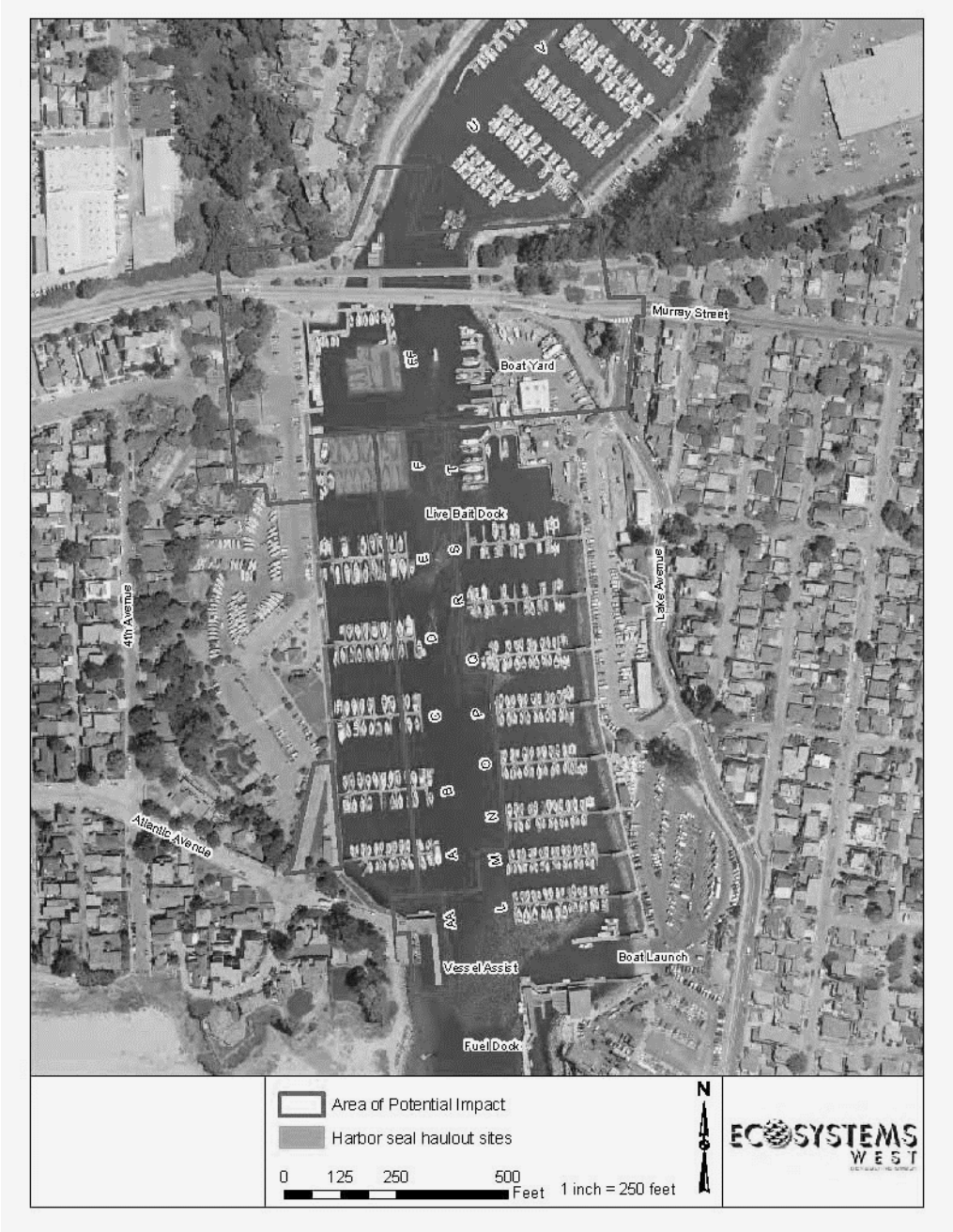

Figure 1-- Proposed Project Area

Detailed Description of the Specified Activity

The Murray St. Bridge seismic retrofit project is proposed for construction in nine phases over an approximate 2 year and 4 month period, commencing in summer 2023. The City has applied for two IHAs for Year 1 and Year 2 of in-water construction

activities. The City plans to apply for an additional IHA to cover any remaining construction work remaining at the end of Year 2. In-water construction activities include the removal and temporary relocation of docks to accommodate construction access, pile driving, potential installation of piles for a construction trestle from the bridge or barge construction, transport of materials, and replacement of harbor docks upon completion of the project.

Removal and replacement of boat berths-- To accommodate construction staging and in-water construction activities, the City plans to temporarily relocate berths at Dock FF and Dock BY (Boat Yard on east side) to existing visitor berths. These docks will be reconstructed upon the completion of the bridge retrofit project. Removal of these docks would involve vibratory extraction of 30 14" precast concrete piles and take place over 14 days in July 2023 during Year 1 as well as over 15 days in July 2024 during Year 2. During Year 1, a maximum of 10 piles would be removed per day from Dock FF. During Year 2, a maximum of four piles per day would be removed from Dock FF over the course of 14 days and five piles would be removed from Dock BY over the course of a day. Reinstallation of piles for Dock FF and Dock BY would occur in October to November 2025 and be covered under a separate IHA. The reinstalled berths would be plastic, wood, or concrete over polyethylene float, and be anchored with pilings.

Pile installation-- The most intensive in-water activity would be the installation of new bridge support piles at Bents 4 through 8 from August through September during Year 2. Installation at Bents 5 through 8 would involve impact and vibratory pile driving of 16 (4 per Bent) 30-inch Cast-in-steel-shell (CISS) piles. At Bents 5 through 8, 30-inch diameter steel casings will be driven to either refusal at rock or into a shaft drilled within rock, depending upon the location. Two additional 30-inch steel piles will be driven using impact and vibratory pile driving at Ben 4, although these piles are only submerged in water during high tide. Bridge piles will be partially or entirely vibrated into the Harbor

substrate, depending upon bottom type, instead of driving them entirely by impact pile driving. A vibratory hammer would be used to start driving all piles, but an impact hammer may be required to complete pile driving, depending upon the density of the subsurface materials. Overall, pile installation is expected to last approximately 23 days, with 1.5 days required to drive each 30-inch diameter steel pile.

Construction barge and/or temporary trestle-- Installation of an in-water barge or temporary bridge trestle is planned to accommodate equipment for pile installation. Work within the waterway will require either the use of a barge or the construction of a temporary trestle to provide a work platform. If a barge is utilized, prefabricated modular units may be brought to the site and locked together. This platform can be installed, reconfigured, and removed relatively quickly, but the system is not suitable for areas that are too narrow to accommodate the modules. If areas are too narrow, a trestle would likely be constructed.

Construction of a trestle would vary depending upon materials available to contractors, however, a potential trestle would be 60-foot (18.3 meters (m)) long and comprised of steel girders over the Harbor navigation channel. The spans would be supported on false work bents, constructed of steel piles. Up to 72 20-inch steel beams (potentially, the contractor may decide to use 120 12-inch steel beams instead) would be required for a trestle spanning the channel. Vibratory drivers would be used to install the trestle during Year 2 and would require an estimated 60 days to install. The trestle would be removed after construction is complete in 2025. This removal would be covered under a separate IHA. Barge construction is likely to be less impactful that trestle construction, therefore, trestle construction is included in the below analysis and barge construction is not discussed further.

The proposed project also includes construction activities that are located on land. These activities include the demolition, pile and anchor installation outside of the

waterway, bridge construction on the northern and southern ends of the bridge as well as the construction of barrier railings and project features below the bridge road surface, contractor staging for construction activities in the boat yard near the eastern edge of the bridge, temporary bypass of the sewer line, and temporary harbor facility relocation. These land-based construction activities are not expected to result in take, and are therefore not discussed further.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see **Proposed Mitigation** and **Proposed Monitoring and Reporting**).

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species. NMFS fully considered all of this information, and we refer the reader to these descriptions, incorporated here by reference, instead of reprinting the information. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*), and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS' website (*https://www.fisheries.noaa.gov/find-species*).

Table 2 lists all species or stocks for which take is expected and proposed to be authorized for this activity, and summarizes information related to the population or stock, including regulatory status under the MMPA and Endangered Species Act (ESA) and potential biological removal (PBR), where known. PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum

sustainable population (as described in NMFS' SARs). While no serious injury or mortality is expected to occur, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species or stocks and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS' stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All stocks managed under the MMPA in this region are assessed in NMFS' U.S. Pacific 2022 draft SARs. All values presented in Table 2 are the most recent available at the time of publication and are available online at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*.

Table 2-- Marine Mammal Species[4] Likely Impacted by the Specified Activities

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance (CV, Nmin, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Order Carnivora – Pinnipedia						
Family Otariidae (eared seals and sea lions)						
California sea lion	*Zalophus californianus*	U.S.	-, -, N	257,606 (N/A,233,515, 2014)	14,011	>320
Family Phocidae (earless seals)						
Harbor seal	*Phoca vitulina*	California	-, -, N	30,968 (N/A, 27,348, 2012)	1,641	43

[1] - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

[2]- NMFS marine mammal stock assessment reports online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable [explain if this is the case].

[3] - These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.,* commercial fisheries, ship strike). Annual M/SI often cannot be

determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.
[4]- Information on the classification of marine mammal species can be found on the web page for The Society for Marine Mammalogy's Committee on Taxonomy (*https://marinemammalscience.org/science-and-publications/list-marine-mammal-species-subspecies/*; Committee on Taxonomy (2022)).

As indicated above, the two species (with two managed stocks) in Table 2 temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur. While bottlenose dolphins (*Tursiops truncatus*) and harbor porpoises (*Phocoena phocoena*) have been reported in the area, the temporal and/or spatial occurrence of these species is such that take is not expected to occur, and they are not discussed further beyond the explanation provided here. Bottlenose dolphins and harbor porpoises may transit nearshore areas just outside the mouth of the Harbor (Carretta *et al.,* 2022). However, these species were not detected during any surveys of the Harbor area and are expected to remain outside the Harbor and beyond the proposed project area.

In addition, the southern sea otter (*Enhydra lutris nereis*) may be found in the Harbor. However, sea otters are managed by the U.S. Fish and Wildlife Service and are not considered further in this document.

California Sea Lions

California sea lions are known to breed mainly on offshore islands, spanning from Southern California's Channel Islands to Mexico during the spring (Heath and Perrin, 2008), although pups have also been born on Año Nuevo and the Farallon Islands (TMMC, 2020). During the non-breeding season, adult and sub-adult males as well as juveniles migrate northward along the coast, to central and northern California, Oregon, Washington, and Vancouver Island (Jefferson *et al.,* 1993). They return south the following spring (Lowry and Forney, 2005; Heath and Perrin, 2008) while females tend to remain closer to rookeries (Antonelis *et al.,* 1990; Melin *et al.,* 2008). Based upon statistical analysis of annual pup count, annual survivorship, and human-induced impacts, the California stock appears to have experienced an annual increase from 1975-2014

(Laake *et al.,* 2018). The Harbor does not provide mating, breeding, or pupping habitat for California sea lions.

California sea lions are incidental visitors to the Harbor, appearing in the greatest numbers when fish are abundant in the area. Based upon surveys conducted in the Harbor by EcoSystems West Consulting Group during December 2006, October 2009, and February to March 2022, California sea lions may use the Harbor occasionally for hauling out, and specific haul-out locations in the Harbor may vary. In 2009, the closest regular sea lion haul-out location to the project area was the Municipal Wharf, although in 2006 and 2009, sea lions were also observed to haul out near the launch ramp, fuel dock, and Vessel Assist Dock (see Figure 4 in the Application). However, in 2022, no hauled out sea lions were observed in the Harbor.

California sea lions may also use the Harbor for foraging. They feed seasonally on schooling fish and cephalopods, including salmon, herring, sardines, anchovy, mackerel, whiting, rockfish, and squid (Lowry *et al.,* 1990, 1991; Lowry and Carretta, 1999; Weise 2000; Carretta *et al.,* 2022). Seasonal and annual dietary shifts vary with environmental fluctuations that affect prey populations. In central California sea lion populations, short term seasonal variations in diet are related to prey movement and life history patterns while long-term annual changes correlate to large-scale ocean climate shifts and foraging competition with commercial fisheries (Weise and Harvey, 2008; McClatchie *et al.,* 2016). Climate change, specifically increasing sea surface temperatures in the California current, negatively impact prey species availability and reduce California sea lion survival rates (DeLong *et al.,* 2017; Laake *et al.,* 2018). Other conservation concerns for California sea lions include vessel strikes, non-commercial fishery human caused mortality, hookworms, and competition for forage with commercial fisheries (Carretta *et al.,* 2018; Carretta *et al.,* 2022).

California sea lions experienced a UME, not correlated to an El Niño event, from 2013-2017 (Carretta *et al.,* 2022). Pup and juvenile age classes experienced high mortality during this time, likely attributed to sea lion prey availability, specifically sardines. California sea lions are also susceptible to the algal neurotoxin, domoic acid (Brodie *et al.,* 2006; Carretta *et al.,* 2022). This neurotoxin is expected to cause future mortalities among California sea lions due to the prevalence of harmful algal blooms within their habitat.

Harbor Seals

Pacific harbor seals are distributed from Baja California north to the Aleutian Islands of Alaska. Harbor seals do not make extensive pelagic migrations, but may travel hundreds of kilometers to find food or suitable breeding areas (Herder, 1986; Harvey and Goley, 2011; Carretta *et al.,* 2022). Seals primarily haul out on remote mainland and island beaches, reefs, and estuary areas. At haul-outs, they congregate to rest, socialize, breed, and molt.

Harbor seals may use the Harbor seasonally for foraging or hauling out. Documented haul-out locations may vary across years, and harbor seals have been observed foraging around haul-out locations. During December 2006, six harbor seals were observed hauled out on dock FF at night. Docks F, FF, and S were primary haul-out areas in October 2009, however, no harbor seals were observed hauled out during February and March 2022. Based upon the Ecosystems West surveys, harbor seals were more likely to be hauled out in Harbor in the early morning hours. Grigg *et al.* (2009) reported seasonal shifts in harbor seal movements based on prey availability. The highest numbers of harbor seals were observed in the Harbor during late summer, fall, and winter, outside of the breeding season (March – May), and outside of the molting season (June – July). The Harbor does not provide breeding, molting, or pupping habitat for harbor seals.

Harbor seals were observed foraging in the Harbor during December 2006 and October 2009, in close proximity to primary haul-out sites, such as Docks F and FF. In 2009, foraging harbor seals were documented both in the Upper Harbor upstream of the Murray St. Bridge and within the lower Harbor downstream of the Murray St. Bridge and near Dock FF. Harbor seals may forage on a variety of fish, crustaceans, and cephalopods in shallow intertidal waters. Fish prey species may include yellowfin goby, northern anchovy, Pacific herring, staghorn sculpin, plainfish midshipman, and white croaker (Harvey and Torok, 1994).

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007, 2019) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (behavioral response data, anatomical modeling, *etc.*). Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 3.

Table 3-- Marine Mammal Hearing Groups (NMFS, 2018)

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, Cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz
* Represents the generalized hearing range for the entire group as a composite (*i.e.*, all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al*., 2007) and PW pinniped (approximation).	

The pinniped functional hearing group was modified from Southall *et al*. (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al*., 2006; Kastelein *et al*., 2009; Reichmuth and Holt, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information.

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section provides a discussion of the ways in which components of the specified activity may impact marine mammals and their habitat. The **Estimated Take** section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The **Negligible Impact Analysis and Determination** section considers the content of this section, the **Estimated Take** section, and the **Proposed Mitigation** section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and whether those impacts are reasonably expected to, or reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

Acoustic effects on marine mammals during the specified activities can occur from impact pile driving and vibratory driving and removal. The effects of underwater noise from the City's proposed activities have the potential to result in Level A or Level B harassment of marine mammals in the project area.

Description of Sound Sources

The marine soundscape is comprised of both ambient and anthropogenic sounds. Ambient sound is defined as the all-encompassing sound in a given place and is usually a composite of sound from many sources both near and far (ANSI, 1995). The sound level of an area is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.,* waves, wind, precipitation, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.,* vessels, dredging, aircraft, construction).

The sum of the various natural and anthropogenic sound sources at any given location and time—which comprise “ambient” or “background” sound—depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 decibels (dB) from day to day (Richardson *et al.,* 1995). The result is that, depending on the source type and its intensity, sound from the specified activities may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

In-water construction activities associated with the project would include impact and vibratory pile driving and removal. The sounds produced by these activities fall into one of two general sound types: impulsive and non-impulsive. Impulsive sounds (*e.g.,* explosions, sonic booms, impact pile driving) are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI, 1986; NIOSH, 1998; NMFS, 2018). Non-impulsive sounds (*e.g.,* machinery operations such as drilling or dredging, vibratory pile driving, underwater chainsaws, and active sonar systems) can be broadband, narrowband or tonal, brief or prolonged (continuous or intermittent), and typically do not have the high peak sound pressure with raid rise/decay time that impulsive sounds do (ANSI, 1995; NIOSH, 1998; NMFS, 2018). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.,* Ward, 1997).

Two types of hammers would be used on this project, impact and vibratory. Impact hammers operate by repeatedly dropping and/or pushing a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is considered impulsive. Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce non-impulsive, continuous sounds. Vibratory hammering generally produces sound pressure levels (SPLs) 10 to 20 dB lower than impact pile driving of the same-sized pile (Oestman *et al.,* 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards, 2002; Carlson *et al.,* 2005).

The likely or possible impacts of the City's proposed activities on marine mammals could be generated from both non-acoustic and acoustic stressors. Potential non-acoustic stressors include the physical presence of the equipment, vessels, and

personnel; however, we expect that any animals that approach the project site(s) close enough to be harassed due to the presence of equipment or personnel would be within the harassment zone from pile driving and would already be subject to harassment from the in-water activities. Therefore, any impacts to marine mammals are expected to primarily be acoustic in nature. Acoustic stressors are generated by heavy equipment operation during pile installation and removal (*i.e.,* impact and vibratory pile driving and removal).

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from pile driving equipment is the primary means by which marine mammals may be harassed from the City's specified activities. In general, animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall *et al.,* 2007). Generally, exposure to pile driving and removal and other construction noise has the potential to result in auditory threshold shifts and behavioral reactions (*e.g.,* avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior). Exposure to anthropogenic noise can also lead to non-observable physiological responses, such as an increase in stress hormones. Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions, such as communication and predator and prey detection. The effects of pile driving and demolition noise on marine mammals are dependent on several factors, including, but not limited to, sound type (*e.g.,* impulsive vs. non-impulsive), the species, age and sex class (*e.g.,* adult male vs. mother with calf), duration of exposure, the distance between the pile and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok *et al.,* 2004; Southall *et al.,* 2007). Here we discuss physical auditory effects (threshold shifts) followed by behavioral effects and potential impacts on habitat. No physiological effects

other than permanent threshold shift (PTS) and temporary threshold shift (TTS) are anticipated or proposed to be authorized, and therefore are not discussed further.

NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). The amount of threshold shift is customarily expressed in dB. A TS can be permanent or temporary. As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal temporal pattern (*e.g.,* impulsive or non-impulsive), likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, time to recovery (seconds to minutes or hours to days), the frequency range of the exposure (*i.e.,* spectral content), the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.,* how animal uses sound within the frequency band of the signal; *e.g.,* Kastelein *et al.,* 2014), and the overlap between the animal and the source (*e.g.,* spatial, temporal, and spectral).

Permanent Threshold Shift (PTS) —NMFS defines PTS as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Available data from humans and other terrestrial mammals indicate that a 40 dB threshold shift approximates PTS onset (see Ward *et al.,* 1958, 1959; Ward, 1960; Kryter *et al.,* 1966; Miller, 1974; Ahroon *et al.,* 1996; Henderson *et al.,* 2008). PTS levels for marine mammals are estimates, because there are limited empirical data measuring PTS in marine mammals (*e.g.,* Kastak *et al.,* 2008), largely due to the fact that, for various ethical reasons, experiments involving anthropogenic noise exposure at levels inducing PTS are not typically pursued or authorized (NMFS, 2018).

Temporary Threshold Shift (TTS) —TTS is a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS, 2018). Based on data from cetacean TTS measurements (see Southall *et al.,* 2007), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al.,* 2000; Finneran *et al.,* 2000, 2002). As described in Finneran (2015), marine mammal studies have shown the amount of TTS increases with cumulative sound exposure level (SEL_{cum}) in an accelerating fashion: At low exposures with lower $SEL_{cum,}$ the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher SEL_{cum}, the growth curves become steeper and approach linear relationships with the noise SEL.

Depending on the degree (elevation of threshold in dB), duration (*i.e.,* recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that takes place during a time when the animal is traveling through the open ocean, where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. We note that reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.,* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin, beluga whale (*Delphinapterus leucas*), harbor porpoise, and Yangtze finless porpoise

(*Neophocoena asiaeorientalis*), and five species of pinnipeds exposed to a limited number of sound sources (*i.e.,* mostly tones and octave-band noise) in laboratory settings (Finneran, 2015). TTS was not observed in trained spotted (*Phoca largha*) and ringed (*Pusa hispida*) seals exposed to impulsive noise at levels matching previous predictions of TTS onset (Reichmuth *et al.,* 2016). In general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran, 2015). At low frequencies, onset-TTS exposure levels are higher compared to those in the region of best sensitivity (*i.e.,* a low frequency noise would need to be louder to cause TTS onset when TTS exposure level is higher), as shown for harbor porpoises and harbor seals (Kastelein *et al.,* 2019a, 2019b, 2020a, 2020b). In addition, TTS can accumulate across multiple exposures, but the resulting TTS will be less than the TTS from a single, continuous exposure with the same SEL (Finneran *et al.,* 2010; Kastelein *et al.,* 2014; Kastelein *et al.,* 2015a; Mooney *et al.,* 2009). This means that TTS predictions based on the total, cumulative SEL will overestimate the amount of TTS from intermittent exposures, such as sonars and impulsive sources.

The potential for TTS from impact pile driving exists. After exposure to playbacks of impact pile driving sounds (rate 2,760 strikes/hour) in captivity, mean TTS increased from 0 dB after 15 minute exposure to 5 dB after 360 minute exposure; recovery occurred within 60 minutes (Kastelein *et al.,* 2016). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. No data are available on noise-induced hearing loss for mysticetes. Nonetheless, what we considered is the best available science. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al.* (2007, 2019), Finneran and Jenkins (2012), Finneran (2015), and Table 5 in NMFS (2018).

Installing piles for this project requires impact pile driving. There would likely be pauses in activities producing the sound during each day. Given these pauses and the fact that many marine mammals are likely moving through the project areas and not remaining for extended periods of time, the potential for TS declines.

Behavioral Harassment -- Exposure to noise from pile driving and removal also has the potential to behaviorally disturb marine mammals. Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.,* Lusseau and Bejder, 2007; Weilgart, 2007; NRC, 2005).

Disturbance may result in changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); or avoidance of areas where sound sources are located. Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff, 2006). Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.,* species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.,* Richardson *et al.,* 1995; Wartzok *et al.,* 2004; Southall *et al.,* 2007; Weilgart, 2007; Archer *et al.,* 2010; Southall *et al.,* 2021). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous

experience with a sound source, context, and numerous other factors (Ellison *et al.,* 2012), and can vary depending on characteristics associated with the sound source (*e.g.,* whether it is moving or stationary, number of sources, distance from the source). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see Appendices B and C of Southall *et al.* (2007) as well as Nowacek *et al.* (2007); Ellison *et al.* (2012), and Gomez *et al.* (2016) for a review of studies involving marine mammal behavioral responses to sound.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (*e.g.,* bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.,* Croll *et al.,* 2001; Nowacek *et al.,* 2004; Madsen *et al.,* 2006; Yazvenko *et al.,* 2007; Melcón *et al.,* 2012). In addition, behavioral state of the animal plays a role in the type and severity of a behavioral response, such as disruption to foraging (*e.g.,* Sivle *et al.,* 2016; Wensveen *et al.,* 2017). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal (Goldbogen *et al.,* 2013).

Stress responses —An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.,* Selye,

1950; Moberg, 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.,* Moberg, 1987; Blecha, 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.,* 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and "distress" is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.,* Holberton *et al.,* 1996; Hood *et al.,* 1998; Jessop *et al.,* 2003; Krausman *et al.,* 2004; Lankford *et al.,* 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker, 2000; Romano *et al.,* 2002b) and, more rarely,

studied in wild populations (*e.g.,* Romano *et al.,* 2002a). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003), however distress is an unlikely result of these projects based on observations of marine mammals during previous, similar projects in the area.

Masking —Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.,* those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.,* 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.,* snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.,* pile driving, shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.,* signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.,* sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions. Masking of natural sounds can result when human activities produce high levels of background sound at frequencies important to marine mammals. Conversely, if the background level of underwater sound is high (*e.g.,* on a day with strong wind and high waves), an anthropogenic sound source would not be detectable as far away as would be possible

under quieter conditions and would itself be masked. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.,* Clark *et al.,* 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.,* Miller *et al.,* 2000; Foote *et al.,* 2004; Parks *et al.,* 2007; Di Iorio and Clark, 2010; Holt *et al.,* 2009). The Harbor is heavily used by commercial and recreational vessels, and background sound levels in the area are already elevated. Normal ambient noise levels in the Harbor include vessel motors, heavy vehicular traffic on the bridge, and construction noise from the dry dock repair facility, commercial charters, and significant water traffic. Due to the transient nature of marine mammals to move and avoid disturbance, masking is not likely to have long-term impacts on marine mammal species within the proposed project area.

Airborne Acoustic Effects —Pinnipeds that occur near the project site could be exposed to airborne sounds associated with pile driving and removal that have the potential to cause behavioral harassment, depending on their distance from pile driving activities. Airborne noise would primarily be an issue for pinnipeds that are swimming or hauled out near the project site within the range of noise levels elevated above the acoustic criteria. We recognize that pinnipeds in the water could be exposed to airborne sound that may result in behavioral harassment when looking with their heads above water. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon the area and move further from the source. However, these animals would likely previously have been “taken” because of exposure to underwater sound above the behavioral harassment thresholds, which are generally larger than those associated with airborne sound. Thus, the behavioral harassment of these animals is already accounted for in these estimates of potential take.

Therefore, we do not believe that authorization of incidental take resulting from airborne sound for pinnipeds is warranted, and airborne sound is not discussed further here.

Marine Mammal Habitat Effects

The City's proposed construction activities could have localized, temporary impacts on marine mammal habitat, including prey, by increasing in-water sound pressure levels and slightly decreasing water quality. Increased noise levels may affect acoustic habitat (see masking discussion above) and adversely affect marine mammal prey in the vicinity of the project areas (see discussion below). During impact and vibratory pile driving or removal, elevated levels of underwater noise would ensonify the project area where both fishes and mammals occur, and could affect foraging success. Additionally, marine mammals may avoid the area during construction, however, displacement due to noise is expected to be temporary and is not expected to result in long-term effects to the individuals or populations. Construction activities are expected to be of short duration and would likely have temporary impacts on marine mammal habitat through increases in underwater and airborne sound.

A temporary and localized increase in turbidity near the seafloor would occur in the immediate area surrounding the area where piles are installed or removed. In general, turbidity associated with pile installation is localized to about a 25-ft (7.6-m) radius around the pile (Everitt *et al.,* 1980). Any pinnipeds could avoid localized areas of turbidity. Local currents are anticipated to disburse any additional suspended sediments produced by project activities at moderate to rapid rates depending on tidal stage. Therefore, we expect the impact from increased turbidity levels to be discountable to marine mammals and do not discuss it further.

In-Water Construction Effects on Potential Foraging Habitat—The area likely impacted by the Murray St. Bridge retrofit project is relatively small compared to the total available habitat in the Harbor. The proposed project area is highly influenced by

anthropogenic activities, and provides limited foraging habitat for marine mammals. Furthermore, pile driving and removal at the proposed project site would not obstruct long-term movements or migration of marine mammals.

Avoidance by potential prey (*i.e.,* fish) of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish and marine mammal avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated. Any behavioral avoidance by prey of the disturbed area would still leave significantly large areas of potential foraging habitat in the nearby vicinity.

In-water Construction Effects on Potential Prey-- Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.,* crustaceans, cephalopods, fish, zooplankton, other marine mammals). Marine mammal prey varies by species, season, and location. Here, we describe studies regarding the effects of noise on known marine mammal prey.

Fish utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.,* Zelick and Mann, 1999; Fay, 2009). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.,* 2008). The potential effects of noise on fishes depends on the overlapping frequency range, distance from the sound source, water depth of exposure, and species-specific hearing sensitivity, anatomy, and physiology. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality.

Fish react to sounds which are especially strong and/or intermittent low-frequency sounds, and behavioral responses such as flight or avoidance are the most likely effects.

Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to noise depends on the physiological state of the fish, past exposures, motivation (*e.g.,* feeding, spawning, migration), and other environmental factors. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of pile driving on fish; several are based on studies in support of large, multiyear bridge construction projects (*e.g.,* Scholik and Yan, 2001; Popper and Hastings, 2009). Many studies have demonstrated that impulse sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g.,* Fewtrell and McCauley, 2012; Pearson *et al.,* 1992; Skalski *et al.,* 1992; Santulli *et al.,* 1999; Paxton *et al.,* 2017). In response to pile driving, Pacific sardines and northern anchovies may exhibit an immediate startle response to individual strikes, but return to "normal" pre-strike behavior following the conclusion of pile driving with no evidence of injury as a result (Appendix C in NAVFAC SW, 2014). However, some studies have shown no or slight reaction to impulse sounds (*e.g.,* Pena *et al.,* 2013; Wardle *et al.,* 2001; Jorgenson and Gyselman, 2009; Popper *et al.,* 2005).

SPLs of sufficient strength have been known to cause injury to fish and fish mortality. However, in most fish species, hair cells in the ear continuously regenerate and loss of auditory function likely is restored when damaged cells are replaced with new cells. Halvorsen *et al.* (2012a) showed that a TTS of 4-6 dB was recoverable within 24 hours for one species. Impacts would be most severe when the individual fish is close to the source and when the duration of exposure is long. Injury caused by barotrauma can range from slight to severe and can cause death, and is most likely for fish with swim bladders. Barotrauma injuries have been documented during controlled exposure to impact pile driving (Halvorsen *et al.,* 2012b; Casper *et al.,* 2013).

The most likely impact to fishes from pile driving and removal and construction activities at the project area would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary. Further, it is anticipated that preparation activities for pile driving or removal (*i.e.,* positioning of the hammer) and upon initial startup of devices would cause fish to move away from the affected area outside areas where injuries may occur. Therefore, relatively small portions of the proposed project area would be affected for short periods of time, and the potential for effects on fish to occur would be temporary and limited to the duration of sound-generating activities.

In summary, given the short daily duration of sound associated with individual pile driving events and the relatively small areas being affected, pile driving activities associated with the proposed actions are not likely to have a permanent, adverse effect on any fish habitat, or populations of fish species. Any behavioral avoidance by fish of the disturbed area would still leave significantly large potential areas fish and marine mammal foraging habitat in the nearby vicinity. Thus, we conclude that impacts of the specified activities are not likely to have more than short-term adverse effects on any prey habitat or populations of prey species. Further, any impacts to marine mammal habitat are not expected to result in significant or long-term consequences for individual marine mammals, or to contribute to adverse impacts on their populations.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through this IHA, which will inform both NMFS' consideration of "small numbers," and the negligible impact determinations.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of 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).

Authorized takes would primarily be by Level B harassment, as use of the acoustic source (*i.e.*, impact pile driving) has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result, primarily for phocids because predicted auditory injury zones are larger than for otariids. Auditory injury is unlikely to occur for otariids. The proposed mitigation and monitoring measures are expected to minimize the severity of the taking to the extent practicable.

As described previously, no serious injury or mortality is anticipated or proposed to be authorized for this activity. Below we describe how the proposed take numbers are estimated.

For acoustic impacts, generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) the number of days of activities. We note that while these factors can contribute to a basic calculation to provide an initial prediction of potential takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.,* previous monitoring results or average group size). Below, we describe

the factors considered here in more detail and present the proposed take estimates.

Acoustic Thresholds

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source or exposure context (*e.g.*, frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source), the environment (*e.g.*, bathymetry, other noises in the area, predators in the area), and the receiving animals (hearing, motivation, experience, demography, life stage, depth) and can be difficult to predict (*e.g.*, Southall *et al.,* 2007, 2021, Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a metric that is both predictable and measurable for most activities, NMFS typically uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS generally predicts that marine mammals are likely to be behaviorally harassed in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above root-mean-squared pressure received levels (RMS SPL) of 120 dB (referenced to 1 micropascal (re 1 μPa)) for continuous (*e.g.,* vibratory pile-driving, drilling) and above RMS SPL 160 dB re 1 μPa for non-explosive impulsive (*e.g.*, seismic airguns) or intermittent (*e.g.*, scientific sonar) sources. Generally speaking, Level B harassment take estimates based on these behavioral harassment thresholds are expected to include any likely takes by TTS as, in most cases, the likelihood of TTS occurs at distances from the source less than those at which behavioral harassment is likely. TTS of a sufficient degree can manifest as behavioral

harassment, as reduced hearing sensitivity and the potential reduced opportunities to detect important signals (conspecific communication, predators, prey) may result in changes in behavior patterns that would not otherwise occur.

The City of Santa Cruz's proposed construction activity includes the use of continuous (vibratory pile driving and removal) and impulsive (impact pile driving) sources, and therefore the RMS SPL thresholds of 120 and 160 dB re 1 μPa are applicable.

Level A harassment – NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). The City's proposed activity includes the use of impulsive (impact hammer) and non-impulsive (vibratory hammer) sources.

These thresholds are provided in the table below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS' 2018 Technical Guidance, which may be accessed at: *www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance*.

Table 4-- Thresholds Identifying the Onset of Permanent Threshold Shift

	PTS Onset Thresholds* (Received Level)	
Hearing Group	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{p,0\text{-pk,flat}}$: 219 dB $L_{E,p,\text{ LF,24h}}$: 183 dB	*Cell 2* $L_{E,p,\text{ LF,24h}}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{p,0\text{-pk,flat}}$: 230 dB $L_{E,p,\text{ MF,24h}}$: 185 dB	*Cell 4* $L_{E,p,\text{ MF,24h}}$: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{p,0\text{-pk,flat}}$: 202 dB	*Cell 6* $L_{E,p,\text{ HF,24h}}$: 173 dB

	$L_{E,p,HF,24h}$: 155 dB	
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{p,0\text{-pk.flat}}$: 218 dB $L_{E,p,PW,24h}$: 185 dB	*Cell 8* $L_{E,p,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{p,0\text{-pk,flat}}$: 232 dB $L_{E,p,OW,24h}$: 203 dB	*Cell 10* $L_{E,p,OW,24h}$: 219 dB
* Dual metric thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds are recommended for consideration. Note: Peak sound pressure level ($L_{p,0\text{-pk}}$) has a reference value of 1 µPa, and weighted cumulative sound exposure level ($L_{E,p}$) has a reference value of 1µPa^{2}s. In this Table, thresholds are abbreviated to be more reflective of International Organization for Standardization standards (ISO, 2017). The subscript "flat" is being included to indicate peak sound pressure are flat weighted or unweighted within the generalized hearing range of marine mammals (*i.e.*, 7 Hz to 160 kHz). The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The weighted cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these thresholds will be exceeded.		

Ensonified Area

Here, we describe operational and environmental parameters of the activity that are used in estimating the area ensonified above the acoustic thresholds, including source levels and transmission loss coefficient.

The sound field in the project area is the existing background noise plus additional construction noise from the proposed project. Marine mammals are expected to be affected by sound generated by the primary components of the project (*i.e.,* impact and vibratory pile driving).

In order to calculate distances to the Level A harassment and Level B harassment thresholds for the methods and piles being used in this project, the City used acoustic monitoring data from various similar locations to develop source levels for the different pile types, sizes, and methods proposed for use (Table 5).

Table 5—Source Levels for Proposed Removal and Installation Activities

Activity	Location	Pile Size/Type	Method	Peak Sound Pressure (dB re 1 µPa)	Mean Maximum RMS SPL (dB re 1 µPa)	SEL (dB re 1	Source

						µPa2 sec)	
Removal of existing bridge piles. Removal of dock FF&T piles.	Bridge Bent 6. Dock FF & BY	14" P/C concrete	Vibratory	171	163	155	NAVFAC SW, 2022
Install new permanent bridge piles	Bridge Bents 4 through 8	30" steel in CISS	Impact	210	190	177	Caltrans, 2015
Install new permanent bridge piles	Bridge Bents 4 through 8	30" steel in CISS	Vibratory	196	159	175	Caltrans, 2020
Install new permanent bridge piles	Dock FF&T piles	14" P/C concrete	Impact	185	170	160	Caltrans, 2020
Install new permanent bridge piles	Dock FF&T piles	14" P/C concrete	Vibratory	171	163	155	NAVFAC SW, 2022
Install temporary trestle piles	Adjacent to bridge	20" steel [1]	Vibratory	194	154	NA	Caltrans, 2015

[1] 24" steel pipe used as a proxy for 20" steel pile for vibratory pile driving

Level B Harassment Zones

Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

$TL = B * Log_{10} (R_1/R_2)$, where

TL = transmission loss in dB

B = transmission loss coefficient; for practical spreading equals 15

R_1 = the distance of the modeled SPL from the driven pile, and

R_2 = the distance from the driven pile of the initial measurement

The recommended TL coefficient for most nearshore environments is the practical spreading value of 15. This value results in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions, which is the most

appropriate assumption for the City's proposed activities. The City assumed an open water attenuation rate of 4.5 dB per doubling of distance. The Level B harassment zones and ensonified area for the City's proposed activities are shown in Table 6.

Table 6 – Distances to Level B Harassment Thresholds

Pile Type/Size	Method	Projected radial distance to Level B harassment threshold (m)
Year 1		
14" P/C concrete	Vibratory	7,356
Year 2		
30" steel pipe pile in CISS	Impact	1,000
	Vibratory	3,981
14" p/c concrete	Impact	46
	Vibratory	7,356
20" steel pipe piles	Vibratory	1,848

Level A Harassment Zones

The ensonified area associated with Level A harassment is more technically challenging to predict due to the need to account for a duration component. Therefore, NMFS developed an optional User Spreadsheet tool to accompany the Technical Guidance that can be used to relatively simply predict an isopleth distance for use in conjunction with marine mammal density or occurrence to help predict potential takes. We note that because of some of the assumptions included in the methods underlying this optional tool, we anticipate that the resulting isopleth estimates are typically going to be overestimates of some degree, which may result in an overestimate of potential take by Level A harassment. However, this optional tool offers the best way to estimate isopleth distances when more sophisticated modeling methods are not available or practical. For stationary sources such as pile installation or removal, the optional User Spreadsheet tool predicts the distance at which, if a marine mammal remained at that distance for the

duration of the activity, it would be expected to incur PTS. The isopleths generated by the User Spreadsheet used the same TL coefficient as the Level B harassment zone calculations (*i.e.,* the practical spreading value of 15). Inputs in the User Spreadsheet tool (*i.e.,* number of piles per day, duration, and/or strikes per pile) are presented in Table 1. The maximum RMS SPL/SEL SPL for each pile type are presented in Table 5. Resulting Level A harassment isopleths are reported below in Table 7.

Table 7-- Distances to Level A Harassment Thresholds

Pile Type/Size	Method	Projected distances to Level A harassment threshold (m)	
		Phocids	Otariids
Year 1			
14" P/C concrete	Vibratory	22.6	1.6
Year 2			
30" steel pipe pile in CISS	Impact	300	22
	Vibratory	12.3	1
14" p/c concrete	Impact	13	1
	Vibratory	22.6	1.6
20" steel pipe piles	Vibratory	5.7	0.4

Marine Mammal Occurrence

In this section we provide information about the occurrence of marine mammals, including density or other relevant information that will inform the take calculations. Unless otherwise specified, the term “pile driving” in this section, and all following sections, may refer to either pile installation or removal. NMFS has carefully reviewed the City’s analysis and concludes that it represents an appropriate and accurate method for estimating incidental take that may be caused by the City’s activities.

Daily occurrence estimates of marine mammals in the proposed project area are based upon marine mammal surveys conducted in the vicinity of the Murray St. Bridge by EcoSystems West Consulting Group. Survey sessions were conducted in December

2006, September 2009 through October 2009. Of these monitoring years, the maximum counts of California sea lions and harbor seals were observed in 2009 (Table 8). As the 2009 surveys occurred during the fall season and the proposed project would occur during the summer and fall seasons, the 2009 data are likely representative of maximum occurrences that could be expected in the proposed project area.

Table 8—Maximum Counts of Species Likely Impacted by Proposed Activities

Species	2006 Monitoring	2009 Monitoring
California sea lion	1	15
Harbor seal	6	11

Take Estimation

Here we describe how the information provided above is synthesized to produce a quantitative estimate of the take that is reasonably likely to occur and proposed for authorization.

Maximum occurrence estimates (reported in Table 8) were multiplied by the number of days of pile removal and installation (14 days in Year 1; 98 days in Year 2) to calculate estimated take by Level B harassment of California sea lions and harbor seals (Table 9). The City assumed a maximum of two harbor seals would be present in the proposed project area that may be impacted during the 37 days of impact pile driving. The expected occurrence of two harbor seals was multiplied by the number of impact pile driving days (37) to estimate take by Level A harassment of harbor seals. Given the very small Level A harassment isopleths for California sea lions and proposed mitigation measures, Level A harassment of California sea lions is not requested or expected. By using the sighting-based approach, take values are not affected by the estimated harassment distances from Tables 6 and 7. NMFS has carefully reviewed these methods and agrees with this approach.

Table 9-- Estimated Proposed Take by Level A and Level B Harassment and Percent of Stock Proposed to be Authorized for Take

Species	Maximum Number of Animals Expected to Occur/Day	Maximum Total Days of In-Water Work [1]	Proposed Take by Level A harassment	Proposed Take by Level B harassment	Total Proposed Take	Percent of Stock Proposed for Take
Year 1						
Harbor Seal	11	14	0	154	154	0.49
California Sea Lion	15	14	0	210	210	0.082
Year 2						
Harbor Seal	11	98	74 [2]	1,078	1,152	3.72
California Sea Lion	15	98	0	1,470	1,470	0.57

[1] Includes potential temporary trestle installation/removal.
[2] Assumes a maximum of 2 harbor seals sighted per day that may be impacted and 37 days of impact pile driving.

Proposed Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, NMFS considers two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned); and

(2) The practicability of the measures for applicant implementation, which may consider such things as cost and impact on operations.

Shutdown Zones

Prior to commencement of in-water construction activities, the City would establish shutdown zones for all activities. The purpose of a shutdown zone is to define an area within which shutdown of the activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). During all in-water construction activities, the City will implement a standard minimum 10 m (32.8 ft) shutdown zone. If a marine mammal enters the shutdown zone, in-water activities would be stopped until visual confirmation that the animal has left the zone of the animal is not sighted for 15 minutes.

All marine mammals will be monitored in the Level B harassment zones and throughout the area as far as visual monitoring can take place. If a marine mammal enters the Level B harassment zone, in-water activities will continue and the animal's presence within the estimated harassment zone will be documented. Pile driving activity must be halted upon observation of either a species for which incidental take is not authorized or a species for which incidental take has been authorized but the authorized number of takes has been met, entering or within the harassment zone.

Table 10 -- Shutdown Zones and Level B Harassment Zones

Pile size, type, and method	Minimum Shutdown Zone (m)		Level B Harassment Zone (m)
	Phocid	Otariid	
Year 1			
14" p/c concrete vibratory removal	10	10	7,356
Year 2			
14" p/c concrete vibratory install/removal	10	10	7,356
14" p/c concrete impact install			46
30" steel pile in CISS impact install			1,000
30" steel pile in CISS vibratory install			3,981
20" steel pile vibratory install			1,848

Protected Species Observers

The placement of protected species observers (PSOs) during all pile driving activities (described in the **Proposed Monitoring and Reporting** section) would ensure that the entire shutdown zone is visible. Should environmental conditions deteriorate such that the entire shutdown zone would not be visible (*i.e.*, fog, heavy rain), pile driving would be delayed until the PSO is confident marine mammals within the shutdown zone could be detected.

Pre-Activity Monitoring

Prior to the start of daily in-water construction activity, or whenever a break in pile driving of 30 minutes or longer occurs, PSOs would observe the shutdown zone and monitoring zones for a period of 30 minutes. The shutdown zone would be considered cleared when a marine mammal has not been observed within the zone for that 30-minute period. If a marine mammal is observed within the shutdown zones listed in Table 10, pile driving activity would be delayed or halted. If work ceases for more than 30 minutes, the pre-activity monitoring of the shutdown zones would commence. A determination that the shutdown zone is clear must be made during a period of good visibility (*i.e.,* the entire shutdown zone and surrounding waters must be visible to the naked eye).

Pre-construction monitoring will also take place over the course of at least 5 days before commencing in-water construction activities. The purpose of this monitoring effort would be to update occurrence information on marine mammals in the project area. Specifically, this monitoring would cover a period of at least 1 week for 4 hours each day.

Soft-Start Procedures

Soft-start procedures provide additional protection to marine mammals by providing warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity. For impact pile driving, contractors would be required to provide an initial set of three strikes from the hammer at reduced energy, followed by a 30-second waiting period, then two subsequent reduced-energy strike sets. Soft-start would be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer.

Based on our evaluation of the City's proposed measures, NMFS has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on the affected 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 IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations 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 while conducting the activities. Effective reporting is critical both to

compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the activity; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

Visual Monitoring

Marine mammal monitoring during pile driving activities would be conducted by PSOs meeting the following NMFS requirements:

- Independent PSOs (*i.e.*, not construction personnel) who have no other assigned tasks during monitoring periods would be used;

- At least one PSO would have prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued incidental take authorization;
- Other PSOs may substitute education (degree in biological science or related field) or training for experience; and
- Where a team of three or more PSOs is required, a lead observer or monitoring coordinator would be designated. The lead observer would be required to have prior experience working as a marine mammal observer during construction.

PSOs would have the following additional qualifications:

- Ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; and
- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

The City would have at least one PSO stationed at the best possible vantage points in the project area to monitor during all pile driving activities. If a PSO sights a marine mammal in the shutdown zone, the PSO should notify the equipment operator to shut

down. The PSO will let the contractor know when activities can re-commence. Additional PSOs may be employed during periods of low or obstructed visibility to ensure the entirety of the shutdown zones are monitored. A marine mammal monitoring plan will be developed and submitted to NMFS for approval prior to commencing in-water construction activities.

Reporting

A draft marine mammal monitoring report would be submitted to NMFS within 90 days after the completion of pile driving activities for each IHA, or 60 days prior to a requested date of issuance of any future IHAs for the project, or other projects at the same location, whichever comes first. The marine mammal report would include an overall description of work completed, a narrative regarding marine mammal sightings, and associated PSO datasheets. Specifically, the report would include:

- Dates and times (begin and end) of all marine mammal monitoring;
- Construction activities occurring during each daily observation period, including: (a) How many and what type of piles were driven or removed and the method (*i.e.,* impact or vibratory); and (b) the total duration of time for each pile (vibratory driving) or number of strikes for each pile (impact driving);
- PSO locations during marine mammal monitoring; and
- Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance.

PSOs would record all incidents of marine mammal occurrence, regardless of distance from activity, and would document any behavioral reactions in concert with distance from piles being driven or removed. Specifically, PSOs will record the following:

- Name of PSO who sighted the animal(s) and PSO location and activity at time of sighting;
- Time of sighting;
- Identification of the animal(s) (*e.g.,* genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;
- Distance and location of each observed marine mammal relative to the pile being driven or hole being drilled for each sighting;
- Estimated number of animals (min/max/best estimate);
- Estimated number of animals by cohort (adults, juveniles, neonates, group composition, *etc.*);
- Description of any marine mammal behavioral observations (*e.g.,* observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (*e.g.,* no response or changes in behavioral state such as ceasing feeding, changing direction, or flushing);
- Number of marine mammals detected within the harassment zones, by species; and
- Detailed information about implementation of any mitigation (*e.g.*, shutdowns and delays), a description of specified actions that ensued, and resulting changes in behavior of the animal(s), if any.

If no comments are received from NMFS within 30 days, the draft report would constitute the final reports. If comments are received, a final report addressing NMFS' comments would be required to be submitted within 30 days after receipt of comments. All PSO datasheets and/or raw sighting data would be submitted with the draft marine mammal report.

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the City of Santa Cruz would report the incident to the Office of Protected Resources (OPR), NMFS (*PR.ITP.MonitoringReports@noaa.gov*) and to the West Coast regional stranding network (866-767-6114) as soon as feasible. If the death or injury was clearly caused by the specified activity, the City of Santa Cruz must immediately cease the activities until NMFS OPR is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the IHAs. The City of Santa Cruz would not resume their activities until notified by NMFS.

The report would include the following information:

- Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
- Species identification (if known) or description of the animal(s) involved;
- Condition of the animal(s) (including carcass condition if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- If available, photographs or video footage of the animal(s); and
- General circumstances under which the animal was discovered.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact 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 (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 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 harassment, NMFS considers other factors, such as the

likely nature of any impacts or responses (*e.g.*, intensity, duration), the context of any impacts or responses (*e.g.*, critical reproductive time or location, foraging impacts affecting energetics), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS' implementing regulations (54 FR 40338, September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, the discussion of our analysis applies to California sea lions and harbor seals, given that the anticipated effects of this activity on these different marine mammal stocks are expected to be similar. Where there are meaningful differences between these species, in anticipated individual responses to activities, impact of expected take on the population due to differences in population status, or impacts on habitat, they are described independently in the analysis below.

Pile installation and removal activities have the potential to disturb or displace marine mammals. Specifically, the project activities may result in take, in the form of Level B harassment and, for harbor seals, Level A harassment, from underwater sounds generated from impact pile installation and vibratory pile installation and removal activities. Potential takes could occur if individuals move into the ensonified zones when these activities are underway.

No serious injury or mortality would be expected, even in the absence of required mitigation measures, given the nature of the activities. Further, no take by Level A harassment is anticipated for California sea lions due to the application of planned mitigation measures, such as shutdown zones that encompass the Level A harassment

zones for this species. The potential for harassment would be minimized through the construction method and the implementation of the planned mitigation measures (see **Proposed Mitigation** section).

Take by Level A harassment is proposed for harbor seals during Year 2 as the Level A harassment zone for impact pile driving exceeds the size of the shutdown zone for this activity. Therefore, there is the possibility that an animal could enter a Level A harassment zone without being detected, and remain within that zone for a duration long enough to incur PTS. Any take by Level A harassment is expected to arise from, at most, a small degree of PTS (*i.e.,* minor degradation of hearing capabilities within regions of hearing that align most completely with the energy produced by impact pile driving such as the low-frequency region below 2 kHz), not severe hearing impairment or impairment within the ranges of greatest hearing sensitivity. Animals would need to be exposed to higher levels and/or longer duration than are expected to occur here in order to incur any more than a small degree of PTS.

Further, the amount of take proposed for authorization by Level A harassment for species is very low. For California sea lions, NMFS anticipates and proposes to authorize no Level A harassment take over the duration of the City's planned activities; for harbor seals, NMFS proposes to authorize no take by Level A harassment in Year 1 and no more than 74 takes by Level A harassment in Year 2. If hearing impairment occurs, it is most likely that the affected animal would lose only a few decibels in its hearing sensitivity. Due to the small degree anticipated, any PTS potential incurred would not be expected to affect the reproductive success or survival of any individuals, much less result in adverse impacts on the species or stock.

The takes from Level B harassment would be due to potential behavioral disturbance. On the basis of reports in the literature as well as monitoring from other similar activities, effects would likely be limited to reactions such as avoidance, increased

swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.,* Thorson and Reyff 2006; NAVFAC SW, 2018). Most likely, individuals would simply move away from the sound source and temporarily avoid the area where pile driving is occurring. If sound produced by project activities is sufficiently disturbing, animals are likely to simply avoid the area while the activities are occurring. Marine mammals could also experience TTS if they move into the Level B monitoring zone. 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. Thus, it is not considered an injury. While TTS could occur, it is not considered a likely outcome of this activity. We expect that any avoidance of the project areas by marine mammals would be temporary in nature and that any marine mammals that avoid the project areas during construction would not be permanently displaced. Short-term avoidance of the project areas and energetic impacts of interrupted foraging or other important behaviors is unlikely to affect the reproduction or survival of individual marine mammals, and the effects of behavioral disturbance on individuals is not likely to accrue in a manner that would affect the rates of recruitment or survival of any affected stock. The potential for harassment is minimized through construction methods and the implementation of planned mitigation strategies (see **Proposed Mitigation** section).

Anticipated and authorized takes are expected to be limited to short-term Level A (potential PTS) and Level B harassment (behavioral disturbance) as construction activities will occur over the course of 14 days in Year 1 and 98 days in Year 2. Take would also occur within a limited, confined area of each stock's range. Level A and Level B harassment would be reduced to the level of least practicable adverse impact through use of mitigation measures described herein. Further, the amount of take authorized is extremely small when compared to stock abundance.

No marine mammal stocks for which incidental take authorization is proposed are listed as threatened or endangered under the ESA or determined to be strategic or depleted under the MMPA. The relatively low marine mammal occurrences in the area, small shutdown zones, and proposed monitoring make injury takes of marine mammals unlikely. The shutdown zones would be thoroughly monitored before the proposed pile installation or removal begins, and construction activities would be postponed if a marine mammal is sighted within the shutdown zone. There is a high likelihood that marine mammals would be detected by trained observers under environmental conditions described for the proposed project. Therefore, the proposed mitigation and monitoring measures are expected to reduce the amount and intensity for Level A and Level B behavioral harassment. Furthermore, the pile installation and removal activities analyzed here are similar to, or less impactful than, numerous construction activities conducted in other similar locations which have occurred with no reported injuries or mortality to marine mammals, and no known long-term adverse consequences from behavioral harassment.

The proposed project is not expected to have significant adverse effects on marine mammal habitat. There are no Biologically Important Areas or ESA-designated critical habitat within the project area, and the proposed activities would not permanently modify existing marine mammal habitat. The activities may cause fish to leave the area temporarily. This could impact marine mammals' foraging opportunities in a limited portion of the foraging range, however, due to the short duration of activities and the relatively small area of affected habitat, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

In combination, we believe that these factors, as well as the available body of evidence from other similar activities, demonstrate that the potential effects of the specified activities would have only minor, short-term effects on individuals. The

specified activities are not expected to impact reproduction or survival of any individual marine mammals, much less affect rates of recruitment or survival and would therefore not result in population-level impacts.

In summary and as described above, the following factors primarily support our preliminary determination that the impacts resulting from this activity are not expected to adversely affect any of the species or stocks through effects on annual rates of recruitment or survival:

- No serious injury or mortality is anticipated or authorized;
- No Level A harassment of California sea lions is proposed;
- The small Level A harassment takes of harbor seals proposed for authorization are expected to be of a small degree;
- The intensity of anticipated takes by Level B harassment is relatively low for all stocks. Level B harassment would primarily be in the form of behavioral disturbance, resulting in avoidance of the project areas around where pile driving or removal activities are occurring;
- Biologically important areas or critical habitat have not been identified within the project area;
- The lack of anticipated significant or long-term effects to marine mammal habitat;
- Effects on marine mammal prey species are expected to be short-term and, therefore, any associated impacts on marine mammal feeding are not expected to result in significant or long-term consequences for individuals, or to accrue to adverse impacts on their populations; and
- The efficacy of the mitigation measures in reducing the effects of the specified activities on all species and stocks.

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 the proposed activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted previously, only small numbers of incidental take may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is fewer than one-third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The instances of take NMFS proposes to authorize is below one-third of the estimated stock abundance for all impacted stocks (Table 9). (In fact, take of individuals is less than 4 percent of the abundance for all affected stocks.) The number of animals that we expect to authorize to be taken would be considered small relative to the relevant stocks or populations, even if each estimated take occurred to a new individual. Furthermore, these takes are likely to only occur within a small portion of the each stock's range and the likelihood that each take would occur to a new individual is low.

Based on the analysis contained herein of the proposed activity (including the proposed mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS preliminarily finds that small numbers of marine mammals would be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated 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

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species.

No incidental take of ESA-listed species is proposed for authorization or expected to result from this activity. Therefore, NMFS has determined that formal consultation under section 7 of the ESA is not required for this action.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to the City for conducting pile driving activities in the Harbor in July 2023 and July through September 2024, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA can be found at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities.*

Request for Public Comments

We request comment on our analyses, the proposed authorization, and any other aspect of this notice of proposed IHA for the proposed construction. We also request comment on the potential renewal of this proposed IHA as described in the paragraph

below. Please include with your comments any supporting data or literature citations to help inform decisions on the request for this IHA or a subsequent renewal IHA.

On a case-by-case basis, NMFS may issue a one-time, 1-year renewal IHA following notice to the public providing an additional 15 days for public comments when (1) up to another year of identical or nearly identical activities as described in the **Description of Proposed Activities** section of this notice is planned or (2) the activities as described in the **Description of Proposed Activities** section of this notice would not be completed by the time the IHA expires and a renewal would allow for completion of the activities beyond that described in the *Dates and Duration* section of this notice, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to the needed renewal IHA effective date (recognizing that the renewal IHA expiration date cannot extend beyond 1 year from expiration of the initial IHA).
- The request for renewal must include the following:

(1) An explanation that the activities to be conducted under the requested renewal IHA are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.*, reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take).

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

Upon review of the request for renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: February 21, 2023.

Kimberly Damon-Randall,

Director, Office of Protected Resources,

National Marine Fisheries Service.

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