



H. T. HARVEY & ASSOCIATES
Ecological Consultants

Alameda Point Seaplane Lagoon Ferry Terminal Application for Incidental Harassment Authorization for Marine Mammals

Project #3333-14

Prepared for:

Jolie Harrison, Division Chief
NOAA Fisheries
Permits and Conservation Division,
Office of Protected Resources
1315 East-West Highway, F/PR1 Room 13805
Silver Spring, MD 20910

Prepared by:

H. T. Harvey & Associates

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983 University Avenue, Building D • Los Gatos, CA 95032 • Ph: 408.458.3200 • F: 408.458.3210

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List of Preparers

Stephen Rottenborn, Ph.D., Principal-In-Charge, Senior Wildlife Ecologist

Robin Carle, M.S., Senior Wildlife Ecologist

Section 1. Description of Specified Activity

The City of Alameda is requesting incidental take authorization under Section 101(a)(5) of the Marine Mammal Protection Act (MMPA) of 1972, as amended, for the potential harassment of marine mammals that may result from the Alameda Point Seaplane Lagoon Ferry Terminal Project in Alameda, California. The MMPA protects marine mammal species from take, which is defined as "to harass, hunt, capture or kill, or attempt to harass, hunt, capture or kill." Section 101(a)(5) of the MMPA allows the National Marine Fisheries Service (NMFS) to authorize the incidental harassment of marine mammals via the issuance of an Incidental Harassment Authorization (IHA), provided an activity results in negligible impacts on marine mammals and would not adversely affect subsistence use of these animals.

The proposed Project could potentially result in the incidental harassment of the harbor seal (*Phoca vitulina*), California sea lion (*Zalophus californianus*), harbor porpoise (*Phocoena phocoena*), northern elephant seal (*Mirounga angustirostris*), gray whale (*Eschrichtius robustus*), northern fur seal (*Callorhinus ursinus*), and bottlenose dolphin (*Tursiops truncatus*), which are protected under the MMPA, due to pile driving activities that will occur in Seaplane Lagoon. The City of Alameda is requesting an IHA for Level A (i.e., permanent threshold shift or other non-serious injury) and Level B (i.e., behavioral disturbance or temporary threshold shift) harassment of these species. No serious injury or mortality of marine mammals is anticipated.

1.1 Project Purpose

The purpose of the Project is to provide facilities to expand the existing ferry service from Alameda and Oakland to San Francisco in order to address the limited capacity at the existing Main Street Ferry Terminal, accommodate the anticipated increase in demand for ferry service from Alameda to San Francisco due to planned development of the Alameda Point Project, and to provide enhanced emergency response services to Alameda in the event of transbay service disruptions.

Currently, the nearest operational ferry terminal to Alameda Point is the Alameda Main Street Terminal along the Oakland Alameda Estuary. There is also a ferry terminal that serves Oakland's Jack London Square. Both of these terminals are owned and operated by the San Francisco Bay Area Water Emergency Transportation Authority (WETA). Peak time ferry service demand is at capacity. It is not unusual for passengers to be left behind at Alameda during the morning commutes, and parking demand at the facility currently outstrips available spaces. Ferry ridership at the Alameda Main Street WETA terminal is currently at 94% capacity and rose 12% in the last calendar year. WETA and the City intend to establish a commute-oriented ferry service between Seaplane Lagoon and San Francisco once operating funds and terminal and vessel assets are secured to operate the expansion service.

1.2 Project Description

Seaplane Lagoon is located at the western end of Alameda Island within the 150-acre Waterfront Town Center area of Alameda Point and on the former Alameda Point Naval Air Station in Alameda, California (Figure 1). The Project area is located along the eastern shoreline of Seaplane Lagoon, west of Ferry Point, south of West Atlantic Avenue, and north of West Oriskany Avenue (Figure 2).

The Project encompasses both landside and waterside components, including the construction and operation of a new ferry terminal along the eastern edge of Seaplane Lagoon (Figure 3). The new ferry terminal would provide service from Alameda to San Francisco and offer a direct route and shorter commute time than current ferry service from the Main Street Ferry Terminal. In addition, the Project would construct intermodal facilities adjacent to Seaplane Lagoon Ferry Terminal, including a passenger drop off location, new bike lanes and bike parking, a pedestrian promenade, and a new parking facility with up to 451 parking spaces.

1.2.1 In-Water Components

1.2.1.1 Abutment and Pier

A pier and abutment are required at the entrance to the ferry terminal to provide secure and safe entry from the land to the passenger access gangway (Figure 3). The pier will extend out from the abutment to provide sufficient depth for the ferry vessels and float. The abutment will be located on the shoreline and will consist of a concrete abutment (24 feet long by 3 feet wide) supported on steel piles. The pier will be placed in the water and consist of a cast-in-place concrete structure (83.1 feet long by 20 feet wide) supported on piles with a perimeter guardrail. Approximately six 24-inch-diameter octagonal concrete piles offshore of the revetment and four 24-inch-diameter steel piles inshore of the revetment will be used for the pier. The abutment and pier deck will be installed above the high tide line. The finished deck surface will have an elevation of +14 feet NAVD88[1].

The pier will be covered by a canopy similar to those on other San Francisco Bay Area WETA terminals in the San Francisco Bay Area. Dimensions would be longer than the pier by 16 feet (100 feet long by 20 feet wide), with an approximate height of 8.5 feet to 20 feet above the pier deck. The additional length would overhang the pier landside and shade the stairs up to the pier. The pier will serve as a passenger waiting area, and could include benches and educational interpretive signs to enhance the waiting area for ferry passengers. A security gate at the west end of the pier will regulate access to the gangway. Ticketing facilities will be provided on the vessels; a commuter Clipper Card reader could also be installed on the pier (beyond the security gate).

[1] The North American Vertical Datum of 1988 (NAVD88) is the vertical control datum of orthometric height established for vertical control surveying in the United States of America based upon the General Adjustment of the North American Datum of 1988.

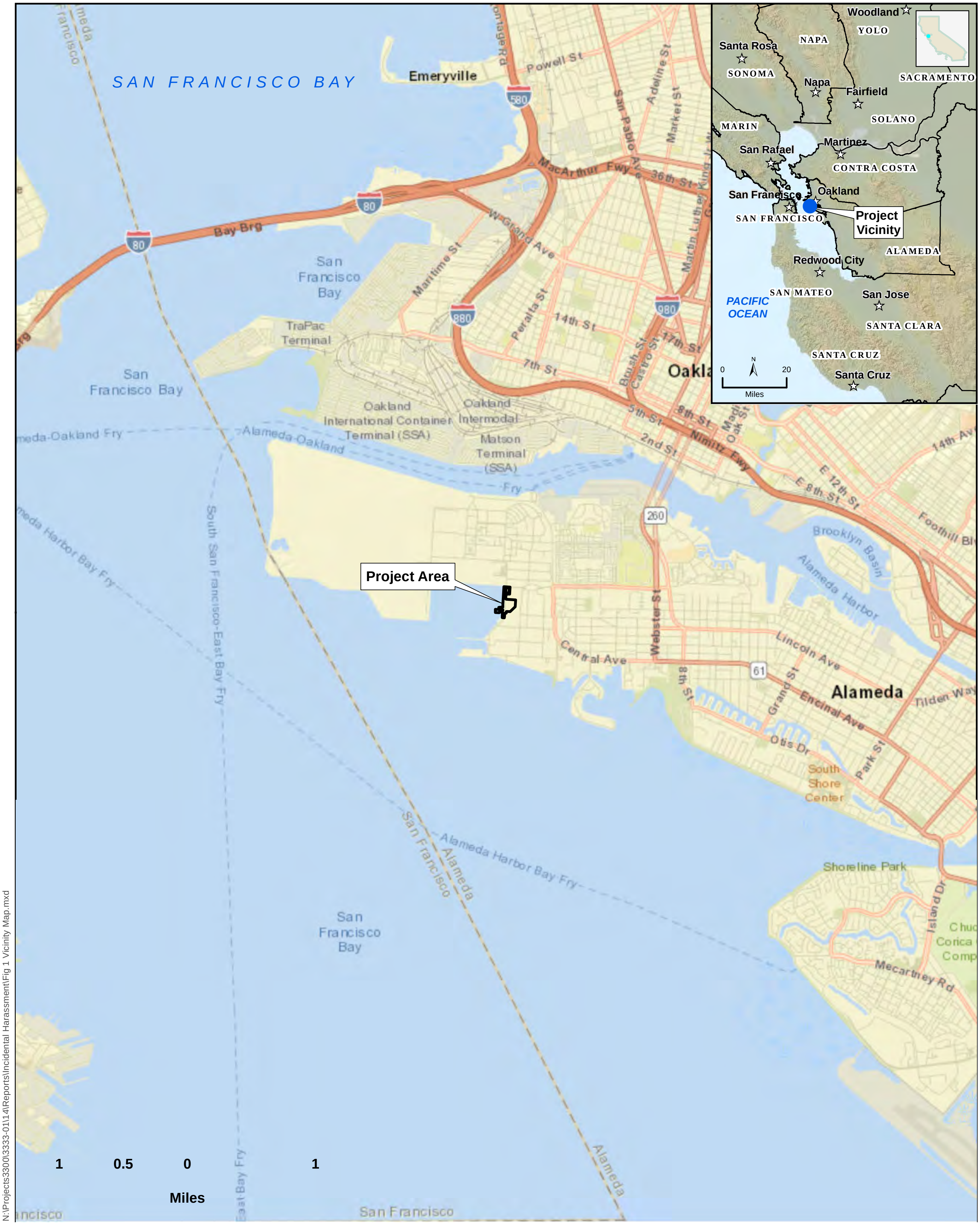

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Figure 1. Vicinity Map
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Figure 2. Project Area
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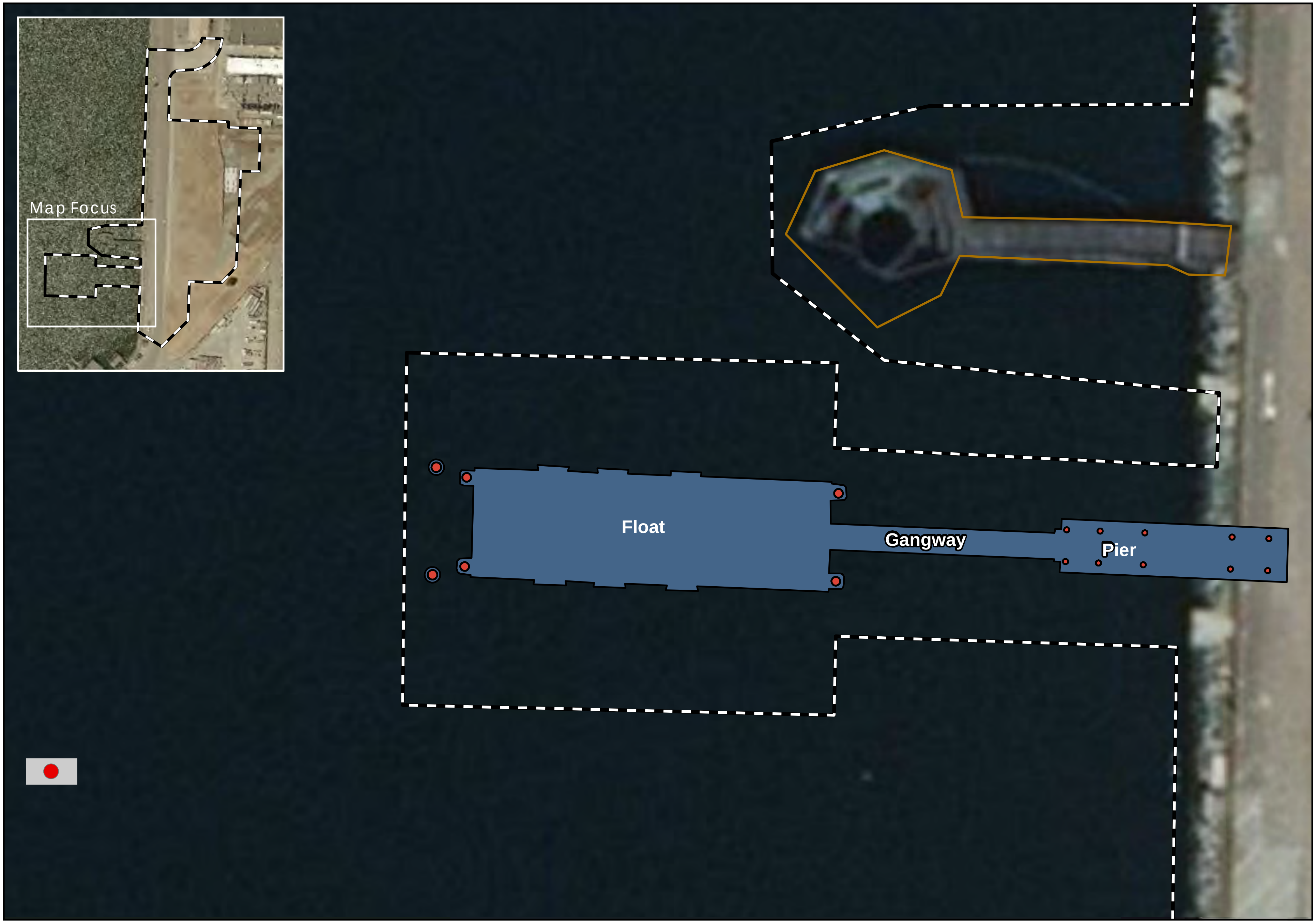

N:\Projects3300\3333-01\14\Reports\Incidental Harassment\Fig 3 Ferry Terminal Overview.mxd

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Figure 3. Ferry Terminal Overview
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1.2.1.2 Gangway

A gangway will connect the pier to the boarding float (Figure 3). The aluminum gangway (90 feet long by 10 feet wide) will be supported on the landside end of the pier by cantilevered seat supports, and the waterside end of the gangway will be supported by a boarding float. On the float, the gangway will be fitted with a UHMU slider to permit relative movement for tides and float motion. The finished walking surface, which will consist of fiberglass micromesh decking, will range in elevation from 8.4 feet at the pier to approximately 4.4 feet above the water surface on the boarding float.

The pier and gangway will provide the necessary distance from shore to allow the ferry to dock at sufficient water depth for navigation. At the proposed Seaplane Lagoon Ferry Terminal location, there is sufficient depth for terminal operations and no dredging will be required for construction or operations of the ferry.

1.2.1.3 Boarding Float

The Seaplane Lagoon Ferry Terminal will include a boarding float where passengers will board and disembark from the ferry (Figure 3). The float structure will be a steel pontoon barge (135 feet long by 42 feet wide by 8 feet deep) with internal compartments. Fenders and mooring cleats will be located around the perimeter of the float to accommodate vessel berthing scenarios. The float will be held in position with an arrangement of four 36-inch-diameter steel guide piles and two 36-inch-diameter steel fender piles, totaling six piles (Figure 3). The fender piles will provide protection to both the float and the vessel should the ferry have navigational problems. The float will be placed in a minimum water depth relative to the lowest observed tide.

1.2.1.4 Waterside Utilities

The Seaplane Lagoon Ferry Terminal will require electrical and mechanical utilities. Electrical service will be provided by Alameda Municipal Power and water will be provided by East Bay Municipal Utility District. Required communication lines will be installed concurrently with other utilities.

The terminal will be designed to minimize artificial lighting over the water. Lighting will also be required on the pier, gangway, and float. Lighting will include a system for safe operations (loading and unloading of passengers) during non-daylight conditions and security lighting during non-operating hours. Navigation lights will be included; these lights are typically mounted on top of fenders, emit a blue light, and are solar powered. Water will be required for wash-down purposes on the float, gangway, and pier. A dry standpipe will provide fire water to the float.

1.2.2 Landside Components

Access and parking improvements will include new paving for bicycle, pedestrian, transit, and vehicular circulation and the installation of a 451-space parking facility. Near the proposed ferry terminal, Ferry Point will remain a two-lane road (one lane each direction), but will be reconfigured with a sidewalk, cycle track, and pedestrian plaza/promenade along the waterfront. Ferry Point will be reconfigured from just north of West Oriskany Avenue to just south of West Atlantic Avenue. The roadway will be 22 feet wide with one lane in each direction. Bicycle amenities will include a two-way cycle track along Ferry Point, with a 3-foot buffer separating the roadway from the cycle track, and bicycle parking immediately north of the new ferry terminal. Along the waterfront, a 29-foot pedestrian promenade will be designated.

An asphalt surface parking lot will be constructed on the existing vacant lot located across Ferry Point from the proposed Seaplane Lagoon Ferry Terminal. This parking lot will have approximately 451 parking spaces and will include drop-off at its southern end, immediately across Ferry Point from the terminal. The parking lot will be accessible from four pedestrian crosswalks connecting the parking area to the promenade.

Utilities for landside improvements will include electrical service for the roadway and parking lighting. In addition, new storm drains will be installed in the paved area of the temporary parking lot and a temporary bus stop. Storm drains from parking areas will drain into the stormwater management treatment basins.

1.2.2.1 Shoreline Ramps

Due to the proposed elevation of the pier, which will be approximately 2.5 feet above the existing landside grade and approximately 5 feet above the high tide line, two ramps will be constructed to facilitate access to/from the Seaplane Lagoon Ferry Terminal. The ramps will be constructed of cast in place concrete material. The ramps will be constructed on the existing shoreline revetment and over appropriate sub-base material and the underlying soil shall be stabilized as part of this Project, outside the high tide line, and will be parallel to the roadway for passengers approaching the terminal from the south and north. The ramps will have a slope in accordance with the Americans with Disabilities Act guidelines. There will also be a stairway for passengers approaching from the east.

1.2.3 Operations

1.2.3.1 Proposed Ferry Service

The Project will expand ferry service to western Alameda by constructing a new terminal at Seaplane Lagoon while maintaining the existing Main Street Ferry Terminal service. The new route will be commute-oriented, with approximately 20-minute service between Seaplane Lagoon and San Francisco. The new service will have three AM peak period departures to San Francisco and two return trips to Seaplane Lagoon (6:00 to 9:00 a.m.), and three PM peak period departures to Seaplane Lagoon and two return trips to San Francisco (4:00 to 8:00 p.m.).

Service will operate approximately 253 days a year. One primary and one spare vessel will be dedicated to service at the Seaplane Lagoon Ferry Terminal. Service for special events could be provided subject to WETA's board policy for special event service cost recovery; however, due to dock capacity constraints at AT&T Park, it is not anticipated that AT&T baseball game service will be provided from the Seaplane Lagoon Ferry Terminal.

1.2.3.2 Vessel Characteristics, Navigation, and Berthing

The vessel used for operations at the Seaplane Lagoon Ferry Terminal will be similar to the future vessels currently under construction (209 tons, 135 feet long). The top speed of these vessels is approximately 27 knots, and their maximum capacity is 400 passengers. These vessels have propulsion engines, which use diesel fuel, and the vessel engines are Tier 3 with Selective Catalytic Reduction, which results in an emissions reduction equivalent to Tier 4 engines. Passenger walkways and ramps are approximately 5 to 8 feet above the water. These vessels typically require a 270-foot-diameter turning area, which will be provided west of the terminal. Vessel fueling and sewage outflow procedures will take place at WETA's proposed Central Bay Operations and Maintenance Facility.

The proposed ferry route will travel through established navigation channels within the San Francisco Bay. When departing Seaplane Lagoon, the ferry vessel will turn west upon reaching the southern end of the Lagoon and will then travel northwest towards San Francisco before turning west upon reaching the San Francisco Ferry Terminal. The service route will be reversed in the opposite direction but would remain essentially the same, with slight modifications for currents and other navigational constraints.

1.2.3.3 Security and Maintenance

The proposed terminal will be designed as an unstaffed facility with a security gate at the end of the pier by the gangway and will be open only when a vessel is at the terminal, generally for 5 to 10 minutes. The boat captain will dock and tie up the ferry to the float. The ferry operator will then unlock and open the gate for passenger entry and departures. Lighting will be installed for passenger safety during early morning and late evening departures and arrivals, as well as for property protection. WETA will be responsible for operating waterside facilities through either transfer of ownership or long-term lease, and the City will be responsible for landside facilities.

1.2.4 Construction Methods

1.2.4.1 Demolition

Proposed mitigation for the Project will include demolition of the existing (deteriorating) wooden pier and the existing structure located on the area where the parking lot will be constructed. The existing timber pier structure, including the existing handrail, timber deck, timber stringers, and fencing, will be demolished and removed from the lagoon. All debris will be off-hauled, processed, and properly disposed of. The piles will be cut at the mudline and pulled out of the water; no vibratory equipment will be used in the removal of the piles. Timber piles that have been treated with creosote, or that contain other potentially hazardous materials, will be handled properly and disposed of at a facility permitted to handle hazardous waste. The on-shore concrete abutments will remain. Debris on the seafloor in the pier's vicinity will be removed and disposed of on land.

1.2.4.2 Access and Parking Facilities Construction

Landside construction activities for the ferry terminal access and parking facilities involve site preparation, including minor demolition; rough grading of the parking lot, pathway; installation of the rock base for the parking lot, and pathway; surface painting of the parking lot and roadway bicycle track; and promenade striping. Minor excavation will be required to install the underground utilities and stormwater controls. Construction equipment will include excavators, compactors, graders, pickup trucks, concrete trucks, and dump trucks.

1.2.4.3 Ferry Terminal Construction

Ferry terminal construction activities include soil improvements and revetment work; construction and installation of the abutment, pier, gangway and float; and utility installation. Four 24-inch steel piles will be driven above the high tide line as a part of the pier (Table 1). Construction equipment will include a land-based pile driving rig, barge-mounted pile driver with vibratory and impact hammer equipment, flat deck barge and tug boat for pile delivery, work boat and work skiff, concrete transit trucks, concrete pumpers, material delivery trucks, air compressors, generators, backhoes, and dump trucks.

Table 1. Pile Installation Details

Project Component	Pile Type	Pile Size (diameter)	Number of Piles	Pile Location	Installation Methods
Pier	Concrete	24-inch	6	In water	Pile driver operated from barge-mounted crane
Pier	Steel	24-inch	4	On land	Pile driver operated from land
Boarding Float	Steel	36-inch	6	In water	Pile driver operated from barge-mounted crane
All	Steel H-type	14-inch	18[1]	In water	Pile driver operated from barge-mounted crane

[1]Up to 18 H-type template piles may be driven to support in-water pile driving.

1.2.4.4 Pile Installation

Piles will be installed for the abutment, pier, and float. The 36-inch steel piles will be installed with a vibratory hammer, 24-inch concrete piles will be installed with an impact hammer, and 14-inch steel template piles will be installed with a vibratory hammer. The abutment piles will be installed from the landside, and are expected to require an impact hammer to penetrate the underlying material. Four steel piles (the abutment piles) will be installed above the high tide line and six octagonal concrete piles will be installed below the high tide line (see Table 1). These six in-water piles will be installed using a pile driver operated from barge-mounted cranes. The barges for this equipment are variable, but will likely be approximately 150 feet long by 40 to 60 feet wide. The barge will be held in place with anchors and/or barge spuds. Spuds (steel pipe piles affixed to the barge) will be lowered into the lagoon substrata to hold the barge in position during the specific operation. The barge will be moved and positioned with a tugboat. A material barge adjacent to the crane barge will provide the construction materials (such material barges are typically small, about 90 to 120 feet long by 35 to 50 feet wide). The abutment piles will be installed using a pile driver operated from land.

Template piles will be used to support the in-water piles. These will consist of 12 to 18 14-inch steel H-type piles. One template typically includes four piles, but up to six template piles would be used at one time.

1.2.5 Pier Deck

The pier deck will be a cast-in-place concrete structure. After pile installation, formwork will be installed, supported on the piles. After the reinforcing bars are placed, the concrete will be poured using concrete transit trucks. The concrete mix will be pumped from the shore to the pier. Once the concrete has gained adequate strength, the formwork will be removed. At this point, the pier will be ready for installation of the gangway. No dewatering will occur as part of the proposed Project.

1.2.5.1 Gangway and Float

Both the float and the gangway will be fabricated at off-site locations. Once completed, the float and gangway will be transported by barge to the ferry terminal site and installed after the pier is in place. This installation will require a barge-mounted crane. Fabrication of these two structures will most likely start prior to construction work at the Alameda Point Seaplane Lagoon Ferry Terminal site.

The float will be transported to the site once the other terminal work is ready to receive it. The float could be placed in position and then the guide piles driven through the pile collars. (Some contractors elect to follow the reverse procedure by installing the piles first.) Approximately six 36-inch diameter steel pipe guide piles will hold the float in position. Installation of these piles will follow the same procedure and involve similar equipment as the piles supporting the pier (i.e. installed using a pile driver operated from barge-mounted cranes).

The two 36-inch diameter fender steel piles will be installed following the same procedure as the guide piles and involve similar equipment. Once installed, a donut fender will be placed on each pile. The donut fender floats and thus follows the tide, providing protection to the vessel at the appropriate height above the water line.

1.2.5.2 Waterside Utilities

Utilities service will be located in the street immediately adjacent to the pier. The utility improvements will likely be hard-piped out to the end of the pier for future connection to the gangway. The float and gangway will be outfitted with all utilities and fixtures on site. Utilities on the pier will be attached after removal of the pier formwork. Connection of the utilities will require flexible lines between the pier and gangway and between the gangway and float.

1.3 Components of the Activity that May Result in Take

Construction of the new pier and boarding float will require the use of a pile driver to install new pilings (see Section 1.2.4.4). Sounds generated by percussive pile driving have the potential to affect marine mammals in several ways, ranging from the alteration of behavior to physical injury or mortality depending on the intensity and characteristics of the sound, the distance and location of the animal relative to the sound source, and the size and species of animal involved. The potential acoustic effects of Project pile driving are summarized in Table 2, and the anticipated impacts of pile driving activities on marine mammals are described in detail in Section 7. No project activities other than pile driving are anticipated to result in the take of marine mammals under the MMPA, as other activities will be much less intensive compared to pile driving. No impacts on marine mammals are anticipated to occur during the installation of any piles on land.

Table 2. Project Pile Driving Summary[1]

	Impact Hammer	Vibratory Hammer	
	24-inch Concrete Piles	36-inch Steel Piles	14-inch Steel H-Type Piles
Source Level (Single Strike SEL[2]) (dB)	166	-	-
Peak SPL[3] (dB)	193	-	-
Source Level (RMS SPL[4]) (dB)	176	170	155
Distance of Measurement (meters)	10	10	10
Number of Strikes per Pile	3100	N/A	N/A
Duration to Drive a Single Pile (minutes)[5]	N/A	20	4
Number of Piles per Day	1	1	6
Number of Days Piles will be Driven	6	6	12

[1]The data provided are rough estimates from documented acoustic observations of similar activities on previous projects (California Department of Transportation 2015). Because Project hammer sizes, cushions, pile tip designs, and other factors that may affect the attenuation of sound underwater are unknown, actual numbers may differ from those provided (though because of our conservative approach, if the actual numbers differ, they are likely to be less than those shown here).

[2]Single strike Sound Exposure Level (SEL) measured at 10 meters. No bubble curtain or other means of sound attenuation was used. For purposes of isopleth calculation using the NMFS spreadsheet, we assumed that the Project's use of an air bubble curtain would reduce the Single Strike SEL by 7 dB (only measured values are provided in Table 2; values adjusted for attenuation are used in the Section 6 analysis).

[3]Peak Sound Pressure Level (SPL). No bubble curtain or other means of sound attenuation was used. For purposes of isopleth calculation using the NMFS spreadsheet, we assumed that the Project's use of an air bubble curtain would reduce the Peak SPL by 7 dB (only measured values are provided in Table 2; values adjusted for attenuation are used in the Section 6 analysis).

[4]Root-Mean-Square (RMS) peak Sound Pressure Level (SPL); or the maximum instantaneous SPL measured at 10 meters over the impulse duration. No bubble curtain or other means of sound attenuation was used. For purposes of isopleth calculation using the NMFS spreadsheet, we assumed that the Project's use of an air bubble curtain would reduce the Source Level RMS SPL by 7 dB for piles driven with an impact hammer (only measured values are provided in Table 2; values adjusted for attenuation are used in the Section 6 analysis).

[5]The number of minutes needed to drive each pile was not available for all pile/hammer combinations. The data provided are worst-case-scenario estimates based on estimates from the Project engineer and documented observations of similar activities on previous projects (California Department of Transportation 2015).

The Project pile driving information provided in Table 2 can be used by NMFS to independently determine injury distances for marine mammal species. In addition, for the purpose of this assessment, we used the following assumptions for calculations using the NMFS user spreadsheet (NMFS 2018):

- We used a weighting adjustment factor of 2.0 kilohertz for an impact hammer and 2.5 kilohertz for a vibratory hammer, per the guidance provided by NMFS.
- We used a practical spreading model to calculate transmission loss for pile driving activities occurring underwater.
- We assumed that air bubble curtains would be used for all underwater impact driving, and that use of a bubble curtain will provide approximately 7 decibels (dB) of sound attenuation.

As described in Section 11, the Project will also use 12-inch thick wooden cushion blocks to reduce sound levels from impact pile driving. However, per guidance provided by the California Department of Transportation (2015), we have not assumed any reduction in sound levels from the use of these blocks.

Calculations of injury distances for marine mammals using the data from Table 2 are provided in Section 6.

Section 2. Dates, Duration, and Specified Geographic Region

2.1 Duration of Project Activities

Project construction is expected to begin in 2019 and will be completed within approximately one year of initiation. All of the in-water work (float installation with piles and gangway) will be completed within one environmental work season (June 1 to November 30).

Construction will occur during weekdays and on weekends if needed. Site preparation and ground improvements will occur over one month, and could overlap with in-water work. Construction of landside improvements will require approximately 4 to 6 months.

For the ferry terminal, fabrication of the float and gangway will be completed off-site. The pier and abutment will be completed before the arrival of the float and gangway. With the pier completed, the float will be brought in and located in position. This will involve installing the guide piles for the float, and most likely the fender piles at the end of the float, because the installation equipment will be at the site. Once the float is in position, the gangway will be placed using a barge crane. Utilities will then be connected.

2.2 Geographic Region

Seaplane Lagoon is located within the 150-acre Waterfront Town Center area of Alameda Point, on the former Alameda Point Naval Air Station, at the western end of Alameda Island, in the City of Alameda, California (Figure 1). The Project area is located along the eastern shoreline of Seaplane Lagoon, west of Ferry Point, south of West Atlantic Avenue, and north of West Oriskany Avenue (Figure 2). It is located within the *Oakland, California* U.S. Geological Survey 7.5-minute quadrangle. A GIS shapefile of the Project area is provided as an attachment with the electronic copy of this report.

Seaplane Lagoon is a rectangular basin approximately 3,000 feet by 1,600 feet. Breakwaters protect the basin from wind-generated waves, providing typically calm conditions. Seaplane Lagoon is bordered by an existing concrete and steel sheet pile bulkhead to the north, rock slope revetments to the east and west, and a breakwater with a 600-foot opening to the south. The proposed location of the ferry terminal is on the eastern shoreline of the lagoon (Figure 4).

The area surrounding Seaplane Lagoon consists of developed land, primarily featuring a large paved area immediately to the north, paved and vegetated areas to the west (which were formerly part of an aircraft landing area), and industrial and former military structures to the east. Existing land uses within the Project area and vicinity include warehouses and other light industrial uses. The landside portion of the Project area includes

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Figure 4. Harbor Seal Haul-Outs
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Ferry Point roadway, a concrete sidewalk on the eastern side of the roadway, and both paved and unpaved areas. Several one- and two-story industrial buildings lie to the east of the Project area. A vacant lot is located to the east of the proposed Seaplane Lagoon Ferry Terminal. This lot is partially enclosed with a fence and contains a building foundation.

No critical habitat for marine mammal species is present within or near the Project area. Two known pinniped haul-out sites in the vicinity are located on an existing haul-out platform approximately 0.5 mile southeast of the Project area (separated from Project activities by approximately 0.3 mile of developed areas on-land), and at the western end of Breakwater Island, approximately 1.0 mile southwest of the Project area (Figure 4).

Section 3. Species and Numbers of Marine Mammals

The harbor seal and California sea lion are the only marine mammal species known or expected to occur within or very close to Seaplane Lagoon. Additional marine mammal species that are less commonly observed in the San Francisco Bay but that have some potential to occasionally occur near Alameda Point are the gray whale, harbor porpoise, bottlenose dolphin, northern elephant seal, and northern fur seal. The legal status and likelihood of occurrence of these species are presented in Table 3, and additional discussions of these seven species are provided in Section 4 below, as these are the only marine mammal species that have some potential to be affected by the Project.

Additional marine mammal species that were considered for potential occurrence in the Bay off of Alameda Point, and which are also listed in Table 3, are the humpback whale (*Megaptera novaeangliae*), which occurs in the San Francisco Bay only very rarely, and Guadalupe fur seal (*Arctocephalus townsendi*), which is determined to be absent. These species are not expected to be incidentally taken by the Project. Thus, they are not discussed further in this report.

Table 3. Marine Mammal Species, Their Status, and Potential for Occurrence in the Project Vicinity

Name, DPS[1], and Stock	*Status	Minimum Stock Population Estimate	Habitat	Potential for Occurrence in the Project Vicinity
Federal or State Endangered or Threatened and MMPA Protected Species				
Humpback whale (Central America DPS, California/ Oregon/Washington Stock) (*Megaptera novaeangliae*)	FE	1,876	Breeds in Central America and forages as far north as Oregon.	**Rare in Adjacent Bay Waters.** Does not breed in the Project region. No suitable foraging habitat is present in Seaplane Lagoon due to the relatively shallow habitat, the presence of breakwaters that shelter the lagoon, and high levels of human disturbance from boat traffic and surrounding development. Rare foraging individuals in the San Francisco Bay may occur in small numbers in waters adjacent to Alameda Point, outside of the breakwaters, from May to November. An ailing humpback whale was present in Alameda Lagoon in early June 2019; however, this is an extremely unusual occurrence, and this individual is not expected to be present when pile driving activities occur later in 2019.
Humpback whale (Mexico DPS, California/Oregon/ Washington Stock) (*Megaptera novaeangliae*)	FT	1,876	Breeds along Mexico and Baja California and forages as far north as Alaska.	**Rare in Adjacent Bay Waters.** Does not breed in the Project region. No suitable foraging habitat is present in Seaplane Lagoon due to the relatively shallow habitat, the presence of breakwaters that shelter the lagoon, and high levels of human disturbance from boat traffic and surrounding development. Rare foraging individuals in the San Francisco Bay may occur in small numbers in waters adjacent to Alameda Point, outside of the breakwaters, from May to November. An ailing humpback whale was present in Alameda Lagoon in early June 2019; however, this is an extremely unusual occurrence, and this individual is not expected to be present when pile driving activities occur later in 2019.

Name, DPS[1], and Stock	*Status	Minimum Stock Population Estimate	Habitat	Potential for Occurrence in the Project Vicinity
Guadalupe fur seal (Mexico Stock) (*Arctocephalus townsendi*)	FT, SP	15,830	Breeds on offshore islands along California and Mexico. Haul-outs located on rocky shoreline on gravel beaches.	**Absent.** Does not breed or typically occur in the Project region. Rare individuals are known to strand along the California coast, but the species is not expected to forage or occur near the Project area. Determined to be absent.
State Fully Protected and MMPA Protected Species				
Northern elephant seal (California Breeding Stock) (*Mirounga angustirostris*)	SP	81,368	Occurs throughout the eastern and central North Pacific Ocean. Breeds in the Channel Islands or Baja California.	**May be Present in Adjacent Bay Waters.** Breeds along the California coast outside of the San Francisco Bay. Known to forage in the San Francisco Bay in small numbers, and occasional individuals may occur as foragers in waters off of Alameda Point from December to August.
MMPA Protected Species				
Gray whale (Eastern North Pacific DPS, Eastern North Pacific Stock) (*Eschrichtius robustus*)	Delisted	20,125	Occurs throughout the Northern Pacific Ocean.	**May be Present in Adjacent Bay Waters.** No suitable habitat is present in Seaplane Lagoon due to the relatively shallow habitat, the presence of breakwaters that shelter the lagoon, and high levels of human disturbance from boat traffic and surrounding development. Foraging individuals in the San Francisco Bay may occur in small numbers in waters adjacent to Alameda Point, outside of the breakwaters, typically from December to May.
Harbor porpoise (San Francisco-Russian River Stock) (*Phocoena phocoena*)	None	6,625	Coastal habitats in the northern hemisphere.	**May be Present in Adjacent Bay Waters.** Known to occur regularly in the San Francisco Bay, primarily north of the Bay Bridge. Small numbers of individuals may forage in waters off of Alameda Point year-round. Not expected to enter Seaplane Lagoon due to the low-quality of foraging resources in this area as well as high levels of disturbance from boat traffic and surrounding development.

Name, DPS[1], and Stock	*Status	Minimum Stock Population Estimate	Habitat	Potential for Occurrence in the Project Vicinity
Bottlenose dolphin (California Coastal Stock) (*Tursiops truncatus*)	None	346	Temperate and tropical waters worldwide.	**May be Present in Adjacent Bay Waters.** Bottlenose dolphins are uncommon as far north as the San Francisco Bay; however, occasional individuals may forage in waters off of Alameda Point year-round. Not expected to enter Seaplane Lagoon due to the low-quality of foraging resources in this area as well as high levels of disturbance from boat traffic and surrounding development.
Northern fur seal (Eastern DPS, California Stock) (*Callorhinus ursinus*)	None	7,524	Occurs across the Pacific Ocean from Japan to California. Breeds on islands in the eastern North Pacific Ocean and Bering Sea.	**Uncommon in Adjacent Bay Waters.** Does not breed in the Project region, and the species is typically pelagic during the nonbreeding season. Individuals are known to strand along the California coast, especially when off-shore waters are warm and foraging resources are reduced, and in some years small numbers of individuals (typically juveniles) may occur in the San Francisco Bay. Not expected to forage or occur regularly within or near the Project area.
California sea lion (U.S. Stock) (*Zalophus californianus*)	None	153,337	Endemic to the eastern North Pacific Ocean. Breeds and hauls out on sandy beaches or in rocky coves.	**Present.** Does not breed in the Project region, but occurs as a common resident of the San Francisco Bay year-round. Small numbers may forage in Seaplane Lagoon and haul-out on nearby breakwater islands or platforms.
Harbor seal (California Stock) (*Phoca vitulina*)	None	30,968	Temperate coastal habitats in the Pacific and Atlantic Oceans. Hauls in a variety of areas including rocks and beaches.	**Present.** Common resident of the San Francisco Bay. Moderate to small numbers are known to forage in Seaplane Lagoon and haul-out or breed on nearby breakwater islands or platforms.

[1]DPS=Distinct population segment

Section 4. Affected Species Status and Distribution

4.1 Harbor Seal

The harbor seal is a year-round resident in the San Francisco Bay and is routinely seen in Bay waters. Harbor seals have been observed as far upstream in the Delta and Sacramento River as the City of Sacramento, though their use of the habitat north of Suisun Bay is irregular (Goals Project 2000). Harbor seals feed in the deepest waters of the Bay, with the region from the Golden Gate to Treasure Island and south to the San Mateo Bridge being the principal feeding site (Kopec and Harvey 1995). They feed on a variety of fish in the Bay, such as perch, gobies, herring, and sculpin, and forage in waters in the Project area.

Harbor seals are known to use the tip of Breakwater Island, which is located approximately 1.0 mile southwest of the Project area, as a haul-out site, and these seals will forage in the area between Breakwater Island and the Project area (WETA 2011). In recent years, up to 32 harbor seals have been observed making irregular use of the Breakwater Island haul-out (AECOM 2017). The City of Alameda has also recently installed a haul-out platform approximately 0.5 mile southeast of the site. Although these locations are not considered primary haul-outs for harbor seals due to the relatively low numbers of individuals that are present, Breakwater Island and the City haul-out platform are reportedly the only haul-out sites in the central Bay that are accessible to seals throughout the full tidal range.

A local group of Alameda Point Harbor Seal Monitors regularly counts the number of harbor seals at Alameda Point, and based on count data from 2014 to 2019 an average of 11.7 harbor seals is present at Alameda Point year-round (Bangert 2019). However, the numbers of harbor seals present in the area varies considerably with season, with higher numbers in the winter due to the presence of spawning Pacific herring (*Clupea pallasii*) in the San Francisco Bay. Project pile driving activities will occur during the months of August and September, and therefore we estimated the average number of harbor seals based on count data these months only. The data summary indicated that the numbers of harbor seals present at Alameda increased in 2017 and 2018 compared to 2015 and 2016, and therefore we used count data from 2017 and 2018 only to ensure that the density estimate reflects current conditions. The average number of harbor seals counted at Alameda Point in August and September of 2017 and 2018 was 6.5 individuals.

The population size of the California stock of harbor seals has increased since the 1980s, with the highest count in 2004 (NMFS 2015b). The species is not afforded any special status under the federal Endangered Species Act, California Endangered Species Act, or MMPA. No other notable current impacts to the California stock are known.

4.2 California Sea Lion

Like the harbor seal, the California sea lion is a permanent resident in the San Francisco Bay-Delta. Sea lions are found throughout the West Coast, generally within 10 miles of shore. They breed in Southern California and the Channel Islands, after which they migrate up the Pacific coast to the Bay. They haul out on offshore rocks, sandy beaches, and onto floating docks, wharfs, vessels, and other man-made structures in the Bay and in coastal waters of California. California sea lions feed on a wide variety of seafood, mainly squid and fish and sometimes clams. This species has been recorded only infrequently and in low numbers in the vicinity of Alameda Point, but it may occasionally forage in the waters of the Project area.

Because California sea lions are not known to occur regularly at Alameda Point, we have assumed a density of 0.161 sea lions per square kilometer based on at-sea density estimates for this species produced by the California Department of Transportation, and consistent with the recent IHA for WETA's Central Bay Operations and Maintenance Facility construction project near the Seaplane Lagoon (NMFS 2015a).

All California sea lions belong to the United States stock. The population size of the species has increased since the 1980s, with the highest count in 2011 (NMFS 2015c). The species is not afforded any special status under the federal Endangered Species Act, California Endangered Species Act, or MMPA. No other notable current impacts to the species are known.

4.3 Harbor Porpoise

Harbor porpoises occur in California coastal waters to depths of approximately 150 meters. This species disappeared from the San Francisco Bay in the early 1940s and reappeared in 2008, and their abundance in the San Francisco Bay is increasing (Stern et al. 2017). Recent data from Golden Gate Cetacean Research has documented harbor porpoises in San Francisco Bay year-round, with individuals observed passing under the Golden Gate Bridge in an average group size of 2.15 and a maximum group size of 16 (Stern et al. 2017). The majority of sightings are located in the central portion of the Bay north of the Bay Bridge; the species is uncommon in the South Bay, although it is known to occasionally strand there (Stern et al. 2017). The diet of harbor porpoises consists mainly of schooling fish such as herring and mackerel (NMFS 2019), and they are known to be sensitive to acoustic disturbance (NMFS 2014).

More than 100 harbor porpoises have been documented entering the San Francisco Bay at one time, and more than 600 individuals have been identified in the San Francisco Bay (Stern et al. 2017). Based on 257 days of monitoring in the vicinity of the Bay Bridge between 2000 and 2017, when 24 harbor porpoises were observed in the vicinity of the Bay Bridge with increasing numbers in 2015–2017, the estimated density of harbor porpoises in the Project vicinity is estimated at 0.167 individuals per square kilometer (California Department of Transportation 2018).

Harbor porpoises in the San Francisco Bay belong to the San Francisco-Russian River Stock. Estimates of the population size show no apparent trend (NMFS 2014). The species is not afforded any special status under the federal Endangered Species Act, California Endangered Species Act, or MMPA. No other notable current impacts to the species are known.

4.4 Northern Elephant Seal

Northern elephant seals occur year-round off the California coast. For the majority of the year, male elephant seals forage on benthic prey between California and Alaska, and females feed on pelagic prey off the coast of Alaska and in the North Pacific Ocean (NMFS 2015d). Individuals return to land to molt between March and August, and return again to breed on offshore islands and some coastal beaches between December and March. Juvenile northern elephant seals occasionally occur as foragers in the San Francisco Bay, where approximately 100 stranding events are documented annually (California Department of Transportation 2018).

Insufficient data are available to estimate the density of northern elephant seals in the San Francisco Bay (California Department of Transportation 2018). For the purpose of this assessment and to ensure that the Project has coverage for incidental take of this species, it is assumed that up to one northern elephant seal may occur in the San Francisco Bay in the Project vicinity on up to 20% of pile driving days (i.e., up to 4.8 individuals in 24 days). This assumption is consistent with the recent IHA for the demolition and reuse of the marine foundations of the original east span of the San Francisco-Oakland Bay Bridge (California Department of Transportation 2018).

Northern elephant seals that occur in California belong to the California Breeding Stock, and the population of this stock is increasing annually (NMFS 2015d). This species is fully protected under the California Fish and Game Code, but is not afforded any special status under the federal Endangered Species Act, California Endangered Species Act, or MMPA. No other notable current impacts to the species are known.

4.5 Gray Whale

Gray whales occur primarily as migrants along the California coast, where they migrate south in October and November and return north in late winter to early spring. Individuals typically spend the summer in the Bering Sea, Chukchi Sea, and Beaufort Sea, but they are occasionally known to summer as far south as central California (California Department of Transportation 2018). Breeding and calving occur in the winter off the coast of Baja, California.

Insufficient data are available to estimate the density of gray whales in the San Francisco Bay (California Department of Transportation 2018). Gray whales are uncommon in the San Francisco Bay, and the majority of documented occurrences are from the month of May, when groups of up to five individuals have been sighted in the central and northern portions of the Bay (NMFS 2015e). It is estimated that approximately 2–6 individuals enter the Bay in a typical year (California Department of Transportation 2018); however, nine gray whales have stranded in the San Francisco Bay in 2019 (Katz 2019). For the purpose of this assessment and to ensure that the Project has coverage for incidental take of this species, it is assumed that up to 6.4 individuals could occur in the San Francisco Bay in the Project vicinity during 24 days of pile driving activities. This assumption is consistent with the recent IHA for the demolition and reuse of the marine foundations of the original east span of the San Francisco-Oakland Bay Bridge (California Department of Transportation 2018).

Gray whales that occur in the San Francisco Bay belong to the Eastern North Pacific Stock, which has a relatively stable population size (NMFS 2015e). The species is not afforded any special status under the federal Endangered Species Act, California Endangered Species Act, or MMPA. No other notable current impacts to the species are known.

4.6 Northern Fur Seal

Northern fur seals occur year-round off of the California coast, where they breed on offshore islands and forage in open waters. Males occur on shore to breed from approximately June through August, and females occur on shore to breed and raise pups from approximately June to November (NMFS 2015f). After leaving shore, both males and females remain at sea for approximately 7–8 months (NMFS 2015f). The northern fur seal population off the California coast appears to be generally increasing, although the species is highly susceptible to El Niño events and its population can experience large fluctuations in some years (NMFS 2015f).

Insufficient sighting data are available to estimate the density of northern fur seals in the San Francisco Bay (California Department of Transportation 2018). Northern fur seals rarely enter the San Francisco Bay unless they are sick, emaciated, or injured, and they are more likely to strand and occur in the Bay during El Niño events (California Department of Transportation 2018). For the purpose of this assessment and to ensure that the Project has coverage for incidental take of this species, it is assumed that one northern fur seal may occur in the San Francisco Bay in the Project vicinity on up to 10% of pile driving days (i.e., up to 2.4 individuals in 24 days). This assumption is consistent with the recent IHA for the demolition and reuse of the marine foundations of the original east span of the San Francisco-Oakland Bay Bridge (California Department of Transportation 2018).

Northern fur seals in the San Francisco Bay may belong to the California Stock or the Eastern Pacific Stock. Individuals from the California Stock breed and forage along the California coast and are more likely to be present in the vicinity of the San Francisco Bay (NMFS 2015f). Individuals from the Eastern Pacific Stock breed in the Bering Sea, but females and juveniles will travel south to forage along the California Coast during the fall and winter and may occasionally occur in the San Francisco Bay (NMFS 2015f). Northern fur seals are not afforded any special status under the federal Endangered Species Act, California Endangered Species Act, or MMPA. No other notable current impacts to the species are known.

4.7 Bottlenose Dolphin

Bottlenose dolphins occur year-round as transients along the California coast, and their distribution is largely influenced by ocean temperatures (NMFS 2017). Due to an increase in water temperatures along California, their range has recently expanded as far north as Bodega Bay (NMFS 2017).

Insufficient sighting data are available to estimate the density of bottlenose dolphins in the San Francisco Bay (California Department of Transportation 2018). Individuals in the San Francisco Bay are typically sighted near the Golden Gate Bridge, where an average of five dolphins enter the Bay approximately three times annually (NMFS 2015a). Two individuals are sighted regularly near Alameda Point, outside of the lagoon (California Department of Transportation 2018). For the purpose of this assessment and to ensure that the Project has coverage for incidental take of this species, it is assumed that 1.5 bottlenose dolphins may occur in the San Francisco Bay in the Project vicinity on all pile driving days (i.e., up to 36 individuals in 24 days). This assumption is consistent with the recent IHA for the demolition and reuse of the marine foundations of the original east span of the San Francisco-Oakland Bay Bridge (California Department of Transportation 2018).

The California coastal stock of bottlenose dolphins occurs within approximately 1 kilometer of the shoreline between central California and Mexico (NMFS 2017). This population appears to be stable or increasing (NMFS 2017). Bottlenose dolphins are not afforded any special status under the federal Endangered Species Act, California Endangered Species Act, or MMPA. No other notable current impacts to the species are known.

Section 5. Type of Incidental Taking Authorization Requested

The City is requesting take authorization from NFMS under Section 101(a)(5) of the MMPA for Level A (i.e., permanent threshold shift or other non-serious injury) and Level B (i.e., behavioral disturbance or temporary threshold shift) harassment of harbor seals, California sea lions, harbor porpoises, northern elephant seals, gray whales, northern fur seals, and bottlenose dolphins due to the exposure of individuals to underwater sounds from pile driving activities. No additional project activities are anticipated to result in take of marine mammals, and the serious injury or mortality of marine mammals is not anticipated to occur.

Section 6. Take Estimates for Marine Mammals

6.1 Applicable Noise Thresholds

NMFS publishes technical guidance for assessing the effects of construction impacts on marine mammals (NMFS 2018). A summary of the current guidance, with respect to acoustic thresholds for disturbance of marine mammals, is provided in Table 4.

Table 4. Summary of NMFS Acoustic Thresholds for the Disturbance of Marine Mammals

	NMFS Acoustic Thresholds for Disturbance[1]	
	Impulsive Sounds (Impact Pile Driving)	Non-Impulsive Sounds (Vibratory Pile Driving)
Level A Harassment Underwater Thresholds		
Harbor Seal and Northern Elephant Seal	PK: 218 dB SEL_{CUM}: 185 dB	SEL_{CUM}: 201 dB
California Sea Lion and Northern Fur Seal	PK: 232 dB SEL_{CUM}: 203 dB	SEL_{CUM}: 219 dB
Harbor Porpoise	PK: 202 dB SEL_{CUM}: 155 dB	SEL_{CUM}: 173 dB
Bottlenose Dolphin	PK: 230 dB SEL_{CUM}: 185 dB	SEL_{CUM}: 198 dB
Gray Whale	PK: 219 dB SEL_{CUM}: 183 dB	SEL_{CUM}: 199 dB
Level B Harassment Underwater Thresholds		
All Species	RMS: 160 dB	RMS: 120 dB

[1]PK = peak sound level, SEL_{cum} = weighted cumulative sound exposure level, RMS = root mean square sound pressure level

6.2 Distances to Acoustic Thresholds

A summary of the distances to NMFS acoustic thresholds for Project pile driving activities is provided in Tables 5 and 6.

Table 5. Distances to NMFS Acoustic Thresholds for Impact Pile Driving

Species and Location	Threshold[1] (Impulsive Sounds)	Distance to Threshold (meters) 24-inch Concrete Piles
Level A Thresholds		
Harbor Seal and Northern Elephant Seal	PK: 218 dB	<1.0
	SEL_{CUM}: 185 dB	28.5
California Sea Lion and Northern Fur Seal	PK: 232 dB	<1.0
	SEL_{CUM}: 203 dB	2.1
Harbor Porpoise	PK: 202 dB	<1.0
	SEL_{CUM}: 155 dB	63.5
Bottlenose Dolphin	PK: 230 dB	<1.0
	SEL_{CUM}: 185 dB	1.9
Gray Whale	PK: 219 dB	<1.0
	SEL_{CUM}: 183 dB	53.3
Level B Thresholds		
All Species	RMS: 160 dB	39.8

[1]PK = peak sound level, SEL_{cum} = weighted cumulative sound exposure level, RMS = root mean square sound pressure level

Table 6. Distances to NMFS Acoustic Thresholds for Vibratory Pile Driving

		Distance to Threshold (meters)	
Species and Location	Threshold[1] (Non-Impulsive Sounds)	36-inch Steel Piles	14-inch Steel H-Type Piles
Level A Thresholds			
Harbor Seal and Northern Elephant Seal	SEL_{CUM}: 201 dB	7.9	0.9
California Sea Lion and Northern Fur Seal	SEL_{CUM}: 219 dB	0.6	0.1
Harbor Porpoise	SEL_{CUM}: 173 dB	19.3	2.2
Bottlenose Dolphin	SEL_{CUM}: 198 dB	1.2	0.1
Gray Whale	SEL_{CUM}: 199 dB	13.1	1.5
Level B Thresholds			
All Species	RMS: 120 dB	21,544.3	2,154.4

[1]PK = peak sound level, SEL_{cum} = weighted cumulative sound exposure level, RMS = root mean square sound pressure level

Distances to Level A thresholds for impact pile driving were calculated using method E.1-2 of the NMFS user spreadsheet (NMFS 2018). Underwater impact pile driving Single Strike sound exposure level (SEL) and peak Source Level values from Table 2, above, were reduced by 7 dB to account for sound attenuation from the use of a bubble curtain. Copies of the user spreadsheets are provided in Appendix A.

Distances to Level A thresholds for vibratory pile driving were calculated using method A.1 of the NMFS user spreadsheet (NMFS 2018). Copies of the user spreadsheets are provided in Appendix A.

Distances to Level B underwater thresholds for all species were calculated using a practical spreading model:

$$TL = 15 * \log(R_2/R_1)$$

Where TL is transmission loss, R_1 is the distance from the pile driving activity to the known/measured sound level, and R_2 is the estimated distance to the threshold (NMFS 2012a).

6.3 Take Estimation

We determined the areas where Level A and Level B harassment would occur (hereafter, *zones of influence*) using the distances in Tables 5 and 6 as radii for the impact area. For the purpose of this analysis, we assumed that sounds from underwater pile driving activities would not travel through a major land mass (e.g., Alameda Point), but could potentially travel through minor features such as Breakwater Island. Figures 5–8 illustrate the zones of influence where Level A and Level B harassment would occur for harbor seals and California sea lions.

As discussed in Section 4.1:

- An estimated 6.5 harbor seals per square kilometer are present in Seaplane Lagoon, and an estimated 3.957 harbor seals per square kilometer are present in the San Francisco Bay.
- California sea lions are less common in Seaplane Lagoon, and an estimated 0.161 sea lions per square kilometer occur within Seaplane Lagoon and the San Francisco Bay.
- Harbor porpoises are uncommon south of the Bay Bridge in the San Francisco Bay, and an estimated 0.167 harbor porpoises per square kilometer occur within Seaplane Lagoon and in the Project vicinity in the San Francisco Bay.

Based on these density estimates, we estimated the take of harbor seals, California sea lions, and harbor porpoises from Project pile driving activities using the following equation:

$$Take = N * A * D$$

Where N is the density of animals per square kilometer, A is the impact area from Table 7, and D is the number of days the activity would take place. Take estimates calculated with this equation are provided in Table 8. These

N:\Projects3300\3333-01\14\Reports\Incidental Harassment\Fig 5 Distances to NMFS Level A v2.mxd

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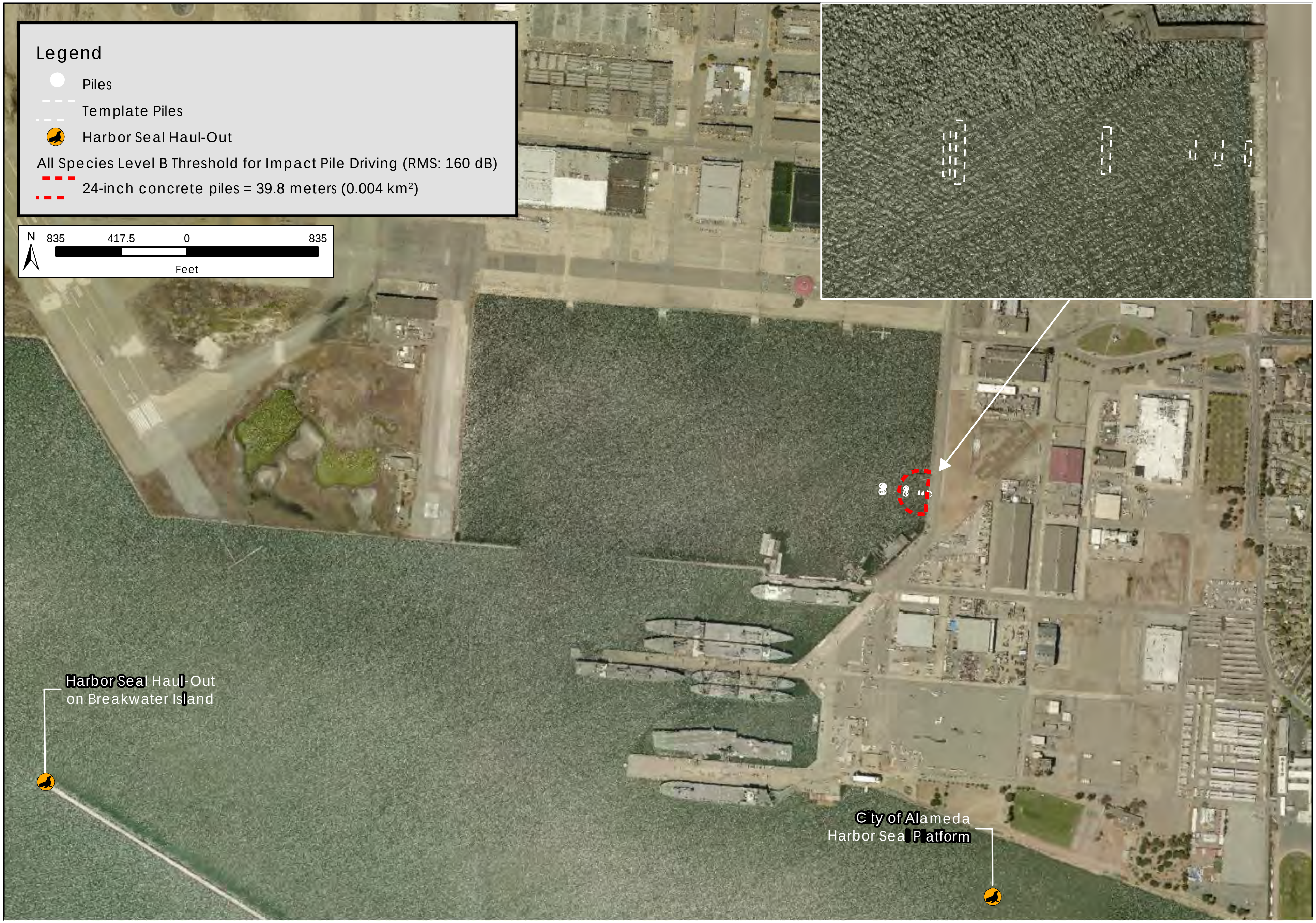
Figure 5. Distances to NMFS Level A Acoustic Thresholds for Impact Pile Driving

Alameda Point Seaplane Lagoon Ferry Terminal Application for
Incidental Harassment Authorization for Marine Mammals (3333-14)
June 2019



N:\Projects3300\3333-01\14\Reports\Incidental Harassment\Fig 6 Distances to NMFS Level B Acoustic Thresholds for Impact Pile Driving.mxd

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Figure 6. Distances to NMFS Level B Acoustic Thresholds for Impact Pile Driving

Alameda Point Seaplane Lagoon Ferry Terminal Application for
Incidental Harassment Authorization for Marine Mammals (3333-14)
June 2019

N:\Projects3300\3333-01\14\Reports\Incidental Harassment\Fig 7 Distances to NMFS Level A Acoustic Thresholds for Vibratory Pile Driving.mxd

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Figure 7. Distances to NMFS Level A Acoustic Thresholds for Vibratory Pile Driving
Alameda Point Seaplane Lagoon Ferry Terminal Application for Incidental Harassment Authorization for Marine Mammals (3333-14)
June 2019

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Figure 8. Distances to NMFS Level B Acoustic Thresholds for Vibratory Pile Driving
Alameda Point Seaplane Lagoon Ferry Terminal Application for Incidental Harassment Authorization for Marine Mammals (3333-14)
June 2019

Table 7. Zones of Influence

Species and Location	Impact Pile Driving: Threshold (Impulsive Sounds)	Impact Pile Driving: 24-inch Concrete Piles	Vibratory Pile Driving: Threshold (Non-Impulsive Sounds)	Vibratory Pile Driving: 36-inch Steel Piles	Vibratory Pile Driving: 14-inch Steel H-Type Piles
Zone of Influence for Level A Harassment (km^2)[1]					
Harbor Seal and Northern Elephant Seal	SEL_{CUM}: 185 dB	0.002	SEL_{CUM}: 201 dB	0.001	0.0003
California Sea Lion and Northern Fur Seal	SEL_{CUM}: 203 dB	<0.001	SEL_{CUM}: 219 dB	<0.001	0.0001
Harbor Porpoise	SEL_{CUM}: 155 dB	0.009	SEL_{CUM}: 173 dB	0.004	0.0005
Bottlenose Dolphin	SEL_{CUM}: 185 dB	<0.001	SEL_{CUM}: 198 dB	<0.001	0.0001
Gray Whale	SEL_{CUM}: 183 dB	0.006	SEL_{CUM}: 199 dB	0.002	0.0003
Zone of Influence for Level B Harassment (km^2)					
All Species	RMS: 160 dB	0.004	RMS: 120 dB	21.49	2.19

[1]km^2=square kilometers

Table 8. Take Estimates

Species	Estimated Density or Number of Individuals within the Impact Area	Impact Pile Driving	Vibratory Pile Driving		Total Estimated Project Takes
		24-inch Concrete Piles	36-inch Steel Piles	14-inch Steel H-Type Piles	
Level A Harassment (Number of Individuals per Square Kilometer)					
Harbor Seal	6.5 seals/day within the breakwater, 3.957 seals/km^2 in San Francisco Bay	39	39	78	156
California Sea Lion	0.161 sea lion/km^2	<0.01	<0.01	<0.01	<0.01
Harbor Porpoise	0.167 porpoise/km^2	0.01	<0.01	<0.01	0.01
Northern Elephant Seal	0.2 seals/day	1.2	1.2	2.4	4.8
Gray Whale	0.267 whales/day	1.6	1.75	3.2	6.4
Northern Fur Seal	0.1 seals/day	0.6	0.6	1.2	2.4
Bottlenose Dolphin	1.5 dolphins/day	9	9	18	36
Level B Harassment (Number of Individuals per Square Kilometer)					
Harbor Seal	6.5 seals/day within the breakwater, 3.957 seals/km^2 in San Francisco Bay	39	505.53	94.62	639.15
California Sea Lion	0.161 sea lion/km^2	<0.01	20.76	4.23	24.99
Harbor Porpoise	0.167 porpoise/km^2	<0.01	21.53	4.39	25.93
Northern Elephant Seal	0.2 seals/day	1.2	1.2	2.4	4.8
Gray Whale	0.267 whales/day	1.6	1.6	3.2	6.4
Northern Fur Seal	0.1 seals/day	0.6	0.6	1.2	2.4
Bottlenose Dolphin	1.5 dolphins/day	9	9	18	36

estimates assume that Project pile driving activities will occur over a maximum of 24 days, that a single animal can only be taken once per pile/hammer type per day.

Insufficient sighting data are available to estimate the density of northern elephant seals, gray whales, northern fur seals, and bottlenose dolphins in the San Francisco Bay. To ensure that the Project has coverage for incidental take of these species, the number of individuals that may be taken by the Project was estimated as follows; these estimates are consistent with the recent IHA for the demolition and reuse of the marine foundations of the original east span of the San Francisco-Oakland Bay Bridge (California Department of Transportation 2018):

- It is assumed that up to one northern elephant seal may occur in the San Francisco Bay in the Project vicinity on up to 20% of pile driving days (i.e., up to 4.8 individuals in 24 days).
- It is assumed that up to 6.4 gray whales could occur in the San Francisco Bay in the Project vicinity during 24 days of pile driving activities.
- It is assumed that one northern fur seal may occur in the San Francisco Bay in the Project vicinity on up to 10% of pile driving days (i.e., up to 2.4 individuals in 24 days).
- It is assumed that 1.5 bottlenose dolphins may occur in the San Francisco Bay in the Project vicinity on all pile driving days (i.e., up to 36 individuals in 24 days).

We estimate that the Project will result in the following Level A take under the MMPA due to both impact and vibratory pile driving activities:

- **Level A harassment of no harbor seals**. Because all Level A harassment would occur within 28.5 meters of Project pile driving activities (see Figures 5 and 7), we have assumed that the presence of a biological monitor during these activities would reduce the estimated number of harbor seals subject to Level A harassment from 156 individuals (see Table 8) to effectively zero individuals. As a result, no Level A take of harbor seals is anticipated to occur as a result of the Project.
- **Level A harassment of no California sea lions**. The estimated zone of influence for Level A harassment of California sea lions includes areas within up to 2.1 meters of Project pile driving activities (see Figures 5 and 7). With the presence of a biological monitor, the estimated number of California sea lions subject to Level A harassment would be reduced from <0.01 individual (see Table 8) to effectively zero individuals. As a result, no Level A take of California sea lions is anticipated to occur as a result of the Project.
- **Level A harassment of no harbor porpoises.** Because all Level A harassment would occur within 63.5 meters of Project pile driving activities (see Figures 5 and 7), we have assumed that the presence of a biological monitor during these activities would reduce the estimated number of harbor porpoises subject to Level A harassment from 0.01 individuals to effectively zero individuals. As a result, no Level A take of harbor porpoises is anticipated to occur as a result of the Project.

- **Level A harassment of no northern elephant seals, gray whales, northern fur seals, or bottlenose dolphins.** Although Level A zones of influence are estimated for northern elephant seals, gray whales, northern fur seals, and bottlenose dolphins (Table 5), all of these zones of influence extend no more than 53.3 meters from Project pile driving activities. We have assumed that the presence of a biological monitor would reduce the estimated number of animals subject to Level A harassment from 4.8 northern elephant seals, 6.4 gray whales, 2.4 northern fur seals, and 36 bottlenose dolphins to effectively zero individuals. As a result, no Level A take of these species is anticipated to occur as a result of the Project.

We estimate that the Project will result in no Level B take under the MMPA due to impact pile driving activities. The estimated zone of influence for Level B harassment of all species due to impact pile driving includes all areas within 39.8 meters of Project pile driving activities (Figure 6). As a result, we have assumed that the presence of a biological monitor during these activities would reduce the estimate number of marine mammals subject to Level B harassment from 39 harbor seals, <0.01 California sea lions, <0.01 harbor porpoises, 1.2 northern elephant seals, 1.6 gray whales, 0.6 northern fur seals, and 9 bottlenose dolphins to effectively zero individuals. As a result, no Level B take of marine mammal species is anticipated to occur as a result of the project.

We estimate that the Project will result in the following Level B take under the MMPA due to vibratory pile driving:

- **Level B harassment of up to 601 harbor seals**. The estimated zone of influence for Level B harassment of harbor seals includes all areas within 21,544.35 meters of Project pile driving activities, and extends across the Bay from Seaplane Lagoon (Figure 8). Given the estimated number of harbor seals present within Seaplane Lagoon (6.5 individuals per day, see Section 4.1) and in the San Francisco Bay (3.957 individuals per square kilometer, see Section 4.1), the number of harbor seals that would be subject to Level B harassment from Project pile driving activities is estimated to be up to 600.15 individuals (Table 8). With the presence of the biological monitor, which reduces the potential for harassment of harbor seals within Seaplane Lagoon, the actual number of harbor seals expected to be harassed by the project is would be lower than this estimate. Nevertheless, rounding up to whole numbers, the Project would potentially result in Level B harassment of up to 601 harbor seals due to vibratory pile driving.
- **Level B harassment of up to 25 California sea lions**. The estimated zone of influence for Level B harassment of California sea lions includes all areas within 21,544.35 meters of Project pile driving activities, and extends across the Bay from Seaplane Lagoon (Figure 8). Given the estimated density of California sea lions within Seaplane Lagoon and in the San Francisco Bay (0.161 individuals per square kilometer, see Section 4.1), the number of sea lions that would be subject to Level B harassment from Project pile driving activities is estimated to be up to 24.99 individuals (Table 8). The presence of the biological monitor will reduce the potential for harassment of California sea lions within Seaplane Lagoon; however, because the species occurs at low densities both in Seaplane Lagoon and in the San Francisco Bay, this does not measurably reduce the estimated number of California sea lions that would potentially be subject to Level

B harassment due to vibratory pile driving. Rounding up to whole numbers, the Project would potentially result in Level B harassment of up to 25 California sea lions due to vibratory pile driving.

- **Level B harassment of up to 26 harbor porpoises.** The estimated zone of influence for Level B harassment of harbor porpoises includes all areas within 21,544.35 meters of Project pile driving activities, and extends across the Bay from Seaplane Lagoon (Figure 8). Given the estimated density of harbor porpoises within Seaplane Lagoon and in the San Francisco Bay (0.167 individuals per square kilometer, see Section 4.1), the number of harbor porpoises that would be subject to Level B harassment from Project pile driving activities is estimated to be up to 25.92 individuals (Table 8). The presence of the biological monitor will reduce the potential for harassment of harbor porpoises within Seaplane Lagoon; however, because the species occurs at low densities both in Seaplane Lagoon and in the San Francisco Bay, this does not measurably reduce the estimated number of harbor porpoises that would potentially be subject to Level B harassment due to vibratory pile driving. Rounding up to whole numbers, the Project would potentially result in Level B harassment of up to 26 harbor porpoises due to vibratory pile driving.
- **Level B harassment of up to 4 northern elephant seals.** As stated above, it is assumed that up to one northern elephant seal may occur in the San Francisco Bay in the Project vicinity on up to 20% of pile driving days (i.e., up to 3.6 individuals in 24 days). The presence of the biological monitor will reduce the potential for harassment of northern elephant seals within Seaplane Lagoon; however, because the species occurs at low densities both in Seaplane Lagoon and in the San Francisco Bay, this does not measurably reduce the estimated number of northern elephant seals that would potentially be subject to Level B harassment due to vibratory pile driving. Rounding up to whole numbers, the Project would potentially result in Level B harassment of up to 4 northern elephant seals due to vibratory pile driving.
- **Level B harassment of up to 5 gray whales.** As stated above, it is assumed that up to 6.4 gray whales could occur in the San Francisco Bay in the Project vicinity during 24 days of pile driving activities. The presence of the biological monitor will reduce the potential for harassment of gray whales within Seaplane Lagoon; however, because the species occurs at low densities both in Seaplane Lagoon and in the San Francisco Bay, this does not measurably reduce the estimated number of gray whales that would potentially be subject to Level B harassment due to vibratory pile driving. Rounding up to whole numbers, the Project would potentially result in Level B harassment of up to 5 gray whales due to vibratory pile driving.
- **Level B harassment of up to 2 northern fur seals.** As stated above, it is assumed that one northern fur seal may occur in the San Francisco Bay in the Project vicinity on up to 10% of pile driving days (i.e., up to 2.4 individuals in 24 days). The presence of the biological monitor will reduce the potential for harassment of northern fur seals within Seaplane Lagoon; however, because the species occurs at low densities both in Seaplane Lagoon and in the San Francisco Bay, this does not measurably reduce the estimated number of northern fur seals that would potentially be subject to Level B harassment due to vibratory pile driving. Rounding up to whole numbers, the Project would potentially result in Level B harassment of up to 2 northern fur seals due to vibratory pile driving.
- **Level B harassment of up to 27 bottlenose dolphins.** As stated above, it is assumed that 1.5 bottlenose dolphins may occur in the San Francisco Bay in the Project vicinity on all pile driving days (i.e., up to 36

individuals in 24 days). The presence of the biological monitor will reduce the potential for harassment of bottlenose dolphins within Seaplane Lagoon; however, because the species occurs at low densities both in Seaplane Lagoon and in the San Francisco Bay, this does not measurably reduce the estimated number of bottlenose dolphins that would potentially be subject to Level B harassment due to vibratory pile driving. Thus, the Project would potentially result in Level B harassment of up to 27 bottlenose dolphins due to vibratory pile driving.

Table 9 provides a summary of estimated take by species for the Project.

Table 9. Estimated Take by Species

Species	Level A	Level B		
	Total	Impact	Vibratory	Total
Harbor Seal	0	39	601	640
California Sea Lion	0	1	25	26
Harbor Porpoise	0	1	26	27
Northern Elephant Seal	0	2	4	6
Gray Whale	0	2	5	7
Northern Fur Seal	0	1	2	3
Bottlenose Dolphin	0	9	27	36

Section 7. Anticipated Impact of the Activity

Our evaluation of potential impacts of this proposed Project on harbor seals and California sea lions is based on the following:

- The Alameda Point Project Environmental Impact Report (Environmental Science Associates 2014);
- The Seaplane Lagoon Ferry Terminal of the Alameda Point Project California Environmental Quality Act Addendum to the Alameda Point Project Environmental Impact Report (City of Alameda 2016);
- A search of the California Natural Diversity Database (2019) records for recent marine mammal occurrences in the Project vicinity;
- The IHA issued by NMFS for the WETA facility located just to the southeast of the proposed Seaplane Lagoon ferry terminal (NMFS 2015);
- Prior surveys for special-status plants and animals performed for the City of Alameda; and
- Site visits conducted by H. T. Harvey biologists, and our understanding of marine wildlife distribution in the vicinity of the proposed Project area.
- The draft IHA template for the Project, provided by NMFS on May 7, 2019.

Project activities with the potential to affect harbor seals and California sea lions include construction of the ferry terminal, demolition of the deteriorated wooden pier, and ferry operation. No injury or mortality of harbor seals or California sea lions is expected as a result of any Project component. However, pile driving activities during construction of the new ferry terminal have some potential to result in the take of harbor seals, California sea lions, harbor porpoises, northern elephant seals, gray whales, northern fur seals, and bottlenose dolphins under the MMPA.

Since its original design, the Project has been modified to reduce the number of in-water piles (from 18 to 12) and to replace some steel piles with concrete piles. Concrete piles exhibit a reduced radial deformation due to a lower Poisson's ratio (Reinhall and Dahl 2011) and hence lower sound pressure levels during impact driving compared to steel piles of the same radius (Washington State Department of Transportation 2018). Also, during Clean Water Act Section 404 permitting, the U.S. Army Corps of Engineers consulted with NMFS regarding impacts to federally listed fish, and the City of Alameda and H. T. Harvey & Associates underwent considerable coordination with NMFS regarding measures to minimize sound pressure levels during pile driving. The City will implement the measures described in NMFS's Biological Opinion to reduce sound pressure impacts. The proponent will also implement a NMFS-approved Sound Attenuation Monitoring Plan during in-water construction activities as well as various avoidance and minimization measures to reduce impacts on aquatic species and habitats (Appendix B). These measures will limit the intensity of pile-driving sound in the marine environment. In addition, the use of vibratory hammers to install piles where feasible, and employment of a "soft start" approach in which pile driving intensity increases gradually, is expected to encourage marine mammals to move away from disturbance areas so that they are less likely to be present within these areas during pile driving activities. The use of sound attenuation devices such as cushion blocks and bubble curtains will further reduce transmitted sound levels.

Nevertheless, noise from proposed pile driving activities can potentially result in harassment of marine mammals. Level A harassment of marine mammals is possible if individuals occur in Seaplane Lagoon near the Project area when these activities occur (Figure 5 and 7).

The potential for construction activities to result in Level B harassment of marine mammals is somewhat greater due to the potential for sounds from a vibratory hammer to travel outside of Seaplane Lagoon into the San Francisco Bay (Figure 8). We estimate that Level B harassment of up to 263 harbor seals, 18 California sea lions, 6 harbor porpoises, 3 northern elephant seals, 4 gray whales, 2 northern fur seals, and 23 bottlenose dolphins is possible with use of a vibratory hammer (see Section 6). However, project activities would be short-term in nature, with pile driving activities occurring for approximately 20 to 80 minutes per day for 24 days. As a result, the majority of marine mammals that would potentially be affected by pile driving activities are foraging individuals in the San Francisco Bay. These individuals may experience temporary behavioral disturbance (e.g., startling or a disruption in foraging activities) and/or a temporary hearing threshold shift as a result of pile driving activities.

With the implementation of the avoidance and minimization measures described in Section 11, Level A and B harassment of marine mammals from Project pile driving activities will have a negligible short-term effect on marine mammals that may be foraging in the vicinity when work occurs, and the Project will not result in population-level effects on these species.

Section 8. Anticipated Impacts on Subsistence Uses

The proposed Project is located in the San Francisco Bay, which is not within or near a traditional Arctic subsistence hunting area. Thus, no impacts on subsistence uses will occur as a result of the Project.

Section 9. Anticipated Impacts on Habitat

Limited Project impacts on habitat for marine mammals are anticipated to occur as a result of in-water construction activities and installation of the new pier. Construction of landside components of the Project are not expected to result in adverse effects on marine mammals or their habitat because the Project will implement conservation measures to prevent the runoff and discharge of pollutants from landside activities to the waters of San Francisco Bay (see Section 11).

9.1 Loss of Habitat

The installation of piles for the new pier will result in permanent impacts on 61 square feet (ft^2) of aquatic habitat for marine mammals and their prey. Habitat loss will be further offset by the demolition of the existing pier, including removal of its supporting piles, which will result in the restoration of at least 36 ft^2 of benthic foraging habitat.

At best the impact area, which is located in Seaplane Lagoon, provides marginal foraging habitat for marine mammals and fish. The net loss of such a small area (25 ft^2) of benthic habitat is not expected to impair the health of these species or affect their populations.

Construction of the new abutment will not disturb the existing rock slope protection along the shoreline of Seaplane Lagoon. The new pier will bridge this intertidal zone, so no loss of or impact to the intertidal habitat is expected. Harbor seals and California sea lions are not known to haul out within or near the Project area, and Project construction and long-term operation are not expected to disturb nearby harbor seal haul-outs, which are located 1.0 mile to the southwest on Breakwater Island and 0.5 mile to the southeast on a platform installed by the City.

9.2 Effects on Water Quality

If marine mammals or their prey are present in the vicinity of the Project area during construction, in-water construction activities could temporarily affect individuals through elevated levels of underwater sound during pile driving and degradation of water quality during construction. Following construction, the operation of ferry boats in the Project area may affect marine mammals and fish species through occasional, short-term increases in turbidity and noise disturbance. However, any effects from ferry operation would be very limited (due to the occurrence of only 10 trips/day associated with the new ferry terminal) and would be similar to existing effects of boat traffic in San Francisco Bay on these species. With implementation of conservation measures, Project effects on marine mammals and their prey species are expected to be minimal.

As old piles are removed and new piles are driven into the Seaplane Lagoon floor, fine-grain sediments, including clay and silt material, will be disturbed, generating increased levels of turbidity in the adjacent water column and temporarily degrading water quality. As described in Section 7 above, the effects of construction activities on marine mammals and fish are unlikely to affect the harbor seal or California sea lion.

In aquatic environments, most anthropogenic chemicals and waste materials, including toxic chemicals, eventually accumulate in the sediment. Contaminated sediments may be directly toxic to aquatic life or can be a source of contaminants for bioaccumulation in the food chain (Ingersoll 1995 as cited in NMFS 2012b). As part of its base closure activities, the Navy previously identified hazardous waste sites in the Project area. The Navy completed remediation activities (i.e., dredging, dewatering, and off-site disposal of impacted sediments) within Seaplane Lagoon in 2012. Thus, the Project is not expected to result in an adverse effect due to mobilization of contaminated sediments.

The Project is expected to result in an overall long-term benefit on water quality due to the removal of the deteriorating wooden pier. Thirty creosoted piles supporting the existing pier, as well as a variety of other creosoted wood that supports the pier and is in contact with the water, will be removed, thus benefiting water quality and enhancing fish habitat by removing this existing source of pollution.

Increased levels of turbidity may affect marine mammals by disrupting normal feeding behavior, reducing growth rates, increasing stress levels, and reducing respiratory functions. However, harbor seals and California sea lions are well adapted to living in estuaries, intertidal areas, and harbors, and are tolerant of high levels of turbidity. In addition, marine mammals inhabiting the San Francisco Bay commonly encounter areas of increased turbidity due to storm runoff events, wind and wave action, and benthic foraging activities of other aquatic organisms. Marine mammals are expected to react to temporary increases in turbidity by avoiding the disturbed area and returning when concentrations of suspended solids are lower. The minor and localized areas of turbidity associated with the Project's in-water construction activities are not expected to result in harm or injury of marine mammals or in behavioral responses that impair migration, foraging, or predator avoidance. If marine mammals temporarily relocate from the Project area during construction, areas of similar or greater value and that provide adequate carrying capacity to support individual marine mammals that are temporarily displaced are available in the adjacent Bay.

9.3 Effects of Shading and Covering of Benthic Habitat

Construction of the new pier, gangway and floats will result in the shading of approximately 0.168 acre of the water column and benthic habitat in Seaplane Lagoon. Shading potentially reduces the growth of submerged aquatic vegetation, decreases primary productivity, alters predator-prey interactions, changes invertebrate assemblages, and reduces the density of benthic invertebrates (NMFS 2012b, Helfman 1981, Glasby 1999, Struck et al. 2004, Stutes et al. 2006), which may lead to a reduction in the quality of fish habitat. However, San Francisco Bay waters are typically relatively turbid, which naturally limits ambient light penetration and phytoplankton production, and no eelgrass beds have been mapped within or near the Project area. With the abundance of similar or better habitat available in adjacent waters, the effects of shading associated with the proposed ferry terminal are not expected to result in a substantial impact on habitat for, or individuals of, marine mammal species or their prey. The impact of shading will be further minimized by the removal of the existing timber pier structure, which includes approximately 4,680 ft^2 of overwater structure in the Project area. The removal of this structure will allow light penetration to areas previously shaded and this site will have the opportunity to re-colonize with submerged vegetation and benthic organisms.

9.4 Effects of Future Operations

Long-term ferry operations at Seaplane Lagoon pose some risk of contamination of aquatic habitat. Leaks of diesel fuel and similar substances from ferry boats can result in adverse impacts on fish, including immobilization and impaired locomotion, reduced growth, reduced reproduction, genetic damage, tumors and lesions, developmental abnormalities, behavior changes (avoidance), and impairment of olfactory and brain functions (Eisler 2000 as cited in NMFS 2012b).

To address any potential for the release of toxic substances into the waters of San Francisco Bay, the Project will implement a number of conservation measures, including a spill prevention and control plan. The Project will also implement standard best management practices (BMPs) to avoid degradation of aquatic habitat and wetlands by maintaining water quality and controlling erosion and sedimentation during construction as required for compliance with the National Pollutant Discharge Elimination System General Permit for Construction Activities. The stormwater pollution prevention plan will include specifications for BMPs that will be implemented during construction, including measures to control degradation of surface water by preventing soil erosion or the discharge of pollutants from the construction area. Following construction, the applicant will implement BMPs to prevent and/or minimize the discharge of pollutants (e.g., fuel spills and litter) to San Francisco Bay. BMPs will include, but are not limited to the following:

- develop spill prevention and emergency response plan to handle potential fuel or other spills
- practice good housekeeping (e.g., provide covered trash bins on vessels and at the Ferry Terminal, store hazardous materials in centralized locations protected from rainfall).

With implementation of these BMPs, the Project is not expected to result in adverse effects on fish or marine mammal species due to the release of toxic substances.

Ferries are expected to transit the Bay to and from new terminal facility up to 10 times each day (six departures and four arrivals). Increased levels of turbidity associated with ferry boat arrivals and departures are expected to last for a matter of a few minutes during each trip. These short-term increases in turbidity are expected to return rapidly to background levels with tidal circulation (NMFS 2012b). Pinnipeds startled by elevated noise levels will have adequate opportunity to avoid boat traffic in adjacent open-water areas in Central San Francisco Bay.

Increased ferry boat traffic in the area could facilitate the spread of the non-native Asian kelp *Undaria pinnatifida*. The invasive kelp is a native of the Western Pacific, is quick-growing and opportunistic, and can quickly become established on ship hulls, moorings, ropes, and docks. This species negatively affects native species by outcompeting native vegetation for space and light (NMFS 2012b). In 2009, *Undaria* was documented in the San Francisco Marina and at several locations along the City of San Francisco waterfront (NMFS 2012b). Ferry traffic associated with the Project may increase its potential spread; however, the potential effect on harbor seals, California sea lions, and their habitat is not expected to be substantial because the action area does not currently support eelgrass. Further, the Project will development and implementation of a Marine Invasive Species Control Plan, as described in Section 11. Thus, ferry boat traffic from the Project is not expected to result in substantial adverse effects on harbor seals, California sea lions, or their habitat.

Section 10. Anticipated Effects of Habitat Impacts on Marine Mammals

The potential loss of foraging habitat resulting from construction of the ferry terminal is minimal given the extremely small footprint of the Project area compared to the available habitat within the San Francisco Bay, and such habitat loss will be largely offset by removal of the deteriorating wooden pier. Increased levels of turbidity and marine mammal disturbance associated with ferry boat arrivals and departures are expected to last only a matter of a few minutes during each of the 10 trips/day associated with this terminal, and the effects of this boat traffic are expected to be minimal. Therefore, with implementation of the avoidance and minimization measures described in Section 11, we do not expect Project impacts on habitats to result in impacts on marine mammal populations.

Section 11. Mitigation Measures to Protect Marine Mammals and their Habitat

11.1 Conservation Measures Incorporated into the Project

The Project incorporates a number of avoidance and minimization measures as conservation measures. The Project's proposed conservation measures applicable to marine mammal species are as follows:

1. All in-water work will be conducted between June 1 and November 30.
2. To the extent feasible, all piles will be installed with a vibratory pile driver.
3. An impact pile driver will only be used when necessary to complete installation of piles in accordance with seismic safety or engineering criteria.
4. If an impact pile driver is used it will be cushioned using a 12-inch thick wood cushion block.
5. Bubble curtains will be used during any impact pile driving of piles located in water. The bubble curtain will be operated in a manner consistent with the following performance standards:

    a. The bubble curtain will distribute air bubbles around 100% of the piling perimeter for the full depth of the water column.
    b. The lowest bubble ring will be in contact with the mudline for the full circumference of the ring, and the weights attached to the bottom ring shall ensure 100% mudline contact. No parts of the ring or other objects shall prevent full mudline contact.
    c. Air flow to the bubblers must be balanced around the circumference of the pile.

6. A "soft start" technique will be employed if an impact pile driver will be used on any piles (on land or in water). This technique will be used upon initiation of pile driving or when there is a downtime of 30 minutes or more without pile driving.
7. Pile driving will occur only during daylight hours.
8. A biological monitor will be present during all pile driving to observe the work area before, during, and after pile driving. A single monitor will be present during impact pile driving, when impacts of the project will be limited to the area within the Alameda Lagoon, and two monitors will be present during vibratory pile driving when project impacts will extend into the waters of the San Francisco Bay.
9. The Applicant will ensure that a Marine Invasive Species Control Plan is developed and implemented prior to commencement of any in-water work. Provisions of the plan will include but not be limited to the following:

    a. environmental training of construction personnel involved in in-water work;

    b. actions to be taken to prevent the release and spread of marine invasive species, especially algal species such as *Undaria* and *Sargasso*;

    c. procedures for the safe removal and disposal of any invasive taxa observed;

d. the onsite presence of qualified marine biologists to assist the contractor in the identification and proper handling of any invasive species; and

e. a post-construction report identifying any invasive species located and a description of handling and removal techniques. This report will be shared with any agency that requests it.

10. BMPs will be employed to protect aquatic habitats and wetlands. These BMPs will include but not be limited to the following:

    a. installing silt fencing between wetlands and aquatic habitat and construction-related activities;

    b. locating fueling stations away from potentially jurisdictional features; and

    c. isolating construction work areas from any identified jurisdictional features.

11. The Applicant will prepare and implement a stormwater pollution prevention plan.

12. A spill prevention and control plan will be prepared to specify restrictions and procedures for fuel storage location, fueling activities, and equipment maintenance.

13. An existing (deteriorating) wooden pier located adjacent to the proposed ferry pier will be removed to help offset the addition of in-water structures associated with the ferry pier. The wooden pier to be demolished is supported by 30 12-inch-diameter creosoted pilings, as well as three concrete foundations for additional wooden piles in the water at the base of the pier, each approximately 24 inches on a side. In total, at least 36 ft^2 of creosoted wood and concrete supporting the pier will be removed. Demolition of this pier will also result in the removal of the pier decking, which represents approximately 2,914 ft^2 of wood currently covering the bay. The existing timber pier structure, including the existing handrail, timber deck, timber stringers, and fencing, will be demolished and removed from the lagoon. All debris will be off-hauled, processed, and properly disposed of. The piles will be cut at the mudline and pulled out of the water; no vibratory equipment will be used in the removal of the piles. Timber piles that have been treated with creosote, or that contain other potentially hazardous materials, will be handled properly and disposed of at a facility permitted to handle hazardous waste. Any debris found on the seafloor in the pier's vicinity will be removed and disposed of on land.

11.2 Avoidance and Minimization Measures

In addition, the Project will implement the measures outlined in Mitigation Measure 4.E-1c of the project's Environmental Impact Report. The measures in Mitigation Measure 4.E-1c applicable to marine mammal species are as follows:

- **Mitigation Measure 4.E-1a:** Prior to the start of marina or ferry terminal construction, the City will require a NMFS-approved hydroacoustic monitoring plan to protect fish and marine mammals, if pile driving is planned for the Seaplane Lagoon (Appendix B). This plan will provide detail on the sound attenuation system, detail methods used to monitor and verify sound levels during pile driving activities, and describe management practices to be taken to reduce impact hammer pile-driving sound in the marine environment. The sound monitoring results will be made available to the NMFS. The plan will incorporate, but not be limited, to the following BMPs:

- All in-water work will be conducted between June 1 and November 30.
- To the extent feasible, all piles will be installed with a vibratory pile driver.
- An impact pile driver will only be used when necessary to complete installation of piles in accordance with seismic safety or engineering criteria.
- If an impact pile driver is used it will be cushioned using a 12-inch thick wood cushion block.
- Bubble curtains will be used during any impact pile driving of piles located in water.
- A "soft start" technique will be employed if an impact pile driver will be used on any piles (on land or in water). This technique will be used upon initiation of pile driving or when there is a downtime of 30 minutes or more without pile driving.
- Pile driving will occur only during daylight hours.
- A biological monitor will be present during all pile driving to observe the work area before, during, and after pile driving.
- The City's consultant/monitor will monitor and verify sound levels during pile driving activities. The sound monitoring results will be made available to NMFS.
- In the event that exceedance of noise thresholds established and approved by NMFS occurs, a contingency plan involving the use of bubble curtains or air barrier will be implemented to attenuate sound levels to below the approved thresholds.

- **Mitigation Measure 4.E-1c:** As part of the NMFS-approved hydroacoustic monitoring plan required for pile driving in the Seaplane Lagoon in Mitigation Measure 4.E-1a (Appendix B), the City will ensure that the Project applicant implements the following actions in addition to those listed in Mitigation Measure 4.E-1a to reduce the effect of underwater noise transmission on marine mammals. These actions will include at a minimum:
  - A "soft start" technique will be employed in all pile driving to allow marine mammals an opportunity to vacate the area;
  - Maintain sound levels below 90 dBA in air when pinnipeds (seals and sea lions) are present; and
  - A NMFS-approved biological monitor will conduct daily surveys before and during impact hammer pile driving to inspect the work zone and adjacent Bay waters for marine mammals. The monitor will be present during the impact pile-driving phases of construction.
- **Mitigation Measure 4.E-1d:** The City will ensure dock lighting is installed on all floating docks in a way that minimizes artificial lighting of Bay waters by using shielded, low-mounted, and low light-intensity fixtures and bulbs.

11.3 IHA Measures

In addition, the Project will comply with the following terms and conditions from the draft Seaplane Lagoon Ferry Terminal Project IHA provided by NMFS to avoid and minimize harassment of marine mammals:

- **Marine Mammal Briefing.** The Project applicant will brief all construction personnel, monitors, and City staff working on the project prior to the start of pile driving activities regarding responsibilities, communication procedures, marine mammal monitoring protocols, and operational procedures.
- **Marine Mammal Monitoring.** Monitoring of marine mammal species will be conducted by NMFS-approved protected species observers (PSOs) as described in Section 13.2 below and consistent with the requirements of the Project's IHA.
- **Soft Start:** When initiating pile driving, or when there has been downtime of 30 minutes or more without pile driving, the contractor will initiate the driving with ramp-up procedures described below.
    - For vibratory hammers, the contractor will initiate the driving for 15 seconds at reduced energy, followed by a 30-second waiting period. This procedure will be repeated two additional times before continuous driving is started.
    - For impact driving, an initial set of three strikes would be made by the hammer at 40% energy, followed by a 30-second waiting period, then two subsequent three-strike sets at 40% energy, with 30-second waiting periods, before initiating continuous driving.
- **Acoustic Monitoring.** Acoustic monitoring will be conducted as described in Section 13.1 below and in accordance with the Project's Hydroacoustic Monitoring Plan (Appendix B).

Section 12. Mitigation Measures to Protect Subsistence Uses

The proposed Project is located in the San Francisco Bay, which is not within or near a traditional Arctic subsistence hunting area. Thus, no mitigation measures to protect subsistence uses are warranted.

Section 13. Monitoring and Reporting

13.1 Acoustic Monitoring

The City has developed a sound attenuation monitoring plan to protect fish and marine mammals during pile driving activities. This plan is attached as Appendix B; the City requests NMFS's approval of this plan. The acoustic monitoring will include documentation of the following, at a minimum:

- Hydrophone equipment and methods: recording device, sampling rate, distance from the pile where recordings were made; and depth of recording device(s).
- Type of pile being driven and method of driving during recordings.
- Mean, medium, and maximum sound levels (dB re: 1μPa): cumulative sound exposure level, peak sound pressure level, root mean square sound pressure level, and single-strike sound exposure level.

13.2 Marine Mammal Monitoring

Marine mammal activity will be monitored as follows during pile driving activities, consistent with the requirements of the Project's IHA:

- **Protected Species Observers.** Protected species observers (PSOs) approved by NMFS will conduct marine mammal monitoring during pile driving activities. The PSOs will have no other assigned tasks during the monitoring periods. Marine mammal monitoring will begin at least 30 minutes prior to the initiation of pile driving activities and will continue at least 30 minutes following the completion of pile driving activities. Pile driving will only commence when the PSO has declared the shutdown zone clear of marine mammals.

  PSOs will have the following 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.

- 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.

Monitoring will be conducted using high-quality binoculars. Marine mammal visual monitoring will be conducted from the best vantage point available, including the piers, jetties, and adjacent docks within the lagoon, to maintain an excellent view of the monitoring and shutdown zones and adjacent areas during the work period. Monitors would be equipped with radios or cell phones for maintaining contact with work crews.

- **Establishment of Level A Shutdown Zones.** The Project will establish shutdown zones for each marine mammal species based on the distance at which the Level A permanent hearing threshold shift for a species is exceeded. If a marine mammal is sighted within or approaching its species-specific zone, all pile driving activities will cease. Modeled radial distances for Level A shutdown zones are provided for each species that can potentially occur within or near the work area in Tables 5 and 6.

  During initial test pile driving, underwater acoustic measurements will be taken to determine the actual Level A shutdown zones that must be observed (as opposed to the estimated distances in Tables 5 and 6). The Project will adjust the sizes of the shutdown zones only if the measured shutdown zones are larger than modeled zones, unless NMFS approves a reduction in the shutdown zone based on the acoustic data.

  A minimum shutdown zone of 10 meters will be established during all pile driving and removal activities (i.e., pile driving activities will cease whenever a marine mammal is detected within 10 meters of the pile driving location, regardless of the modeled radial threshold distance provided in Tables 5 and 6). This 10-meter shutdown zone will also apply during all in-water construction activities other than pile driving that involve heavy machinery (i.e., all operations will cease and vessel speed will be reduced to the minimum required to maintain steerage and safe working conditions).

- **Establishment of Level B Monitoring and Shutdown Zones.** The PSO will monitor all areas in which take of marine mammals can potentially occur, per the distances at which the Level B permanent hearing threshold shifts would be exceeded (Tables 5 and 6). The primary purpose of this monitoring is to document instances of Level B harassment. Given the size of the monitoring zone for vibratory pile driving, PSOs are not expected to detect all marine mammals within this area or to make fine-scale behavioral observations in response to pile driving activities. Nevertheless, the PSOs will document all marine mammals observed within the monitoring zones, as feasible. If a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized takes are met, is observed within or approaching the Level B monitoring zone, pile driving activities will cease.

- **Shutdown Measures.** In the event of a delay or shutdown of activity resulting from marine mammals in the Level A or Level B shutdown zones, animals shall be allowed to remain in the shutdown zone (i.e., must leave of their own volition) and the PSO shall monitor and document their behavior. Pile driving will not commence or resume until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone, 15 minutes have passed without subsequent detections of small cetaceans and pinnipeds, or 30 minutes have passed without subsequent detections of large cetaceans.

13.3 Reporting

13.3.1 Monitoring Reporting

The City will submit a draft report to NMFS summarizing all marine mammal and acoustic monitoring activities within 90 calendar days of the completion of the monitoring or 60 days prior to the issuance of any subsequent IHA for this project, whichever comes first. A final report shall be prepared and submitted within 30 days following resolution of comments on the draft report from NMFS. The report will include the following:

- Dates and times (begin and end) of all marine mammal monitoring.
- Construction activities occurring during each daily observation period, including how many and what type of piles were driven or removed and by what method (i.e., impact or vibratory).
- Weather parameters and water conditions during each monitoring period (e.g., wind speed, percent cover, visibility, sea state).
- The number of marine mammals observed, by species, relative to the pile location and if pile driving or removal was occurring at time of sighting.
- Age and sex class, if possible, of all marine mammals observed.
- PSO locations during marine mammal monitoring.
- Distances and bearings of each marine mammal observed to the pile being driven or removed for each sighting (if pile driving or removal was occurring at time of sighting).
- Description of any marine mammal behavior patterns during observation, including direction of travel.
- Number of individuals of each species (differentiated by month as appropriate) detected within the monitoring zone, and estimates of number of marine mammals taken, by species (a correction factor may be applied to total take numbers, as appropriate).
- Detailed information about any implementation of any mitigation triggered (e.g., shutdowns and delays), a description of specific actions that ensued, and resulting behavior of the animal, if any.
- Description of attempts to distinguish between the number of individual animals taken and the number of incidences of take, such as ability to track groups or individuals.

13.3.2 Reporting Dead or Injured Marine Mammals

If Project activities clearly cause the take of a marine mammal in a manner prohibited by the Project's IHA (e.g., serious injury or mortality), the City shall immediately cease the specified activities and report the incident to NMFS, the NMFS Office of Protected Resources, and NMFS West Coast Regional Office stranding coordinator. Project activities will not resume until notification is received from NMFS. The City's report will include:

- Time and date of the incident

- Description of the incident
- Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility)
- Description of all marine mammal observations and active sound source use in the 24 hours preceding the incident
- Species identification or description of the animal(s) involved
- Fate of the animal(s)
- Photographs or video footage of the animal(s)

If a dead or injured marine mammal is discovered during the course of the Project and the PSO determines that the cause of injury or death is unknown and death is relatively recent, the City shall immediately report the incident to NMFS, the NMFS Office of Protected Resources, and NMFS West Coast Regional Office stranding coordinator. The report shall include the information listed above. Project activities may continue while NMFS reviews the report.

If a dead or injured marine mammal is discovered during the course of the Project and the PSO determines that the injury or death is not associated with Project activities, the City shall report the incident to NMFS, the NMFS Office of Protected Resources, and NMFS West Coast Regional Office stranding coordinator within 24 hours.

Section 14. Suggested Means of Coordination

All Project activities will be conducted in accordance with applicable federal, state, and local regulations. The City of Alameda will coordinate Project activities with relevant agencies including the NMFS, San Francisco Bay Conservation and Development Commission, U.S. Army Corps of Engineers, and San Francisco Bay Regional Water Quality Control Board. Results of the monitoring effort described in Section 13 will be provided to NMFS in a summary report.

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Appendix A. NMFS User Spreadsheet Calculations

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.0: 2018

KEY

(green)	**User Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Alameda Point Seaplane Lagoon Ferry Terminal
PROJECT/SOURCE INFORMATION	James Connolly (COWI); Amy Scholik (NOAA); CALTRANS (Compendium of Pile Driving Sound Data)

Please include any assumptions

PROJECT CONTACT	Steve Rottenborn, H. T. Harvey & Associates

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)[¥]	2.5	This is the suggested WFA for vibratory pile driving, provided on page 1 of the NMFS user spreadsheet

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

*** BROADBAND Sources: Cannot use WFA higher than maximum applicable frequency (See GRAY tab for more information on WFA applicable frequencies)**

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (RMS SPL)	155
Number of piles within 24-h period	6
Duration to drive a single pile (minutes)	4
Duration of Sound Production within 24-h period (seconds)	1440
10 Log (duration of sound production)	31.58
Propagation (xLogR)	15
Distance from source level measurement (meters)*	10

Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**1.5**	**0.1**	**2.2**	**0.9**	**0.1**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

E.1: IMPACT PILE DRIVING (STATIONARY SOURCE: Impulsive, Intermittent)

VERSION 2.0: 2018

KEY

(green)	**User Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Alameda Point Seaplane Lagoon Ferry Terminal
PROJECT/SOURCE INFORMATION	James Connolly (COWI); Amy Scholik (NOAA); CALTRANS (Compendium of Pile Driving Sound Data)

Please include any assumptions

PROJECT CONTACT	Steve Rottenborn, H. T. Harvey & Associates

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)[¥]	2	This is the suggested WFA for impact pile driving, provided on page 1 of the NMFS user spreadsheet.

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 75), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

*** BROADBAND Sources: Cannot use WFA higher than maximum applicable frequency (See GRAY tab for more information on WFA applicable frequencies)**

STEP 3: SOURCE-SPECIFIC INFORMATION

NOTE: Choose either E1-1 OR E.1-2 method to calculate isopleths (not required to fill in sage boxes for both)

E.1 1: METHOD TO CALCULATE PK AND SEL_{cum} (USING RMS SPL SOURCE LEVEL)

SEL_{cum}

Source Level (RMS SPL)	
Number of piles per day	
Strike Duration[Δ] (seconds)	
Number of strikes per pile	
Duration of Sound Production (seconds)	0
10 Log (duration of sound production)	#NUM!
Propagation (xLogR)	
Distance of source level measurement (meters)	

[Δ]Window that makes up 90% of total cumulative energy (5%-95%) based on Madsen 2005

Unless otherwise specified, source levels are referenced 1 m from the source.

PK

Source Level (PK SPL)	
Distance of source level measurement (meters)	
Source level at 1 meter	#NUM!

Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**	**#NUM!**

E.1 2: ALTERNATIVE METHOD TO CALCULATE PK AND SEL_{cum} (SINGLE STRIKE EQUIVALENT)

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	**193.9**

SEL_{cum}

Source Level (Single Strike SEL)	159
Number of strikes per pile	3100
Number of piles per day	1
Propagation (xLogR)	15
Distance of single strike SEL measurement (meters)	10

Unless otherwise specified, source levels are referenced 1 m from the source.

PK

Source Level (PK SPL)	186
Distance of source level measurement (meters)	10
Source level at 1 meter	201.0

Unless otherwise specified, source levels are referenced 1 m from the source.

RESULTANT ISOPLETHS*

*Impulsive sounds have dual metric thresholds (SELcum & PK). Metric producing largest isopleth should be used.

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	183	185	155	185	203
PTS Isopleth to threshold (meters)	**53.3**	**1.9**	**63.5**	**28.5**	**2.1**
PK Threshold	219	230	202	218	232
PTS PK Isopleth to threshold (meters)	**NA**	**NA**	**NA**	**NA**	**NA**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (dB)†	**-0.01**	**-19.74**	**-26.87**	**-2.08**	**-1.15**

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

A.1: Vibratory Pile Driving (STATIONARY SOURCE: Non-Impulsive, Continuous)

VERSION 2.0: 2018

KEY

(green)	**User Provided Information**
(pink)	**NMFS Provided Information (Technical Guidance)**
(blue)	**Resultant Isopleth**

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Alameda Point Seaplane Lagoon Ferry Terminal
PROJECT/SOURCE INFORMATION	James Connolly (COWI); Amy Scholik (NOAA); CALTRANS (Compendium of Pile Driving Sound Data)

Please include any assumptions

PROJECT CONTACT	Steve Rottenborn, H. T. Harvey & Associates

STEP 2: WEIGHTING FACTOR ADJUSTMENT

Specify if relying on source-specific WFA, alternative weighting/dB adjustment, or if using default value

Weighting Factor Adjustment (kHz)[¥]	2.5	This is the suggested WFA for vibratory pile driving, provided on page 1 of the NMFS user spreadsheet

[¥] Broadband: 95% frequency contour percentile (kHz) OR Narrowband: frequency (kHz); For appropriate default WFA: See INTRODUCTION tab

† If a user relies on alternative weighting/dB adjustment rather than relying upon the WFA (source-specific or default), they may override the Adjustment (dB) (row 48), and enter the new value directly. However, they must provide additional support and documentation supporting this modification.

*** BROADBAND Sources: Cannot use WFA higher than maximum applicable frequency (See GRAY tab for more information on WFA applicable frequencies)**

STEP 3: SOURCE-SPECIFIC INFORMATION

Source Level (RMS SPL)	170
Number of piles within 24-h period	1
Duration to drive a single pile (minutes)	20
Duration of Sound Production within 24-h period (seconds)	1200
10 Log (duration of sound production)	30.79
Propagation (xLogR)	15
Distance from source level measurement (meters)[†]	10

Unless otherwise specified, source levels are referenced 1 m from the source.

NOTE: The User Spreadsheet tool provides a means to estimates distances associated with the Technical Guidance's PTS onset thresholds. Mitigation and monitoring requirements associated with a Marine Mammal Protection Act (MMPA) authorization or an Endangered Species Act (ESA) consultation or permit are independent management decisions made in the context of the proposed activity and comprehensive effects analysis, and are beyond the scope of the Technical Guidance and the User Spreadsheet tool.

RESULTANT ISOPLETHS

Hearing Group	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
SEL_{cum} Threshold	199	198	173	201	219
PTS Isopleth to threshold (meters)	**13.1**	**1.2**	**19.3**	**7.9**	**0.6**

WEIGHTING FUNCTION CALCULATIONS

Weighting Function Parameters	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
a	1	1.6	1.8	1	2
b	2	2	2	2	2
f_1	0.2	8.8	12	1.9	0.94
f_2	19	110	140	30	25
C	0.13	1.2	1.36	0.75	0.64
Adjustment (dB)†	**-0.05**	**-16.83**	**-23.50**	**-1.29**	**-0.60**

$$W(f) = C + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\}$$

ALAMEDA POINT SEAPLANE LAGOON FERRY TERMINAL PROJECT

HYDROACOUSTIC MONITORING PLAN

Prepared for:

H.T. Harvey & Associates for the
City of Alameda
2263 Santa Clara Avenue, Room 120
Alameda, CA 94501

Prepared by:

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality

429 East Cotati Avenue
Cotati, CA 94931

September 2018
Revised August 2019

Project No.18-167

INTRODUCTION

The purpose of this Hydroacoustic Monitoring Plan is to describe the methodology proposed for measuring underwater sound levels during the installation of steel pipe and concrete piles for the Seaplane Lagoon at Alameda Point in Alameda, California. Piles will be installed for the abutment, pier, and float. The 36-inch steel piles will be installed with a vibratory hammer, 24-inch concrete piles will be installed with an impact hammer, and 14-inch steel template piles will be installed with a vibratory hammer. The abutment piles will be installed from the landside and are expected to require an impact hammer to penetrate the underlying material. Four steel piles (the abutment piles) will be installed above the high tide line and six octagonal concrete piles will be installed below the high tide line (see Table 1). These six in-water piles will be installed using a pile driver operated from barge-mounted cranes. The barges for this equipment are variable but will likely be approximately 150 feet long by 40 to 60 feet wide. The barge will be held in place with anchors and/or barge spuds. Spuds (steel pipe piles affixed to the barge) will be lowered into the lagoon substrata to hold the barge in position during the specific operation. The barge will be moved and positioned with a tugboat. A material barge adjacent to the crane barge will provide the construction materials (such material barges are typically small, about 90 to 120 feet long by 35 to 50 feet wide). The abutment piles will be installed using a pile driver operated from land. Template piles will be used to support the in-water piles. These will consist of 12 to 18 14-inch steel H-type piles. One template typically includes four piles, but up to six template piles would be used at one time. An air bubble curtains will be used for all underwater impact driving. It is anticipated that 3,100 strikes and 73 minutes will be required to install each concrete pile with an impact hammer, 20 minutes will be needed to install each 36-inch steel pile with a vibratory hammer, and 4 minutes will be needed to install each 14-inch template pile with a vibratory hammer. The total duration of pile driving activities will be up to 24 days.

PROJECT AREA

The project area consists of the Seaplane Lagoon and adjacent upland areas in the City of Alameda, Alameda County, California. Seaplane Lagoon is a 1,102-acre rectangular manmade basin constructed as part of the Alameda Naval Air Station in the 1930's and 1940's. The lagoon is bordered by an existing concrete and steel sheet pile bulkhead to the north, rock slope revetments to the east and west, and a rock breakwater to the south. There is an existing derelict wooden pier that is located along the eastern shoreline, which includes a 12-foot wide walkway and a 35-foot circular deck. The lagoon's shoreline is composed of riprap and the lagoon connects to the open waters of San Francisco Bay through the 600-foot opening in the breakwater on the south side. The substrate in the lagoon is mainly composed of silty mud and sand substrates. Water depths in the lagoon range from -10 to -20 feet mean lower low water. See vicinity map (Figures 1 and 2).

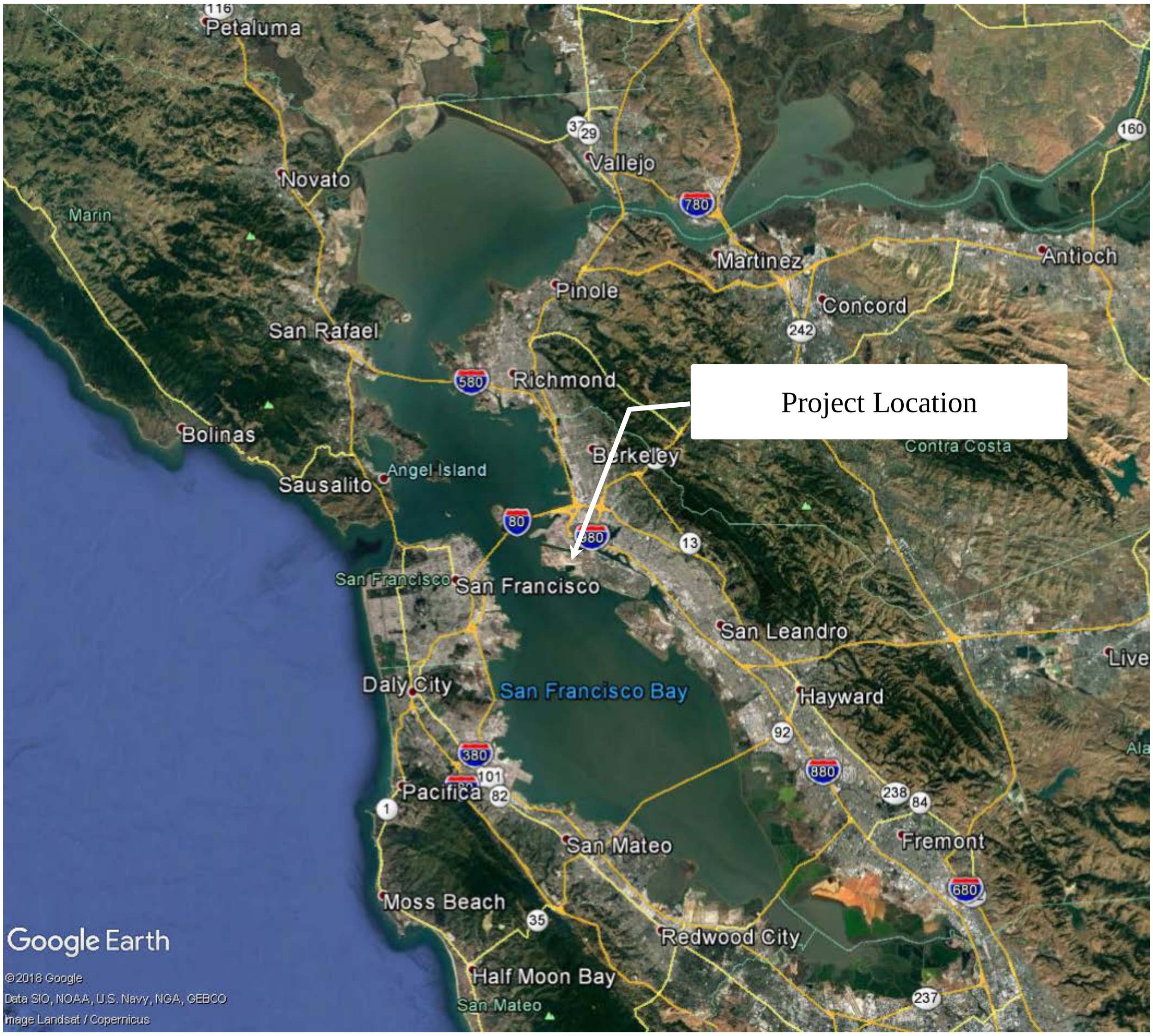

Figure 1 – Project Site Location

Figure 2 – Site Map

PILE INSTALLATION

Hydroacoustic monitoring will be conducted for pile driving activities of each pile type that is driven in water. Table 1 shows the details of the number, type and location of the piles to be installed for the project.

Table 1 – Pile Details

Project Component	Pile Type	Pile Size (Diameter)	Number of Piles	Pile Location
Pier	Concrete	24-inch	6	In Water
Pier	Steel	24-inch	4	On Land
Boarding Float	Steel	36-inch	6	In Water
All	Steel H-Type	14-inch	18[1]	In Water

[1]Up to 18 H-type template piles may be driven to support in-water pile driving.

The hydroacoustic monitoring will be conducted in accordance with the requirements of the National Marine Fisheries Service (NMFS) Biological Opinion[1] and Marine Mammal Incidental Harassment Authorization[2] for the project. The monitoring will be done in accordance with the methodology outlined in this Hydroacoustic Monitoring Plan. The monitoring will be conducted based on the following:

- Dual metric criteria (Popper et al. 2006) and the accumulated sound exposure level (SEL);
- Establish field locations that will be used to document the extent of the area experiencing 187 decibels (dB) cumulative SEL;
- Describe the methods necessary to continuously assess underwater noise on a real-time basis, including details on the number, location, distance and depth of hydrophones, and associated monitoring equipment;
- Provide a means of recording the time and number of pile strikes, the peak sound energy per strike, and interval between strikes;
- Provide provisions to provide all monitoring data to NMFS.

Two hydrophone systems are proposed to record the sound levels at two locations and determine the extent that sound levels decrease spatially. The second hydrophone will be used to calculate transmission loss over distance.

CHARACTERISTICS OF UNDERWATER SOUND

Several descriptors are used to evaluate underwater noise impacts. Two common descriptors are the instantaneous Peak sound pressure level (SPL) and the Root Mean Square (RMS) pressure level during the impulse, which are sometimes referred to as the SPL and RMS level, respectively. The Peak pressure is the instantaneous maximum or minimum overpressure observed during each pulse and can be presented in Pascals (Pa) or decibels (dB) referenced to a pressure of 1 microPascal (µPa). Since water and air are two distinctly different mediums, a different sound pressure level reference pressure is used for each. In water, the most commonly used reference pressure is 1 µPa, whereas the reference pressure for air is 20 µPa. For comparison, an underwater sound level of equally perceived loudness would be 62 dB higher to a comparable sound level in air.

The RMS level is the square root of the sum of the squared pressures multiplied by the time increment and divided by the impulse duration. This level, presented in dB, referenced 1 µPa, is the mean square pressure level of the pulse. It has been used by National Marine Fisheries Service (NMFS) in criteria for determining harassment to marine mammals from underwater impulse-type sounds. The majority of literature uses Peak sound pressures to evaluate barotrauma injuries to fish.

[1] National Marine Fisheries Service, West Coast Region, Tracking Number WCR-2016-5245, Dated July 03, 2017
[2] H. T. Harvey & Associates. 2019. Alameda Point Seaplane Lagoon Ferry Terminal Application for Incidental Harassment Authorization for Marine Mammals.

Sound Exposure Level (SEL), frequently used for human noise exposures, is now used as a metric to quantify impacts to fish (Hastings and Popper 2005). SEL is calculated by summing the cumulative pressure squared (p^2) over the measurement duration, integrating over time, and normalizing to one second. This metric accounts for both negative and positive pressures because p^2 is positive for both negative and positive pressure, and thus, both are treated equally in the cumulative sum of p^2 (Hastings and Popper 2005).[3] The units for SEL are dB re: 1 micropascal^2-sec. (1 µPa^2-sec).

METHODOLOGY

Hydroacoustic monitoring will be performed for 2 of the 24-inch concrete piles installed with an impact hammer, 2 of the 36-inch piles installed with a vibratory hammer, 2 of the 14-inch H-type steel template piles installed with a vibratory hammer, and 2 H-piles extracted with a vibrtory hammer (i.e., 8 piles total).

One hydrophone will be placed at mid-water depth or a minimum of one meter (3.3 ft.) deep at approximately 10 meters (33 ft.) from each pile being monitored, depending on site conditions. An additional hydrophone will be placed at mid-water depth to provide two sound level readings during background and pile driving recording. The far field hydrophone will be used to calculate transmission loss over distance. For impact pile driving, the far field hydrophone will be placed at approximately 100 meters (320 ft.) from the pile[4]. For vibratory pile driving, the hydrophone will be placed at approximately 1,000 meters (1,640 to 3,280 ft.) from the pile[5] in the area in between the lagoon entrance and breakwater where sound would propagate out into the San Francisco Bay, as required by NMFS.

A weighted tape measure will be used to determine the depth of the water. The hydrophones will be attached to a nylon cord or a steel chain if the current is swift enough to cause strumming of the line. One end of the nylon cord or chain will be attached to an anchor that will keep the hydrophone at the specified distance from the pile. The opposite end of the nylon cord or chain will be attached to a float or tied to a static line at the surface at the specified measurement distance from the pile. The distance will be measured by a tape measure, where possible, or a range finder. To the extent practicable, there will be an unobstructed path between the pile and the hydrophones.

Background underwater sound levels will be measured for at least 10 minutes prior to initiation of pile driving, as well as in the absence of construction activities. Background levels will be reported

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[3] Hastings, M. C. and Popper, A. N. (2005). "Effects of sound on fish." Report to California Department of Transportation Contract No. 43A0139, Task order1, http://www.dot.ca.gov/hq/env/bio/files/Effects_of_Sound_on_Fish23Aug05.pdf.

[4] The distance from the pile will be approximately twenty times the source depth from the source measurement as described in the NMFS Northwest Region, 2012. *Data Collection Methods to Characterize Underwater Background Sound Relevant to Marine Mammals in Coastal Nearshore Waters and Rivers of Washington and Oregon*.

[5] The second hydrophone will be placed at as close to 1,000 meters from the pile being driven as possible, as access allows.

as SEL and include a representative spectral analysis. The inspector/contractor will inform the hydroacoustics specialist when pile driving is about to start.

Underwater sound levels will be continuously monitored during the entire duration of each pile being driven. Peak levels of each strike will be monitored in real time. Sound levels will be measured in decibels.

Prior to and during the pile driving activity, environmental data will be gathered, including but not limited to wind speed and direction, air temperature, water depth, wave height, other weather conditions, and other factors (e.g. aircraft, boats, etc.) that could contribute to influencing the underwater sound levels. Start and stop time of each pile driving event will be recorded.

All impact pile driving shall be monitored to determine the efficacy of the sound attenuation system and to determine if the calculated sound pressure levels and associated distances from piles differ from the actual measurements. Table 2 details the equipment that will be used to monitor underwater sound pressure levels.

The chief construction inspector will supply the hydroacoustics specialist with the substrate composition and physical characteristics of the bottom substrate into which the piles are driven, hammer model, and size; depth which the pile is driven and blows per foot for the piles monitored. Hammer energy settings will also be recorded by the chief construction inspector, as well as any changes made to those settings during the pile monitoring period.

EQUIPMENT

Measurements will be made using hydrophones that have a flat frequency response and are omni-directional over a frequency range of 10 to 20,000 Hertz (Hz). For example, a G.R.A.S. CT-10 hydrophone with PCB in-line charge amplifiers (Model 422E13) and PCB Multi-Gain Signal Conditioners (Model 480M122) or equivalent systems could be used to measure sound pressures that pile driving could generate. The signals will be fed into Larson Davis Model 831 Integrating Sound Level Meters (SLM). Quality recordings using a digital solid-state audio recorder would be made as required.

The peak pressure, RMS, and SEL will be measured using the SLM. The SLM has the ability to measure the Z-weighted or unweighted peak sound pressure levels over the relative short periods (e.g., less than 35 milliseconds). The SLM can closely approximate the unweighted SEL of each pile strike by measuring the one-second equivalent sound energy level ($L_{eq(1\text{-}sec)}$) using the linear integration setting. The SLM can also approximate the unweighted 90% RMS of each pile strike by measuring the L_{max} with the SLM set on impulse.

All measurement equipment used would be required to have a frequency response of $\pm$1 dB from 10 to 20,000 Hz over the anticipated measurement range of 170 to 220 dB linear peak re: 1 µPa. Hydrophones of different sensitivities may be required, depending on the acoustic environment.

Table 2 - Equipment for underwater sound monitoring.

Item	Specifications	Quantity	Usage
Hydrophone	Minimum Sensitivity- 211dB ±3dB re 1V/µPa OR 203 dB +2dB re 1V/ µPa	2	Capture underwater sound pressures and convert to voltages that can be recorded/analyzed by other equipment.
Signal Conditioning Amplifier	Amplifier Gain- 0.1 mV/pC to 10 V/pC Transducer Sensitivity Range- 10^{-12} to 10^{3} C/MU	2	Adjust signals from hydrophone to levels compatible with recording equipment.
Calibrator (pistonphone-type)	Accuracy- IEC 942 (1988) Class 1	1	Calibration check of hydrophone in the field.
SLM and Solid-State Recorder	Sampling Rate- 48K Hz or greater	2	Measures and Records data.
Laptop computer	Compatible with digital analyzer	1	Store digital data on hard drive.
Post-analysis	Real time Analyzer-	1	Monitor real-time signal and post-analysis of sound signals.

Note: All have current National Institute of Standards and Technology (NIST) traceable calibration.

CALIBRATION

Calibration of measurement systems shall be established prior to use in the field each day. An acoustical piston phone and hydrophone coupler would be used, along with manufacturer calibration certificates. Calibration of measurement systems would be established as follows:

- Use an acoustically certified piston phone and hydrophone coupler that fits the hydrophone and that directly calibrates the measurement system. The volume correction of the hydrophone coupler using the hydrophone is known so that the piston phone produces a known signal that can be compared against the measurement system response. The response of the measurement system is noted in the field book and is applied to all measurements.

The SLMs are calibrated to the calibration tone prior to use in the field. The tone is then measured by the SLM and is recorded on the beginning of the digital audio recordings that will be used. The system calibration status would be checked by measuring the calibration tone and recording the tones. The recorded calibration tones are used for subsequent detailed analyses of recorded pile strike sounds.

All field notes would be recorded in water-resistant field notebooks. Such notebook entries would include operator's name, date, time, calibration notes, measurement positions, pile driving information, system gain setting information, and equipment used to make each measurement.

The equipment will be calibrated and set to properly measure sounds in the proper range; that is, pile driving sounds will not overload the instrumentation and the noise floor of the instrumentation is not set too high that pile driving sounds above 170 dB $_{peak}$ cannot be properly measured.

Signal Processing

Post-analysis of the sound level signals will include determination of the maximum absolute value of the instantaneous pressure within each strike, RMS value for each absolute peak pile strike, mean and standard deviation/error of the RMS for all pile strikes of each pile, number of strikes per pile and per day, number of strikes exceeding 206 dB Peak, number or percent of individual strikes exceeding 183 dB SEL and 187 dB SEL, SEL of the pile strike with the absolute peak sound pressure, mean SEL, and cumulative SEL (cumulative SEL = single strike SEL + 10*log (# hammer strikes)) and a frequency spectrum between a minimum of 10 and 20,000 Hz for up to eight successive strikes with similar sound levels. Calculation methodology is provided in Appendix A.

REPORTING

In coordination with the Construction Liaison and Project Biologist, the hydroacoustic data consisting of Peak sound levels, single strike SEL levels, and cumulative SEL levels will be submitted to the NMFS on a daily basis if requested. These will be considered preliminary data and include:

- The observed typical and maximum peak pressures, as recorded in field notebooks or depicted from the instrument raw data output.
- The typical and maximum single strike SEL and the daily cumulative SEL, as recorded from the SLM.
- The measured RMS level from the SLM and the $RMS_{90\%}$ calculated during the post-processing of the recorded signals.

A Final Hydroacoustic Report will be prepared and submitted within 60 days following the completion of pile driving activities. This report will contain acoustical information (peak, RMS, and SEL) for all piles where measurements were made. The report shall include:

1. Size and type of piles.
2. A detailed description of the sound attenuation device, including design specifications.
3. A description of the monitoring equipment.
4. The distance between hydrophones and pile.
5. The depth of the hydrophones.
6. The depth of water in which the pile was driven.
7. The depth into the substrate that the pile was driven.
8. The physical characteristics of the bottom substrate into which the piles were driven.

9. For impact pile driving the ranges (minimum and maximum), median and means for Peak, $RMS_{90\%}$, single strike SELs and the pulse duration used for calculating the RMS for each pile. For vibratory pile driving the 1-sec and 10-second averaged SEL will be reported.
10. The results of the hydroacoustic monitoring, including the frequency spectrum, peak, RMS SPLs, and single-strike and cumulative SEL.

APPENDIX A

Calculation of Cumulative SEL

An estimation of individual SEL values can be calculated for each pile strike by calculating a 1-second L_{eq} for each individual pile strike. As can be seen in eq. 1 below, the SEL is essentially a subset of the L_{eq} function. When the time interval for the L_{eq} is set to one second, it is equal to the SEL. The cumulative SEL values produced by calculating a 1 second L_{eq} for each pile strike can then be accumulated for each pile strike.

$$L_{eq,T} = 10\lg\left(\frac{1}{T}\int_0^T \frac{p^2(t)}{p_0^{\ 2}}dt\right) \quad dB \qquad = \qquad SEL = 10\lg\left(\int_{-\infty}^{\infty} \frac{p^2(t)}{p_0^{\ 2}}dt\right) \quad dB \qquad \text{(eq. 1)}$$

Calculating a cumulative SEL from individual SEL values cannot be accomplished simply by adding each SEL decibel level arithmetically. Because these values are logarithms, they must first be converted to antilogs and then accumulated. Perhaps the easiest method for this is to divide each SEL decibel level by 10 and then take the antilog. This will convert the decibels to units of microPascals. Paste these values into a spreadsheet and then sort from smallest to largest value. In a separate column starting with the second row of these values add this value to the one above it and then repeat this process to the last row of data. The last value in this column is the cumulative SEL in units of microPascals. Next convert the microPascal values to dB_{SEL} by dividing each value by the total number of values and calculating the log base 10 of each of these values, then multiply by 20 to get dB_{SEL}.

It is recommended that you also plot these values on a cumulative plot such as the one below.