

**Pier 36 / Brannan St. Wharf
San Francisco, San Francisco
County, California**

**Incidental Harassment Authorization
Permit Application**

April 2011



**US Army Corps
of Engineers** ®
San Francisco District

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1.) A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals

The United States Army Corps of Engineers, San Francisco District (USACE) and the Port of San Francisco propose to demolish the existing Pier 36 along the San Francisco, California waterfront and construct a 57,000-square-foot (ft²) open space, pile-supported park that will be known as the “Brannan Street Wharf.” The project site is located in San Francisco, California, on the San Francisco Bay waterfront, four blocks south of the San Francisco Oakland Bay Bridge (Attachment A – Project Vicinity).

The 156,000-ft² (3.6 acre) project site (Assessor’s Block 9900, Lot 034, 036) is located between Pier 30-32 and Pier 38 directly fronting the east side of The Embarcadero, in proximity to the intersection of Brannan Street and Townsend Street, within the South of Market (SOMA) district of San Francisco (Figure 1).

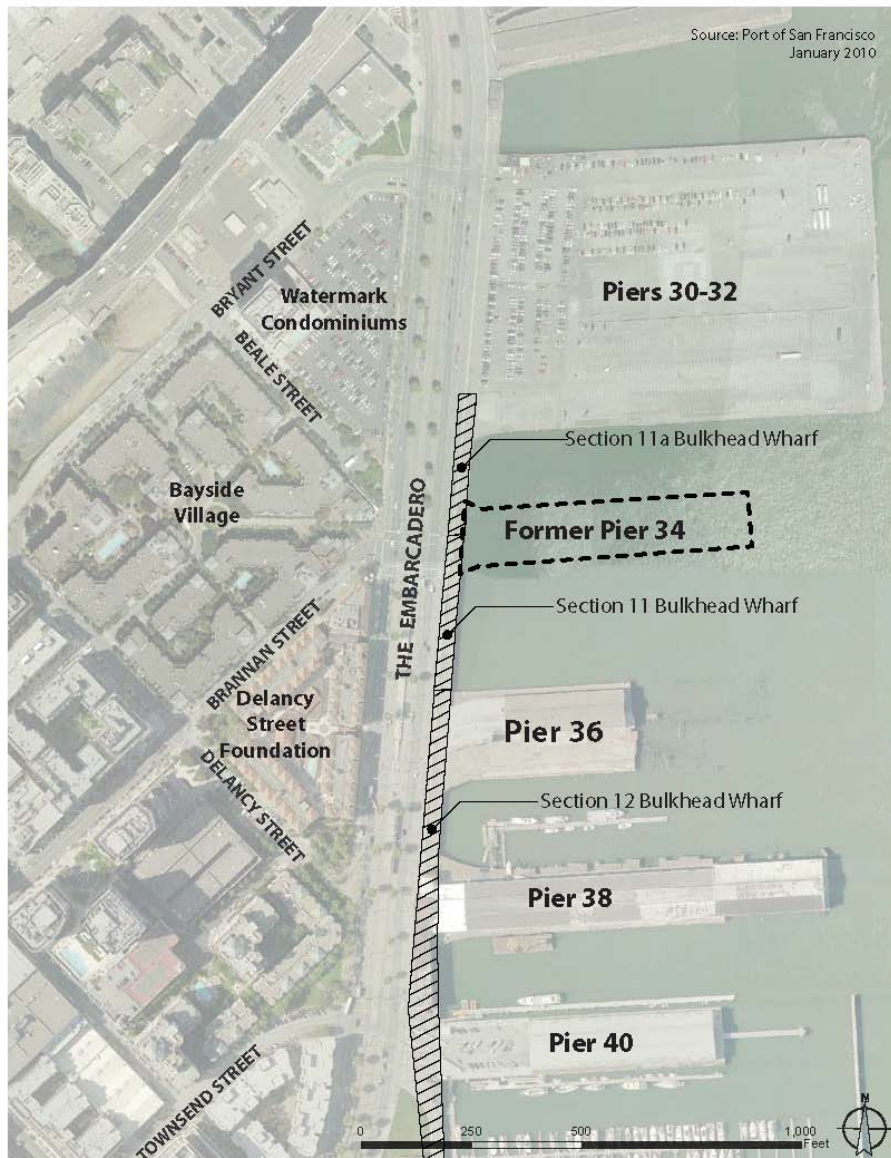


Figure 1. Pier 36 / Brannan St. Wharf Project Location

The proposed demolition will involve removal of 350-400 caisson piles (approximately 12,000 linear feet) that support Pier 36 and the Bulkhead Wharf Sections 11, 11a, and 12, as well as demolition of 133,000 ft² of pile-supported concrete and dilapidated wooden decks and piles, the 35,000-ft² Pier 36 warehouse building, and approximately 18,800 ft² of marginal wharf that runs between Piers 30-32 and Pier 38. Construction of the new wharf will require installation of 261 steel and concrete piles and 57,000 ft² of new decking (Figure 2).

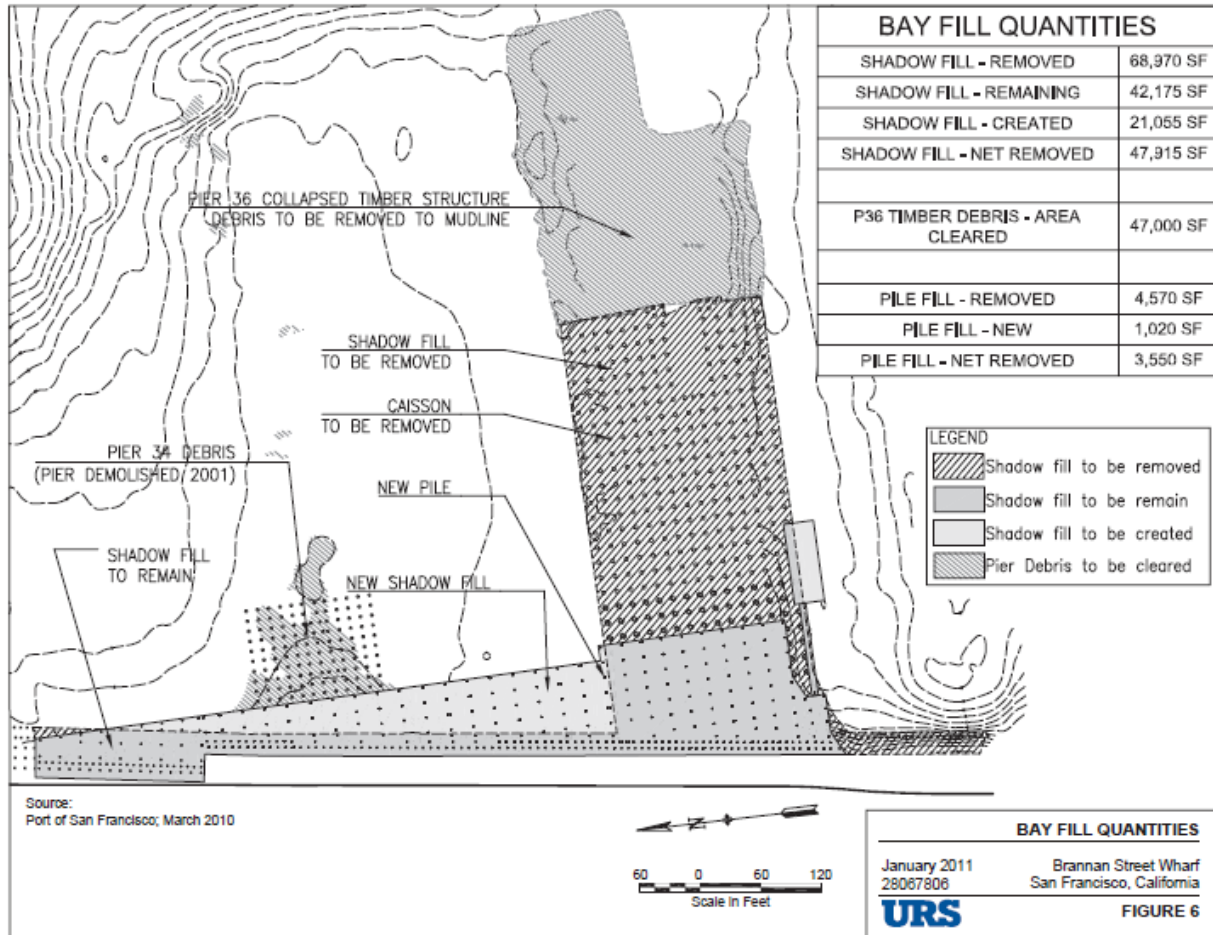


Figure 2. Proposed Pier 36 / Brannan St. Wharf Demolition and Construction

Demolition of the existing overwater Pier 36 structures and removal of the supporting caissons is not likely to result in incidental taking of marine mammals. The height of the existing Pier 36 decking prevents marine mammal haul out at the project site, and the nearest marine mammal haul-out site, the Yerba Buena Island haul-out site, is over 3.2 Kilometers (2 miles) from Pier 36. Because the removal of existing overwater Pier 36 structures and decking will occur out of water and far from known haul-out sites, these actions are not likely to result in acoustic harm or harassment of marine mammals.

The caissons currently supporting Pier 36 will be removed using a barge-mounted excavator. Each caisson will be rocked back and forth to free the belled end using the excavator and then lifted out using the derrick. Caissons will be removed one or two at a time and approximately eight caissons per day will be removed. The proposed method is not expected to generate sound at pressures outside of the 120-155 peak decibel (dB) range expected under ambient conditions in a

large marine bay with heavy industrial use and boat traffic, such as San Francisco Bay (Caltrans 2009).

Construction of the proposed wharf project will involve in-water pile driving and out-of-water installation of 57,000 square feet of new cast-in-place concrete decking. The proposed project requires 261 concrete and steel piles be driven into the waters of San Francisco Bay, which could produce high-intensity noise under the water surface. Such noise has the potential to incidentally take marine mammals through harassment due to acoustic disturbance. After placement of the new piles, the installation of new cast-in-place concrete decking for the Brannan St. Wharf will occur out of water and away from known haul-out sites for marine mammals. Therefore, the installation of new decking is not expected to result in harm or harassment of marine mammals. Table 1 details the major actions associated with the Brannan St. Wharf Project, the anticipated timing of those actions, and whether those actions are expected to result in incidental take of marine mammals through harassment.

Table 1. Pier 36/ Brannan St. Wharf Project Actions and Potential of Incidental Harassment

Project Action	Anticipated Timing	Potential for incidental harassment?
Demolition of Existing Over-water Structures	Jan 2012 – May 2012	No
Removal of Existing Pilings	Jan 2012 – May 2012	No
New Pile Driving	May 2012– Dec 2012	Yes
Installation of New Over-water Structures	Jan 2013 – June 2013	No

Concrete piles will be driven into the bay using impact driving methods only, while steel shell piles will be driven using a combination of impact and vibratory driving methods. All Impact pile driving will employ a “soft start” technique to give marine mammals in the action area’s injury and harassment threshold zones the opportunity to move out of the area. To reduce sound levels during pile driving, an unconfined bubble curtain system will be used to place all steel shell piles when the water depth is greater than two feet. Bubbles in the water attenuate noise energy by disrupting the sound waves, and on other wharf projects in the San Francisco Bay area, such systems have been shown to reduce peak sound levels by 5 to 15 decibels (dB) (Caltrans, 2009). The proposed pile driving work (Table 2) is detailed in the following paragraphs.

Table 2. Proposed Pile Driving for the Pier 36/Brannan St. Wharf Project

Pile Type	Total Piles Proposed	Pile Driver	Attenuation device	Minutes of Vibratory Driving	Impact Blows per Pile	Max Piles Per Day
24-inch octagonal concrete	141	Impact	None	n/a	800	8
24-inch steel shell	116	Vibratory and Impact	Bubble Curtain	8:00	300	5
36-inch steel shell	4	Vibratory and Impact	Bubble Curtain	15:00	600	4

24-Inch Octagonal Concrete Piles

Approximately 141, 24-inch diameter octagonal concrete piles will be driven in water depths ranging from 2 to 15 feet mean lower low water (MLLW) with an impact pile driver to a depth of approximately 60 feet below the mudline elevation. The substrate at the site includes approximately 20 feet of Bay Mud underlain by a sand mixture. The total time of pile driving for each pile is estimated to be 20 minutes. During one work day, five to eight of these piles may be installed. Up to 800 blows from an impact driver will occur for each pile, using a DelMag D46-32 diesel impact hammer, which produces approximately 122,000 foot-pounds (ft-lbs) maximum energy per blow, 1.5 seconds per blow (sec/blow) average. Conservatively assuming the maximum number of impact blows is required for each 24-inch concrete pile, 112,800 impact blows would be necessary over the 12-month duration of the Incidental Harassment Authorization to install all 141, 24-inch concrete piles.

24-Inch Steel Shell Piles

Two rows of 24-inch diameter steel shell piles (approximately 116) will be installed nearest the shoreline as pier support piles. These will be used instead of concrete piles due to the presence of rock dike material along the shoreline. These piles will be driven through waters with a depth of approximately 0 to 6 feet MLLW, depending on the location and tides. As with the concrete piles, they will be driven to a depth of approximately 60 feet below the mudline. The substrate at the site includes a layer of rocky dike material and Bay Mud underlain by a sand/clay mixture. During one work day, three to five of these piles may be installed. Each pile will be driven for 20 to 30 minutes. Installation will begin with approximately eight minutes of vibratory pile driving, and finish with up to 300 blows from an impact hammer using the DelMag D46-32 diesel hammer described above. Conservatively assuming the maximum vibratory time and number of impact blows is required for each 24-inch steel pile, 928 minutes of vibratory driving and 34,800 impact blows would be necessary over the 12-month duration of the Incidental Harassment Authorization to install all 116, 24-inch steel piles.

36-Inch Steel Shell Piles

Installation of the new Pier 36 floating dock requires the placement of four 36-inch diameter steel shell piles. These piles will be driven in an area with a water depth of approximately 10 to 15 feet MLLW. As with the other piles, they will be driven to a depth of approximately 60 ft below the mudline. The substrate at the site includes approximately 20 feet of Bay Mud underlain by a

sand/clay mixture. It is estimated that each pile will be driven in 20 to 30 minutes. All four of these piles will be installed in one work day. Installation will begin with 5 to 15 minutes of vibratory driving, and finish with approximately 600 blows from a DelMag D62-22 diesel impact hammer, producing approximately 165,000 ft-lbs maximum energy (may not need full energy), 1.5 sec/blow average. Conservatively assuming the maximum vibratory time and number of impact blows is required for each 36-inch steel pile, 60 minutes of vibratory driving and 2,400 impact blows would be necessary over the 12-month duration of the Incidental Harassment Authorization to install all 4, 36-inch steel piles.

Only one pile type (24-inch concrete, 24-inch steel, or 36-inch steel) is expected to be installed on any given day. Conservatively assuming the maximum vibratory time and number of impact blows is required for each pile type, a total of 988 minutes of vibratory driving and 150,000 impact blows would be necessary over the 12-month duration of the Incidental Harassment Authorization to install all the piles anticipated for the project.

2.) The date(s) and duration of such activity and the specific geographical region where it will occur

The specific geographic location is depicted in Figure 1 and described in section 1. The wharf and pier demolition are expected to be completed in 5 months, and the new wharf construction is expected to be completed in 13 months. Demolition of the existing wharf structures is expected to begin in January 2012, and be completed in May 2012. Construction of the new Brannan St. Wharf is expected to begin in May 2012, and be completed in June 2013. Pile driving activities are expected to occur between May 2012 and December 2012. The project will be conducted during daylight hours between 7 am and 6 pm.

3.) The species and numbers of marine mammals likely to be found within the activity area

Marine mammal species that are commonly observed in the San Francisco Bay include Pacific Harbor Seal (*Phoca vitulina richardii*), California Sea-lion (*Zalophus californianus*), and Gray Whale (*Eschrichtius robustus*). While once considered rare, observations of harbor porpoise (*Phocoena phocoena*) in the Bay have been increasing (Perlman 2010). Incidental observations of other marine mammals such as the humpback whale (*Megaptera noveangliae*) have also been made within the Bay (WRA 2010).

Humpback Whale

The revised Caltrans marine mammal monitoring program for the San Francisco/Oakland Bay Bridge (SFOBB) project reported that cases of humpback whales (*Megaptera noveangliae*) straying into the Bay were extremely rare and concluded that the species was unlikely to be present in the project vicinity during project construction (SRS Technologies 2004 as cited in WRA 2010). Given the smaller scale and shorter duration of this project in comparison to the SFOBB project, it is even more unlikely that humpback will be present in the vicinity during construction of the Pier 36/Brannan St. Wharf project and therefore, incidental take authorization is not being requested for this species.

Harbor Porpoise

Occasional sightings of harbor porpoises (*Phocoena phocoena*) in the Bay, including near the Yerba Buena Island harbor seal haul-out site, were reported by the revised Caltrans marine mammal monitoring program (SRS 2004 as cited in WRA 2010) and the Golden Gate Cetacean Research (GGCR) Organization suggests that the species is returning to San Francisco Bay after an absence of approximately 65 years (GGCR 2010). GGCR has begun a National Marine

Fisheries Service (NMFS) – authorized, multi-year assessment to document the population abundance and distribution in the Bay. Recent observations of harbor porpoises have been reported by GGCR researchers off Cavallo Point, outside Raccoon Strait between Tiburon and Angel Island, off Fort Point and as far into the Bay as Carquinez Strait (Perlman 2010). The Pier 36 project site is located in the south bay (south of the SFOBB) and based on the Caltrans marine mammal monitoring and GGCR observations, the closest site at which harbor porpoises have been observed is the Yerba Buena Island. Yerba Buena Island is located in the middle of the SFOBB and the harbor seal haul-out site is on the south side of the Island (Bohorquez 2002). During Caltrans monitoring in 2000 a single harbor porpoise was observed at this site (CalTrans 2006). This site is approximately 3.2 Kilometers (km, 2.1 miles) north east of the Pier 36 site and 2.2 km from the anticipated 120 dB Root Mean Square (dB RMS) behavioral (Level B) harassment zone associated with vibratory driving (see Figure 3 below; see Question 7 for calculation of the anticipated harassment zone isopleths). The remaining sites where harbor porpoises have been reported are located in the central and north bay (Figure 3). There have been no known reports of porpoises near the project activity area and none were observed during reconnaissance surveys conducted by project biologists.

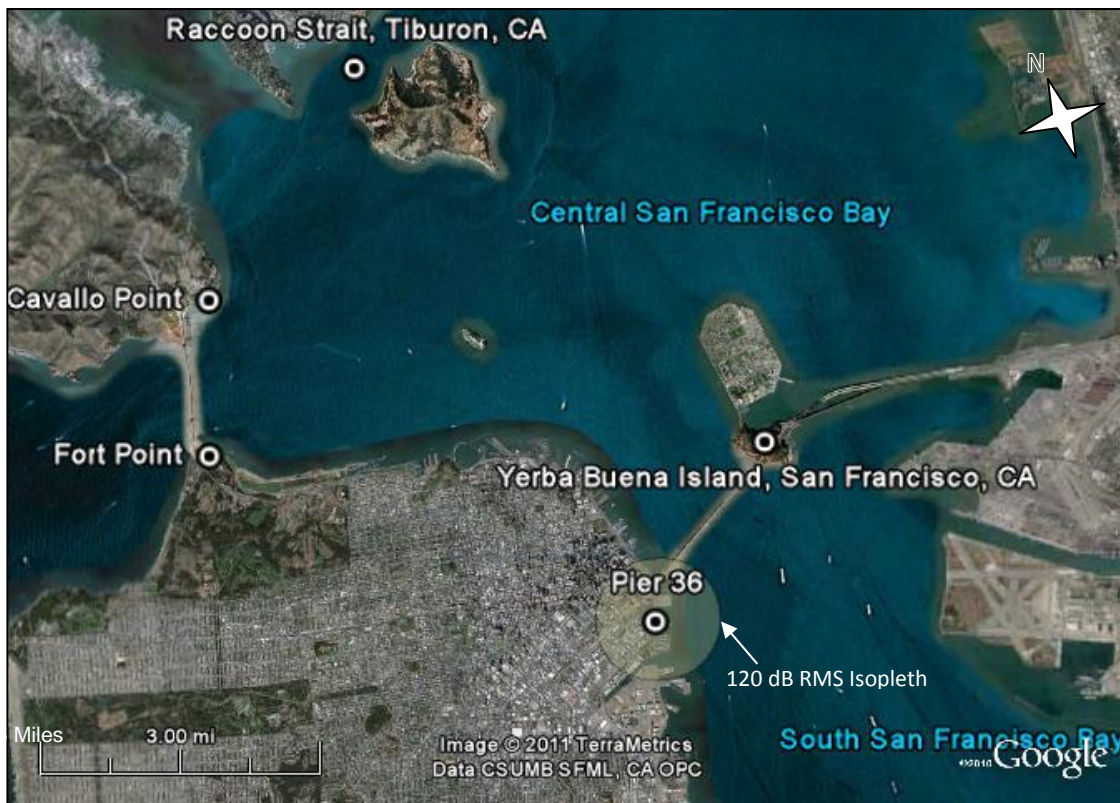


Figure 3. Locations where harbor porpoises have been observed in relation to the Pier 36 project site and 120 dB RMS behavioral Harassment isopleth. The Carquinez Strait is not shown but is located further north and east of central San Francisco Bay.

Harbor Seal

Harbor seals (*Phoca vitulina*) are the dominant and only year round resident pinniped in the San Francisco Bay Area (Manna et al 2006; Goals Project 2000). San Francisco Bay Pacific Harbor Seal counts conducted in 1987, 1999, 2002, and 2004 found 524, 641, 558, and 621 seals, respectively, and population numbers in the San Francisco Bay are considered relatively stable

(Goals Project 2000; Lowry et al. 2008). Up to 200 harbor seals per day have been observed to haul out at the Yerba Buena Island haul-out site (CalTrans 2006) which, as noted above, is approximately 3.2 km (2.1 miles) north east of the Pier 36 site and 2.2 km from the anticipated 120 dB Root Mean Square (dB RMS) behavioral (Level B) harassment zone associated with vibratory driving. Individuals occasionally forage or pass through the waters in the project area.

Reconnaissance-level wildlife habitat assessments at the project site were conducted by biologists from Coast Ridge Ecology and URS Corporation on May 6, 2009 and February 3, 2010. These surveys were conducted from land by walking the existing wharf edge. The warehouse structure, wharf, old piers, and nearshore tidal habitat were visually inspected. During the February 3, 2010 survey, two Pacific harbor seals were observed swimming and foraging offshore within 300 feet of the wharf edge.

California Sea lion

California sea lions (*Zalophus californianus*) rest and forage within San Francisco Bay, but travel south to the Channel Islands off the coast of Ventura, California to breed and pup (CalTrans 2006). California sea lion haul out primarily on floating docks at Pier 39 in the Fisherman's Wharf area of San Francisco Bay (approximately 3.6 km (2.25 miles) from the project site) and may be found on buoys elsewhere in the Bay (WRA 2010). Winter numbers of California sea lion generally average 200 to 300 animals per day and can reach over 500 (Goals Project 2000). These numbers are generally thought to be stable within the Bay. While sea lions were not observed during two reconnaissance-level wildlife habitat assessments at the project site, they are likely to occasionally forage or pass through the waters in the activity area.

Gray Whale

The gray whale (*Eschrichtius robustus*), though uncommon, are occasionally seen in the Bay. In the late fall, gray whales migrate south along the coast of North America to spend the winter in their breeding and calving areas off the coast of Baja California, Mexico (USACE 2011). Between mid-February and May, gray whales migrate northward along the coast of North America and low numbers may enter rivers and bays (such as San Francisco Bay) (USACE 2011). Gray whales have been sighted in San Francisco Bay in Richardson Bay off the tip of the Tiburon Peninsula, and as far south as the San Bruno Shoals area (USACE 2011). Observations in San Francisco Bay are typically made from December through May, during the whales' coastal migration (USACE 2011). Given that pile driving activities for the proposed Pier 36 Brannan St. Wharf project are expected to take place between May and December 2012, it is unlikely that gray whales will be present in the project area during construction; therefore, it is unlikely that incidental harassment would occur. Pile driving activities could overlap with the southbound migrating whales; however, typically southbound migrating whales travel farther offshore and are less likely to enter into the Bay.

4.) A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities

The marine mammal species with the potential to be affected by the project include harbor seals, California sea lion, gray whales and harbor porpoises.

Pacific Harbor Seal

Pacific Harbor Seals range from Cedros Island (Baja California) along the Pacific coasts of the United States, Canada and Alaska, through the Aleutian Islands to the Pribilof Islands (WRA 2010). In California, approximately 400-500 harbor seal haul out sites are widely distributed along

the mainland and on offshore islands, including intertidal sandbars, rocky shores and beaches (Hanan 1996). The south side of Yerba Buena Island is the nearest haul out area to the Pier 36 project site. Seals haul out year round on Yerba Buena Island, but it is used most frequently during winter months coinciding with the Pacific herring spawn (Bohorquez 2002). Yerba Buena Island is not considered a pupping site for harbor seals (Kopec and Harvey 1995 as cited in WRA 2010) but pups are occasionally observed there (average of three pups per year between 1995-1997, Bohorquez 2002).

California Harbor Seals are not listed under the Endangered Species Act (ESA) or considered strategic under the Marine Mammal Protection Act (MMPA). The most recent harbor seal counts in May-July 2004, estimate California's harbor seal population (based on Hanan's revised correction factor) at 34,233 individuals (Carretta et al. 2006, WRA 2010). The population appears to be stabilizing at what may be their carrying capacity and the human-caused mortality is declining.

California Sea Lion

California sea lions reside in the Eastern North Pacific Ocean in shallow coastal and estuarine waters (WRA 2010). They breed and give birth in spring, primarily in the Channel Islands (USACE 2011). After breeding season, about mid-August, the adult males, many subadult males, and a few subadult females disperse from the rookeries. Males travel northward while females travel south or remain near the rookeries (Schoenherr, 1995; Zeiner, 1990 as cited in USACE 2011). In San Francisco Bay, California sea lions have been observed at Angel Island and occupying the docks near Pier 39 which is approximately 3.6 km (2.2 miles) north of the Pier 36 project site and 2.6 km from the anticipated 120 dB Root Mean Square (dB RMS) behavioral (Level B) harassment zone associated with vibratory driving. The sea lions appear at Pier 39 after returning from the Channel Islands at the beginning of August (Bauer 1999). No other sea lion haul-out sites have been identified in the Bay and no pupping has been observed at the pier 39 site or any other site in San Francisco Bay (USACE 2011)

California sea lions in the U.S. are not listed under the ESA or considered depleted under the MMPA (NOAA 2007). They are also not considered a strategic stock under the MMPA (NOAA 2007). The most current National Marine Fisheries Service (NMFS) stock assessment report estimates the population size at approximately 238,000 individuals in the U.S. (NOAA 2007).

Gray Whale

Gray whales are found in the Pacific Ocean along the western coastline of North America. Gray Whales spend winters off Baja California and between mid-February and May, the Eastern North Pacific stock, migrates 5,600 miles northward with newborn calves along the West Coast of the U.S. to spend their summers north of Alaska (USACE 2011). They are typically seen off the California coastline from December through May as they migrate northward to the Bering and Chukchi Seas, and again in the return trip to Baja California.

The Gray Whale is not listed as depleted under the MMPA and was delisted from the ESA in 1994 (59 FR 31094). The population size of the Eastern North Pacific stock has been increasing over the past several decades and NMFS's most current stock assessment report estimates this population at approximately 18,813 individuals (NOAA 2008).

Harbor Porpoise

In the Pacific, harbor porpoises inhabit coastal and inland waters from Point Conception, California to Alaska (NOAA 2009). Recent stock assessments have indicated that harbor

porpoise along the west coast of North America are not migratory and the genetically distinct stock off the coast of central California from San Francisco to Point Arena is identified as the San Francisco- Russian River stock (NOAA 2009).

Harbor porpoise in California are not listed under the ESA or considered depleted under the MMPA (NOAA 2009). Abundance of the San Francisco - Russian River harbor porpoise stock appeared to be stable or declining between 1988-1991 and has steadily increased since 1993. NMFS's most current stock assessment report estimates this population at approximately 9,189 individuals (NOAA 2009).

5.) The type of incidental taking authorization that is being requested (i.e., takes by harassment only; takes by harassment, injury and/or death) and the method of incidental taking;

Pursuant to the Marine Mammal Protection Act, the USACE and Port of San Francisco request authorization from the National Marine Fisheries Service for incidental take by harassment of small numbers of Pacific harbor seal, California sea lion, gray whale, and Pacific harbor porpoise resulting from construction of the Pier 36/ Brannan St. Wharf project. Take by harassment may result from acoustic disturbance associated with pile driving between May and December 2012.

6.) By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking identified in paragraph (a)(5) of this section, and the number of times such takings by each type of taking are likely to occur

Take by incidental harassment may occur as a result of acoustic disturbance associated with pile driving during construction of the Pier 36 project. The age, sex, and reproductive condition of individuals of each species that may potentially be taken is difficult to estimate given the lack of information on the class distribution of these species within the activity area and greater San Francisco Bay. The nearest known haul out sites for both the Pacific harbor seal (Yerba Buna Island) and California sea lion (Pier 39) are each more than 2 miles from the project site and neither of these haul out sites are considered to be pupping sites. California sea lion breed and give birth in spring, primarily in the Channel Islands, and Pacific harbor seals in San Francisco Bay generally pup March through May. Because the timing of pile driving activities (May-December) avoids the majority of the pupping season for these species it is expected that only adults, juveniles, and weaned pups would be the age classes impacted. Similarly, gray whales calve primarily in Baja California and generally migrate to Alaska by May to spend their summers. Given the timing of pile driving activities, it is unlikely that any gray whale calves would be impacted. Most harbor porpoise calves are born between May and August (Bjorge and Tolley 2008) but sightings more than 1 km inside the Golden Gate Bridge are infrequent (NOAA 2006).

Harbor seals have been observed foraging in the activity area and California sea-lion may also use the activity area for foraging and/or daily migrations. Monitoring data collected by Caltrans for the SFOBB project presents the most relevant surrogate data to approximate density of these species within the activity area. However, the monitoring data for the SFOBB give occurrences of Pacific harbor seals and California sea lion that are likely higher than those for the activity area given that the monitoring occurs in close proximity to the Yerba Buena Island haul out site whereas the Pier 36/ Brannan St. Wharf activity area is located more than 2 miles from the site.

During 22 days of monitoring from January through August 2006, 35 pinnipeds (33 harbor seals [94.3%] and 2 California sea lions [5.7%]) were observed during open water pile-driving for Piers

E2 and T1 of the SFOBB project (CalTrans 2006). No gray whales were observed and there were no reports of whales in San Francisco Bay during that time (CalTrans 2006). While the marine mammal monitors did not observe any harbor porpoises, one of the crew boat captains indicated that he saw a small pod of harbor porpoises on one day (CalTrans 2006). Assuming equal monitoring effort time per day, the density of harbor seals and California sea lions is 1.5 seals/day and 0.09 sea lions/day (CalTrans 2006). During previous CalTrans monitoring efforts for pile-driving activities associated with the eastbound SFOBB Skyway structure, 63 pinnipeds were observed during 31 days (2.0 pinnipeds/day) (CalTrans 2006). However, this monitoring period included two days of herring runs in late January 2004 which resulted in 20 sea lions and 21 harbor seals being observed within and outside of the marine mammal safety zone (MMSZ) established for that project (CalTrans 2006). There were no observed herring runs during marine mammal monitoring for Piers E2 or T1. If data for the two days herring runs are subtracted out, then only 22 pinnipeds (0.8 pinnipeds/day) would have been observed during the eastbound structure pile-driving (CalTrans 2006). CalTrans (2006) noted that it appeared that most pinnipeds were transiting through the construction area and were only briefly seen 1 to 3 times before they move out of the area. However, herring runs could likely result in increased presence and foraging behavior. No observations of gray whales or harbor porpoises were noted in this case.

To be conservative, pinniped presence within the Pier 36/Brannan St. Wharf activity area is estimated to be 2 harbor seals and 1 California sea lion per day. These animals could come within the Level B harassment threshold isopleth. It is additionally estimated that 1 harbor porpoise per day and 2 gray whales per year could be present within the Pier 36/Brannan St. Wharf activity area. These cetaceans could come within the Level B harassment threshold isopleth.

The Pier 36/Brannan St. Wharf project proposes to drive a total of 261 concrete and steel piles into the waters of San Francisco Bay and this action has the potential to incidentally take marine mammals through harassment due to acoustic disturbance. The project requires three different types of piles be installed and only one pile type is expected to be installed on any given day. One-hundred-forty-one (141), 24-inch concrete piles will be driven in total and during one work day, five to eight of these piles may be installed. Conservatively assuming five 24-inch concrete piles are installed per day, installation of these piles would require 29 days. One-hundred-sixteen (116), 24-inch steel piles will be driven in total and during one work day, three to five of these piles may be installed. Conservatively assuming three 24-inch concrete piles are installed per day, installation of these piles would require 39 days. Finally, four (4), 36-inch steel piles will be driven in a single day. Therefore, the maximum number of pile driving days expected for the project would be 69.

Based on the conservatively estimated presence of the pinniped and cetacean species described above, and the estimated number of pile driving days, the Pier 36/Brannan St. Wharf project is requesting an authorization for incidental take by harassment of 138 harbor seals (2 per day), 69 California sea lion (1 per day), 69 harbor porpoises (1 per day), and 2 gray whales (2 annually).

7.) The anticipated impact of the activity upon the species or stock

With the implementation of the proposed Marine Mammal Mitigation and Monitoring Plan described in question 11 below, no permanent impacts to individuals or stocks of Pacific harbor seals, California sea lions, harbor porpoises, and gray whales are expected to occur as a result of the project. However, Pier 36/Brannan St. Wharf project construction may temporarily impact these species through harassment due to avoidance and disruption of foraging behavior as a

result of pile driving.

Currently, the National Marine Fisheries Service (NMFS) thresholds for acoustic impacts from impulse sounds to marine mammals are set at the following levels:

- 120 dB RMS for behavioral harassment of marine mammals from continuous source vibrations ("Level B" harassment);
- 160 dB RMS for behavioral harassment of marine mammals from impact source vibrations ("Level B" harassment);
- 180 dB RMS for physical injury of cetaceans, such as gray whales and harbor porpoises ("Level A" criteria); and
- 190 dB RMS for physical injury of pinnipeds, such as Pacific harbor seal and California sea lion ("Level A" criteria).

As previously noted, concrete piles placed for the Pier 36/Brannan St. Wharf project will be driven using impact driving methods only, while steel shell piles will be driven using a combination of impact and vibratory driving methods. Only one pile type is expected to be driven on any given day. All impact pile driving will employ a "soft start" technique and an unconfined bubble curtain system will be used to place all steel shell piles when water depth is greater than 2 feet deep.

A review of different projects with comparable water depth and substrate conditions (shallow water in areas of soft substrate) was conducted to identify source sound level data and determine potential sound levels from the pile driving activities associated with the Pier36/Brannan St. Wharf project (USACE 2011). These projects included the Berth 22 Reconstruction at the Port of Oakland, Berth 32 project at the Port of Oakland, Pier 40 construction in San Francisco, Amports Pier 95 in Benicia, Richmond-San Rafael Bridge project, Rodeo Dock Repair project, Amorco Wharf Repair project, Alameda Bay Ship and Yacht project, and Humboldt Bay Bridges Project (USACE 2011). The expected sound levels along with the project-specific pile driving activity information summarized in section one were used to calculate the sound levels (in dB RMS) expected for the proposed project.

For the calculations it was conservatively assumed that the use of a bubble curtain would reduce sound levels by 5 dB RMS. The analysis also assumes an attenuation factor of 16 dB RMS (approximately 5 dB RMS per doubling of distance) within the activity area. This is a conservative value for attenuation in shallow water pile driving (depths of less than 45 feet), the attenuation in the activity area will likely be greater than 16 (CalTrans 2009 as cited in USACE 2011). Furthermore, pile driving for the proposed project is expected to occur in depths of 0 to 15 feet of water and pile driving in such shallow water generally limits underwater noise levels. Finally, the analysis assumes that a receptor (i.e. a marine mammal) within a threshold for acoustic impacts is stationary during the pile driving and that all pile strikes produce noise at the maximum sound level.

Table 3 below summarizes by pile size the sound levels (in dB RMS) expected at approximately 10 meters from the source.

Table 3. Expected Pile Driving Sound Levels for the Pier36/Brannan St. Wharf Project

Pile Type	Attenuation device	Sound Level
24-inch octagonal concrete	None	170.00 dB RMS
24-inch steel shell	Bubble Curtain	190.00 dB RMS
36-inch steel shell	Bubble Curtain	190.00 dB RMS

Harassment threshold isopleths for pile driving are based on the sound level produced at the source and the expected attenuation rate of sound with distance from the source. Based on the anticipated sound levels given in Table 3, the expected distance from the source sound to the NMFS thresholds for acoustic impacts to marine mammals were calculated for the proposed project. The expected distance to the NMFS thresholds for acoustic impacts are summarized in Table 4. Because the driving of concrete piles will involve only impact driving while the driving of the two types of steel piles will involve both impact and vibratory driving, two sets of threshold distances were identified: one for concrete piles and one for steel piles. The threshold distances listed for the steel piles are those expected from the 36-inch steel pile driving activities as these would encompass the isopleths for the 24-inch steel pile driving activities. Predicting audibility (or detectability) with any certainty at distances beyond 1,000 meters is not possible (CalTrans 2009). Therefore, the maximum distance of a threshold isopleth is considered to be 1,000 meters (3281 feet).

Table 4. Expected NMFS threshold isopleths distance for the Pier36/Brannan St. Wharf Project

Threshold	Concrete Piles (24-inch) Distance from source to minimum threshold (Meters / Feet)	Steel Piles (24- and 36-inch) Distance from source to minimum threshold (Meters / Feet)
120 dB RMS (Level B – Continuous Source)	Not Applicable – No Vibratory Driving Involved	1000 m / 3281 ft
160 dB RMS (Level B – Impact Source)	42 m / 138 ft	750 m / 2460 ft
180 dB RMS (Level A – Cetaceans)	Not Applicable – Not Exceeded	42 m / 138 ft
190 dB RMS (Level A – Pinnipeds)	Not Applicable – Not Exceeded	Not Applicable – Not Exceeded

Based on these calculations, for the 141 concrete piles to be driven the Level A harassment thresholds for pinnipeds and cetaceans are not expected to be exceeded. The 120 dB RMS Level B harassment threshold for continuous source sounds is not applicable since the concrete piles will not be driven using vibratory methods. The 160 dB RMS Level B harassment isopleth for impact source sounds would extend approximately 42 meters (138 feet) into the Bay. This isopleth is illustrated in Attachment B.1 (Pier 36 Brannan St. Wharf Concrete Pile Driving Threshold Isopleths).

For the 116, 24-inch steel piles and 4, 36-inch steel piles to be driven, it is expected that the Level A harassment threshold for pinnipeds would not be exceeded and that the Level A harassment isopleth for cetaceans would reach approximately 42 meters (138 feet) into the Bay in any direction from the pile hammer. The Level B harassment isopleths associated with driving the steel piles are expected to extend approximately 750 meters (2460 feet) and 1000 meters (3281 feet) for impact and continuous source pile driving activities, respectively. These isopleths are illustrated in Attachment B.2. (Pier 36 Brannan St. Wharf Steel Pile Driving Threshold Isopleths).

Given these harassment threshold isopleths, two sets of Level A Marine Mammal Safety Zones (MMSZs) and Level B buffer zones are proposed: one set to be adhered to when driving the concrete piles, and one set to be adhered to when driving either type of steel pile (24- or 36-inch). For the concrete piles, a 50-meter (164-foot) Level B buffer zone will be established. There will be no Level A safety zone because exceedance of either the pinniped or cetacean Level A thresholds is not anticipated during driving of the concrete piles. For the steel piles, a 50-meter (164-foot) Level A MMSZ and a 1000 meter (3281-foot) Level B buffer zone will be established. The proposed MMSZs and buffer zones for concrete and steel pile driving are listed in Table 5.

Table 5. Proposed Pier 36/Brannan St. Wharf Marine Mammal Safety Zone (MMSZ) Distances

Threshold	<u>Concrete Piles (24-inch)</u>	<u>Steel Piles (24- and 36-inch)</u>
	Zone Distance (Meters / Feet)	Zone Distance (Meters / Feet)
Level B Buffer Zone (Continuous Source)	Not Applicable – No Vibratory Driving Involved	1000 m / 3281 ft
Level B Buffer Zone (Impact Source)	50 m / 164 ft	1000 m / 3281 ft ¹
Level A Safety Zone (Cetaceans)	Not Applicable – Not Exceeded	50 m / 164 ft
Level A Safety Zone (Pinnipeds)	Not Applicable – Not Exceeded	Not Applicable – Not Exceeded

¹The impact source Level B threshold isopleth (750 m) is encompassed by the continuous source Level B threshold isopleths (1000 m). For ease of observation, the project will use the continuous source Level B isopleth distance (1000 m) as the buffer zone distance for both vibratory and impact source driving of steel piles.

Marine mammal monitors will be present during pile driving activities (as further described in question 11). The monitors will record observations of marine mammals within the Level B buffer zones before, during, and after pile driving activities. Should a marine mammal come within or

approach the Level A MMSZ prior to the start of pile driving, pile driving activities will be delayed until the mammal is seen exiting the Level A MMSZ or if the marine mammal has not been observed within the Level A zone for a period of 15 minutes or more.

8.) The anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses

Marine mammals in San Francisco Bay are not harvested for subsistence use. Therefore no impact would occur to subsistence uses.

9.) The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat

The Pier 36/ Brannan St. Wharf project is expected to beneficially impact the habitat of marine mammal populations. The project involves the net removal of approximately 3,550 square feet of pile fill and clearing of 47,000 square feet of timber debris that has collapsed at the end of the existing Pier 36 (see Figure 2). These pilings are a mixture of concrete pilings and creosote treated wood pilings. Creosote can leach out of the wood over time into adjacent sediment and water column impacting water quality and causing both toxicity and long term impacts to sensitive aquatic species. The removal of approximately 350 to 400 creosote treated pilings and replacement with 261 concrete pilings will benefit these species by removing a potential source of polycyclic aromatic hydrocarbons PAH's. Additionally, the net removal of fill associated with this project will result in a net reduction of 47,800 square feet (1.10 acres) of shadow fill (shading over the Bay waters). This net increase of 1.10 acres of unshaded waters of San Francisco Bay is expected to be beneficial to benthic invertebrates, fish, and marine mammals through restoration of ambient light conditions and increased biological productivity

No permanent detrimental impacts to marine mammal habitat are expected to occur. Acoustic impacts associated with pile driving may temporarily decrease the quality of habitat in the activity area but would end once pile installation is complete. Site conditions are anticipated to be improved or substantively unchanged from existing conditions for marine mammals following project construction and restoration is not expected to be necessary.

10.) The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved

No habitat loss will occur as a result of the proposed project. As noted in 9, above, the project will result in a net gain of approximately 50,550 square feet of habitat due to removal of pile fill and clearing of timber debris. Additionally, the project will result in a net increase of 47,800 square feet (1.10 acres) of unshaded waters. These modifications of the marine habitat are expected to be permanent benefits to marine mammal species.

11.) The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance

The Pier 36/Brannan St. Wharf project is not anticipated to result in Level A impacts to marine mammals, but may result in Level B harassment of small numbers of Pacific harbor seals, California sea lion, harbor porpoises, and/or gray whales. Level B harassment associated with the

proposed project would be temporary in duration, and is not expected to result in any long term effects to marine mammal stocks or habitat in the region. While the steel shell pile driving activities may result in exceedance of the Level A threshold established by NMFS for cetaceans, the monitoring and avoidance measures described below will be implemented to prevent Level A take of marine mammals and to minimize Level B harassment to the greatest practicable extent. Additionally, the nearest harbor seal and sea lion haul out sites (Yerba Buena Island and Pier 39, respectively) are each more than 2 miles (3.2 kilometers) away from the project site and well outside of the Level A and B harassment isopleths; therefore, impacts to these sites and the individuals at them are not expected to occur.

An unconfined bubble curtain attenuation device will be used during installation of all steel piles in water greater than 2 feet deep in order to minimize the expected sound exposure levels. In addition, a "soft-start" procedure at the start of pile driving activity will be used to allow animals within the area a chance to leave before full energy is reached. The soft-start will involve the initiation of noise from the pile driving hammer at reduced energy followed by a short waiting period. The procedure will be repeated two additional times before full energy is achieved. This procedure will be conducted prior to initiating pile driving if previous pile-driving has ceased for more than 30 minutes for any reason. The following marine mammal mitigation and monitoring measures will be implemented during the project to prevent Level A impacts and minimize Level B harassment to the greatest practicable extent:

1.) Mitigation Measures

- (a) All construction equipment will comply with equipment noise standards of the U.S. Environmental Protection Agency and have noise control devices no less effective than those provided on the original equipment.
- (b) Briefings will be conducted between construction supervisors and crews and the marine mammal monitoring team prior to the start of all pile-driving activity, and when new personnel join the work, that explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.
- (c) For all in-water permanent pile-driving, the applicable Level A marine mammal safety zones (MMSZs) and Level B buffer zones for the type of pile being driven (concrete or steel) – as described in section 7, table 5 of this application – will be established around the pile driving site before pile driving commences. For concrete piles, a 50 meter Level B buffer zone will be established. This radius represents the approximate distance from the impact source sound to the 160 dB behavioral threshold isopleth. There will be no Level A MMSZ for concrete pile driving as exceedance of either the pinniped or cetacean Level A thresholds is not anticipated during driving of the concrete piles. For steel piles, a 50 meter Level A MMSZ and 1000 meter Level B buffer zone will be established. These radii represent the approximate distance from the source sound to the 180 dB injury threshold isopleth for Level A impacts (to harbor porpoises and/or gray whales), and to the 120 dB behavioral threshold isopleth for Level B impacts (associated with continuous source vibrations), respectively.
- (d) If marine mammals are visually sighted within the Level A safety zone prior to start of pile-driving, the resident engineer (or other authorized individual) will

delay pile driving of the segment until the mammals have moved beyond the Level A safety zone. Verification will be conducted either through sighting by a qualified observer or by waiting until enough time has elapsed without a sighting (at least 15 minutes for pinnipeds and 30 minutes for cetaceans) to assume the animal has moved beyond the Level A safety zone.

- (e) If marine mammals are sighted within the Level A safety zone after pile driving has begun, a qualified marine mammal observer will record the species, numbers and behaviors of the animal(s) and report to Monica DeAngelis at the Southwest Regional Office, NMFS, phone (562-980-3232) within 48 hours of the sighting.
- (f) "Soft-starts" will be employed for all impact and vibratory pile driving operations.

2.) Monitoring Plan

- (a) A minimum of one biologically-trained, on-site individual will be designated, and approved in advance by the National Marine Fisheries Service's Southwest Regional Office, to monitor the area for marine mammals before, during, and after pile driving activities from land or boat.
- (b) Visual Monitoring
 - a. For all in-water permanent pile-driving the observer(s) will visually monitor the pile-driving site from land or boat.
 - b. The marine mammal monitor(s) will be provided with the equipment necessary to effectively monitor for marine mammals including, high-quality binoculars, compass, range-finder, and a vessel with driver, if deemed necessary by the designated observer in order to determine if animals have entered into the harassment (Level B) buffer zone and to record species, behavior, responses to pile-driving, etc.
 - c. *Pre-Activity Monitoring:* At least 30 minutes prior to the start of all in-water permanent pile-driving segments, the marine mammal monitor(s) will conduct observations on the number, type(s), location(s), and behaviors of marine mammals in the designated safety and buffer zones.

If the time between pile-segment driving is less than 30 minutes, a new 30-minute survey will be considered unnecessary provided the marine mammal monitor(s) continue observations during the interruption. If pile driving ceases for 30 minutes or more and a marine mammal is sighted within the designated Level A safety zone prior to the commencement of pile-driving, the observer(s) will notify the resident engineer (or other authorized individual) immediately (see measure 1(d)).

- d. *Monitoring during Activity:* During all in-water permanent pile-driving the marine mammal monitor(s) will conduct and record observations on marine mammals in the Level B buffer zones and pay particular attention to designated Level A safety zones. If marine mammals are sighted within the

Level A safety zone(s) during the activity, the marine mammal monitor(s) will record the species, numbers and behaviors of the animal(s) and report as stated in measure 1(e).

- e. *Post-Activity Monitoring:* For a minimum of 30 minutes after in-water permanent pile driving stops, the marine mammal monitor(s) will conduct observations of the project area and record information on the number, type(s), location(s), and behavior of marine mammals and pay attention to designated buffer and safety zones.
- f. *Monitoring under Low Light Condition:* In late afternoon and/or early evening when light condition is low, the marine mammal monitor(s) will use infrared (IR) scopes to conduct observation of the project area.
- g. If visual monitoring continues for two weeks of pile driving activities without observation of marine mammals in the buffer or safety zones, the project sponsors will consult with the NMFS and the frequency of on-site observation may be reduced to a level agreed upon by both parties in writing.
- h. Pinniped presence during herring runs can be sporadic and unpredictable. As a result, the marine mammal monitor(s) will be present on site at all times during pile installation conducted between December 1 and February 28. If a Herring spawning event is observed, work will cease for a period of two weeks following the spawning event. The area will be surveyed by the marine mammal monitor(s) prior to resumption of work to ensure that further work will not impact spawning or newly hatched Herring in addition to marine mammals.

(c) Data

- a. All observations will be recorded and shall include the following information:
 - (i) date and time that pile driving or removal starts and ends;
 - (ii) location of sighting;
 - (iii) species;
 - (iv) number of individuals;
 - (v) number of calves present;
 - (vi) duration of sighting;
 - (vii) behavior of marine animals sighted;
 - (viii) direction of travel;
 - (ix) distance from pile driving/removal;
 - (x) environmental information associated with sighting event including Beaufort sea state, wave height, tide state, water currents, wind direction, visibility, glare, percentage of glare, percentage of cloud cover;
 - (xi) when in relation to pile driving or removal activities did the sighting occur (before, "soft-start", during, or after the pile driving or removal); and
 - (xii) other human activity in the area.

(d) Reporting

- a. When in-water pile driving is conducted, the resident engineer (or other authorized individual) will submit weekly monitoring reports providing a status

report on the appropriate reporting items found under measure 2(c), unless other arrangements for monitoring reports are agreed to in writing.

- b. A final report on all activities will be submitted to the Southwest Regional Office and the Office of Protected Resources, National Marine Fisheries Service, within 90 days after completion of the activities. This report will contain the following information:
 - (i) Dates and types of activities;
 - (ii) The results of the visual and hydroacoustic monitoring program

(e) Hydroacoustic Monitoring

- a. Hydroacoustic monitoring will be performed at the initial installation of each pile type (24-inch concrete, 24-inch steel, 36-inch steel) to ensure that the threshold sound levels are not extending past the calculated isopleths distances described in this application.
- b. If measurement indicates threshold isopleths greater than calculated, pile driving activities will cease and the contractors and project sponsors will work to resolve the matter. The NMFS will be notified within 48 hours if the calculated threshold isopleths are exceeded or if take occurs that is not covered by the IHA permit.

Boat based monitoring of marine mammals at Yerba Buena Island will not be performed as the known haul out is approximately 3.2 kilometers (2 miles) from the project site, which is well outside of the 1000 meter Level B harassment isopleth. Although effects at Yerba Buena Island are not anticipated, any unexpected effects should be visible by observation with a spotting scope during monitoring at and around the project site.

12.) Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses

The proposed activity would not take place in or near a traditional Arctic subsistence hunting area nor affect the availability of a species or stock of marine mammal for Arctic subsistence uses.

13.) The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding.

Guidelines for developing a site-specific monitoring plan may be obtained by writing to the Director, Office of Protected Resources

The proposed monitoring is described in section 11 above, including a description of the techniques that will be used to determine the movement and activity of marine mammals near the project site.

14.) Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects

In order to encourage learning and coordinate research opportunities related to incidental taking of marine mammals, data gathered during construction will be made available to NMFS, researchers and other interested parties.

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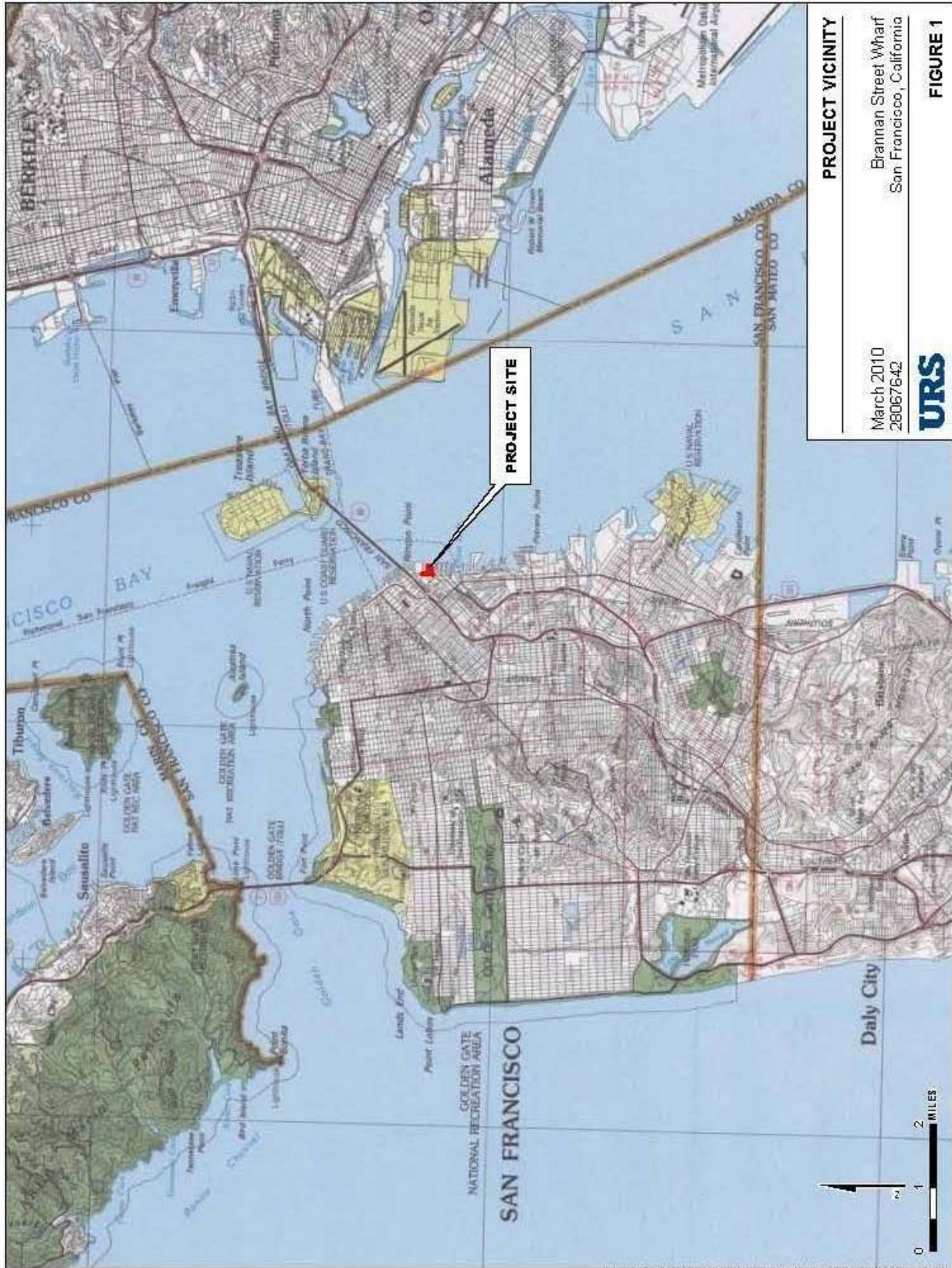
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Attachment A – Project Vicinity



Attachment B.1 – Pier 36 Brannan St. Wharf Concrete Pile Driving Threshold Isoleths

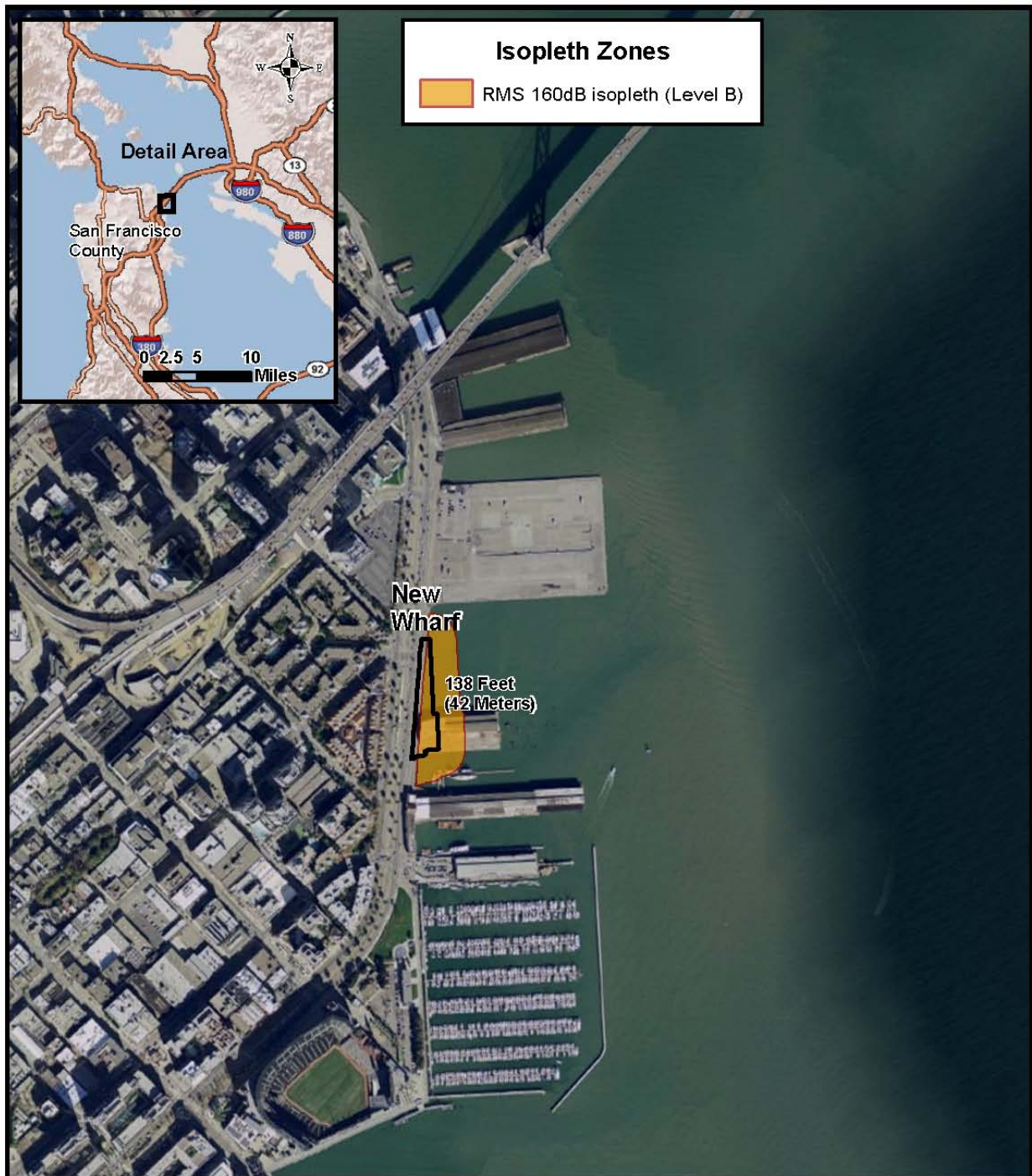


Figure 1. Level B Harassment Isoleths

Pier 36 Removal Project
San Francisco, CA

Data Sources: ESRI/AUSGS for background layers,
Project Location from Port of San Francisco

0 400 800 1,600
Feet



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San Francisco District, GIS Section
1455 Market Street, San Francisco, CA 94103

Attachment B.2 – Pier 36 Brannan St. Wharf Steel Pile Driving Threshold Isoleths

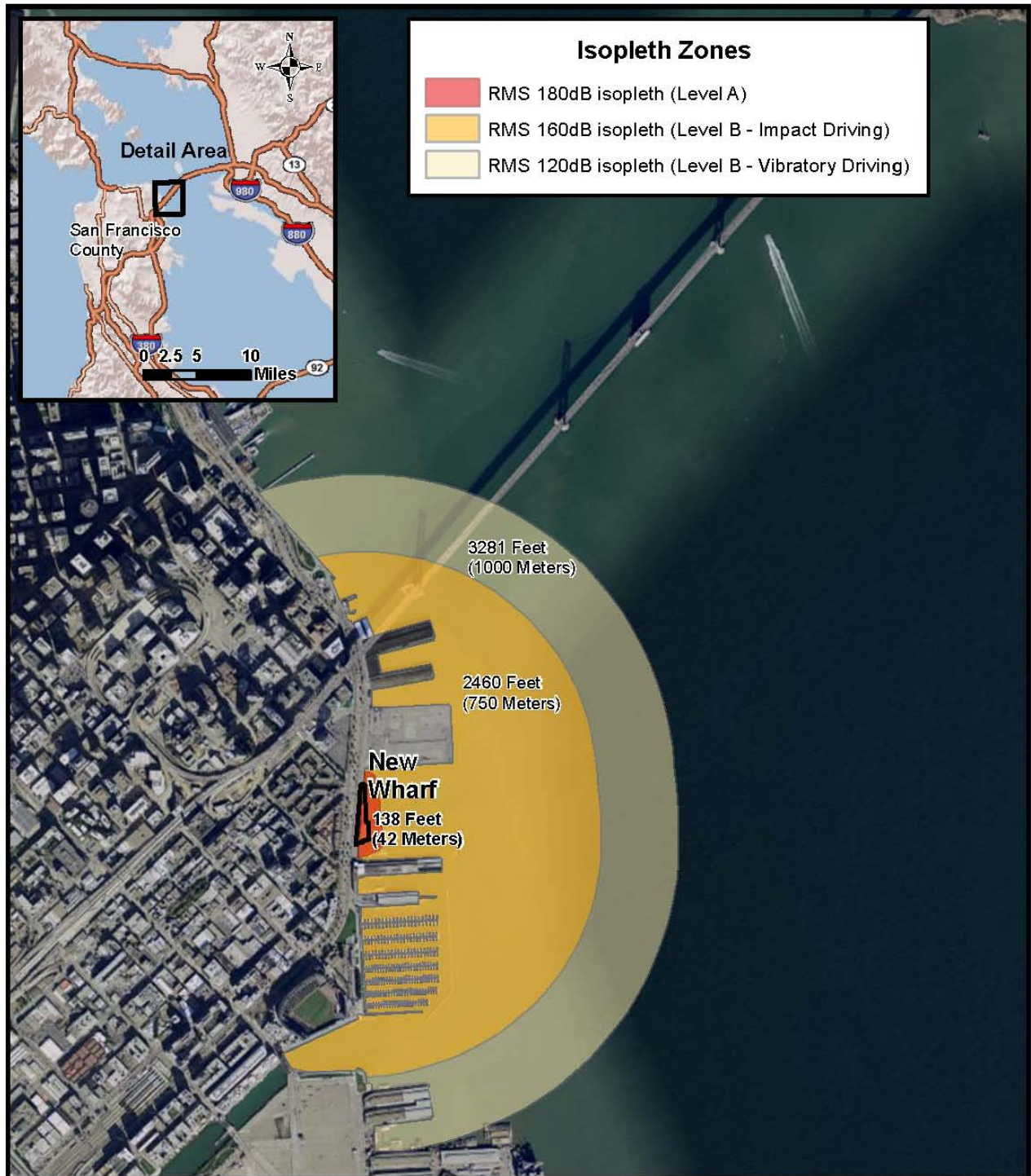
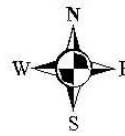


Figure 1. Level A and B Harassment Isoleths

Pier 36 Removal Project
San Francisco, CA

Data Sources: ESRI/AJSGS for background layers,
Project Location from Port of San Francisco



0 750 1,500 3,000
Feet



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