National Marine Fisheries Service

Application for Incidental Harassment Authorization for Marine Mammals

Casitas Pier Fender Pile Replacement Project

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1.0 Project Activities Affecting Marine Mammals

An Incidental Harassment Authorization (IHA) is requested to allow the unavoidable incidental take of marine mammals resulting from fender pile replacement activities at Casitas Pier ("Pier") in the City of Carpinteria (Figure 1). These activities are in support of continued safe operations of the pier, which is necessary for ongoing offshore oil and gas operations.

All activities covered by the IHA will take place on and adjacent to the Pier. Marine mammals that are typically present in the area are Pacific harbor seals (*Phoca vitulina richardii*) and, less frequently, California sea lions (*Zalophus californianus*), as well as small cetaceans such as the coastal stock of bottlenose dolphins (*Tursiops truncatus t.*). Harbor seals haul out on the rocks and sandy beach at the base of the cliff adjacent to the Pier, approximately 700 feet (213 meters) from the pile replacement work area. The majority of harbor seal activity occurs approximately 100 to 300 feet (30 to 91 meters) east of the base of the Pier.

California sea lions have been observed traversing the project area and occasionally hauling out as individual animals. Sea lions also haul out on mooring buoys used by oil crew boats southeast of the Pier.

The Pier is owned by the City of Carpinteria and leased to Venoco, LLC (Venoco) who, subject to said lease, operates and maintains the Pier. The Pier is located in offshore tidelands, owned and governed by the City of Carpinteria. The Pier was built in the mid- to late-1960s and extends approximately 720 feet (220 meters) from shore (Figure 1). The onshore uplands, adjacent to the Pier, are owned by Venoco. Fender piles at the end of the Pier are used to enable safe transfer of personnel and equipment between the Pier and vessels. Certain fender piles on both the west and east side of the Pier have failed or are likely to fail due to corrosion and physical damage from many years of use and require replacement. Repairs are planned prior to the 2017-2018 storm season to enable safe transfer of personnel and equipment on both sides of the Pier.

The water depth ranges from 13 to 27 feet (4 to 8 meters) at the end of the Pier (the project work area), with seasonal variations due to beach sand withdraw and return between the winter and summer seasons. The predominant seafloor habitat based on an April 2017 scientific diver survey is soft sand sediment consisting of predominantly coarse sand, with limited areas of exposed rock inshore of the pile repair work area.

All activities discussed in this application are anticipated to be covered through the U.S. Army Corps of Engineers (USACE) Nationwide Permit (NWP) #3 (Repair and Maintenance) for work within navigable waters of the U.S. per Section 10 of the Rivers and Harbors Act. As such, National Environmental Policy Act (NEPA) compliance is addressed through the NWP program.

1.1 Fender Pile Replacement Plan

Up to 13 fender piles located on the end of the Pier will be replaced (6 on west side, and 7 on the east side, see Appendix A, Drawing 1616-CPFPR-S1). Work will take place over a 2 to 3 week period during fall 2017. Any work that is not completed during this period will be completed during summer or fall 2018.

The replacement piles will be substantially similar in construction to original pile construction utilizing an upper section approximately 48 to 50 feet (15 meters) to long consisting of 16-inch diameter x 0.50-inch wall thickness pipe pile with a 12-foot (4-meter) long driven lower section consisting of 14 inch x 73 pound H-pile spliced to the bottom of the upper pipe pile section. Epoxy coating will be used on the new fender piles. Installation will be accomplished per the original construction utilizing pile driving techniques supported from the Pier work platform. The replacement piles will be installed offset slightly (about 2 feet) from the original fender pile positions. This design has been in service for more than 60 years at the Pier. The proposed approach will minimize impacts to the seafloor and marine environment.

The following general procedures will be used to implement these repairs:

- The contractor will mobilize diving equipment, welding equipment, replacement pile, and associated rigging to the site.
- Divers, along with on-site facility crane and personnel, will remove debris and damaged fender pile from the work area, as required. Divers will be deployed from the existing Pier work platform.
- The damaged portions of existing fender piles will be cut approximately six inches above the mudline and removed, and the remainder of the piles below the mudline will remain in place unless they present a hazard to the pier.
- A project-specific pile driving crew, crane and pile driving hammer will be positioned on, and operated from, the Pier to place and drive the replacement piles.
- Each new pile will be guided by a diver and positioned adjacent to an existing stub. Once positioned, the weight of the pile and vibratory pile hammer will be applied to the seabed and the pile will penetrate into the seabed slightly. At this point, the diver will confirm that the replacement pile remains adjacent to the old stub and exit the water or reposition the new pile and repeat.
- Once the replacement pile has slightly penetrated the seabed adjacent to the old pile stub and the diver has exited the water, the pile will be driven to approximately elevation 12 feet (4 meters) below the mudline or to refusal.
- Once the replacement pile is driven, welders will connect the replacement pile top to the main horizontal fender beam.
- Project-related debris will be removed from the seafloor and Pier. Debris will be properly disposed of, and project personnel and equipment will be demobilized from site.

Based on similar past projects in the project area, it is anticipated that seafloor sediment conditions and any underlying shale will be soft enough to enable the fender piles to be installed with the use of a vibratory driver. Pile installation will begin with vibratory driving; however, seabed composition and/or debris below mudline may affect the force required to drive the fender pile and necessitate the use of impact driving. The fender piles are not load bearing; therefore, a minimum target embedment of 6 feet below mudline will be used if shale is encountered at or before 6 feet of penetration.

The following pile driving information was compiled in order to calculate potential acoustic impacts to marine mammals:

- Duration of vibratory pile driving per pile and the number of piles driven by vibratory hammer per day
- Number of strikes per pile for impact pile driving, and the number of piles that would be planned to be driven by impact hammer per day

Each pile will require approximately 25 minutes of vibratory driving, and up to 6 piles could be installed by this method in a single day (i.e., up to 2.5 hours of vibratory pile driving per day). During this time the sound levels above and below water will be in excess of normal pier operations. Sound levels from various other fender pile construction activities will not be discernible from daily pier operations.

In the unlikely event that an impact hammer is used, installation of a single pile will require an estimated 400 hammer strikes over 15 minutes, and up to 6 piles could be installed by this method in a single day (i.e., up to 1.5 hours of pile driving per day). This information is summarized in Table 1 and representative pile driving equipment specifications are provided in Appendix A.

Table 1
Pile Driving Summary Information

Pile Driving Method	Estimated Duration of Driving Per Pile	Estimated Strikes per Pile	Maximum Number of Piles per day
Vibratory Hammer	25 minutes	N.A.	6
Impact Hammer	15 minutes	400	6

Installation of up to 13 fender piles will result in minor impacts to the sandy seafloor and substratum immediately adjacent to the existing Pier. The depth and weight of the steel pile matches the original construction and as such will be sufficient to provide adequate protection for Pier and vessel operations.

1.2 Equipment Requirements, Access, and Staging

The following vehicles and equipment will be used on the Pier to complete the fender pile repairs:

- Topside preparation: 1 to 3 personnel with 1 to 2 vehicles parked onshore, and 5 to 6 work truck trips per day on the Pier to deliver tools, materials and personnel throughout the day. Two 1-ton flatbed trucks will be staged on the Pier with welding equipment and dive equipment.
- Underwater preparation: 5 to 8 personnel with 4 to 6 vehicles parked onshore and 5 to 6 work truck trips per day on the Pier to deliver materials and personnel throughout the day.
- Pile installation: 5 to 9 personnel with 4 to 7 vehicles parked onshore and 5 to 6 work truck trips per day on the pier to deliver tools, materials and personnel throughout the day. Piles will be staged on the pier, near the work site.
- Pier siding (tire panel) reinstallation: 1 to 3 personnel with 1 to 2 vehicles parked onshore and 3 to 4 work truck trips per day on the Pier to deliver tools, materials and personnel throughout the day.
- All vehicles parked onshore will in the designated onshore parking area rather than at the base of the pier, unless waiting for brief times for access to the Pier. The designated parking area is set back from the bluff and not visible from the seal rookery (Figure 2).

The existing Pier crane and forklift will be used at various times during these procedures. An air compressor stationed on the Pier will be used during diving operations. Compressor noise levels will be in line with other typical Pier operations.

Pier operations are continuous, 24 hour per day, 365 days per year. The planned level of project activity will be minor in comparison to the daily operations that occur on the Pier. For example the following list indicates the actual level of daily Pier activity over a period of several months in 2015 and 2016.

- Average daily heavy truck deliveries: 6
- Average daily light trucks and passenger vehicles: 52
- Average daily vessels operations: 7 related to cargo, up to 12 when including passenger only trips
- Average daily crane operation: 5 hrs per day
- Average daily forklift operation: 3 hrs per day, with several trips up and down the causeway.

A site plan, material details, and work sequence diagram are provided in Appendix A.

Access to the Pier is via Carpinteria Avenue and Dump Road in Carpinteria. Equipment will be staged on the Pier and at a designated staging location within Venoco's existing Pier parking areas; this site is greater than 100 feet (30 meters) from the bluff edge and not visible from the beach. Figure 2 indicates the onshore staging area. Figure 3 provides photographs of the Pier, and Figure 4 indicates the beach area extending east and west of the base of the Pier.

Coastal access via Dump Road and the Carpinteria Bluffs coastal trail (which traverses Venoco's onshore staging area) will be unaffected by project-related staging and access activities.

1.3 Pile Repair Noise-Generating Equipment

Harbor seals are acclimated to long standing, year-round Pier operations which include frequent boat and truck travel, crane and forklift activity, loading and unloading operations, general maintenance and random noise generating activities. The planned construction activities will be comparable to ongoing Pier activities except for the temporary use of pile driving equipment which will be needed to drive the new fender piles to the required depth below the mudline.

For the Casitas Pier fender pile project, 14-inch H-piles, topped with 16-inch cylindrical steel pipe piles will be driven beneath the sea floor to a depth of 12 feet (4 meters) or to the point of refusal. A vibratory pile driver is anticipated to be adequate to accomplish the pile driving. Representative pile driving equipment specifications are provided in Appendix A.

1.3.1 Pile Driving Noise from Various Projects Near the Project Site

Underwater and airborne noise from pile driving, when known, are presented in Table 2 from four past pile-driving operations within 35 nautical miles of the project site. Two of these projects were conducted in similar depths of water. Table 3 presents the pile driver specifications for these projects.

Table 2
Noise levels from Various Pile-driving Operations near Project Site

Year	Project	Pile Diameter(s)	Airborne	Underwater
2001	Venoco Pipeline Repair, Carpinteria	12.75” X 0.375” wall; 6’ into bedrock	Reportedly 100 dBA re 20 µPa at 100-foot (30-meter) range	Pile driver not measured; ~1 m depth to beach
2005	Arco Bird Island, Goleta	30” X 0.4”; 25’ into bedrock	Not measured	Pile driver: 204 dB re 1 µPa – m Vibratory tool: 184 re 1 µPa – m
2011-2014	Rincon Causeway, Mussel Shoals (Seacliff)	20”, 28” & 30”, 0.5” wall; 11.5 to 17’ depth	Not measured	Pile driver: 209.1 dB re 1 µPa – m with pile wrap & steel plate; 185.6 dB re 1 µPa – m with max. attenuation
2014	ExxonMobil Well Conductor, Platform Harmony	30”, 0.5” wall; 300’ below sea floor in 1,200’ depth	Not available	Not available

Sources: MMCG 2001a and b; 2006; 2013a and b; 2014a, b and c.

Table 3
Pile Driver Specifications from Various Pile-driving Operations near Project Site

Year	Project	Pile Driver	Settings	Blows per Minute
2001	Venoco Pipeline Repair	Diesel pile-driver	One power setting	Unknown
2005	Arco Bird Island	Diesel pile-driver Vibratory tool hammer	Not known Not known	Not known
2011-2014	Rincon Causeway	Diesel Delmag D8-22 Diesel Delmag D19-42	One setting; 18,000 pounds Four settings; first three used; 21,510, 28,035, 35,260 foot pounds	32-52 37-52
2014	ExxonMobil Well Conductor	Hydraulic pile-driver	9 to 90 kJ (6,838 to 68,380 foot pounds	Variable

Sources: MMCG 2001a and b; 2006; 2013a and b; 2014a, b and c.

The hydraulic pile driver used by ExxonMobil was capable of being shut down instantly and the rate of hammer blows could be varied. It was also by far the most powerful pile-driver when set at maximum power. However, it was used to drive 30-inch well conductors with a 0.5-inch wall thickness 300 feet (91 meters) beneath the seafloor in 1,200 feet (366 meters) of water, for a total conductor height of 1500 feet (457 meters) each. Pile driving time required 1.5 to 2 hours per conductor (MMCG 2014c).

By contrast, the pile driver used for pipeline support repairs in Carpinteria by Venoco in 2001 was small, perhaps comparable to the Delmag D8-22. That pile driver was used to force 12.75-inch piles into 6 feet (2 meters) of bedrock. This required from 15 to 20 minutes per pile. This work was conducted right on the rookery beach under an IHA granted to Venoco by NOAA (Figure 5). No significant adverse impacts occurred (MMCG 2001a and b).

The second pile driver (Delmag D18-42), used during the Rincon causeway pile replacement, had variable power settings. These were started at the lowest setting, then progressed to the next setting as the pile faced more resistance, then finally to the third setting to drive the pile to design depth or to the point of refusal at 11.5 to 17 feet (3.5 to 5 meters) beneath the sea floor. This pile driver was used to drive piles 28 to 30 inches in diameter, however. The fourth power setting (48,480 foot pounds) was not used. Sound attenuation measures were employed which resulted in bringing underwater sound levels to standards accepted by California Coastal Commission (CCC) and NOAA in 2014. The variable power settings allowed the sound exposure levels (SELs—not to be confused with sound *energy* level, which is abbreviated the same way) received by marine mammals to be kept below threshold levels. The average pile driving time was between 15 and 20 minutes (MMCG 2013a and b; 2014a and b).

1.4 Ambient Noise

Ambient sounds are important because they can mask operational noise from the project. Ambient airborne noise was measured at the Carpinteria rookery in 2006 during field studies for the Paredon Project, which would have involved slant drilling under the Carpinteria seal rookery to offshore oil reserves. Sound levels were measured when the surf was moderate (3 to 5 feet; 1 to 2 meters) and when winds were 3 to 7 miles per hour. The average daytime airborne measurement was 65.9 dBA re 20 µ. The range was from 64.4 to 66.8 dBA re 20 µPa (MMCG 2007a). No underwater measurements were taken.

Airborne ambient noise levels were obtained at San Miguel Island, about 45 nautical miles from the project site, during the launches of several Atlas V rockets from Vandenberg Air Force Base. Ambient levels were obtained before any launch or sonic boom noise struck the island. During the May 2011 launch, the maximum unweighted peak sound level was 120.3 dB re 20 µPa, while the A-weighted level was 100.2 re 20 µPa (MMCG 2011a). This was during periods of strong winds (20-25 knots). In September, 2012, maximum unweighted sound levels were 113 dB re 20 µPa, with slightly less wind present (MMCG 2012). In March 2017, unweighted ambient levels were 74.9 dB re 20 µPa, with only a light breeze. These results indicate that strong winds and surf can result in high ambient sound levels (MMCG and Leidos 2017).

During the Arco-BP PRC-421 decommissioning project, ambient underwater noise reached 130 dB re 1µPa – rms, largely because of snapping shrimp. It reached 140 dB re 1µPa – rms during a windy day (MMCG 2006). During the Mobil Seacliff pier decommissioning project, ambient underwater sounds were measured at 58 dB re 1µPa – rms, but this was offshore, with virtually no swell or wind over a sandy sea floor with no snapping shrimp (MMCG 1998c and d). During the Rincon causeway project, ambient sound reached 130 dB re 1µPa – rms, also largely because of snapping shrimp (MMCG 2013a and 2014a). At the source, snapping shrimp can generate up to 218 dB re 1 µPa.

2.0 Dates, Durations, and Affected Geographical Regions

Work will take place over a period of 2 to 3 weeks during fall 2017. Any work that is not completed during this period will be deferred to late summer or fall 2018. Work will occur during daylight hours, typically between 7:00 AM and 6:00 PM. As shown in Table 1, each pile will require approximately 25 minutes of vibratory driving, and up to 6 piles could be installed by this method in a single day (i.e., up to 2.5 hours of vibratory pile driving per day). In the unlikely event that an impact hammer is used, installation of a single pile will require an estimated 400 hammer strikes over 15 minutes, and up to 6 piles could be installed by this method in a single day (i.e., up to 1.5 hours of pile driving per day).

The Pier is located along the south coast of Santa Barbara County in Southern California, near the southeastern corner of the City of Carpinteria (Figure 1). This area is used routinely for oil and gas operations, as well as for recreation. The Carpinteria Bluffs, located immediately upland of the Pier, provide a heavily used recreational trail system connecting downtown Carpinteria and the Carpinteria Beach State Park to the west with the Carpinteria Bluffs Nature Preserve to the east. The beach at the base of the Pier is accessible from points to the west, and is open to the public during summer and fall months. During the City of Carpinteria's established beach closure period for the seal pupping season (December 1 to May 31), the City restricts public access along the beach in an area extending approximately 750 feet (230 meters) east and west of the base of the Pier (Figure 4).[1]

During normal Pier operations cargo and personnel transfer operations occur at all hours of the day, as late as 11:30 PM and as early as 12:20 AM. Cargo loading and unloading operations consist of typical industrial noise associated with truck air brakes and backing alarms, forklift backing alarm, crane movement, chain and cable rigging, various material impact noise, etc. The Pier has existing fixed light fixtures placed along the Pier causeway and at multiple pier work locations to enable normal night operations including the vessel loading location where repairs are planned. The Pier crane has its own light fixtures that focus on vessel loading and unloading operations on both sides of the Pier. No light plants are needed for the planned work. Consequently, the planned work will not be out of character with or discernibly different from ongoing Pier activity.

3.0 Species and Numbers of Affected Marine Mammals

Marine mammals reported in the Santa Barbara Channel include 33 species of cetaceans, six species of pinnipeds, and the sea otter (Carretta et al. 2015; Allen and Angliss 2014; Hatfield and Tinker 2014). Four listed species of marine turtles also have been reported in the channel and are included below as well (NMFS and U.S. Fish and Wildlife Service [USFWS] 1998a-d). Table 4 lists the occurrence of federal Endangered Species Act (ESA)-listed marine mammals and turtles in the project region. Table 5 lists the occurrence of Marine Mammal Protection Act (MMPA)-listed marine mammals in the project region. The likelihood of each species' occurrence in the project area is based on their occurring within a conservative distance of one nautical mile from the project site. The likelihood of their occurrence is based on Carpinteria Seal Watch sighting data (from January 1 through May 30 of each year), data from past projects at the rookery and nearby using NOAA-approved monitors (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2011c, 2013b, and 2014b), strandings reported by the Santa Barbara Marine Mammal Center (SBMMC 1976-2015), and sightings from commercial whale watch vessels (Benko 1976-2010). The habitats, stock sizes, and status are based on published literature from NOAA and other government sources.

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[1] https://www.municode.com/library/ca/carpinteria/codes/code_of_ordinances?nodeId=TIT12STSIPUPL_CH12.24PUPABE_12.24.090PRHASE. City of Carpinteria Municipal Code section 12.24.090 – Protection of Harbor Seals. Part (A) of this ordinance states: *"Access to that portion of the city beach, starting at the base of the existing Chevron Pier and extending approximately seven hundred fifty feet easterly and westerly along the beach, with the exact boundary to be determined by the city manager (in consultation with qualified marine mammal experts), shall be closed at all times during the harbor seal pupping season, commencing each December 1st and ending May 31st of the following year.*" Part D restricts motorized vessels within 300 feet seaward of the mean high tide line for the length of the closed beach area. Personal water craft are restricted within 1,000 feet of the beach in this area.

Table 4
Occurrence of ESA-listed Marine Mammals and Turtles in Region

Common Name/ Stock	Scientific Name	Seasonal Distribution/ Likelihood of Occurrence	Habitat	Stock Size	Status
North Pacific right whale/ Eastern North Pacific	*Eubalaena japonica*	No seasonality here/ nil	Mainly Bering Sea and Gulf of Alaska; coastal to pelagic	26	Endangered ESA; strategic, depleted MMPA
Humpback whale/ California-Oregon-Washington	*Megaptera novaeangliae*	Year-round but mostly summer-fall/ unlikely	Central America to British Columbia; nearshore to pelagic	1918	Endangered ESA;* strategic, depleted MMPA
Blue whale/ Eastern North Pacific	*Balaenoptera musculus*	Summer-fall/ extremely unlikely	Gulf of Alaska to eastern tropical Pacific; coastal to pelagic	1647	Endangered ESA; strategic, depleted MMPA
Fin whale/ California-Oregon-Washington	*Balaenoptera physalus*	Mostly summer-fall/ nil	California to Washington; coastal to pelagic	3051	Endangered ESA; strategic, depleted MMPA
Sei whale/ California-Oregon-Washington	*Balaenoptera borealis*	Year round well offshore/ nil	California to British Columbia; mostly pelagic	126	Endangered ESA; strategic, depleted MMPA
Sperm whale/ California-Oregon-Washington	*Physeter macrocephalus*	Year round well offshore/ nil	California to Washington; offshore often near trenches	2106	Endangered ESA; strategic, depleted MMPA
Guadalupe fur seal/ Guadalupe Island	*Arctocephalus townsendi*	Occasional strandings/ nil	Mexico to California; pelagic	7408	Threatened ESA; strategic, depleted MMPA
Southern sea otter/ California	*Enhydra lutris nereis*	Spring/ very unlikely	California; nearshore	2944	Threatened ESA; strategic, depleted MMPA
Green turtle/ U.S. Pacific	*Chelonia mydas*	Late summer & fall; mainly El Niños/ nil	San Diego, California to Baja California; onshore to pelagic	Unknown	Threatened ESA
Loggerhead turtle/ U.S. Pacific	*Caretta caretta*	Late summer & fall; mainly El Niños/ nil	North Pacific; pelagic but juveniles off Southern California	Unknown	Threatened ESA
Olive ridley turtle/ U.S. Pacific	*Lepidochelys olivacea*	Late summer & fall; mainly El Niños/ nil	Central America to Southern California; nearshore to pelagic	Unknown	Threatened ESA
Leatherback turtle/ Eastern Pacific	*Dermochelys coriacea*	Summer & early fall/ nil	Peru to Alaska; continental shelf and slope	Unknown	Endangered ESA

Sources: Carretta et al. 2015; Allen and Angliss 2014; Hatfield and Tinker 2014; Santa Barbara Marine Mammal Center 1976-2015; Benko 1976-2010; NMFS and USFWS 1998a-d.

*The California-Oregon-Washington stock and Distinct Population Segment of humpback whales was proposed for delisting in 2015. However, frequent entanglements in commercial fishing gear is causing researchers to reassess this proposal.

Table 5
Occurrence of MMPA-listed Marine Mammals in Region

Common Name/ Stock	Scientific Name	Seasonal Distribution/ Likelihood of Occurrence	Habitat	Stock Size
Mysticetes				
Gray whale/ Eastern North Pacific	*Eschrichtius robustus*	January through May/ extremely unlikely during period of project	Alaska to Baja California; nearshore coastal waters	20,990
Common minke whale/ California-Oregon-Washington	*Balaenoptera acutorostrata scammoni*	Year-round/ unlikely	California to Washington; nearshore and continental shelf	478
Bryde's whale/ Eastern Pacific	*Balaenoptera edeni*	Unknown but favors tropical and warm temperate waters/ nil	California to Washington; coastal to pelagic	12
Oceanic Dolphins				
Short-beaked common dolphin/ California-Oregon-Washington	*Delphinus delphis d.*	Year-round/ unlikely	Mainly California to Mexico; coastal to at least 300 nm offshore	411,211
Long-beaked common dolphin/ California	*Delphinus capensis c.*	Year-round/ possible	Central California to Baja California; usually within 50 nm of coast	107,016
Pacific white-sided dolphin/ California-Oregon-Washington northern and southern stocks	*Lagenorhynchus obliquidens*	Winter and early spring/ extremely unlikely	California to Washington; coastal to pelagic	26,930
Striped dolphin/ California-Oregon-Washington	*Stenella coeruleoalba*	Unknown but favors tropical and warm temperate waters/ nil	California to Mexico; offshore waters	10,908
Pantropical spotted dolphin/ Eastern tropical Pacific (not a U.S. stock*)	*Stenella attenuata*	Eastern tropical Pacific/ nil	Mexico to Central America; pelagic	Not available
Risso's dolphin/ California-Oregon-Washington	*Grampus griseus*	Year-round, more fall and winter/unlikely	Washington to northern Baja California; coastal to offshore	6,272
Common bottlenose dolphin/ California-Oregon-Washington offshore stock	*Tursiops truncatus t.*	Year-round/ nil	California to Mexico; coastal to offshore	1006
Common bottlenose dolphin/ California coastal stock	*Tursiops truncatus t.*	Year-round/ likely in small numbers	Central California to Baja California; within 500 m of shore	323
Northern right whale dolphin/ California-Oregon-Washington	*Lissodelphis borealis*	Fall and winter; favors colder water/ nil	Washington to California; coastal to continental slope	8,334
Killer whale/ Eastern North Pacific offshore and transient	*Orcinus orca*	Most often with spring gray whale migration/ extremely unlikely during period of project	Alaska to California; coastal to 500 nm offshore	240
False killer whale/ Tropical Eastern North Pacific (not a U.S. stock)	*Pseudorca crassidens*	Late summer to early fall Favors tropical and warm temperate waters/ extremely unlikely	Southern California to Central America; coastal to pelagic	Unknown
Melon-headed whale/ Tropical Eastern North Pacific (not a U.S. stock*)	*Peponocephala electra*	Eastern tropical Pacific/ nil	Mexico to Central America; pelagic	Not available
Short-finned pilot whale/ California-Oregon-Washington	*Globicephala macrorhynchus*	Year-round/ nil	California to Mexico; coastal to pelagic	760
Porpoises				
Dall's porpoise/ California-Oregon-Washington	*Phocoenoides dalli*	Mostly winter with colder water/ extremely unlikely	Washington to California; coastal to offshore	42,000

Common Name/ Stock	Scientific Name	Seasonal Distribution/ Likelihood of Occurrence	Habitat	Stock Size
Sperm Whales				
Pygmy sperm whale/ California-Oregon-Washington	*Kogia breviceps*	Unknown/ nil	Washington to California; continental slope to pelagic	579
Dwarf sperm whale/ California-Oregon-Washington	*Kogia sima*	Unknown/ nil	Washington to California; continental slope to pelagic	Unknown
Beaked whales				
Baird's beaked whale/ Eastern North Pacific	*Berardius bairdii*	Late spring to early fall/ nil	Washington to California; continental slope	847
Cuvier's beaked whale/ California-Oregon-Washington	*Ziphius cavirostris*	Year-round/ nil	Washington to California; continental shelf to pelagic	6,590
Mesoplodont beaked whales (six species)/ California-Oregon-Washington	*Mesoplodon* spp.	Unknown/ nil	Washington to California; continental slope to pelagic	694
Pinnipeds				
California sea lion/ U.S. stock	*Zalophus californianus*	Year-round/ will be seen	Southeast Alaska to Baja California; onshore to continental slope	296,750
Steller sea lion/ Eastern Pacific**	*Eumetopias jubatus*	Year-round/ extremely unlikely	Central Gulf of Alaska to California; onshore to outer continental shelf	60,131 to 74,448
Northern fur seal/ California stock	*Callorhinus ursinus*	Year-round/ extremely unlikely	San Miguel and Farallon islands; onshore to pelagic	12,844
Northern elephant seal/ California breeding stock	*Mirounga angustirostris*	Year-round/ zero except possible rare individual stranded newly weaned pups	Aleutians (males) and Washington (females) to Baja California; onshore to pelagic	179,000
Pacific harbor seal/ California stock	*Phoca vitulina richardii*	Year-round/ will be seen	California; coastal	30,196

Sources: Carretta et al. 2015; Allen and Angliss 2014; Santa Barbara Marine Mammal Center 1976-2015; Benko 1976-2010.

*Occasional reported interactions with U.S. tuna purse seine industry in eastern tropical Pacific. These stocks are managed separately under the MMPA.

**The Eastern Pacific stock of Steller sea lions was delisted from the ESA in December 2014.

4.0 Status and Seasonal Distribution of Affected Marine Mammals

Of the listed species summarized in Table 4, only the humpback whale and the sea otter may possibly range within one nautical mile of the project site, and this is unlikely. The humpbacks are found farther offshore in this region, often from mid-channel out to the northern shores of the northern Channel Islands and beyond (Carretta et al. 2015; SBMMC 1976-2015; Benko 1976-2010). Sea otters (*Enhydra lutris nereis)* have been reported rarely in the Southern California Bight (SCB) except for animals appearing from Isla Vista west to Point Conception in spring. A sea otter was spotted off More Mesa, Goleta, in 2005 (MMCG 2006). Another was sighted east of the Mobil Seacliff Pier area in Ventura County in 1997, during a decommissioning project. It was seen about 7.5 nautical miles east of the project site (MMCG 1998e).

Of the MMPA-listed species of marine mammals summarized in Table 5, only the Pacific harbor seal, the California sea lion, and the coastal stock of bottlenose dolphin are anticipated to be found in the immediate vicinity of the project site with regularity. The long-beaked common dolphin may venture within one nautical mile of the project site. The short-beaked common dolphin is much less likely to appear there. These species are discussed in further detail below.

The gray whale occurs within one nautical mile of the project site, but it does not migrate through the region until late December through May, with most gray whales being sighted near the project area in the spring. The other species generally occur farther offshore and have not been reported in the vicinity, so they will not be discussed further in this document. The species discussed below are presented in the order of the likelihood of their appearance near the project site.

4.1 Pacific Harbor Seal

The Pacific harbor seal (*Phoca vitulina richardii*) ranges along the west coast of North America from the central Bering Sea off Alaska to Baja California. The California stock of harbor seals is not considered threatened or endangered under the ESA, and is not a depleted or a strategic stock under the MMPA (Carretta et al. 2015).

Pacific harbor seals inhabit the entire coast of California, including the offshore islands, forming small, relatively stable populations. According to NOAA's June 2017 marine mammal stock assessments report, the harbor seal population in California is estimated at 30,968 animals (Carretta et al. 2017). This species is non-migratory, but local movements of short to moderate distances sometimes occur (California Department of Fish and Game [CDFG] 1990). They breed along the California coast between March and June. The preferred habitat of the Pacific harbor seal includes offshore rocks, sandy beaches, gravelly or rocky beaches, and estuarine mud flats (NMFS 1997). Molting occurs from late May through July or August and lasts approximately 6 weeks. Between fall and winter, harbor seals spend less time on land, but they usually remain relatively close to shore while at sea.

The project area is in the vicinity of one of the most well-known seal rookeries on the mainland shore of the SCB. This rookery, east of the base of the Pier, is inhabited year-round. Since 1991, the Carpinteria seal rookery has been monitored from January 1 through May 30 by the Carpinteria Seal Watch, an ad hoc citizens' group. (The group does not start watches until January 1 because of the Holidays.) In the 15-year period prior to 2008, the highest record of seals hauling out during pupping season was 390 animals in 2006. A calculation, known as Hanan's and Beeson's formula (1994), was applied to the observed number of 390 individuals, to account for individuals in the water during the count. Such a calculation brings the population to 507 individuals in 2006. However, Hanan's and Beeson's formula was designed to estimate total population from aerial counts conducted once a year, one time over each area, as opposed to extensive daily ground counts over a period of six months each year.

Population counts have occasionally occurred during or after molting season, when the number of seals utilizing the rookery are believed to be even higher than during pupping season. However, the rookery beach is open to the public during this time, so accurate counts are more difficult to obtain, since human use of the beach disturbs the animals. As such, the most accurate counts have occurred early in the morning before animals have been disturbed. The highest number of seals recorded by a Carpinteria Seal Watch member (not during their usual watch season) totaled 364 in September 1993. Applying Hanan's and Beeson's formula to this count revealed a total population during molting season of 473.

In 2006, field studies were conducted for the environmental evaluation of the Paredon project, which would have involved slant drilling under the Carpinteria seal rookery to offshore oil reserves. These studies resulted in a count of 482 animals in October and 462 animals in November (MMCG 2007a and b). Boveng (1988) calculated that 50 to 70 percent of all harbor seals were hauled out during molting. However, his calculations were based on once-a-year annual aerial surveys, with only one pass over each site. These were conducted during daytime hours. The MMCG studies were conducted on multiple occasions at night from October through December, using black and white film, digital photos, and infrared photos. These were pasted into photo mosaics to accurately count every animal by dividing the area up into segments. The lowest total number of animals was selected from the photos taken during the highest count (482), which was tallied in October. In November, another count revealed 452 animals, suggesting that the high count was not an anomaly. The lowest nighttime count was 310. Using Boveng's formula, this suggests that the population ranged from 443 to 964 animals. Obviously the highest *actual* count exceeded Boveng's lowest estimate. It is clear that the minimum population was 482, but that assumes all animals were present on the beach. The more likely population estimate is probably from 500 to 700 animals. This is believed to be an accurate estimate of the total population of harbor seals at Carpinteria. However, this estimate was derived from a nighttime count and does not reflect a daytime estimate of the Carpinteria population, especially when the beaches are open to the public and very few seals are present (MMCG 2007b).

Years of observations have revealed that harbor seals sometimes react to various anthropogenic stimuli. These include low-flying aircraft of all descriptions (including even a blimp on one occasion) hang and para gliders, people and dogs on the beach and bluff, bicyclists, boats, jet skis, surfers, divers, swimmers, fishers, passing trains, equipment activity and people on the Pier, crews coming and going from boats, and various oil company repair activities. All of these activities have been short-lived and have not deterred the seals from the haul-out area except during daytime from June 1 through November 30, when the beach is open to the public. At such times, the beach is often deserted by the seals, although some haul out on offshore rocks beyond the action area to the west during low tides (MMCG 2007a and b). During very high tides, when the beach is inaccessible to humans because of prominent points jutting to the sea, a few seals may remain on the beach.

Natural disturbances also frighten the seals. These include birds suddenly taking flight or making low passes, coyotes roaming the beach, ground squirrels and rabbits burrowing into the coastal bluffs, large waves washing ashore, high tides that preclude most seals from finding a spot to haul out, excessive heat during periods of little wind, and white sharks in the water (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2007a and b; 2011c; 2013b; and 2014b; SBMMC 1976-2015; SBMMC 1976-2015; Seagars 1988).

Based on review of the available observational data, similar past experience in the project vicinity, and project timing (fall season, during daytime hours), an estimated range of zero to 50 harbor seals is anticipated to be present on the beach and in the ocean within the project vicinity during work periods.

4.2 California Sea Lion

California sea lions (*Zalophus californianus*) range from British Columbia south to Mexico. California sea lions are not considered threatened or endangered under the Endangered Species Act, and are not depleted or a strategic stock under the Marine Mammal Protection Act (Carretta et al. 2015).

According to NOAA's June 2017 marine mammal stock assessments report, the California sea lion U.S. stock population is estimated at 296,750 animals (Carretta et al. 2017). This estimate is likely to be revised downward because of a long-lasting Unusual Mortality Event (UME). The causes are still being studied, but lack of prey, domoic acid outbreaks, and shark predation are being examined.

California sea lions are the most abundant pinniped in the SCB. Although no rookeries occur on the mainland shore of the SCB, this species regularly hauls out on buoys, oil platforms, docks, breakwaters and other structures along the coast in the vicinity of the project. Individuals are regularly observed hauled out on mooring buoys used by oil supply vessels southeast of the Pier, although these buoys are small and only allow less than a dozen animals to haul out. These buoys are beyond the action area. They also haul out on oil platforms and attendant buoys off Carpinteria, but these are miles away for the action area. Occasionally, individual stranded specimens haul out at the Carpinteria seal rookery (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2011c, 2013b, and 2014b; SBMMC 1976-2015). Such occurrences are rare, with less than half a dozen animals stranded in the action area a year and usually even less (SBMMC 1976-2015). The action area is not a sea lion haul-out site.

During the breeding season, the majority of California sea lions are found in Southern California and Mexico. Rookery sites in Southern California are limited to San Miguel Island and to the more southerly Channel Islands of San Nicolas, Santa Barbara, and San Clemente (NMFS 1997). Rocky ledges and sandy beaches on offshore islands are the preferred rookery habitat. Pupping season begins in mid-May, peaking in the third week of June and tapering off in July. The California sea lion molts gradually over several months during late summer and fall.

Based on review of the available observational data, similar past experience in the project vicinity, and project timing (fall season), an estimated range of zero to 15 sea lions is anticipated to be present within the project vicinity during work periods.

California sea lions exhibit annual migratory movements; in the spring, males migrate southward to breeding rookeries in the Channel Islands and Mexico, then migrate northward in late summer following breeding season. Females migrate as far north as San Francisco Bay in winter, but during El Niño events, have moved as far north as central Oregon.

4.3 Coastal Stock of Bottlenose Dolphin

Coastal bottlenose dolphins (*Tursiops truncatus t.*) range from San Francisco, California to Baja California. This stock prefers coastal waters between the surf zone and 0.6 nautical miles offshore. Almost all (99 percent) are found within 0.6 nautical miles of shore. According to NOAA's June 2017 marine mammal stock assessments, the California stock size of coastal bottlenose dolphins is estimated at 453 to 515 animals (Carretta et al. 2017). The project site represents a very small portion of its overall range. Past projects have revealed anywhere from 2 to 32 animals present at any one time, with an average pod size of 8 animals, although many days or even weeks go by with no dolphins seen (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2011c, 2013b, and 2014b). Carpinteria Seal Watch data are incomplete, in that bottlenose dolphins are sometimes noted and sometimes not. Also, long-beaked common dolphins (below) are sometimes noted as bottlenose dolphins.

In summary, based on review of the available observational data, similar past experience in the project vicinity, and project timing (fall season, during daytime hours), an estimated range of 2 to 32 coastal bottlenose dolphins is anticipated to be present within the project vicinity during work periods, with an average pod size of 8 animals (although many days or even weeks go by with no dolphins seen).

4.4 Long-beaked Common Dolphin

Long-beaked common dolphins (*Delphinus capensis*) have a more limited distribution than short-beaked common dolphins, from central California south to Baja California. In the SCB, this species is most abundant within about 50 nautical miles of shore from summer to fall, although it can occur anytime throughout the year. This species is not as abundant as the short-beaked common dolphin. Its stock size is 107,016 (Carretta et al. 2015). It prefers nearshore coastal waters. As such, it is more likely to be seen near the project site. Groups varying from a few individuals to as many as 500 have been seen in past projects, usually more than a mile offshore (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2011c, 2013b, and 2014b). This species has been confused for bottlenose dolphins on various occasions by the Carpinteria Seal Watch volunteers (above).

4.5 Short-beaked Common Dolphin

Short-beaked common dolphins (*Delphinus delphis d.*) range from north of Eureka, California south to Central America. They are the most abundant species of cetacean in the SCB. The stock size is 411,211 (Carretta et al. 2015). They generally range from near shore out to deep oceanic waters. They are most abundant when their prey (northern anchovies [*Engraulis mordax*], market squid [*Loligo opalescens*], and Pacific hake [*Merluccius productus*]) is present, often from late fall to spring. The north shores of the northern Channel Islands are popular feeding grounds, along with coastal areas usually several miles offshore.

4.6 Risso's Dolphin

The California – Oregon – Washington stock of Risso's dolphins (*Grampus griseus*) numbers about 6,272 individuals (Carretta et al. 2015). They occasionally venture within a few miles of the coast, almost always when squid are present. They are much more often seen farther offshore, from mid-channel to beyond the Channel Islands. If squid are present near Carpinteria, they may venture closer to shore, although it is unlikely they will occur within 1 nautical mile of the project site.

4.7 Gray Whale

The eastern north Pacific population of gray whales (*Eschrichtius robustus*) is estimated at 20,900 individuals (Carretta et al. 2015). Gray whales are observed twice per year in the Santa Barbara Channel during their annual migration from the Bering and Chukchi seas to the coast of Mexico, and during their migration back. The majority of the southbound migration begins in late December and tapers off by mid-February. The whales begin returning north from mid-February through the end of May, with mothers and calves being the last to depart the winter breeding grounds in Mexico.

The majority of migrating gray whales follow migration corridors throughout the Channel Islands. However, some migrate through the Santa Barbara Channel. An inshore corridor exists during the northbound migration near the project site, beyond the breakers. Northbound gray whales have been observed from the Carpinteria seal colony. Gray whales may appear near the project site sporadically from mid-February through the end of May.

4.8 Minke Whale

Minke whales range from Baja California north to Washington. Although not very common in the Santa Barbara Channel, three individual minke whales were observed during the Chevron 4H Decommissioning Project. During the Rincon causeway project, three minke whales were seen (MMCG 2013b; 2014b). Others have been observed by whale watch boats within a few miles of Santa Barbara Harbor. These sightings were always of individual whales, although farther out in the channel, sometimes two or three have been sighted within short distances of one another. This suggests that while they may be uncommon, it is possible that a minke whale could be present within a few miles of the project site, but unlikely within 1 nautical mile.

5.0 Type and Method of Incidental Take Authorization Requested

5.1 Take Authorization Request

Under Section 101 (a)(5)(D) of the MMPA, Venoco requests an authorization from the NMFS for incidental take by Level B harassment (as defined by Title 50 Code of Federal Regulations, Part 216.3) (i.e., Incidental Harassment Authorization [IHA]) of small numbers of marine mammals - specifically, Pacific harbor seals, California sea lions, and the coastal stock of bottlenose dolphins during pile-driving activities associated with replacement of the Pier fender piles. With implementation of the measures outlined in Section 12, no injury from permanent threshold shift (PTS) in an animal's hearing (Level A harassment) is anticipated.

The noise exposure assessment methodology used in this IHA request attempts to quantify potential exposures to marine mammals resulting from underwater and airborne noise generated during fender pile installation. Section 7 describes the acoustic exposure assessment methodology. Results from this approach tend to provide an overestimation of exposures because all animals are assumed to be available to be exposed 100 percent of the time. The effects will depend on the species, pile-driving methods, received level of sound, and distance from the work area; however, temporary behavioral reactions are most likely to occur. The analysis for the project predicts potential exposures (see Section 7 for estimates of exposures by species) over the course of the construction that could be classified as Level B harassment, as defined under MMPA.

5.2 Method of Take

The project, as outlined in Section 1, has the potential to result in incidental take of marine mammals by underwater and airborne noise disturbance during the installation of new fender piles (and the possible extraction of existing damaged fender piles if they present a hazard to the Pier). These activities have the potential to disturb or temporarily displace marine mammals. Specifically, the proposed activities may result in "take" in the form of Level B harassment (behavioral disturbance only) from airborne or underwater noise generated from pile extraction and installation. Level A harassment is not anticipated, given the methods of installation and measures designed to minimize the possibility of injury to marine mammals. Section 11 contains additional details on impact reduction and mitigation measures that are proposed for this project.

6.0 Number and Frequency of Marine Mammals Potentially Affected

Project activities may result in temporary behavioral changes in marine mammals, primarily from underwater and airborne noise levels generated during extraction and pile-driving activities. This section describes the noise levels that are expected to be generated by the project activities, and the potential impacts of the noise levels on marine mammal species that could be found in the project area. This section also outlines the methodology used to quantify the requested take, and presents the results of the take analysis.

The principal form of incidental take resulting from the Pier fender pile replacement activities is expected to result in the infrequent, incidental, and unintentional harassment of pinnipeds and the bottlenose dolphin resulting from noise activity generated by the short-term operations of pile driving equipment. Marine mammal mortality is extremely unlikely. Other than brief periods of elevated noise due to the pile driving activities, no habitat modifications would occur. No animals would be approached or handled by humans.

6.1 Fundamentals of Sound

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water. Sound is generally characterized by several variables, including frequency and intensity. Frequency describes the pitch of a sound, and is measured in the number of cycles per second, or hertz (Hz). Intensity describes the pressure per unit of area (i.e., loudness) of a sound, and is measured in decibels (dB). A dB is a unit of measurement describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. For underwater sounds, a reference pressure of 1 microPascal (μPa) is commonly used to describe sounds in terms of decibels, and is expressed as “dB re 1 μPa.” Therefore, 0 dB on the decibel scale would be a measure of sound pressure of 1 μPa. Sound levels in dB are calculated on a logarithmic basis. An increase of 10 dB represents a tenfold increase in acoustic energy, while 20 dB is 100 times more intense, 30 dB is 1,000 times more intense, etc. For airborne sound pressure, the reference amplitude is usually 20 μPa, and is expressed as “dB re 20 μPa.”

The method commonly used to quantify airborne sounds consists of evaluating all frequencies of a sound according to a weighting system that reflects of human hearing. This method is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. The method is called A-weighting, and the dB level that is measured using this method is called the A-weighted sound level. Sound levels measured underwater are not weighted, and include the entire frequency range of interest.

When a pile-driving hammer strikes a pile, a pulse is created that propagates through the pile and radiates sound into the water, substrate, and air. The sound pressure pulse is a function of time, and is referred to as the waveform. The instantaneous peak sound pressure level (SPLpeak) is the highest absolute value of pressure over the measured waveform, and can be a negative or positive pressure peak. In this document, the SPLpeak is also referenced as the peak levels or thresholds. Sound is frequently described as a root mean square (RMS) level, which is a statistical average of the sound wave amplitude. The RMS level is determined by analyzing the waveform and computing the average of the squared pressures over the time that constitutes the portion of the waveform containing 90 percent of the sound energy (Richardson et al., 1995). Sound levels are also described in relation to cumulative sound exposure levels (cSEL) where the A-weighted instantaneous sound pressures are squared and summed[2] throughout the duration of an event, referenced to 1 μPa. Table 6 contains definitions of these terms.

[2] SEL values are logarithms and must first be converted to antilogs for summation. Because the single strike SEL varies over the sequence of strikes, a linear sum of the energies for all the different strikes needed is computed. This is done as follows: divide each SEL decibel level by 10 and then take the antilog to convert the decibels to linear units (or uPa^2-s). Then the linear units can be summed and converted back into dB by taking 10Log10 of the value. This will be the cumulative SEL for all of the pile strikes.

Table 6
Definitions of Underwater Acoustical Terms

Term	Definition
dB, Decibel	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 μPa, and 1 μPa for underwater.
SPL_{peak}, Peak Sound Pressure Level (dB)	Peak sound-pressure level, based on the largest absolute value of the instantaneous sound pressure. This pressure is expressed in this report as a decibel (referenced to 1 μPa), but can also be expressed in units of pressure, such as μPa or pounds per square inch.
cSEL, cumulative Sound Exposure Level (dB)	cSEL is calculated by summing the cumulative pressure squared over the measurement duration, integrating over time, and normalizing to 1 second, referenced to 1 $microPascal^2$-second (1 $μPa^2$-sec).
RMS, root mean square Level (NMFS Criterion)	The average of the squared pressures over the time that comprise that portion of the waveform containing 90 percent of the sound energy for one pile-driving impulse (referenced to a pressure of 1 μPa).

Notes:
μPa = microPascal; NMFS = National Marine Fisheries Service

In this document, dB for underwater sound is referenced to 1 μPa and 1 $μPa^2$-sec (RMS and cSEL, respectively), and dB for airborne noise is referenced to 20 μPa. The practical spreading model has been used to estimate underwater noise in this analysis. In common use, noise refers to any unwanted sound. This meaning of noise will be used in the following discussion in reference to marine mammals; that is - pile driving noise may harass marine mammals.

6.2 Applicable Noise Thresholds

In 2010, NMFS established interim thresholds regarding the exposure of marine mammals to high-intensity noise that may be considered take under the MMPA. Updated NOAA guidance on assessing the effects of underwater noise on marine mammals for agency impact analysis was adopted in 2016 (NMFS, 2016). The 2016 guidance includes sound thresholds for slight injury to an animal's hearing, or PTS (Level A Harassment). The underwater sound pressure threshold for slight injury or PTS (Level A harassment) is a dual metric criterion for impulse noise (e.g., impact pile-driving), including both a peak pressure and cSEL threshold, which is specific to the species hearing group (i.e., high-frequency cetaceans [i.e., porpoises], mid-frequency cetaceans [i.e., bottlenose dolphin], low-frequency cetacean [i.e., gray whale], phocids [i.e., Pacific harbor seal and northern elephant seal], and otariids [i.e., California sea lion and northern fur seal]). For continuous noise (e.g., vibratory pile extraction or driving), the PTS threshold is based on cSEL for each species hearing group.

The 2010 thresholds for Level B behavioral harassment levels are still applicable: 160 dB RMS for impulse sounds (e.g., impact pile driving) and 120 dB RMS for nonimpulsive or continuous sounds (e.g., vibratory pile driving).[3] Level B Behavioral harassment is considered to have occurred when marine mammals are exposed to noise of 160 dB RMS or greater for impulse noise and 120 dB RMS for continuous noise. In some instances, ambient noise levels may be used in place of the 120 dB RMS threshold for continuous noise. For continuous noise, RMS levels are based on a time constant of 10 seconds, and those RMS levels should be averaged across the entire event. For impact pile-driving, the overall RMS level should be characterized by integrating sound energy for each acoustic pulse across 90 percent of the acoustic energy in each pulse, and averaging all the RMS levels for all pulses. Harassment thresholds for the various types of airborne and underwater noise are shown in Table 7.

The application of the standard 120 dB RMS threshold for underwater continuous noise can sometimes be problematic, because this threshold level can be either at or below the ambient noise level of certain locations, and not all species may respond to noise at that level. Exposure thresholds for continuous noise have been developed based on the best available scientific information on the response of gray whales to underwater noise. To date, there is very little research or data supporting a response by pinnipeds or odontocetes to continuous noise from vibratory pile extraction and driving as low as the 120 dB threshold. Southall et al. (2007) summarized numerous behavioral observations made of low-frequency cetaceans to a range of nonpulse noise sources, such as vibratory pile-driving. Generally, the data suggest no or limited responses to received levels of 90 to 120 dB RMS, and an increasing probability of behavioral effects in the 120 to 160 dB RMS range. There is limited data available on the behavioral effects of continuous noise on pinnipeds while underwater; however, field and captive studies to date collectively suggest that pinnipeds do not react strongly to exposures between 90 and 140 dB re 1 µPa RMS (Southall et al., 2007). Additionally, ambient underwater noise levels in urbanized estuaries often far exceeds 120 dB RMS, as a result of the nearly continuous noise from recreational and commercial boat traffic.

Table 7
Injury and Behavioral Disruption Thresholds for Airborne and Underwater Noise

Hearing Group and Species Considered in this IHA	Airborne Threshold (Impact and Vibratory Pile-Driving)	Underwater Continuous Noise Thresholds (e.g., Vibratory Pile-Driving)		Underwater Impulse Noise Thresholds (e.g., Impact Pile-Driving)		
	Level B RMS Threshold[1]	Level A cSEL Threshold	Level B RMS Threshold[2]	Level A Peak Threshold[3]	Level A cSEL Threshold[3]	Level B RMS Threshold[2]
Low-Frequency Cetaceans (gray whales)	N/A	199 dB	120 dB	219 dB	183 dB	160 dB
Mid-Frequency Cetaceans (porpoises)	N/A	198 dB	120 dB	230 dB	185 dB	160 dB
High-Frequency Cetaceans (bottlenose dolphins)	N/A	173 dB	120 dB	202 dB	155 dB	160 dB

[3] See NOAA guidance, at:
http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/threshold_guidance.html

Hearing Group and Species Considered in this IHA	Airborne Threshold (Impact and Vibratory Pile-Driving)	Underwater Continuous Noise Thresholds (e.g., Vibratory Pile-Driving)		Underwater Impulse Noise Thresholds (e.g., Impact Pile-Driving)		
	Level B RMS Threshold[1]	Level A cSEL Threshold	Level B RMS Threshold[2]	Level A Peak Threshold[3]	Level A cSEL Threshold[3]	Level B RMS Threshold[2]
Phocids (Pacific harbor seals)	90 dB (unweighted)	201 dB	120 dB	218 dB	185 dB	160 dB
Otariids (California sea lions)	100 dB (unweighted)	219 dB	120 dB	232 dB	203 dB	160 dB

Notes:

1 The airborne disturbance guideline applies to hauled-out pinnipeds.

2 Level B threshold can be adjusted to actual ambient conditions, which are often higher than RMS 120 dB in nearshore ocean environments.

3 Level A threshold for impulse noise is a dual criterion based on peak pressure and cSEL. Thresholds are based on the NMFS 2016 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing.

cSEL = cumulative sound exposure level
dB = decibel
IHA = Incidental Harassment Authorization
N/A = Not applicable, no thresholds exist
NMFS = National Marine Fisheries Service
RMS = root mean square
sec = second

Underwater peak and RMS are re: 1 µPa; cSEL is re: 1 μPa^2-sec; Airborne RMS is re: 20 µPa.

Background underwater sound levels in the action area are considered in the assessment of the project's construction impacts. Ambient noise levels have been used as a threshold for behavioral harassment from pile driving in other IHA authorizations, such as for the Mukilteo Multimodal Project Tank Farm Pier Removal in Washington and the Anacortes Ferry Terminal Tie-up Slip Dolphin and Wingwall Replacement Project in Washington, both authorized on September 1, 2015. Underwater noise in the Casitas Pier area is regularly generated by the existing water transit vessels; however, site-specific ambient noise data are not available for the Pier. As a result, the standard Level B threshold of 120 dB RMS will be used in this assessment.

Airborne noise levels at which pinniped behavioral disturbance at haul-out sites have been documented are used to determine potential disturbance from airborne construction noise. It should be noted that these are not official thresholds, but are used as guidelines to determine impacts associated with changes in airborne noise levels.

6.3 Estimation of Pile Driving Noise

NOAA's marine mammal acoustic technical guidance (NOAA 2016) was used to assess the potential underwater effects of proposed pile driving activity at the Pier on marine mammal hearing. The guidance document provides acoustic thresholds for onset of PTS and temporary threshold shifts (TTS) in marine mammal hearing for underwater sound sources. It is intended to be used to better predict how a marine mammal's hearing will respond to sound exposure. The guidance document outlines NOAA Fisheries' acoustic thresholds and describes how the thresholds were developed and how they will be updated in the future. NOAA guidance includes an Optional User Spreadsheet; the spreadsheet provides a set of alternative tools and weighting factor adjustments (WFAs) to allow action proponents with different levels of exposure modeling capabilities to be able to accurately apply NMFS' updated acoustic thresholds for the onset of PTS for all sound sources.

The Optional User Spreadsheet was used to predict marine mammal hearing responses to underwater sound exposure from the proposed pile driving. Copies of the completed Optional User Spreadsheet are provided in Appendix B. A separate worksheet within Appendix B is included for Level B harassment, using appropriate thresholds (refer to worksheet tab titled "ZOI Level B PTS"). The User Spreadsheet includes multiple conservative assumptions and therefore is expected to typically result in higher estimates of instances of hearing impairment than more sophisticated methodology.

As discussed further below, the Level A hazard zone will be equivalent to the area over which Level A harassment may occur. The Level B hazard zone will be equivalent to the area over which Level B harassment may occur. As discussed in Section 11 Mitigation Measures, sound source verification will be performed to validate and adjust the hazard zones if appropriate.

6.3.1 Underwater Acoustic Calculation Assumptions and Results

Reference sound levels were based on underwater sound measurements documented for a number of pile-driving projects with similar pile sizes and types at similar sites (i.e., areas of soft substrate where water depths are less than 16 feet (5 meters) [Caltrans, 2009]). The noise energy would dissipate as it spreads from the pile at a rate of at least 4.5 dB per doubling of distance (Caltrans, 2009). This is a conservative value for areas of shallow water with soft substrates, and actual dissipation rates would likely be higher.

Using this information, and the pile information presented in Table 1, underwater sound levels were estimated using the practical spreading model to determine over what distance the thresholds would be exceeded. Table 8 shows the expected underwater sound levels for pile-driving activities and the estimated distances to the Level A and Level B thresholds.

Input to the Optional User Spreadsheet are based on project-specific parameters that provide the sound source characteristics, including the estimated duration of pile driving, the estimated number of strikes per pile (for the impact hammer method); and the maximum number of piles to be driven in a day.

The key inputs to Optional User Spreadsheet are provided in the attached NOAA worksheet (Appendix B), and summarized below as follows:

- The estimated duration of pile driving for each pile, the number of strikes per pile (for impact driving), and the number of piles per day for each pile driving method, as listed in Table 1. As noted in Table 1, each pile will require approximately 25 minutes of vibratory driving, and up to 6 piles could be installed by this method in a single day. During this time the sound levels above and below water will be in excess of normal pier operations. In the unlikely event that an impact hammer is used, installation of a single pile will require an estimated 400 hammer strikes over 15 minutes, and up to 6 piles could be installed by this method in a single day. Representative pile driving equipment specifications are provided in Appendix A.

- Use of the Caltrans (2015) guidelines for selection of an appropriate pile driving sound source level for a composite 50-foot, 16-inch pipe/12-foot,14-inch H-pile configuration, for both vibratory and impact driving methods, taking into consideration that the H-pile segment of the pile (the bottom portion) will be driven below the mudline, thus the predominant underwater noise source will emanate from the steel pipe segment (see Assumptions tab).

- o For the impact hammer method, the average sound pressure level measured in dB is based on the 16-inch steel pipe sound levels (Caltrans 2015, Table I.2-1), adjusted upward for the composite 16-inch pipe/14-inch H-pile design. As described in Section 1 Project Activities, the replacement piles will be a composite of two materials, pre-welded into a single pile prior to driving. The upper section will consist of 48 to 50 feet (15 meters) of 16-inch diameter x 0.50-inch wall thickness pipe pile and the bottom segment will consist of a 12-foot (4-meter) long 14 inch x 73 pound H-pile. The water depth ranges from 13 to 27 feet (4 to 8 meters) at the end of the Pier (the project work area), with seasonal variations due to beach sand withdraw and return between the winter and summer seasons. When impact driving is initiated the H-pile will partially enter the mud substrate (e.g., up to 2 to 4 feet) pushed by hammer weight and the weight of the pipe itself due to soft substrate (mud) at the seafloor surface. Thus, when impact driving begins only a portion of the 12-foot H pile would be exposed in the water column and most of the length of pile within the water column will be steel pipe pile. As pile driving progresses, the H-pile portion of the fender pile will continue to enter the seabed, and the proportion of H-pile to steel pipe exposed to the water column will decrease until the H-pile is entirely buried or until pile driving is suspended at a minimum depth of 6 feet. Consequently, the sound level for the composite pile is anticipated to be greater than the Caltrans reference sound level for 16-inch steel pipe (158 dB), and less than the Caltrans reference sound level for 14-inch steel H-pile (177 dB). Based on these factors, the reference sound level from composite pile was based on 16-inch steel pipe pile, with an upward adjustment of 6 dB (to 164 dB). This 6 dB adjustment is divided into two parts: 3 dB (one doubling) adjustment for the H-pile itself (i.e., the portion of H-pile being driven by impact hammer); and 3 dB (a second doubling) adjustment for the H-pile that is acting as a foundation, and thus providing some resistance to the pipe pile while it is being driven by impact hammer. This sound level, which represents two doublings of the reference sound level of the 16-inch steel pipe, is considered sufficiently conservative to account for the H-pile portion of the fender pile that would be exposed in the water column and serving as a foundation to the pipe pile during impact driving.

- o For the vibratory driving method, the average sound pressure level measured in dB is based on the 12-inch H-pile sound levels (Caltrans 2015, Table I.2-2), adjusted upward for composite 16-inch pipe/14-inch H-pile design. (Note that Caltrans data do not include specific vibratory reference sound levels for the 14-inch H-pile. Therefore, it was assumed that doubling the reference sound level for 12-inch H-pile plus 1 dB [i.e., a 4 dB increase], would provide a sufficiently conservative assumption for a 14-inch H-pile.)

- Use of the NOAA Optional worksheet Level A isopleth input parameters assuming continuous vibratory driving (worksheet “A: Stationary Source: Non-Impulsive, Continuous”). This is considered conservative because in practice, the vibratory driving will very likely be intermittent.

- Use of the practical spreading loss model for selection of the Level B harassment RMS sound level.

Table 8 presents a summary of results from the NOAA worksheets. The table indicates the estimated PTS isopleth distance to threshold for Level A harassment and the TTS zone of influence (ZOI) for Level B harassment (in feet and meters) and the corresponding area (in square meters and square feet) for the composite pile material, both vibratory and impact pile driving methods. The results are summarized as follows:

- For the vibratory pile driving method, the potential for Level A harassment is limited to the area immediately surrounding the pile (less than or equal to about 21 feet, or 6.4 meter radius) for all species, and the potential for Level B harassment for all species extends out to 6,063 feet (1.15 miles; 1,848 meters) from the pile driving site.

- For the impact pile driving method, the potential for Level A harassment extends out to 379 feet (115 meters) for high-frequency cetaceans and 170 feet (52 meters) for Phocid species (i.e., harbor seals). The potential for Level B harassment for all species extends out to 241 feet (74 meters) from the pile driving site. These levels assume that no sound-reduction measures are applied.

The Level A and Level B hazard zone isopleth distances for vibratory driving are shown on Figures 6 and 7, respectively. The Level A and Level B hazard zones for impact driving are shown on Figure 8.

As noted in Section 1.4, ambient noise levels have been measured in the vicinity of the project and for other similar projects in the region. For example, during the Rincon causeway project, located five miles east of the project site and in similar water depths, ambient sound reached 130 dB re 1µPa – rms, largely because of snapping shrimp (MMCG 2013a and 2014a). Pending project-specific ambient measurements at Casitas Pier, it is anticipated that ambient underwater sound levels will exceed 120 dB; therefore, the Level B harassment ZOI is likely smaller than what is presented in Table 8. For example, if ambient measurements indicate 129 dB (an increase of 9 dB), then the calculated Level B ZOI for vibratory driving would be reduced from 6,060 feet (1.15 miles 1,848 meters) to 1,523 feet (0.3 miles; 464 meters).

Table 8
Underwater Noise Level Estimates

Distance									
Hearing Group			**Level A**					**Level B**	
			Low-Frequency Cetaceans	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**	**RMS 160 dB**	**RMS 120 dB**
SEL_{cum} Threshold (Vibratory Driving)			**199**	**198**	**173**	**201**	**219**		
SEL_{cum} Threshold (Impact Driving)			**183**	**185**	**155**	**185**	**203**		
Vibratory Pile Driving									
Pile Type	**Source Level**	**Weighting Factor**	**PTS Isopleth to threshold (meters)**					**TTS ZOI to threshold (meters)**	
Composite Pipe/H-Pile (steel)	154	2.5	4.30	0.38	6.35	2.61	0.18	NA	1,847.85
Pile Type	**Source PLS**	**Weighting Factor**	**PTS Isopleth to threshold (feet)**					**TTS ZOI to threshold (feet)**	
Composite Pipe/H-Pile (steel)	154	2.5	14.09	1.25	20.84	8.57	0.60	NA	6,062.50
Impact Pile Driving									
Pile Type	**Source Level**	**Weighting Factor**	**PTS Isopleth to threshold (meters)**					**TTS ZOI to threshold (meters)**	
Composite Pipe/H-Pile (steel)	164	2	96.88	3.45	115.39	51.84	3.77	73.56	NA
Pile Type	**Source PLS**	**Weighting Factor**	**PTS Isopleth to threshold (feet)**					**TTS ZOI to threshold (feet)**	
Composite Pipe/H-Pile (steel)	164	2	317.83	11.30	378.59	170.09	12.38	241.35	NA

Area									
Hearing Group			Level A					Level B	
			Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	RMS 160 dB	RMS 120 dB
SEL_{cum} Threshold (Vibratory Driving)			199	198	173	201	219		
SEL_{cum} Threshold (Impact Driving)			183	185	155	185	203		
Vibratory Pile Driving									
Pile Type	**Source Level**	**Weighting Factor**	**Insonified Area (m2)**						
Composite Pipe/H-Pile (steel)	154	2.5	57.97	0.46	126.72	21.42	0.11	NA	10,727,113
Pile Type	**Source PLS**	**Weighting Factor**	**Insonified Area (ft2)**						
Composite Pipe/H-Pile (steel)	154	2.5	624.03	4.90	1364.05	230.55	1.14	NA	115,465,686
Impact Pile Driving									
Pile Type	**Source Level**	**Weighting Factor**	**Insonified Area (m2)**						
Composite Pipe/H-Pile (steel)	164	2	29,483.17	37.30	41,832.20	8,443.63	44.76	17,001	NA
Pile Type	**Source PLS**	**Weighting Factor**	**Insonified Area (ft2)**						
Composite Pipe/H-Pile (steel)	164	2	317,354.26	401.44	450,278.07	90,886.47	481.80	183,001	NA

6.3.2 Airborne Noise

Pile driving generates airborne noise that could potentially result in behavioral disturbance to pinnipeds (e.g., sea lions and harbor seals) that are hauled out or at the water's surface. As with the underwater noise, the practical spreading model is used to determine the extent over which sound levels may result in harassment of marine mammals. A 20 $\log_{10}$ attenuation rate was used to calculate the distances to the NMFS thresholds for pinnipeds.

Measured sound levels of airborne noise from impact pile driving used in this analysis are based on a Federal Transit Administration study where air noise for vibratory pile driving is listed at 96 dBA at 50 feet (15 meters) and impact pile driving is listed as 101 dBA at 50 feet (15 meters) (FTA 2006). Table 9 provides distances to the thresholds to air noise from vibratory and impact pile driving.

Table 9
Modeled Extent of Sound Pressure Levels for Airborne Noise

Pile Driving Activity	Distance to Level B Guideline Thresholds	
	100 dB RMS (Pacific Harbor Seals)	90 dB RMS (California Sea Lions)
Vibratory Driving (96 dBA)	0 (0 meters)	100 feet (36 meters)
Impact Driving (101 dBA)	63 feet (20 meters)	200 feet (61 meters)

Notes:
RMS is re: 20 μPa.
dB = decibel
μPa = microPascal
RMS = root mean square
Source for airborne pile reference sound levels: FTA 2006. Source for 100 dB and 90 dB RMS thresholds: NMFS 2016 (http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/threshold_guidance.html)

During vibratory driving, any pinnipeds that surface in the area over which the airborne noise thresholds may be exceeded would have already been exposed to underwater noise levels above the applicable thresholds; therefore, no additional incidental take would occur. If impact driving is used, harbor seals that surface within 63 feet (20 meters) of the pile driving and California sea lions that surface within 200 feet (61 meters) may be exposed to airborne noise above the Level B underwater Level B hazard presented in Table 8. The rounding up that occurs for take from underwater noise will provide take coverage sufficient for this effect (see Section 6.4.1).

The onshore harbor seal rookery is located approximately 600 feet (180 meters) from the work site (Figure 4), and other available haul-out structures are located well beyond this distance. Sea lions rarely haul out at the rookery, and their normal haulout structures are distant from the pier. These distances exceed the Level B threshold distances for airborne impacts listed in Table 9. Therefore, no airborne-only Level B take is anticipated.

6.4 Description and Estimate of Take

The potential numbers of marine mammals that may be exposed to take as defined in the MMPA is typically determined by comparing the calculated areas over which the Level B and Level A harassment thresholds may be exceeded, as described in Section 6.3, with the expected distribution of marine mammal species within the vicinity of the proposed project, as described in Section 4.

Because at-sea densities for marine mammal species have not been determined in the SCB, estimates here are determined by using observational data taken during marine mammal monitoring associated with other projects, and other marine mammal observations for the SCB.

The mechanisms of take requested are expected to have no more than a behavioral effect on individual animals, and no effect on the populations of these species. Any effects experienced by individual marine mammals are anticipated to be limited to short-term disturbance of normal behavior or temporary displacement of animals near the source of the noise. Monitoring will ensure that no cetaceans or pinnipeds are present in the Level A harassment area during pile driving.

6.4.1 Pacific Harbor Seal

The number of harbor seals in the vicinity of Casitas Pier will vary throughout the work period. As described in Section 4.1, based on a wide range of observational data, the likely harbor seal population estimate in the Casitas Pier area is approximately 500 to 700 animals. This is believed to be an accurate estimate of the total population of harbor seals at Carpinteria. However, this estimate was derived from a nighttime count and does not reflect a daytime estimate of the Carpinteria population, especially when the beaches are open to the public and very few seals are present (MMCG 2007b).

Although a wealth of data exists from the Carpinteria Seal Watch, these data are sometimes incomplete and data from some periods are missing. Moreover, these data were gathered during the period the Carpinteria Seal Watch does its monitoring (about January 1 through May 30 of each year). From June 1 through December 30 of each year, such data are virtually absent. The project is scheduled to begin in the fall, when the seals have largely abandoned the beach because it is open to the public and disturbances are chronic. The seals switch to a nighttime haul-out pattern during this period, hauling out after sundown and before dawn, unless the tide is very high (Seagars 1988). In such cases, the amount of haul-out area is very restricted. Some data are available for the season when the beach is open, including nighttime counts (Section 4.1) as well as some daytime counts. Except when early morning high tides prevent people from walking along the beach, the seals are largely absent during this season.

Reliable density data are not available from which to calculate the expected number of harbor seals within the Level B harassment impact zone for vibratory pile driving. Based on review of the available observational data, similar past experience in the project vicinity, and project timing (fall season, daytime hours), an estimated range of 0 to 50 harbor seals is anticipated to be present within the project vicinity during work periods. Therefore, pile driving is proposed to be conducted only when fewer than 50 seals (the maximum number of the expected range of seals) are present on the beach and within the Level B hazard zone. Other operations may continue, provided the seals on the beach and in the water do not appear disturbed by such activities.

6.4.2 California Sea Lion

As described in Section 4.2, California sea lions are the most abundant pinniped in the SCB. This species regularly hauls out on buoys, oil platforms, docks, breakwaters and other structures along the coast in the vicinity of the project. Individuals are regularly observed hauled out on mooring buoys used by oil supply vessels approximately 0.75 miles southeast of the Pier and at the outermost portion of any hazard zone proposed for this project. They also haul out on oil platforms and attendant buoys several miles off Carpinteria. Occasionally, individual stranded specimens haul out at the Carpinteria seal rookery (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2011c, 2013b, and 2014b; SBMMC 1976-2015).

Reliable density data are not available from which to calculate the expected number of sea lions within the Level B harassment impact zone for vibratory pile driving (0.3 square miles; 0.8 square kilometers per Table 8). Based on the available observational data, similar past experience in the project vicinity, and project timing (fall season), an estimated range of zero to 15 sea lions is anticipated to be present within the project vicinity during work periods. Therefore, pile driving is proposed to be conducted only when fewer than 15 sea lions (the maximum number of the expected range of sea lions) are present within the Level B hazard zone. Set-up operations may continue, provided the sea lions that are hauled out or in the water do not appear disturbed by such activities.

6.4.3 Coastal Bottlenose Dolphin

As described in Section 4.3, almost all (99 percent) of coastal bottlenose dolphins are found within 0.6 nautical miles of shore. The stock size is estimated at only 323 animals throughout its entire range (Carretta et al. 2015). The project site represents a very small portion of its overall range. This species may occur sporadically near the project area, but never in large numbers. Past projects have revealed anywhere from 2 to 32 animals present at any one time (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2011c, 2013b, and 2014b). Carpinteria Seal Watch data are incomplete, in that bottlenose dolphins are sometimes noted and sometimes not. Also, long-beaked common dolphins (below) are sometimes noted as bottlenose dolphins.

Reliable density data are not available from which to calculate the expected number of bottlenose dolphins within the Level B harassment impact zone for vibratory pile driving (0.3 square miles; 0.8 square kilometers per Table 8). Observations in the vicinity of Casitas Pier and in the general project area (MMCG 1995; 1998a, b, d, and e; 2001a and b; 2006; 2007a and b; 2011c; 2013b; and 2014b; SBMMC 1976-2015; SBMMC 1976-2015) have revealed from 2 to 32 coastal bottlenose dolphins present at any one time, with an average pod size of 8 animals (although many days or even weeks go by with no dolphins seen). Therefore, based on these observations, the estimate of take for pile driving is proposed to be conducted only when fewer than 16 coastal bottlenose dolphins (e.g., two groups of up to 8 dolphins), are observed within the Level B hazard zone. Operations may continue, provided the dolphins do not appear disturbed by such activities. Set-up operations may continue, provided the dolphins do not appear disturbed by such activities.

Small Level A zones are estimated for mid-frequency cetaceans (i.e., bottlenose dolphins) and phocids (i.e., harbor seals) during impact driving (approximately 11-foot and 170-foot [3.5- and 52-meter] radius respectively). The Level A hazard zone during vibratory driving is substantially less than the Level A hazard zone for impact driving (approximately 9 feet [3 meters] for phocids, and less than 2 feet [less than 1 meter] for mid-frequency cetaceans) (Table 8). Marine mammal monitoring and reporting, as outlined in Sections 11 and 13, coupled with hydroacoustic monitoring, will ensure that driving does not occur if bottlenose dolphins are in the Level A hazard zones.

6.4.4 Other Marine Mammal Species

The other marine mammal species listed in Section 4 occur only infrequently in the area. If any of these species occur within 0.5 nautical miles of the pile-driving activity pile driving operations will cease until the animals leave the area. No take of these species is requested under the IHA.

6.5 Summary and Schedule of Estimated Take

In summary, Venoco requests an IHA to incidentally harass Pacific harbor seals, California sea lions, and coastal bottlenose dolphins. Pile driving associated with the proposed project would occur over a few days within a 2- to 3-week work schedule, in fall 2017 prior to the harbor seal pupping season and beach closure period. Take that would occur through Level B harassment would occur during short periods of pile driving within this schedule. Table 10 summarizes the estimate of take for each species by pile-driving activity. The estimates are based on the number of individuals assumed to be exposed per day; the number of piles driven; and the number of days of pile driving expected, based on an average installation rate. These totals assume that an individual animal can only be taken once per method of installation during a 24-hour period. There will be day-to-day variability in the presence of marine mammals in the area; therefore, the take per day is included to demonstrate how the total take was calculated.

Table 10
Summary of Estimated Take by Species (Level B Harassment)

Pile Type	Pile-Driver Type	# of Piles per day	# of Driving Days	Estimated Take by Level B Harassment (take per day / project total)		
				Pacific Harbor Seal	California Sea Lion	Coastal Bottlenose Dolphin
Fender pile replacement – composite 16-inch steel pipe pile with 14-inch H pile attachment	Vibratory or Impact	6	2.5	50/125	15/38	16/40

6.6 Sound Reducing Methods

The proposed means of reducing sound levels is primarily through the use of vibratory pile driving during daytime hours. Impact driving would not be used unless necessary to complete the driving process, which is not anticipated to be necessary based on the pile design and sediment conditions.

In the unlikely event that impact driving is needed, then start-up of pile driving activities (either initially or if activities have ceased for more than 30 minutes) will occur with a gradual ramp-up in noise levels. The following additional pile driving sound level reduction measures will be implemented if they are deemed feasible based on final design considerations:

- Steel pile drive caps will be used to uniformly distribute the force of the pile driver hammer throughout the entire pile rather than at the edges
- A wooden cushion block consisting of one or two layers of heavy plywood pre-soaked with water will be used between the hammer impact block and the pile drive cap.

These measures were used during the Rincon causeway pile driving project (2011-2014), located five miles east of the project site and in similar water depths. Layers of heavy plywood soaked in water on top of the pile cap served to dampen the sound of the hammer striking the wood as well as to dissipate friction; plywood not soaked in water was pounded to charred splinters that became very thin and had little value in attenuating sound.

Bubble curtains have been used with some effectiveness in protected waters. However, piers are subject to surge, which affects the distribution of bubbles and the curtain device itself to the point where they become ineffective. During the Mobil Seacliff pier project, a bubble curtain was employed. Sounds were measured with the bubble curtain on and off and no measurable difference in ambient sound was noted (MMCG 1998c and d). A bubble curtain was also used during the Arco-BP PRC-421 decommissioning project with the same ineffectiveness (MMCG 2006). Based on this experience in local coastal waters around piers, the use of bubble curtains is not proposed.

As described in Section 1, Casitas Pier experiences continuous operations. With the exception of pile driving, the planned construction will likely be indistinguishable from typical operations. Nonetheless operational noise will be minimized as practical (e.g., use of properly maintained equipment).

7.0 Anticipated Impact of the Activity

The proposed project will produce underwater noise that may potentially harass marine mammals, as described in Section 6. The estimated level of take by such harassment, as estimated in Section 6, is low when compared to the overall size of the affected stocks provided in Section 4.

Exposure to high-intensity underwater noise may cause a loss of hearing sensitivity in marine mammals. If loss of hearing is permanent (i.e., PTS), NMFS considers it a Level A harassment; whereas temporary hearing loss is considered Level B harassment. PTS is presumed to be likely if the hearing threshold is reduced by equal to or greater than 40 dB (i.e., 40 dB of temporary threshold shift) (NMFS, 2010). Behavioral effects, such as fleeing and the temporary cessation of feeding or spawning behaviors, could also result from underwater noise. However, the above criteria do not address these effects. In assessing the potential effects of noise, Richardson et al. (1995) have suggested criteria for defining four zones of effect. These zones are discussed in Sections 7.1.1 through 7.1.4, from greatest effect to least.

Marine mammals reviewed in this document are considered solitary foragers; however, underwater communicative signals for social reasons or predator avoidance may be disrupted during pile-driving activity that could lead to adverse impacts. Pinniped communication occurs mostly in low-frequency signals underwater (NMFS, 2010). Harbor porpoises are considered high-frequency cetaceans with an estimated auditory bandwidth range from 200 Hz to 180 kilohertz (kHz). Gray whales, like other baleen whales, are in the low-frequency hearing group. Underwater sounds produced by gray whales range from 20 Hz to 20 kHz (NMFS, 2010). Anthropogenic noise within the action area, especially from Casitas Pier itself, would at least partially mask construction sounds. Seals, sea lions, and coastal bottlenose dolphins have also shown habituation to anthropogenic noise and activity near Casitas Pier, which would decrease behavioral reactions to construction activity.

7.1 Zones of Potential Acoustic Effect

7.1.1 Zone of Hearing Loss, Discomfort, or Injury

The zone of hearing loss, discomfort, or injury is the area in which the received sound energy is potentially high enough to cause discomfort or tissue damage to auditory or other systems. The possible effects of damaging sound energy are a temporary hearing threshold shift,[4] a temporary loss in hearing, PTS, and a loss in hearing at specific frequencies, or deafness. Non-auditory physiological effects or injuries that can theoretically occur in marine mammals exposed to strong underwater noise are stress, neurological effects, bubble formation, resonance effects and other types of organ or tissue damage. These effects would be considered Level A harassment; applicable NMFS acoustic thresholds for this type of harassment are species-specific, depending on the hearing group and use dual criteria metrics, including peak pressure and cSEL. The Level A Harassment thresholds are summarized in Table 7, and the distances to those thresholds (the Level A hazard zones for various species) are summarized in Table 8. These distances are considered conservative because they are based on cumulative noise from a full day of pile driving, and an animal would have to be present within that distance for an extended period to potentially experience PTS.

No physiological responses are expected from pile-driving operations occurring during project construction. Vibratory pile driving does not generate high-peak sound-pressure levels commonly associated with physiological damage. Marine mammal observers will monitor the hazard zones for the presence of marine mammals, as discussed further in Section 11. They will alert work crews to the presence of pinnipeds or cetaceans in or near the hazard zones, and advise when to begin or stop work to reduce the potential for acoustic harassment. The Level A hazard zone will be equivalent to the area over which Level A harassment may occur.

7.1.2 Zone of Masking

The zone of masking is the area in which noise may interfere with the detection of other sounds, including communication calls, prey sounds, and other environmental sounds. This effect would be considered Level B harassment; the applicable thresholds for the zone where this effect occurs are 160 dB for impulse sounds (i.e., impact pile driving), and 120 dB for continuous sounds (i.e., vibratory pile driving).

7.1.3 Zone of Responsiveness

The zone of responsiveness is the area in which animals react behaviorally. The behavioral responses of marine mammals to noise depend on a number of factors, including (1) the acoustic characteristics of the noise source of interest; (2) the physical and behavioral state of the animals at the time of exposure; (3) the ambient acoustic and ecological characteristics of the environment; and (4) the context of the noise (e.g., does it sound like a predator?) (Richardson et al., 1995; Southall et al., 2007). However, temporary behavioral effects are often simply evidence that an animal has heard a noise, and may not indicate lasting consequence for exposed individuals (Southall et al., 2007). These types of effects would be considered Level B harassment; the applicable thresholds for the zone where these effects occur are 160 dB for impulse sounds, and 120 dB for continuous sounds.

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[4] On exposure to noise, the hearing sensitivity may decrease as a measure of protection. This process is referred to as a shift in the threshold of hearing, meaning that only sounds louder than a certain level will be heard. The shift may be temporary or permanent.

7.1.4 Zone of Audibility

The zone of audibility is the area in which the marine mammal may hear the noise. Marine mammals as a group have functional hearing ranges of 10 Hz to 180 kHz, with best thresholds near 40 dB (Southall et al., 2007; Au et al. 2000; Lenhardt 1994; Moein et al. 1994; Richardson et al. 1995; Ridgway et al. 1997) (Table 11). Study data show reasonably consistent patterns of hearing sensitivity in three groups: small odontocetes (such as the bottlenose dolphin), medium-sized odontocetes (such as killer whales), and pinnipeds (such as the California sea lion). No thresholds apply to this zone because it is difficult to determine the audibility of a particular noise for a particular species. This zone does not fall within the noise range of a take as defined by NMFS. The zone of audibility is also limited by background noise levels, which may mask the particular noise in question. Background noise is produced both by natural (waves, rain, and other organisms) and anthropogenic sources (watercraft, bridges, etc.).

Table 11
Frequency Hearing Ranges for Selected Marine Mammal Species

Taxa	Common Name	Genus/Species	Frequency Range
Odontocetes	Short-beaked common dolphin	*Delphinus delphis*	500 Hz to 67 kHz
	Short-finned pilot whale	*Globicephala macrorhynchus*	500 Hz to 20 kHz
	Risso's dolphin	*Grampus griseus*	80 Hz to 100 kHz
	Pacific white-sided dolphin	*Lagenoryhnchus obliquidens*	2 kHz to 80 kHz
	Northern right whale dolphin	*Lissodelphis borealis*	1 kHz to 40 kHz
	Killer whale	*Orcinus orca*	500 Hz to 120 kHz
	False killer whale	*Pseudorca crassidens*	1.1 kHz to 130 kHz
	Spotted dolphin	*Stenella attenuata*	3.1 kHz to 21.4 kHz
	Striped dolphin	*Stenella coeruleoalba*	6 kHz to 24 kHz
	Spinner dolphin	*Stenella longirostris*	1 kHz to 65 kHz
	Bottlenose dolphin	*Tursiops truncatus*	40 Hz to 150 kHz
Odontocetes	Hubbs' beaked whale	*Mesoplodon carlhubbsi*	300 Hz to 80 kHz
	Blainville's beaked whale	*Mesoplodon densirostris*	1 kHz to 6 kHz
	Pygmy sperm whale	*Kogia breviceps*	60 kHz to 200 kHz
	Sperm Whale	*Physeter macrocephalus*	100 Hz to 30 kHz
	Harbor porpoise	*Phocoena phocoena*	1 kHz to 150 kHz
	Dall's porpoise	*Phocoenoides dalli*	40 Hz to 149 kHz
Mysticetes	Gray whale	*Eschrichtius robustus*	20 Hz to 2 kHz
	Minke whale	*Balaenoptera acutorostrata*	60 Hz to 20 kHz
	Sei whale	*Balaenoptera borealis*	1.5 kHz to 3.5 kHz
	Bryde's whale	*Balaenoptera edeni*	70 Hz to 950 Hz
	Blue whale	*Balaenoptera musculus*	12 Hz to 31 kHz

Taxa	Common Name	Genus/Species	Frequency Range
	Fin whale	*Balaenoptera physalus*	14 Hz to 28 kHz
	Humpback whale	*Megaptera novaeangliae*	20 Hz to 10 kHz
Pinnipeds	Northern fur seal	*Callorhinus ursinus*	4 kHz to 28 kHz
	California sea lion	*Zalophus californianus*	100 Hz to 60 kHz
	Northern elephant seal	*Mirounga angustirostris*	200 Hz to 2.5 kHz
	Pacific harbor seal	*Phoca vitulina richardsi*	100 Hz to 180 kHz
Mustelids	Southern sea otter	*Enhydra lutris nereis*	3 kHz to 5 kHz

Sources: Au et al. 2000; Lenhardt 1994; Moein et al. 1994; Richardson et al. 1995; Ridgway et al. 1997.

Note: Most of the frequency ranges listed above represent the range of frequencies in which these species vocalize. In a few cases, frequency response ranges are known and are presented. In all cases, the most extreme ranges known at low and high frequencies are noted.

7.2 Expected Responses to Pile Driving

With both vibratory and impact pile driving, it is likely that the onset of activities could result in temporary, short-term changes in typical behavior, and/or avoidance of the affected area. A marine mammal may show signs that it is startled by the noise, and/or may swim away from the noise source and avoid the area. Other potential behavioral changes could include increased swimming speed, increased surfacing time, and decreased foraging in the affected area. Pinnipeds may increase their haul-out time, possibly to avoid in-water disturbance. Because pile replacement work would occur for a just few hours a day, it is very unlikely to result in permanent displacement of animals. Potential impacts from pile driving activities could be experienced by individual marine mammals, but would likely not cause population-level impacts or affect the long-term fitness of the species in the SCB.

The expected responses to pile replacement work noise depend partly on the average ambient background noise of the site. Ocean conditions in the area surrounding the Casitas Pier experience frequent boat traffic, vehicle and equipment traffic on pier, and noise from routine equipment usage on the pier. For marine mammals that traverse this area regularly, or harbor seals that are part of the Carpinteria resident population, responses to noise may be lessened due to habituation.

7.3 Effects of Airborne Noise on Marine Mammals

Marine mammals could be exposed to airborne noise levels at sound-pressure levels that would constitute Level B harassment during impact or vibratory pile driving (see Section 6 for results). However, such exposure would occur to animals that have already been exposed to underwater noise above the Level B threshold, and therefore would not constitute additional take. Injury or Level A harassment is not expected to occur from airborne noise.

Pacific harbor seals and California sea lions may be exposed to airborne noise if they surface in close proximity to pile driving work. Airborne noise would likely cause behavioral responses similar to those discussed above in relation to underwater noise. For instance, the noise generated could cause pinnipeds to exhibit changes in their normal behavior, such as causing them to move farther from the noise source.

As with underwater noise, because of the relatively short duration of the work and the limited amount of time per day when pile replacement work would occur, exposure to airborne noise would likely not result in population-level impacts or affect the long-term fitness of these species.

7.4 Effects of Human Disturbance on Marine Mammals

As described in Section 1, there is regular and daily activity on the Casitas Pier and in the project area as part of baseline conditions related to pier operations, marine traffic, and public beach use. As a result of these factors, visual disturbance associated with the proposed project will not affect haul-out locations.

8.0 Impact on Marine Mammal Availability for Subsistence

There is no subsistence hunting of marine mammals in the project area; therefore, activities at the Pier would not be expected to impact marine mammal availability for subsistence.

9.0 Anticipated Impact on Marine Mammal Habitat

There will be no loss of marine mammal habitat resulting from fender pile replacement activities over the period covered by the requested IHA. Harbor seals are known to use nearshore rocks and sandy beaches along the base of Carpinteria bluff.

As indicated in Section 1 of this application, impacts to marine mammal habitat will be limited to occasional brief periods of noise presenting a temporary impact to harbor seals, sea lions, and small cetaceans in the vicinity of the Pier. These activities will not result in loss of habitat.

10.0 Anticipated Impact of Habitat Modification on Marine Mammal Stocks

There will be no modification of marine mammal habitat resulting from fender pile replacement activities; therefore, there would be no impact from habitat modification to marine mammal populations.

11.0 Mitigation Measures

Since there will be no long-term or cumulative impacts to marine mammal habitat, there will be no anticipated requirement for mitigation with respect to habitat. Construction activities described in Section 1 will have no impact on breeding, molting, or pupping because project activities will not occur during at the times of year when those pinniped activities are expected to occur in the vicinity of the Pier.

Marine mammal protection measures will be implemented in accordance with Venoco's Marine Wildlife Protection and Training Plan (Appendix C). The plan includes details of the worker training that will be followed during construction. Specific measures include:

- Worker training prior to start of work
- Monitoring of the work by NOAA-approved monitor(s)

- Notification of regulatory agencies in the event that project-related activities result in significant adverse disturbances to marine mammals as determined by the designated marine mammal monitor
- Communication and coordination with City of Carpinteria, Coastal Commission, and other agencies as appropriate (e.g., California Department of Fish and Wildlife, National Marine Fisheries Service).

Past measures implemented during similar pile replacement activities at various Southern California project sites have reduced disturbances to marine mammals present within the vicinity by limiting the level of the disturbance or maintaining a constant level that diminished the intensity of disturbance and the potential for startling reactions from the animals. Venoco considers these measures beneficial for the species and will continue to implement such measures. Mitigation measures to be implemented for the Pier fender pile replacement activities include:

- The project will be conducted during fall 2017 because the fewest number of resident marine mammals will be present then, since the beach is open to the public, most harbor seals tend to stay away from the haul-out and rookery area after pupping, breeding and molting activities have ceased, and all harbor seal pups will have been weaned by then.
- This same period will avoid the gray whale migration and is also the period recommended by researchers to avoid most whale activity in general.
- Work vehicles and equipment will be staged out of sight of the haul-out area in the designated parking area. The turnaround area at the base of the Pier will not be used except when waiting short periods to go on the Pier. Vehicles and equipment will be parked out of sight from the haul-out area when using the turnaround area.
- Activities will occur during daylight hours, from 0700 to 1800 each day.
- Site-specific in-air and underwater ambient sound measurements will be performed according to NOAA specifications prior to and during pile driving, to validate and adjust the hazard zones if appropriate. Based on depth of water and tidal conditions, sound level monitoring will likely occur at mid-water depth, and with a focus on the east side of the pier where the majority of noise effects are anticipated. A preliminary hydroacoustic monitoring plan is provided in Appendix D. This plan will be refined to address the project-specific sound monitoring requirements consistent with NOAA guidelines (see, for example, NOAA 2012; this memorandum provides guidance for data collection methods to characterize impact and vibratory pile driving source levels relevant to marine mammals).
- The following pile driving sound level reduction measures will be implemented if an impact pile driver is employed:
    - Start-up of pile driving activities will occur with a gradual ramp-up in noise levels. For impact driving, soft start will be required, and contractors will provide an initial set of strikes from the impact hammer at reduced energy, followed by a thirty-second waiting period, then two subsequent reduced energy strike sets. The reduced energy of an individual hammer cannot be quantified because of variation in individual drivers. The actual number of strikes at reduced energy will vary because operating the hammer at less than full power results in “bouncing” of the hammer as it strikes the pile, resulting in multiple “strikes.” Soft start for impact driving will be required at the beginning of each day’s pile driving work and at any time following a cessation of impact pile driving of thirty minutes or longer.
    - Steel pile drive caps will be used to uniformly distribute the force of the pile driver hammer throughout the entire pile rather than at the edges

  - One or two layers of heavy plywood pre-soaked with water will be used between the hammer impact block and the pile drive cap.
- Venoco will employ NOAA-NMFS qualified marine mammal observer(s) to visually monitor the pinnipeds from the bluff immediately above the rookery beach and on the Pier. They will monitor all marine mammals on the beach and in the ocean in the vicinity of the Pier for any startle or other behaviors that result from activities at the Pier.
- All project personnel will be briefed by the monitor prior to start of operations. Any new personnel will be briefed upon their arrival.
- Key points of contact and communications will be established between the key points of contact and monitor(s) before operations begin, as well as communications between monitor(s).
- The monitor(s) will establish Level A and Level B hazard zones (as described above in Section 6) prior to and during pile driving operations. The hazard zones will be set from each pile driving operation. The monitor(s) will have range-finding binoculars and optical range finders.
- If a marine mammal appears within the Level A hazard zone during the ramp-up, the monitor will order a stop in operations until the marine mammal(s) is clear.
- If a marine mammal appears within 10 meters of the Level A hazard zone while pile driving is occurring, the monitor(s) will observe the animal and order a stop in operations if the animal appears to be distressed. If the animal does not appear to be distressed, the monitor(s) at their discretion may allow the operation to continue.
- The monitor(s) will have the authority to stop any operation that has potential to disturb marine mammals, including excessive noise, and request that steps to taken to reduce such noise.
- The monitor(s) will have authority to determine if a significant adverse impact is about to occur or has occurred because of a project operation and they will have authority to shut down such an operation if this occurs.
- If a significant adverse impact occurs, the monitor will immediately notify the regulatory agencies listed in the training plan and in the preceding section.

These measures will also include the sound attenuation measures discussed in 6.6, above, as appropriate.

12.0 Arctic Subsistence Plan of Cooperation

These activities do not take place in or near any traditional Arctic subsistence hunting area; therefore, a cooperation plan is not required.

13.0 Monitoring and Reporting

Venoco will notify NOAA Fisheries at least 2 weeks prior to the initiation of the activities discussed in Section 1. Monitoring will be conducted by a sufficient number of biologically-trained, on-site individual(s), approved in advance by NOAA Fisheries.

A minimum of two marine mammal observers will be present during pile driving activity. Additional monitors will be deployed if necessary based on the level of observed marine mammal activity and duration of project activity. One monitor will be positioned on the bluff immediately above the rookery beach; the other monitor will be stationed at the end of the Pier.

Monitoring for pile driving activity will consist of the following:

- Half an hour prior to each day's activities, conduct baseline observations on the number, type(s), location(s), and behavior of marine mammals in the project area
- Conduct and record observations of all marine mammal species of interest in the vicinity of the Pier work area for the duration of the activity
- For half an hour after each day's activities, conduct observations of pinniped haul-outs and marine mammals in the water in the project area and record information on the number, type(s), location(s), and behavior of marine mammals.

A report will be submitted at the frequency specified by NOAA Fisheries. This report will include the following:

- Date, time, and duration of activity
- Weather
- Tide state
- Composition (species, gender [when determinable], and age class [when determinable]) and locations of haul-out group(s)
- Horizontal visibility
- Results of the monitoring program:
  - Number and species of pinnipeds or other species of interest present on haulout(s) prior to start of activity and behavioral patterns
  - Number and species of pinnipeds or other species of interest that may have been harassed as noted by the number of pinnipeds estimated to have entered the water or that were in the water and were startled as a result of noise related to the activity
  - Brief description of any activity or action that causes animal(s) to startle
  - Length of time(s) pinnipeds remained off the haul-out or rookery
  - Notes about behavioral modifications by pinnipeds or other species of interest that were likely the result of the project activity

14.0 Planned Research and Learning Activities

Venoco will advise the Carpinteria Seal Watch about the monitoring of pinnipeds during the Pier fender pile replacement activities. Venoco will coordinate with other researchers monitoring marine mammals in the region. All information collected during project-related pinniped monitoring events will be incorporated into other Carpinteria operations that require monitoring to enhance and assist in the increased knowledge and understanding of pinniped populations that occur on the Southern California coastline. The information collected during these monitoring events is essential for a further understanding of the trends of these populations of marine mammals and the effects activities on the Pier have on their continued presence.

It will also be useful to have data on other sources of disturbance to the animals, especially when the beach is open to the public, along with the daytime presence of seals during the period the Carpinteria Seal Watch does not operate. Pursuant to the IHA requirements, data collected during fender pile replacement activities will be submitted in the form of a report to the NOAA Fisheries Office of Protected Resources (Silver Spring, MD) and made available for interested parties and researchers.

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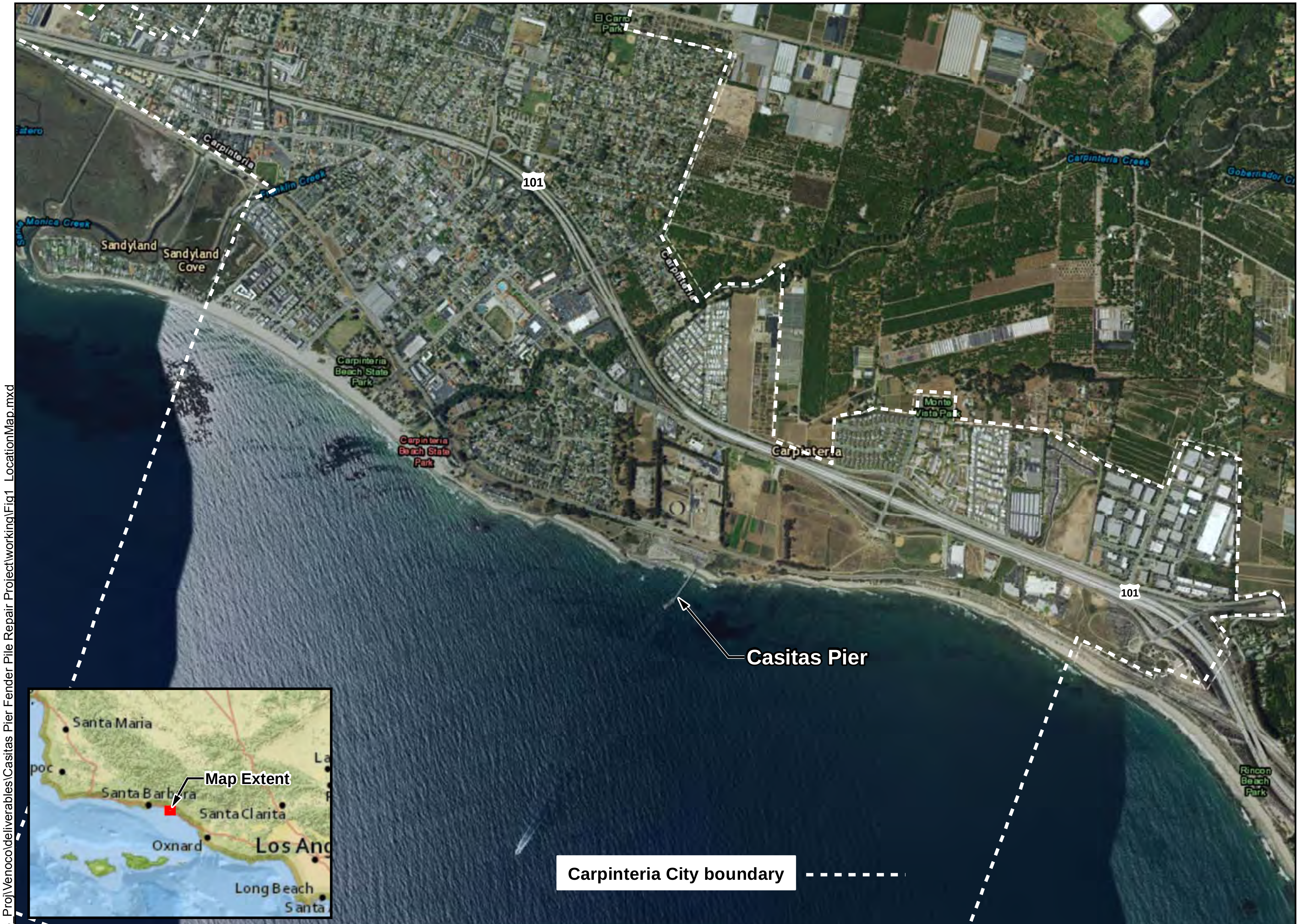
FIGURES



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Venoco, Inc. Casitas Pier Fender Pile Repair Project	AECOM	0 0.15 0.3 0.6 Miles	**Figure 1.** Location Map
Source: [1] World Imagery, ESRI, 2015. [2] National Geographic World Map, 12/11/2013.	October 2016	1 in = 0.33 miles	

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Venoco, Inc.
Casitas Pier Fender Pile Repair Project

Source: NAIP 2016 (Summer), USDA-FSA APFO, https://gis.apfo.usda.gov/arcgis/services

AECOM

August 2017

0 90 180 360 Feet

1 in = 180 feet

N

Figure 2. Casitas Pier aerial view and designated onshore equipment staging area

Figure 3. Photographs of Casitas Pier

Photo 1. Casitas Pier, looking southwest from Carpinteria Bluffs. May 2017.

Photo 2. West end of Casitas Pier, looking southeast from Carpinteria Bluffs. Undated.

Source: Alamy Stock Photos, 2016

Photo 3. East end of Casitas Pier, looking northwest from offshore Carpinteria Bluffs. Undated.

Source: Paredon Project EIR (MRS 2008)

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Venoco, Inc.
Casitas Pier Fender Pile Repair Project

AECOM

Source: [1] World Imagery, ESRI, 2015. [2] National Geographic World Map, 12/11/2013.

October 2016

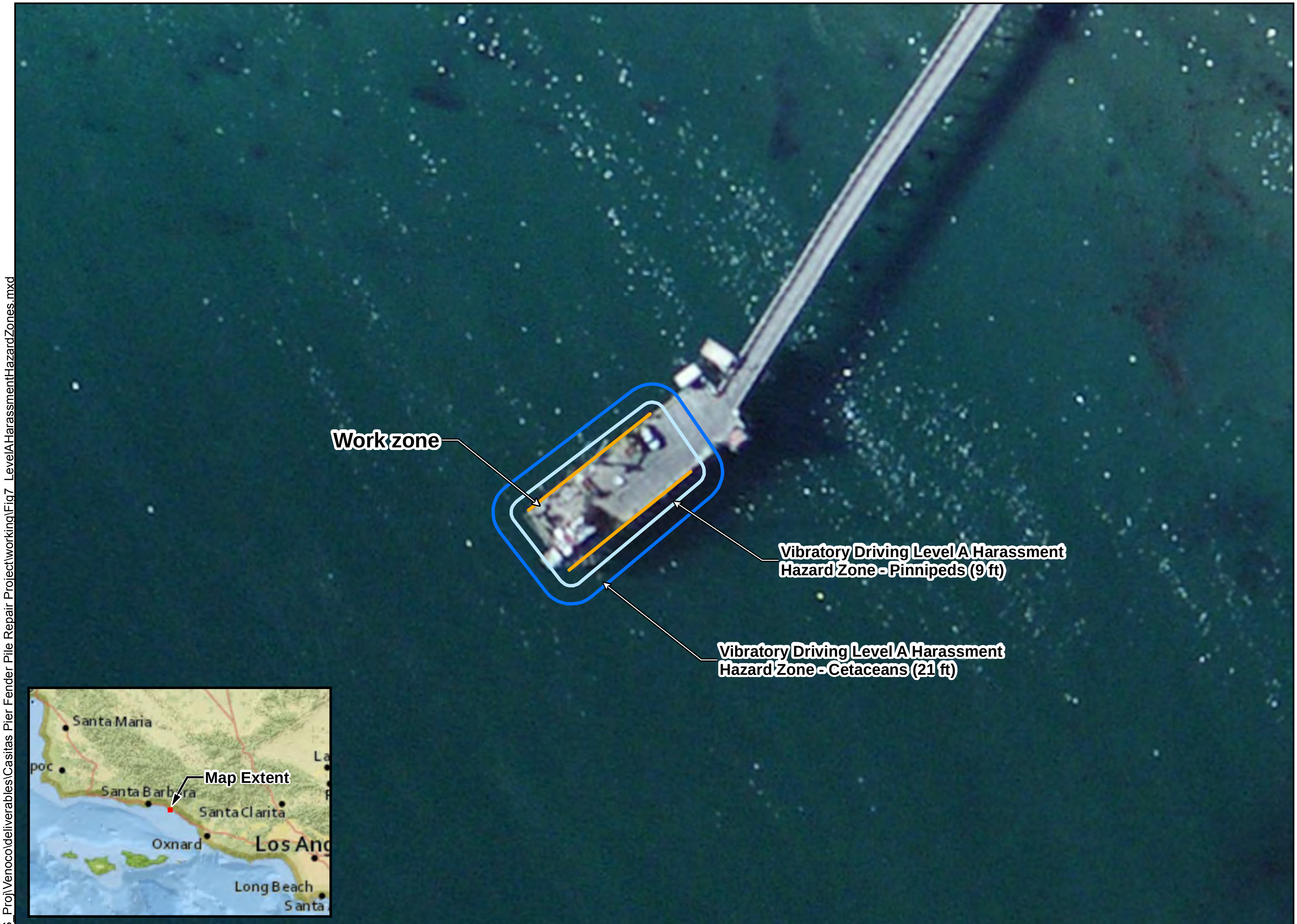
0 125 250 500 Feet

1 in = 250 feet

Figure 4. City of Carpinteria designated harbor seal restricted access area

Figure 5: Pile driving operation at Carpinteria seal rookery, 2001

(Note seals on rock and kayaker in the water)



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Venoco, LLC
Casitas Pier Fender Pile Repair Project

Source: [1] World Imagery, ESRI, 2015. [2] National Geographic World Map, 12/11/2013.

AECOM

July 2017

Figure 6. Level A Harassment Hazard Zones - Vibratory Pile Driving

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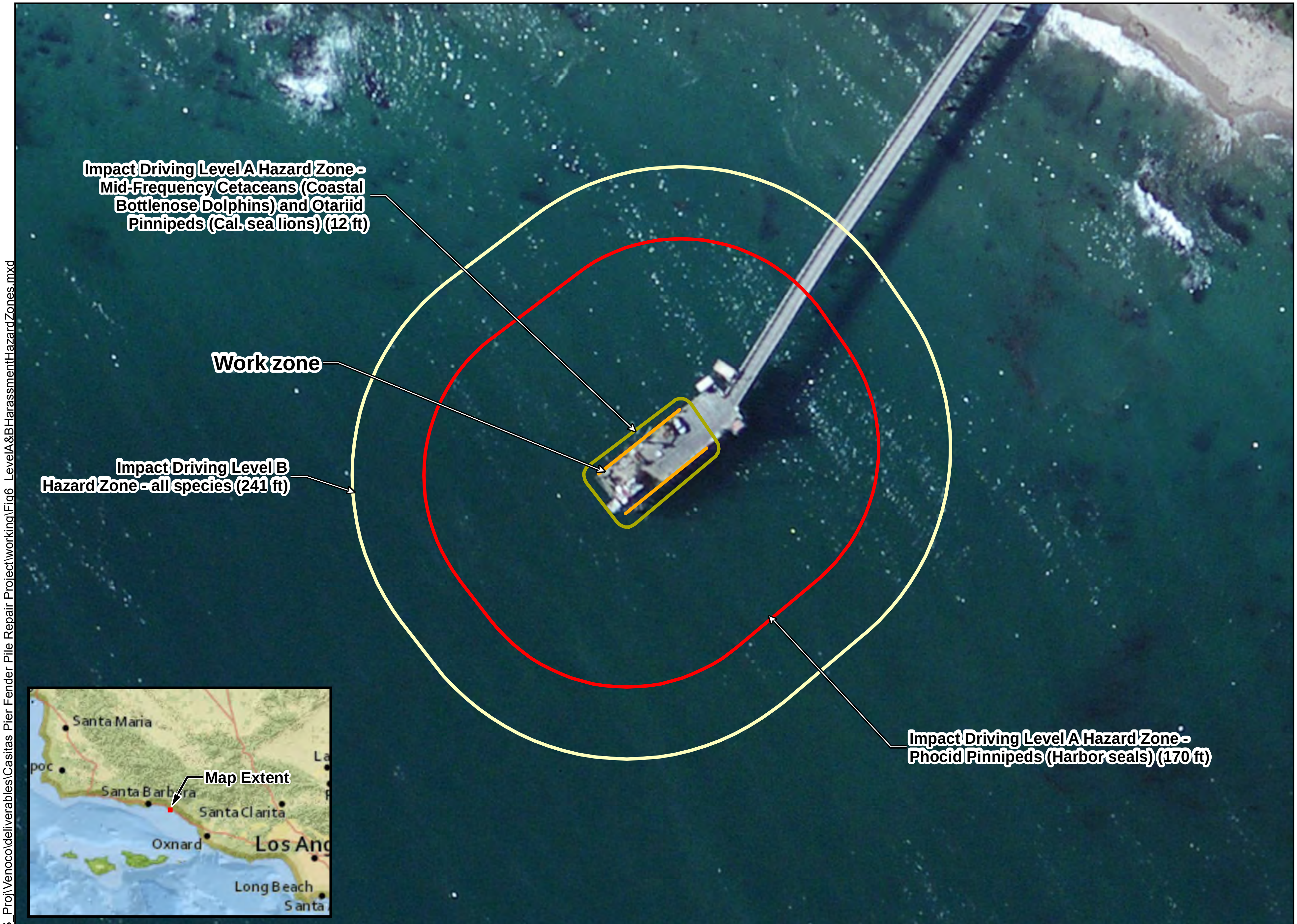
Venoco, LLC **Casitas Pier Fender Pile Repair Project**	AECOM	0 1,000 2,000 4,000 Feet 1 in = 2,000 feet	**Figure 7.** Level B Harassment Hazard Zones - Vibratory Pile Driving
Source: [1] World Imagery, ESRI, 2015. [2] National Geographic World Map, 12/11/2013.	July 2017		



Venoco, LLC
Casitas Pier Fender Pile Repair Project

Source: [1] World Imagery, ESRI, 2015. [2] National Geographic World Map, 12/11/2013.

AECOM

July 2017

0 62.5 125 250 Feet

1 in = 125 feet

N

Figure 8. Level A and B Harassment Hazard Zones - Impact Pile Driving

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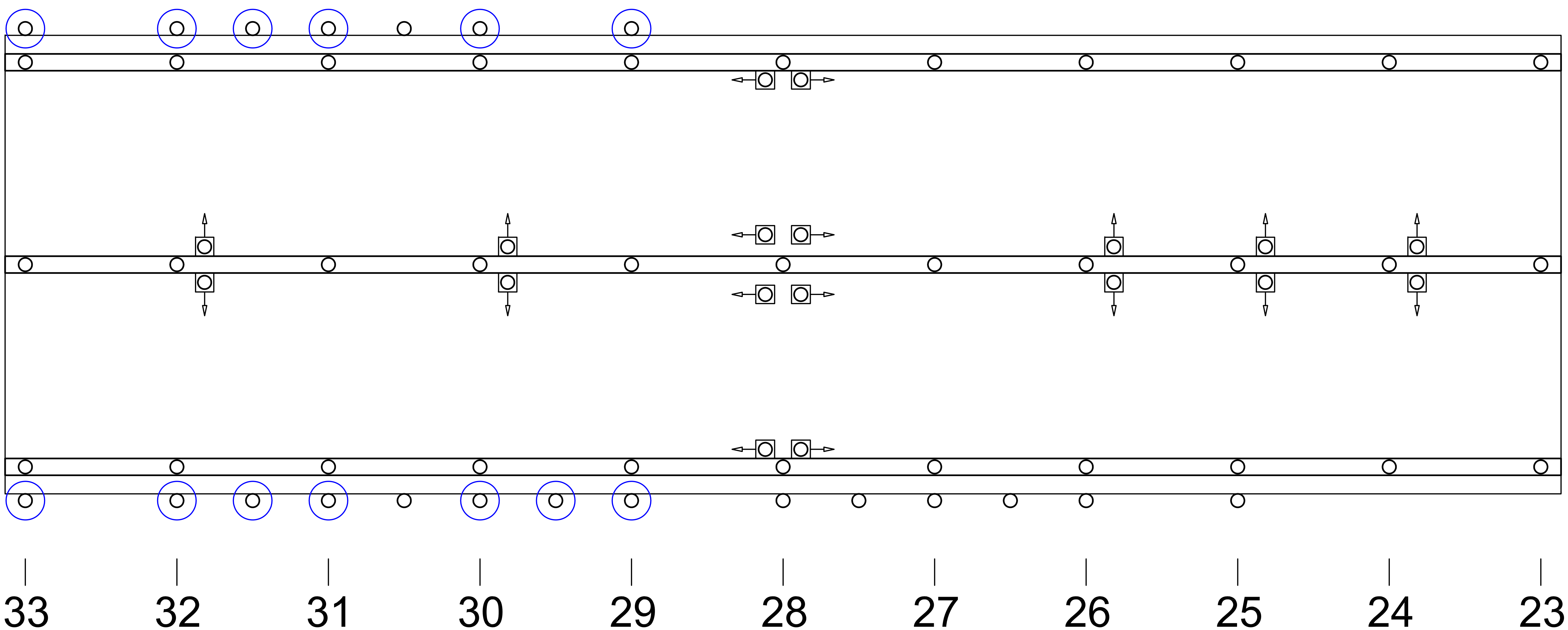
APPENDIX A

Project Details and Representative Pile Driving Equipment Specifications

- Drawing 1616-CPFPR-S1 Fender Pile Replacements
- Drawing 1616-CPFP-S1 Fender Pile Details
- Drawing 1616-CPPDS-S1 Fender Pile Driving Sequence
- Representative Pile Driver Specifications

FENDER PILE REPLACEMENT



PILE CAP PLAN

NO.	DATE	BY	REVISION DESCRIPTION
0.2	05/25/17	AWB	Removed staggered year pile replacements.
0.1	1/20/16	AWB	INITIAL

ENGINEER'S STAMP

SCALE: –

SCALE VALID FOR B-SIZE DRAWING ONLY (11"x17")

DRAWN BY: AWB
DATE: 1/20/16
CHECKED BY: SS
DATE:
APPROVED BY:
DATE:

MARINE PROJECT MANAGEMENT, INC.
201 Bryant St., STE 2B
Ojai, CA 93023
805 640-0799 PH
805 640-9955 FAX

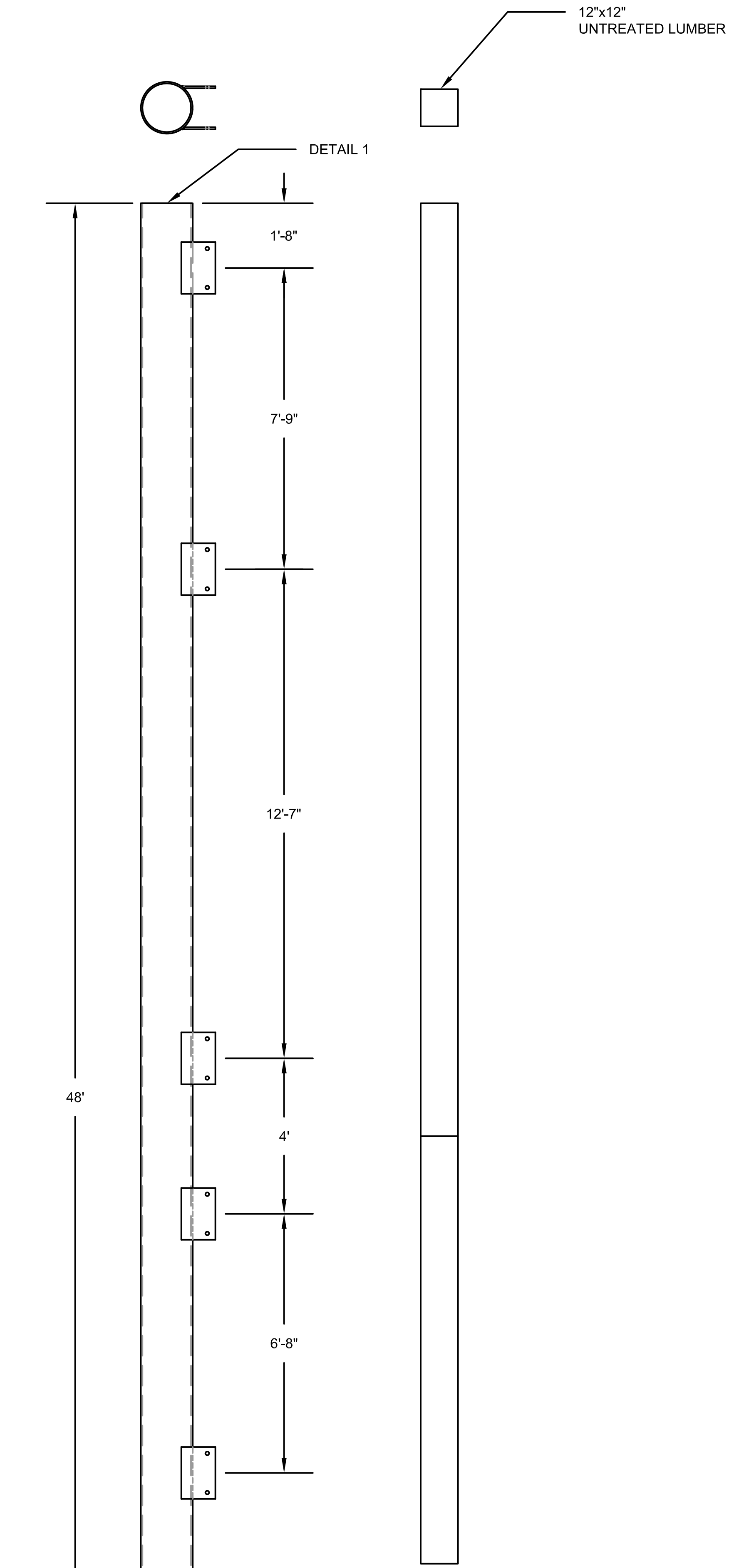
VENOCO
CASITAS PIER

FENDER PILE
REPLACEMENTS

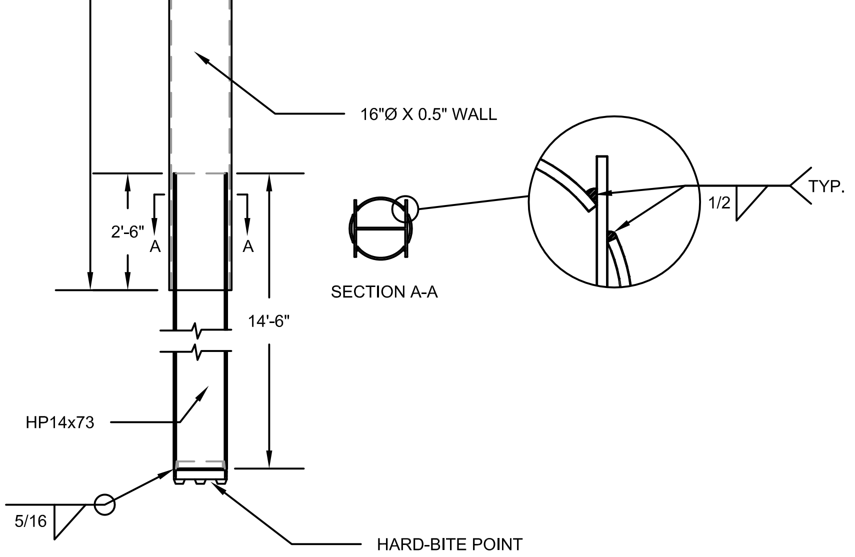
DWG NO. 1616-CPFPR-S1

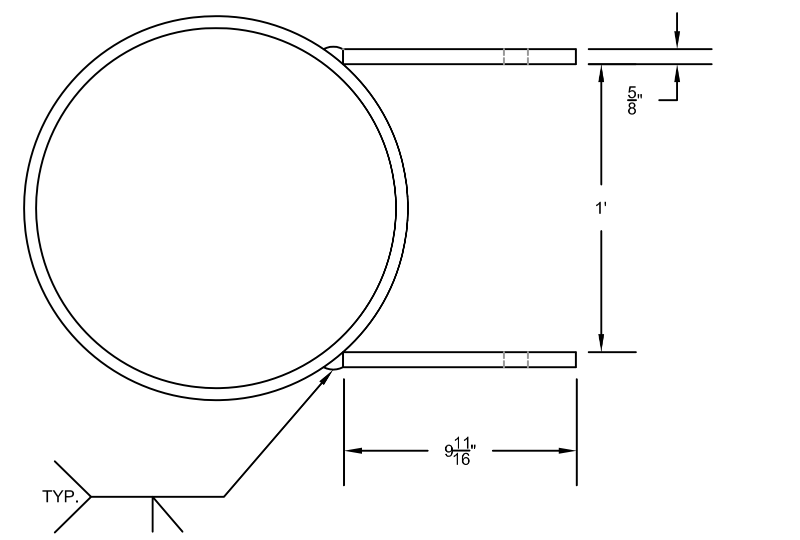
SHEET 1 OF 1

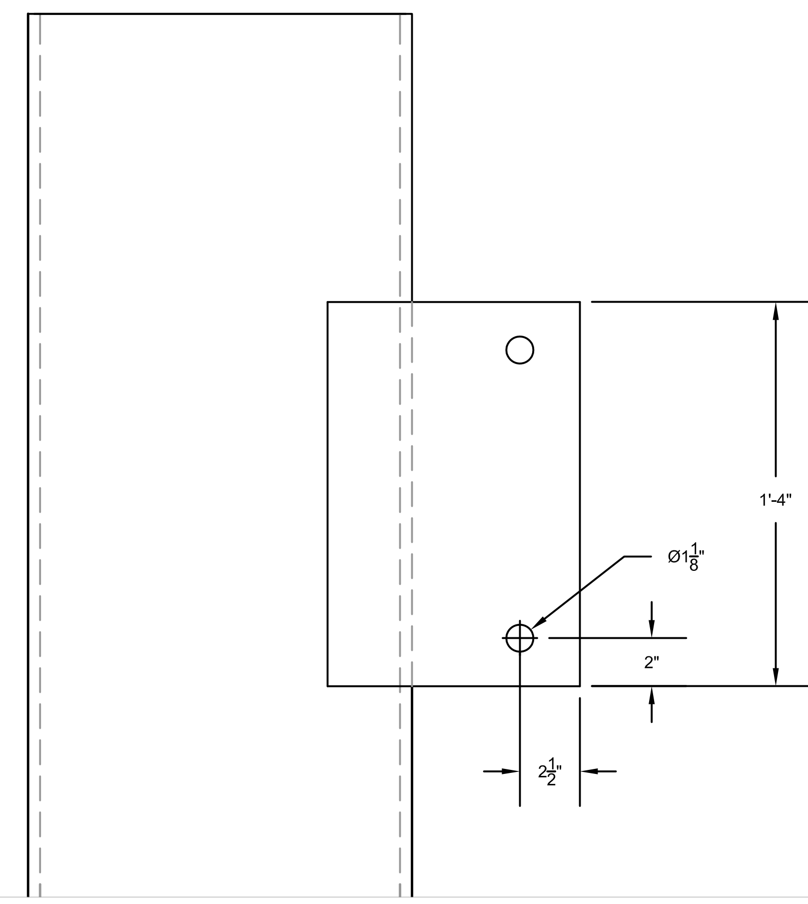
REV. 0.2



LUMBER LENGTHS: IF 35' LENGTH CAN BE OBTAINED ITS USE IS PREFERABLE. 4 BRACKETS TYPICAL IN FULL LENGTH CONFIGURATION. ALTERNATIVELY SHORTER LENGTHS BETWEEN 2 PIECES CAN BE USED BUT WILL REQUIRE AN ADDITIONAL BRACKET AS SHOWN. AS SHOWN 24' AND 11' LENGTHS. INFORM CLIENT OF FINAL LUMBER LENGTHS.







DETAIL 1
SCALE 1:8

GENERAL PROVISIONS.

STRUCTURAL STEEL, BOLTS AND WELDS

1. BOLTING MATERIALS SHALL CONFORM TO ASTM A325
   1" X 16" BOLTS - DOUBLE NUT TYPICAL ON ALL BRACKETS.
2. PIPE PILES: API-5L X-52 (WELDED OR SEAMLESS) OR EQUIVALENT (MIN YIELD = 50 KSI)
3. PLATES: A36.
4. WELDING SHALL CONFORM TO THE AMERICAN WELDING SOCIETY LATEST EDITION OF AWS D1.1 "STRUCTURAL WELDING CODE", USING E70XX LOW HYDROGEN ELECTRODES. ALL WELDING TO BE DONE BY QUALIFIED WELDERS. ALL WELD PROCEDURES TO BE QUALIFIED PER AWS REQUIREMENTS.
5. HARD-BITE POINT - ASSOCIATED PILE AND FITTING INC. PN# HP-77750-B OR COMPANY APPROVED EQUIVALENT.

COATING

1. THE TOP OF PIPE PILE TO APPROXIMATELY THE +10 ELEVATION SHALL BE COATED WITH AMERON 68HS PRIMER AND TOP COATED WITH AMERLOCK 2/400GF COATING.
2. THE BOTTOM OF THE PIPE PILE TO APPROXIMATELY THE +10 ELEVATION SHALL BE COATED WITH AMERON TIDEGAURD 171A COATING.
3. THE H-PILE WILL BE UNCOATED.

MATERIAL CERTS FOR ALL STEEL

LUMBER

1. UNTREATED LUMBER.

NO.	DATE	BY	REVISION DESCRIPTION
2.2	8/17/17	AWB	Removed treated lumber reference. Added coating system details.
2.1	1/20/16	AWB	Removed top cap, padeye and top vent. Increased Pile length to 48'. Added H-Pile with welds and end point.
2.0	10/26/16	AWB	ADDED TOP CAP PL, TOP VENT, AND PADEYE. ADDED D1.1 SPEC, REFINED MATERIAL SPECS. INCREASED BOLT LENGTH
1.1	10/10/16	AWB	ADDED 50 KSI MIN FOR PIPE. ADDED CERT REQUIREMENT
1.0	10/07/16	AWB	FOR BID

ENGINEER'S STAMP

SCALE: 1/4"=1'-0"
SCALE VALID FOR B-SIZE DRAWING ONLY (11"x17")

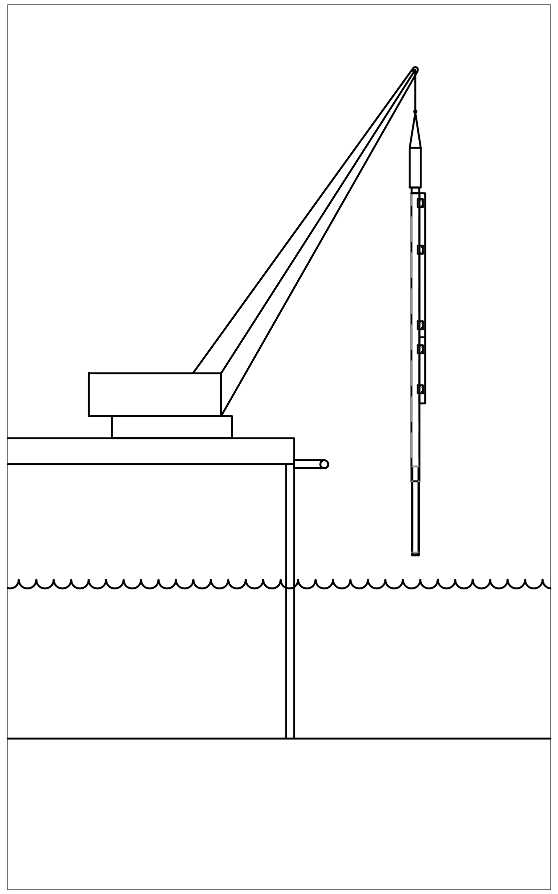
DRAWN BY: AWB
DATE: 10/7/16
CHECKED BY: SS
DATE: 8/17/17
APPROVED BY:
DATE:

MPM
MARINE PROJECT MANAGEMENT, INC.
201 Bryant St., STE 2B
Ojai, CA 93023
805 640-0799 PH
805 640-9955 FAX

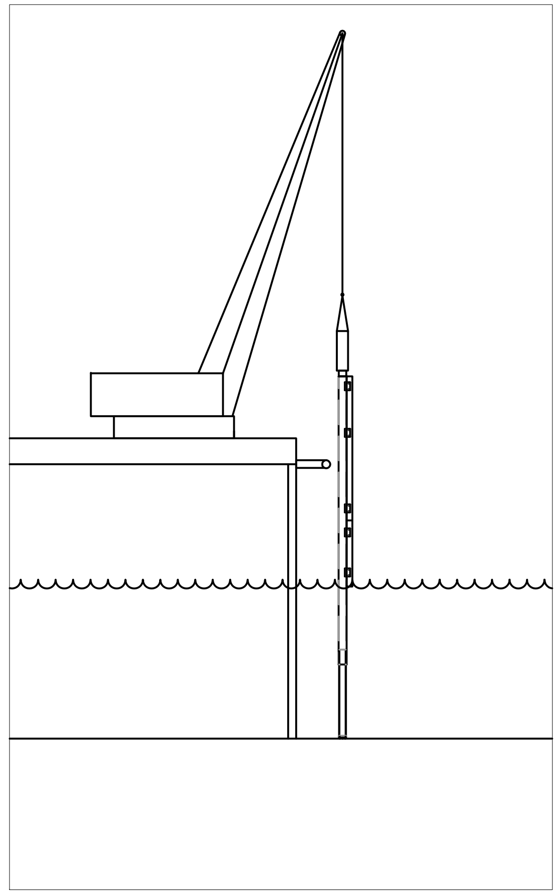
VENOCO
CASITAS PIER

FENDER PILES

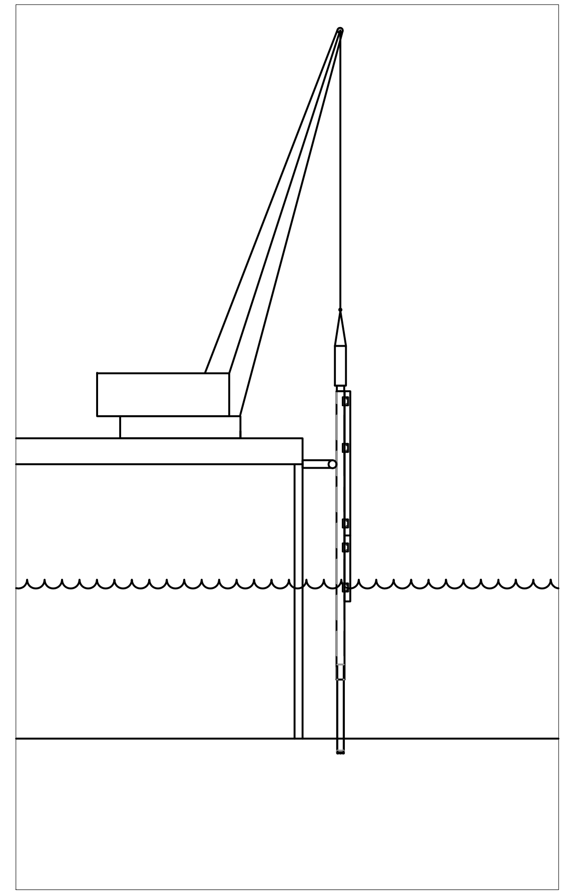
DWG NO. 1616-CPFP-S1
SHEET 1 OF 1
REV. 2.2



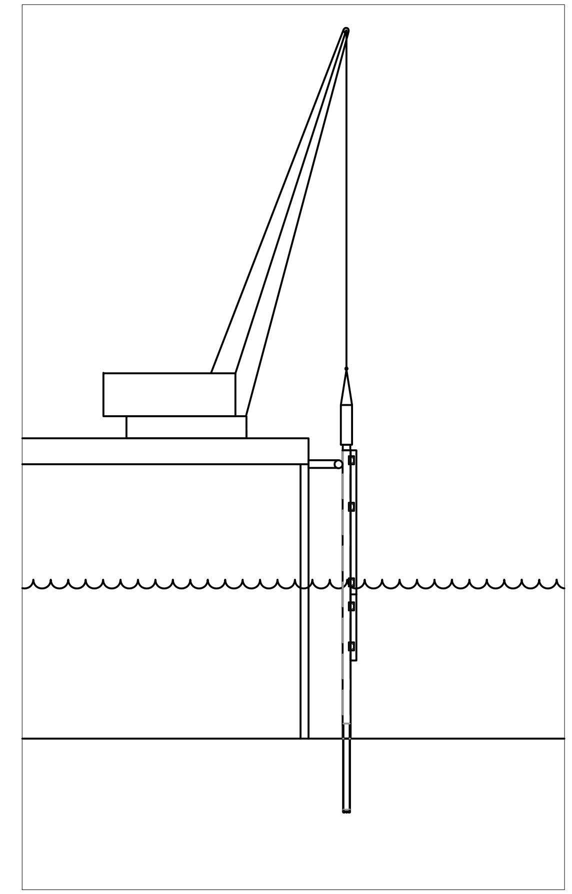
1. Overboard fender pile with crane.



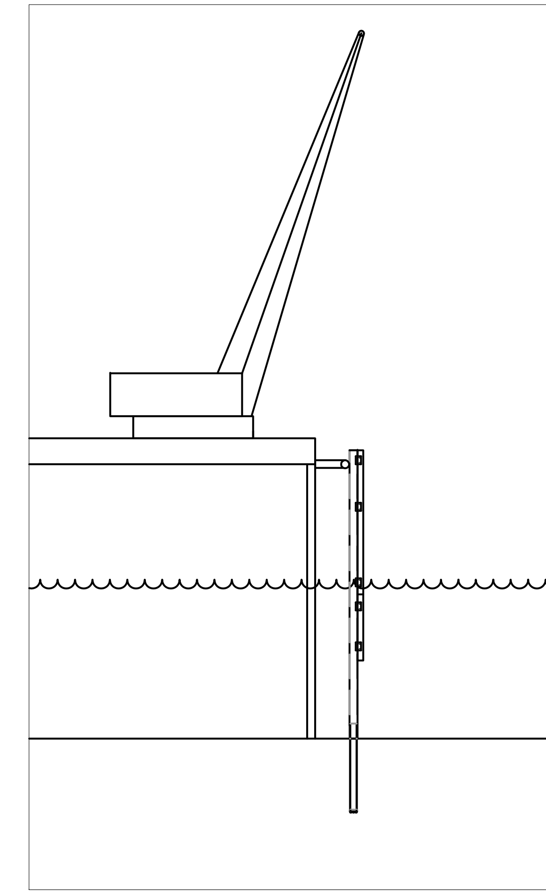
2. With diver assistance crane positions fender pile adjacent to previous pile location.



3. Crane lowers fender pile and allows pile to settle into top layer of seabed, diver confirms proximity to old pile, diver is recovered.



4. Pile hammer/vibrator drives pile to elevation of fender pile or refusal.



5. Hammer/vibrator is secured, welders weld fender pile to fender bearing beam and crane and is secured.

NO.	DATE	BY	REVISION DESCRIPTION
1.0	1/26/17	AWB	INITIAL RELEASE

ENGINEER'S STAMP

SCALE: NO SCALE

SCALE VALID FOR B-SIZE DRAWING ONLY (11"x17")

DRAWN BY: AWB
DATE: 1/25/17
CHECKED BY: SS
DATE: 1/25/17
APPROVED BY:
DATE:

MPM MARINE PROJECT MANAGEMENT, INC.

201 Bryant St., STE 2B
Ojai, CA 93023
805 640-0799 PH
805 640-9955 FAX

VENOCO
CASITAS PIER

FENDER PILE
PILE DRIVING SEQUENCE

DWG NO. 1616-CPPDS-S1

SHEET 1 OF 1

REV. 1.0

HAMMER&STEEL

HAMMER & STEEL, INC.

Piling • Pile Driving Equipment • Drilling Equipment

Model 15 HS Vibratory Driver / Extractor System

Vibrator	
Eccentric Moment	1500 in-lbs
Drive Force	58 tons
Frequency Maximum (vpm)	1650 vpm
Max Line Pull	35 tons
Hammer Weight with Standard Clamp	6100 lbs
Throat Width	13 in
Length	68 in
Clamp Force	85 tons
Amplitude	.99 in

Power Unit	
Engine Type	John Deere 6068 HF 485 Tier III
Horse Power	215 HP
Drive Pressure	4000 psi
Drive Flow	80 gpm
Speed	2400 rpm
Weight	6400 lbs
Length	126 in
Width	48 in
Height	77 in
Hydraulic Reservoir	150 gallons

Technical Specifications

Specification	Units	Hammer Type							
		HPH1200	HPH1800	HPH2400	HPH4500	HPH6500	HPH10K	HPH12K	HPH15K
Hammer									
Ram Weight	kg	1,040	1,500	1,900	3,500	4,650	8,000	10,000	12,000
	lbs	2,300	3,300	4,189	7,840	10,250	17,650	22,050	26,450
Impact Velocity	m/s	4.76	4.99	4.98	5.05	5.25	5.00	5.00	5.00
	ft/s	15.60	16.40	16.30	16.60	17.20	16.40	16.40	16.40
Maximum Pile Energy	kg.m	1,200	1,900	2,400	4,500	6,500	10,000	12,000	15,000
	ft.lbs	8,680	13,750	17,360	32,560	47,000	73,750	88,500	110,600
Maximum Momentum	kg.m/s	4,950	7,485	9,462	17,675	24,413	40,000	50,000	60,000
	lbs.ft/s	35,880	54,120	68,281	130,144	176,300	289,460	361,620	433,780
Blow Rate	bpm	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120
Length - Lead Mounted	mm	3,800	3,930	4,430	4,650	5,350	6,500	6,500	6,500
	ins	150	155	175	183	210	256	256	256
Length - Free Hanging with Sheet Pile Leg Guides	mm	4,670	5,050	5,300	5,500	6,458	-	-	-
	ins	184	199	208	216	137	-	-	-
Length - Free Hanging with Guide Sleeve	mm	-	-	-	5,597	6,310	7,500	7,500	7,500
	ins	-	-	-	220	249	295	295	295
Weight - Lead Mounted	kg	3,000	4,250	6,000	8,500	10,400	15,000	17,000	19,000
	lbs	6,600	9,350	13,227	19,000	23,300	33,000	37,400	41,800
Weight - Free Hanging with Sheet Pile Leg Guides	kg	3,000	4,250	6,000	10,750	14,600	-	-	-
	lbs	6,600	9,350	13,227	23,700	32,700	-	-	-
Weight - Free Hanging with Guide Sleeve	kg	-	-	-	10,000	13,500	23,000	25,000	27,000
	lbs	-	-	-	22,040	29,750	50,700	55,100	59,500
Weight - Ram removed for transport	kg	-	-	-	-	-	11,000	13,000	15,000
	lbs	-	-	-	-	-	24,250	28,660	33,100
Power Pack									
Diesel Engine Power	kW	40	50	68	129	150	400	400	400
	hp	54	67	90	173	200	536	536	536
Hydraulic System Pressure	bar	230	230	230	255	260	180	220	260
	psi	3,300	3,300	3,300	3,700	3,800	2,610	3,190	3,770
Oil Flow Rate	l/min	75	105	150	230	260	750	750	750
	gpm	20	28	40	61	69	200	200	200

HPH1200 running from IHI Hydraulic Crawler Crane - UK

HPH1200 running from Hydraulic Excavator with Delmag style Leads - Germany

HPH1200 running from H&M Vibrator Power Pack - USA

Diesel Pile Hammers

Technical Data

		D6-32	D8-22	D12-42	D16-32
Impact weight (piston)	kg lbs	600 1,320	800 1,765	1280 2,820	1600 3,530
Energy per blow max. - min.	kNm ft-lbs	19-9 14,015-6,640	27-13 19,915-9,590	46-20 33,930-14,750	54-25 39,830-18,440
Number of blows	min-1	38-52	36-52	35-52	36-52
Suitable for driving piles (depending on soil and pile)	kg lbs	300 - 2000 660-4,400	500-3000 1,100-6,600	800-5000 1,760-11,000	1000-6000 2,200-13,200
Consumption					
Diesel oil	l/h gal/h	3,7 0.81	4 0.88	4,5 1	5 1.1
Lubricant	l/h gal/h	0,25 0.05	0,5 0.11	0,5 0.11	0,5 0.11
Tank capacity					
Diesel oil tank	l gal	19 5	20 5.3	25 6.6	32 8.45
Lube tank	l gal	5 1.3	6 1.58	6,5 1.7	9 2.4
Max. rope diameter for deflector sheave of tripping device	mm in	20 0.78	20 0.78	20 0.78	20 0.78
Max. inclined pile driving without / with extension		1:3 / -	1:2 / -	1:5 / 1:1	1:5 / 1:1
Weight					
Diesel pile hammer	kg lbs	1620 3,570	1935 4,265	2735 6,030	3620 7,980
Tripping device	kg lbs	114 250	114 250	114 250	114 250

Technical Data

		D19-42	D25-32	D30-32
Impact weight (piston)	kg lbs	1820 4,010	2500 5,510	3000 6,610
Energy per blow max. - min.	kNm ft-lbs	66-29 48,680-21,390	90-40 66,380-29,500	103-48 75,970-35,400
Number of blows	min-1	35-52	35-52	36-52
Suitable for driving piles (depending on soil and pile)	kg lbs	1100-6000 2,420-13,200	1600-7500 3,530-16,535	2000-9000 4,410-19,840
Consumption				
Diesel oil	l/h gal/h	7,5 1.65	7,5 1.65	10 2.2
Lubricant	l/h gal/h	0,5 0.11	0,6 0.13	1 0.22
Tank capacity				
Diesel oil tank	l gal	32 8.45	67 17.7	67 17.7
Lube tank	l gal	9 2.4	19 5	19 5
Max. rope diameter for deflector sheave of tripping device	mm in	20 0.78	22 0.87	22 0.87
Max. inclined pile driving without / with extension		1:5 / 1:1	1:5 / 1:1	1:5 / 1:1
Weight				
Diesel pile hammer	kg lbs	3840 8,465	5670 12,500	6170 13,600
Tripping device	kg lbs	114 250	186 410	186 410

APPENDIX B

NOAA Optional User Spreadsheet Results

(Also refer to the Microsoft Excel file, provided separately.)

USER SPREADSHEET INTRODUCTION

VERSION: 1.1 Aug-16

Companion[+] User Spreadsheet to:

National Marine Fisheries Service (NMFS): Technical Guidance For Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts (JULY 2016)

http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm

[+]For more information on the optional methodology provided within this User Spreadsheet, see Appendix D of Technical Guidance

DISCLAIMER: NMFS has provided this spreadsheet as an optional tool to provide estimated effect distances (i.e., isopleths) where SEL_{cum} PTS onset thresholds may be exceeded. Results provided by this spreadsheet do not represent the entirety of the comprehensive effects analysis, but rather serve as one tool to help evaluate the effects of a proposed action on marine mammal hearing and make findings required by NOAA's various statutes. Input values are the responsibility of the individual user.

NOTE: An action proponent is **not obligated** to use these associated spreadsheets. The alternative methods, within this User Spreadsheet, include multiple conservative assumptions and therefore would be expected to typically result in higher estimates of instances of hearing impairment. The larger the scale of the activity, the more these conservative overestimates would be compounded if the alternative methodologies were used.

DIRECTIONS

STEP 1: Determine what spreadsheet is appropriate for activity

HOW TO DETERMINE WHICH SPREADSHEET TO USE

1) Is the sound source NON-IMPULSIVE or IMPULSIVE? (If it is unclear which category describes your source, consult NOAA)
- a) NON-IMPULSIVE (e.g., drilling, vibratory pile driving, tactical sonar): Go to Question 2
- b) IMPULSIVE (e.g., explosives, impact pile driving, seismic): Go to Question 5

2) Is the NON-IMPULSIVE sound source STATIONARY or MOBILE?
- a) STATIONARY: Go to Question 3
- b) MOBILE: Go to Question 4

3) Is the NON-IMPULSIVE, STATIONARY source CONTINUOUS or INTERMITTENT?
- a) CONTINUOUS: Use Spreadsheet A — **RED TAB**
- b) INTERMITTENT: Use Spreadsheet B — **YELLOW TAB**

4) Is the NON-IMPULSIVE, MOBILE source CONTINUOUS or INTERMITTENT?
- a) CONTINUOUS: Use Spreadsheet C (methodology from Sivle et al. 2014) — **BLUE TAB**
- b) INTERMITTENT: Use Spreadsheet D (methodology from Sivle et al. 2014) — **ORANGE TAB**

5) Is the IMPULSIVE sound source STATIONARY or MOBILE?
- a) STATIONARY: Use Spreadsheet E* — **GREEN TAB**
- *If source is impact pile driving: Use Spreadsheet E.1 — **EVRGRN TAB**
- b) MOBILE: Use Spreadsheet F (methodology from Sivle et al. 2014) — **PURPLE TAB**

STEP 2: Within the appropriate spreadsheet, fill-in: **SAGE BOXES** specific to the activity
- a) Please provide information used to support values in provided in sage boxes (e.g., surrogate data, direct measurements, etc.)
- b) If information is unavailable to fill-out one or more of the sage boxes, please consult NMFS

STEP 3: Estimated PTS isopleths (meter) will be provided in: **SKY BLUE BOXES** by marine mammal hearing group

STEP 4: When using this spreadsheet to estimate marine mammal takes, please provide a copy of completed spreadsheet used to estimate isopleths
- a) **Note: For impulsive sounds, action proponent must also consider isopleths peak sound pressure level (PK) thresholds (dual thresholds), which are not included in this spreadsheet.**

ASSUMPTIONS & ADDITIONAL INFORMATION

1) Marine mammals remain stationary during activity

2) Currently, recovery between intermittent sounds is not considered regardless of time between sounds (i.e., all sounds within the accumulation period are counted)

3) This User Spreadsheet currently only provides isopleth estimates associated with SEL_{cum} PTS onset thresholds. NMFS assumes action proponents will be able to perform exposure modeling using acoustic thresholds expressed using the PK metric (i.e., methodology is similar to that used with NMFS previous thresholds but with a different metric), and reminds action proponents since the Technical Guidance presents dual thresholds for impulsive sounds, they must evaluate thresholds using both metrics.

Suggested (Default*) Weighting Factor Adjustments (WFA), If Input Value is Unknown for Broadband Source:

Source	WFA	Example Supporting Sources
Seismic	1 kHz	Breitzke et al. 2008; Tashmukhambetov et al. 2008; Tolstoy et al. 2009;
Impact pile driving	2 kHz	Blackwell 2005; Reinhall and Dahl 2011
Vibratory pile driving	2.5 kHz	Blackwell 2005; Dahl et al. 2015
Drilling	2 kHz	Greene 1987; Blackwell et al. 2004; Blackwell and Greene 2006

* NMFS acknowledges default WFAs are likely conservative

Since spectra associated with underwater explosives vary by detonation size and depth (Urick 1983), a default WFA is not provided

Literature Cited

Blackwell, S.B. 2005. Underwater Measurements of Pile Driving Sounds during the Port MacKenzie Dock Modifications, 13-16 August 2004. Juneau, Alaska: Federal Highway Administration.

Blackwell, S.B., C.R. Greene, Jr., and W.J. Richardson. 2004. Drilling and operational sounds from an oil production island in the ice-covered Beaufort Sea. Journal of the Acoustical Society of America 116: 3199-3211.

Blackwell, S.B., and C.R. Green, Jr. 2006. Sounds from an oil production island in the Beaufort Sea in summer: Characteristics and contribution of vessels. Journal of the Acoustical Society of America 119: 182-196.

Breitzke, M., O. Boebel, S. El Naggar, W. Jokat, and B. Werner. 2008 Broad-band calibration of marine seismic sources used by R/V Polarstern for academic research in polar regions. Geophysical Journal International 174: 505-524.

Dahl, P.H., D.R. Dall'Osto, and D.M. Farrell. 2015. The underwater sound field from vibratory pile driving. Journal of the Acoustical Society of America 137: 3544–3554.

Madsen, P.T. 2005. Marine mammals and noise: Problems with root mean square sound pressure levels for transients. Journal of the Acoustical Society of America 117:3952–3957.

Greene, R. 1987. Characteristics of oil industry dredge and drilling sounds in the Beaufort Sea. Journal of the Acoustical Society of America 82: 1315-1324.

Reinhall, P.G., and P.H. Dahl. 2011. Underwater Mach wave radiation from impact pile driving: Theory and observation. Journal of the Acoustical Society of America 130: 1209–1216.

Sivle, L.D., P.H. Kvadsheim, and M.A. Ainslie. 2014. Potential for population-level disturbance by active sonar in herring. ICES Journal of Marine Science 72: 558-567.

Tashmukhambetov, A.M., G.E. Ioup, J.W. Ioup, N.A. Sidorovskaia, and J.J. Newcomb. 2008. Three-dimensional seismic array characterization study: Experiment and modeling. Journal of the Acoustical Society of America 123:4094–4108.

Tolstoy, M., J. Diebold, L. Doermann, S. Nooner, S.C. Webb, D.R. Bohnenstiehl, T.J. Crone, and R.C. Holmes. 2009. Broadband calibration of the R/V *Marcus G. Langseth* four-string seismic sources. Geochemistry Geophysics Geosystems 10: 1-15.

Urick, R.J. 1983. Principles of Underwater Sound. New York, New York: McGraw-Hill Book Company.

Technical questions or suggestion on User Spreadsheet: Please contact Amy Scholik-Schlomer (amy.scholik@noaa.gov)

UPDATES (will be posted when change results in the need to recalculate an isopleth; other non-substantive changes may be made periodically but will not result in a version number change)

Original Version	Updated Version	Change	Date Posted
1.0	1.1	Sheet A, error with formula for phocid pinniped	Aug. 22, 2016

Assumptions

Pile Driving Method	Estimated Duration of Driving Per Pile	Estimated Strikes per Pile	Maximum Number of Piles per day
Vibratory Hammer	25 minutes	N.A.	6
Impact Hammer	15 Minutes	400	6

Vibratory Driving

Pile Type	Attenuation device	Number of seconds per pile	Number of Piles per day	Average Sound Pressure Level Measured in dB		
				Peak	RMS	SEL
Composite Pipe/H-Pile (steel)	None	1500	6	170	154	154

Impact Driving

Pile Type	Attenuation device	Number of Strikes per pile	Number of Piles per day	Average Sound Pressure Level Measured in dB		
				Peak	RMS	SEL
Composite Pipe/H-Pile (steel)	None	400	6	188	173	164

Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish
http://www.dot.ca.gov/hq/env/bio/files/bio_tech_guidance_hydroacoustic_effects_110215.pdf

Table I.2-1. Summary of Near-Source (10-Meter) Unattenuated Sound Pressure Levels for In-Water Pile Driving Using an Impact Hammer

Approximate Pile Size and Pile Type	Relative Water Depth	Average Sound Pressure Level Measured in dB		
		Peak	RMS	SEL
0.30-meter (12-inch) steel H-type – thin	<5 meters	190	175	160
0.30-meter (12-inch) steel H-type – thick	~5 meters	200	183	170
0.36-meter (14-inch) steel H-type - thick	±6 meters	208	--	177
0.6-meter (24-inch) AZ steel sheet	~15 meters	205	190	180
0.33-meter (13-inch) plastic pile	10 meters	177	153	--
0.30-meter (12-inch) concrete pile	Land-based	176	--	146
0.46-meter (18-inch) concrete pile	<3 meters	185	166	155
0.61-meter (24-inch) concrete pile	~5 meters	185	170	160
0.61-meter (24-inch) concrete pile	~15 meters	188	176	166
0.30-meter (12-inch) steel pipe pile	<5 meters	192	177	--
0.36-meter (14-inch) steel pipe pile	~15 meters	200	184	174
0.41 meters (16-inch) steel pipe pile	3 meters	182	--	158
.051 meter (20-inch) steel pipe pile	± 3meters	204	161	--
0.61-meter (24-inch) steel pipe pile	~15 meters	207	194	178
0.61-meter (24-inch) steel pipe pile	~5 meters	203	190	177
0.76 -meter (30-inch) steel pipe pile	± 3 meters	210	190	177
1-meter (36-inch) steel pipe pile	<5 meters	208	190	180
1-meter (36-inch) steel pipe pile	~10 meters	210	193	183
1.5-meter (60-inch) steel CISS pile	<5 meters	210	195	185
1.7-meter (66-inch) steel pipe pile[1]	Land-based	197[1]	--	173[1]
1.8-meter (72-inch) steel pipe pile	Land-Based	204	--	175

2.2-meter (87-inch) steel pipe pile[2]	Land-based	194[2]	--	160[2]
2.4-meter (96-inch) steel CISS pile	~10 meters	220	205	195

[1] Measured 17 meters from pile

[2] Measured 35 meters from pile dB = Decibels

CISS = Cast-in-steel shell

RMS = Root mean square

SEL = Sound exposure level

1 meter = approximately 3.3 feet

Table I.2-3B Summary of Sound Measurements for Marine Pile Driving-Addendum 2-2014 Data (Part 3 of 3)

Wood	10.7m	180	--	148

Table I.2-2. Summary of Near-Source (10-Meter) Unattenuated Sound Pressure Levels for In-Water Pile Installation Using a Vibratory Driver/Extractor

Pile Type and Approximate Size	Relative Water Depth	Average Sound Pressure Measured in dB		
		Peak	**RMS***	**SEL****
0.30-meter (12-inch) steel H-type	<5 meters	165	150	150
0.30-meter (12-inch) steel pipe pile	<5 meters	171	155	155
1-meter (36-inch) steel pipe pile – typical	~5 meters	180	170	170
0.6-meter (24-inch) AZ steel sheet – typical	~15 meters	175	160	160
0.6-meter (24-inch) AZ steel sheet – loudest	~15 meters	182	165	165
1-meter (36-inch) steel pipe pile – loudest	~5 meters	185	175	175
1.8-meter (72-inch) steel pipe pile – typical	~5 meters	183	170	170
1.8-meter (72-inch) steel pipe pile – loudest	~5 meters	195	180	180

* Impulse level (35 millisecond average)

** Sound exposure level (SEL) for 1 second of continuous driving dB = Decibels

RMS = Root mean square

5 meters = approximately 16.5 feet; 15 meters = approximately 49 feet

A: STATIONARY SOURCE: Non-Impulsive, Continuous

VERSION: 1.1 (Aug-16)

KEY

(green)	Action Proponent Provided Information
(pink)	NMFS Provided Information (Acoustic Guidance)
(blue)	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Venoco Casitas Pier Fender Pile Replacement Project
PROJECT/SOURCE INFORMATION Please include any assumptions	Composite Pipe/H-Pile (steel)
PROJECT CONTACT	Keith Wenal (Venoco, LLC) kwenal@venocoinc.com, 805-745-2259

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

[¥] 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 43), 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)	154
Activity Duration (hours) within 24-h period	2.5
Activity Duration (seconds)	9000
10 Log (duration)	39.54
Propagation (xLogR)	15
Distance of source level measurement (meters)[+]	10

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

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW): true seals
Otariid pinnipeds (OW): sea lions and fur seals

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)	**4.3**	**0.4**	**6.4**	**2.6**	**0.2**

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: 1.1 (Aug-16)

KEY	
(green)	Action Proponent Provided Information
(pink)	NMFS Provided Information (Acoustic Guidance)
(blue)	Resultant Isopleth

STEP 1: GENERAL PROJECT INFORMATION

PROJECT TITLE	Venoco Casitas Pier Fender Pile Replacement Project
PROJECT/SOURCE INFORMATION Please include any assumptions	Composite Pipe/H-Pile (steel)
PROJECT CONTACT	Keith Wenal (Venoco, LLC) kwenal@venocoinc.com, 805-745-2259

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

[¥] 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 64), 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 USING RMS SPL SOURCE LEVEL

Source Level (RMS SPL)	
Activity Duration (h) within 24-h period OR Number of piles per day	
Pulse Duration[Δ] (seconds)	
Number of strikes in 1 h OR Number of strikes per pile	
Activity Duration (seconds)	0
10 Log (duration)	#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.

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW): true seals
Otariid pinnipeds (OW): sea lions and fur seals

RESULTANT ISOPLETHS*

*Note: For impulsive sounds, action proponent must also consider isopleths peak sound pressure level (PK) thresholds (dual thresholds).

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!

E.1-2: ALTERNATIVE METHOD (SINGLE STRIKE EQUIVALENT)

Unweighted $SEL_{cum\ (at\ measured\ distance)}$ = SEL_{ss} + 10 Log (# strikes)	197.8

Source Level (Single Strike/shot SEL)	164
Number of strikes in 1 h OR Number of strikes per pile	400
Activity Duration (h) within 24-h period OR Number of piles per day	6
Propagation (xLogR)	15
Distance of single strike SEL measurement (meters)[+]	10

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

Marine Mammal Hearing Group
Low-frequency (LF) cetaceans: baleen whales
Mid-frequency (MF) cetaceans: dolphins, toothed whales, beaked whales, bottlenose whales
High-frequency (HF) cetaceans: true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*
Phocid pinnipeds (PW): true seals
Otariid pinnipeds (OW): sea lions and fur seals

RESULTANT ISOPLETHS*

*Note: For impulsive sounds, action proponent must also consider isopleths peak sound pressure level (PK) thresholds (dual thresholds).

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)	96.9	3.4	115.4	51.8	3.8

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

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

WEIGHTING FACTOR ADJUSTMENTS (WFA) **VERSION: 1.1 (Aug-16)**

Numerical criteria presented in the Technical Guidance consist of both an acoustic threshold and auditory weighting function associated with the SELcum metric. NMFS recognizes that the implementation of marine mammal weighting functions represents a new factor for consideration, which may extend beyond the capabilities of some action proponents. Thus, NMFS has developed simple weighting factor adjustments (WFA) for those who cannot fully apply auditory weighting functions associated with the SELcum metric.

WFAs consider marine mammal auditory weighting functions by focusing on a single frequency. This will typically result in similar, if not identical, predicted exposures for narrowband sounds or higher predicted exposures for broadband sounds, since only one frequency is being considered, compared to exposures associated with the ability to fully incorporate the Technical Guidance's weighting functions.

WFAs have the advantage of allowing everyone to use the same acoustic thresholds and allows for adjustments to be made for each hearing group based on source-specific information.

For Narrowband Sounds: The selection of the appropriate frequency for consideration associated with WFAs is fairly straightforward. WFAs for a narrowband sound would take the weighting function amplitude, for each hearing group, associated with the particular frequency of interest and use it to make an adjustment to better reflect the hearing's group susceptibility to that narrowband sound.

For Broadband Sounds*: The selection of the appropriate frequency for consideration associated with WFAs is more complicated. The selection of WFAs associated with broadband sources is similar to the concept used for to determine the 90% total cumulative energy window (5 to 95%) for consideration of duration associated with the RMS metric and impulsive sounds (Madsen 2005) but considered in the frequency domain, rather than the time domain. This is typically referred to as the 95% frequency contour percentile (Upper frequency below which 95% of total cumulative energy is contained; Charif et al. 2010).

*

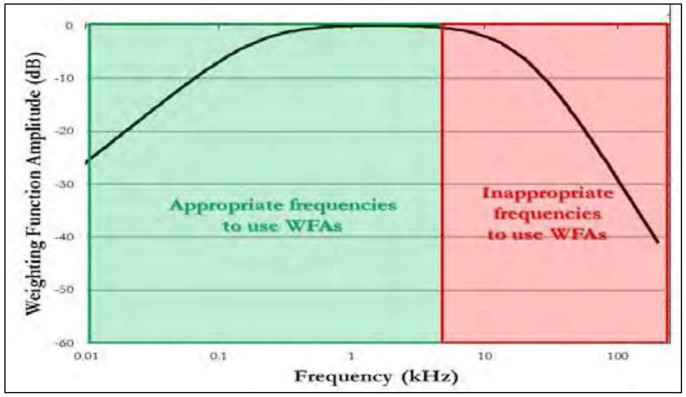
Special Considerations for Broadband Sounds: Since the intent of WFAs is to broadly account for auditory weighting functions below the 95% frequency contour percentile, it is important that only frequencies on the "left side" of the weighting function be used to make adjustments (i.e., frequencies below those where the weighting function amplitude is zero or below where the function is essentially flat; resulting in every frequency below the WFA always having a more negative amplitude than the chosen WFA) (Figure below). It is inappropriate to use WFAs for frequencies on the "right side" of the weighting function (i.e., frequencies above those where the weighting function amplitude is zero). For a frequency on the "right side" of the weighting function (Table below), any adjustment is inappropriate and WFAs cannot be used (i.e., an action proponent would be advised to not use weighting functions and evaluate its source as essentially unweighted; see "Use" frequencies in Table below, which will result in a weighting function amplitude of 0 dB).

TABLE

Hearing Group	Applicable Frequencies	Non-Applicable Frequencies*
Low-Frequency Cetaceans (LF)	4.8 kHz and lower	Above 4.8 kHz (Use: 1.7 kHz)
Mid-Frequency Cetaceans (MF)	43 kHz and lower	Above 43 kHz (Use: 28 kHz)
High-Frequency Cetaceans (HF)	59 kHz and lower	Above 59 kHz (Use: 42 kHz)
Phocid Pinnipeds (PW)	11 kHz and lower	Above 11 kHz (Use: 6.2 kHz)
Otariid Pinnipeds (OW)	8.5 kHz and lower	Above 8.5 kHz (Use: 4.9 kHz)

* With non-applicable frequencies, user should input the "use" frequency in the User Spreadsheet, which will result in a weighting function amplitude/adjustment of 0 dB (i.e., unweighted). NOTE: "use" frequency is only appropriate for that particular hearing group. Thus, if unweighted isopleths are required for more than one hearing group, users will need to provide multiple spreadsheets supporting isopleths (i.e., separate spreadsheets for each different WFA used).

FIGURE



Example weighting function illustrating where the use of weighting function adjustments are (Green: "left side") and are not (Red: "right side") appropriate for broadband sources.

ZOI Level B (TTS)

Fill in SPL and distances for peak and rms pressures, and read distance to threshold for appropriate model

Measured pressure	Peak	RMS
SPL =	170	154
Distance =	10	10

		Meters to Threshold - Vibratory Driving						
Spreading Model	**Spreading Model**	**Low-Frequency (LF) SEL (199 dB)**	**Mid-Frequency (MF) SEL (198 dB)**	**High-Frequency (HF) SEL (173 dB)**	**Phocid Pinnipeds (PW) SEL 201 dB**	**RMS 160 dB**	**RMS 120 dB**	**RMS 90dB- harbor seal in air**
Spherical spreading	dB = 20*log(R1/R2)	0	0	1	0	5	501	15849
Cylindrical spreading	dB = 10*log(R1/R2)	0	0	0	0	3	25119	25118864
Practical spreading	dB = 15*log(R1/R2)	0	0	1	0	4	1848	184785
	Distance (km)	**0.000**	**0.000**	**0.001**	**0.000**	0.005	0.501	
	Area (sq km)	**0.000**	**0.000**	**0.000**	**0.000**	0.000	0.789	
Msc.								
18.4 Log							704	30079
Nedwell →	dB = -0.15/m				-127		227	427
Conversion	meters	feet						
	4642	15229.65928						

Measured pressure	Peak	RMS
SPL =	188	173
Distance =	10	10

		Meters to Threshold - Impact Driving						
Spreading Model	**Spreading Model**	**Low-Frequency (LF) SEL (199 dB)**	**Mid-Frequency (MF) SEL (198 dB)**	**High-Frequency (HF) SEL (173 dB)**	**Phocid Pinnipeds (PW) SEL 201 dB**	**RMS 160 dB**	**RMS 120 dB**	**RMS 90dB- harbor seal in air**
Spherical spreading	dB = 20*log(R1/R2)	3	3	10	0	45	4467	141254
Cylindrical spreading	dB = 10*log(R1/R2)	1	1	10	0	200	1995262	1995262315
Practical spreading	dB = 15*log(R1/R2)	2	2	10	0	74	34145	3414549
	Distance (km)	**0.003**	**0.003**	**0.010**	**0.000**	0.045	4.467	
	Area (sq km)	**0.000**	**0.000**	**0.000**	**0.000**	0.006	62.683	
Msc.								
18.4 Log							7593	324242
Nedwell →	dB = -0.15/m				0		353	553
Conversion	meters	feet						
	4642	15229.65928						

Summary of Results									
Distance									
Hearing Group			Level A					Level B	
			Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds	RMS 160 dB	RMS 120 dB
SEL_{cum} Threshold (Vibratory Driving)			199	198	173	201	219		
SEL_{cum} Threshold (Impact Driving)			183	185	155	185	203		
Vibratory Pile Driving									
Pile Type	**Source Level**	**Weighting Factor**	**PTS Isopleth to threshold (meters)**					**TTS ZOI to threshold (meters)**	
Composite Pipe/H-Pile (steel)	0	2.5	4.30	0.38	6.35	2.61	0.18	NA	1847.85
Pile Type	**Source PLS**	**Weighting Factor**	**PTS Isopleth to threshold (feet)**					**TTS ZOI to threshold (feet)**	
Composite Pipe/H-Pile (steel)	0	2.5	14.09	1.25	20.84	8.57	0.60	NA	6,062.50
Impact Pile Driving									
Pile Type	**Source Level**	**Weighting Factor**	**PTS Isopleth to threshold (meters)**					**TTS ZOI to threshold (meters)**	
Composite Pipe/H-Pile (steel)	164	2	96.88	3.45	115.39	51.84	3.77	73.56	NA
Pile Type	**Source PLS**	**Weighting Factor**	**PTS Isopleth to threshold (feet)**					**TTS ZOI to threshold (feet)**	
Composite Pipe/H-Pile (steel)	164	2	317.83	11.30	378.59	170.09	12.38	241.35	NA

Area									
Hearing Group			**Level A**					**Level B**	
			Low-Frequency Cetaceans	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Phocid Pinnipeds**	**Otariid Pinnipeds**	**RMS 160 dB**	**RMS 120 dB**
SEL_{cum} Threshold (Vibratory Driving)			**199**	**198**	**173**	**201**	**219**		
SEL_{cum} Threshold (Impact Driving)			**183**	**185**	**155**	**185**	**203**		
Vibratory Pile Driving									
Pile Type	**Source Level**	**Weighting Factor**	**Insonified Area (m2)**						
Composite Pipe/H-Pile (steel)	0	2.5	57.97	0.46	126.72	21.42	0.11	NA	10,727,112.60
Pile Type	**Source PLS**	**Weighting Factor**	**Insonified Area (ft2)**						
Composite Pipe/H-Pile (steel)	0	2.5	624.03	4.90	1364.05	230.55	1.14	NA	115,465,686.41
Impact Pile Driving									
Pile Type	**Source Level**	**Weighting Factor**	**Insonified Area (m2)**						
Composite Pipe/H-Pile (steel)	164	2	29,483.17	37.30	41,832.20	8,443.63	44.76	17,001.33	NA
Pile Type	**Source PLS**	**Weighting Factor**	**Insonified Area (ft2)**						
Composite Pipe/H-Pile (steel)	164	2	317,354.26	401.44	450,278.07	90,886.47	481.80	183,000.78	NA

APPENDIX C

Marine Wildlife Protection and Training Plan

VENOCO, INC

Marine Wildlife Protection and Training Plan

Purpose

Venoco Inc. is dedicated to continuous efforts to improve the compatibility of our operations with the marine ecosystems while economically developing energy resources in environmentally sound manner including the protection of marine wildlife.

The objective of this plan is to provide guidelines and information in support of the health and stability of the marine mammals encountered during business operations.

Regulatory Information

All marine mammals are protected under the Marine Mammal Protection Act of 1972 (MMPA) and its amendments. Under the MMPA, the "taking" of any marine mammal is prohibited. "Take" is defined as "to harass, hunt, capture, or kill any marine mammal." In the 1994 amendments, "harassment" was divided into two levels: Level A harassment meant "any act of pursuit, torment or annoyance which has the potential to injure a marine mammal or a marine mammal stock in the wild." Level B meant any act that "has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering" (MMPA 1972, amended 1994, 16 U.S.C., § 1431 et seq.). Takes are allowed under special conditions, such as an Incidental Harassment Authorization (IHA). An IHA will be obtained when necessary on a project-by-project basis (e.g., an IHA is needed for the 2017 Casitas Pier fender pile replacement project because of the possibility of Level B takes during pile driving activity.)

Some populations or stocks of marine mammals are listed as threatened or endangered under the federal and state endangered species acts (ESAs). Further, some populations or stocks of vertebrates, or parts of populations or stocks of vertebrates, may be considered Distinct Population Segments (DSPs). Such segments represent discrete populations or stocks of a species or subspecies that are significant to other populations or stocks of the species or subspecies. As one example, the California-Oregon-Washington stock of humpback whales is just one of 14 worldwide DPSs recognized by NOAA Fisheries.

Several stocks of listed marine mammals are classified as strategic under the MMPA. The definition of strategic is complex, but in this plan it refers to a stock that is being adversely impacted by human activities and may not be sustainable. Such stocks are considered to be of strategic importance at a regional or population level. Some stocks are also considered depleted under the MMPA. This means that the population has fallen below optimum sustainable levels. All species listed under the ESA are also classified under the MMPA as strategic and depleted. Finally, some stocks may be considered vulnerable to decline because their numbers are low.

The California Coastal Commission has jurisdiction over the project under the Coastal Act and the Coastal Zone Management Act. This training plan is prepared in compliance with those acts.

Programs specific to training on marine mammal awareness and protection have been developed by the Federal and State regulating agencies with involvement of local resource users, interested and affected parties and are the basis for Venoco's Marine Wildlife Protection Plan training.

Venoco Inc. Marine Mammal Awareness Training and Protection Practices

All Venoco assets conducting marine operations will be provided marine mammal awareness training annually. Venoco's routine contractors conducting marine operations and contractors performing one-time projects with marine impacts will be required to complete marine mammal awareness training annually or as needed using Venoco provided training materials or other similar training methods and materials approved by Venoco.

Marine mammal awareness training will consist of viewing the following marine mammal protection training videos and discussing the protection practices outlined below. Training is documented and maintained by Venoco.

1. BOEMRE approved: Pacific Operations Offshore LLC Wildlife & Fisheries Training video; and
2. United States Navy Marine Species Awareness Training (MSAT) video.

- All marine mammals are protected under the Marine Mammal Protection Act of 1972 (MMPA). Some of these animals are also protected under the Endangered Species Act (ESA). These laws prohibit the **take** of any marine mammal except by permit or exception.

- The terms to take means to harass, hunt, capture, or kill any marine mammal, or attempts of such conduct. Any action by people, or vessels or aircraft they're operating in the vicinity of marine mammals that substantially alter the behavior of those animals, may be a violation of the law. The act may be subject to a civil penalty of as much as $10,000 for each violation or imprisonment for as much as one year or both.

- Human activities in the vicinity of marine mammals may harass these animals, resulting in a range of impacts. Activities that harass marine mammals can cause detrimental effects such as separation of mother whales and their calves, disruption of migratory patterns; disruption of social groups such as killer whale pods; interference in breeding and reproduction activities and abandonment of nursing pups or rearing activities.

- People, vessels or land-based equipment or operations should not perform any action that substantially disrupts the normal behavior of a marine mammal. Such actions include negligent or intentional operation of an aircraft, vessel, equipment or individual acts that result in a substantial disruption of a marine mammal's normal behavior. These actions could be considered harassment and would be violations under the Marine Mammal Protection Act.

All marine vessel operators must develop and implement a plan that focuses on observation, recognition and avoidance procedures when marine mammals are encountered at sea. Minimum components of the plan must include:

1. Existing and new vessel operators shall be trained by a marine mammal expert or by utilizing materials and information produced by experts to recognize and avoid marine mammals prior to project related activities. Training sessions shall focus on the identification of marine mammal species, the specific behavior of species common to the project area and barge routes, and awareness of seasonal concentrations of marine mammal species. Vessel operators shall complete retraining annually, or as needed for specific projects.

2. A minimum of two mammal observers shall be placed on all vessels during the spring and fall gray whale migration periods (generally December through May), and during periods/seasons when marine mammals are known to be in the project area and along barge route in relatively large numbers. <u>Observers can include the vessel operator and /or crew members, as well as any project worker that has received proper training.</u>

3. Vessel operators will make every effort to maintain a distance of 1,000 feet (305) from sighted whales and other threatened or endangered marine mammals or marine turtles.

4. Vessel speed shall be limited to 16 mph (14 knots) while in the area of all marine mammals.

5. Support vessels will not cross directly in front of migrating whales or any other threatened or endangered marine mammals or marine turtles.

6. When paralleling whales, supply vessels will operate at a constant speed that is not faster than the whales.

7. Vessel operators will not herd or drive whales.

8. Female whales will not be separated from their calves.

9. If a whale engages in evasive or defensive action, vessels will drop back until the animal moves out of the area.

10. Any and all collisions with marine wildlife will be reported promptly to the Federal and State agencies listed at the end of this Plan.

The Venoco Casitas Pier and the Carpinteria Harbor Seal Rookery

Venoco Inc. operates the Casitas Pier to support its offshore operations and to provide support services to other Santa Barbara Channel platform operators. The Casitas Pier operates 365 days a year and activities can occur around the clock. The Casitas Pier is immediately adjacent to the Carpinteria Harbor Seal rookery and Venoco is responsible for ensuring activities on and around the pier do not impact the rookery, nor adversely impact the seal population.

All Venoco Casitas Pier personnel and contractor associates will be provided this information on an annual basis to maintain awareness and prevent adverse impacts to the rookery or seal population.

Haul-outs:

Harbor seals utilize specific shoreline locations on a regular basis as resting places (haul-outs). Haul-outs include beaches, rocks, log booms, floats and buoys. Seals will return to these locations to haul-out but any shoreline or floating feature with easy access to the water can serve as a resting spot.

Harbor seals rest out of the water for several hours each day to regulate body temperature, interact with each other, and sleep. Harbor seals are vulnerable on land and are therefore wary of being approached while out of the water. Some seals may however tolerate activity close by. The most frequent reported encounters with seals out of the water involve pups that are too young to have developed protective wariness (escape response).

The majority of pups are born at protected haul-out sites, which are called rookeries. Nursing pups may remain with their mothers for 4 to 6 weeks and then are weaned to forage and survive on their own.

Human Interference:

Harbor seals are less mobile and therefore more vulnerable to disturbance or predation while out of the water. Adult seals generally are more wary and escape to the water more quickly than pups. Females will flee if disturbed or approached and leave their pups behind.

A female seal is more likely to return to reclaim her pup once the disturbance near the pup goes away. If activity continues near the pup, the female may eventually give up trying and the pup may be abandoned. A nursing pup that is separated from its mother will not survive.

The Carpinteria Harbor Seal Preserve and rookery is home to more than 500 adult seals, although the average number hauled out during daytime hours is generally much less. The adult females give birth to their pups on the Carpinteria shoreline in winter and spring. The

Carpinteria Beach is closed 750 feet on either side of the rookery (their pupping area) from December through May to allow the females to give birth and raise their pups. The seals utilize this section of beach all year long. At low tide they like to rest on the beach. Harbor seals are not prone to migrating and tend to stay year-round.

<u>Prohibitions:</u>

No person, except those authorized by a representative of the National Marine Fisheries Services or accompanied by an authorized employee of the National Marine Fisheries Service, shall approach any rookery or hauling grounds nor pass beyond any posted sign forbidding passages from December 1st through May 31st.

Activities occurring on or near the pier must be conducted in a way as to prevent, to the extent possible, disturbance of the seal haul-out and specifically during December 1st through May 31st.

Marine Wildlife Notifications and Contact List

Primary Notifications

<u>Stranding Coordinator, California Region</u>
Justin Viezbicke
NOAA Fisheries
Long Beach, CA 90802 -4213
(562) 980-3230 office
(562) 506-4317 cell
(808) 313-2803 alternate cell
justin.viezbicke@noaa.gov

Justin Greenman
Assistant Stranding Network
Coordinator
NOAA Fisheries
(562) 980-3264 office
(562) 506-4315 cell
justin.greenman@noaa.gov

<u>California Department of Fish and Wildlife</u>
Enforcement Dispatch Desk
Long Beach, California 90802
(562) 590-5132, (562) 590-5133 or (562) 598-1032

<u>California State Lands Commission</u>
Environmental Planning and Management Division
Sacramento, California 95825-8202
(916) 574-1890 or (916) 574-0748
Slc.ogpp@slc.ca.gov

Other Contacts

<u>National Marine Fisheries Service (NMFS)</u>
Southwest Regional Office
501 West Ocean Boulevard, Suite 4200
Long Beach, CA 90802-4213
(562) 980-4000

<u>Oiled Wildlife Care Network (OWCN)</u>
University of California, Davis
School of Veterinary medicine
One Shields Avenue
Davis, CA 95616
(530) 752-4167 or 877 823-6926

California Department of Fish and Wildlife
Office of Spill Prevention and Response (OSPR)
(800) 852-7550

APPENDIX D

Preliminary Hydroacoustic Monitoring Plan

CASITAS PIER FENDER PILE REPLACEMENT PROJECT

PRELIMINARY HYDROACOUSTIC MONITORING PLAN

Prepared for:

Venoco, LLC
6267 Carpinteria Avenue, Suite 100
Carpinteria, CA 93013

Prepared by:
AECOM
130 Robin Hill Road, Suite 100
Goleta, California 93117

July 2017

INTRODUCTION

The purpose of this Preliminary Hydroacoustic Monitoring Plan is to describe the methodology proposed for measuring underwater sound levels before and during the installation of new fender piles at Casitas Pier in Carpinteria, California. This monitoring plan addresses the underwater sound monitoring required to assess the project's potential effect on marine wildlife. The project consists of installation of up to 13 new fender piles at the seaward end of the Casitas Pier. New piles will be consist of a composite of approximately 50 feet of 16-inch diameter steel pipe, with approximately 10 to 12 feet of 14-inch steel H-pile welded to the bottom of the steel pipe. The H-pile portion of the fender pile will be driven into the seafloor with a pile driver, which will be staged on the pier. Vibratory pile driving is planned; however, site conditions may dictate that impact driving is necessary.

PILE INSTALLATION

Hydroacoustic monitoring will be conducted during at least one full day of pile driving to confirm the modeled Sound Exposure Level (SEL) results, which are based on a full day of pile driving activity. Additional monitoring will be performed as needed, for example if site conditions materially change.

Hydroacoustic monitoring will be conducted in accordance with the requirements of the National Marine Fisheries Service (NMFS) Marine Mammal Incidental Harassment Authorization and California Coastal Commission (CCC) Coastal Development Permit. The monitoring will be done in accordance with the methodology outlined in this Hydroacoustic Monitoring Plan. The monitoring will be conducted to achieve the following:

- Be based on the dual metric criteria (Popper et al., 2006[1]) and the accumulated SEL
- Establish field locations that will be used to document the extent of the area experiencing 187 decibels (dB) SEL accumulated
- Verify the distance of the marine mammal Level A and Level B hazard zone thresholds established in the Incidental Harassment Authorization, thus allowing for field adjustments to the onsite monitoring program
- Describe the methods necessary to 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 and CCC.

Two hydrophone systems are proposed to record the sound levels at two locations and determine the extent that sound levels decrease spatially. One hydrophone will be located 10 meters (33 feet) from the pile being driven and the second hydrophone will be located at the modeled worst case isopleth for Level A impacts to marine mammals, depending on the type of driving

[1] Popper, A.N. et al. 2006. "Interim Criteria for Injury of Fish Exposed to Pile Driving Operations: A White Paper" http://s3.amazonaws.com/academia.edu.documents/43295141/piledrivinginterimcriteria_13may06.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1501181057&Signature=hty0l3W6fG1cx31pKCiAKJqpmmw%3D&response-content-disposition=inline%3B%20filename%3DInterim_criteria_for_injury_of_fish_expo.pdf

from the pile being driven (i.e., 115 meters (380 feet) for impact driving or 6.4 meters (21 feet) for vibratory driving), with a clear line of sight between the pile and the hydrophones. The second hydrophone will be used to determine if the cumulative SEL is in compliance with the modeled levels shown in the Incidental Harassment Authorization. This hydrophone may be moved either further out or closer in depending on the levels measured.

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 media, 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 equal 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 NMFS in criteria for judging impacts to marine mammals from underwater impulse and continuous-type sounds. The majority of literature uses peak sound pressures to evaluate barotrauma injuries to fish.

SEL, frequently used for human noise exposures, is now used as a metric to quantify impacts to fish[2] and marine mammals[3]. SEL is calculated by summing the cumulative pressure squared (p^2) over the measurement duration, integrating over time, and normalizing to 1 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. The units for SEL are dB re: 1 microPascal^2-sec (1 µPa^2-sec).

METHODOLOGY

Hydrophones will be placed at mid water depth and set up as close as practicable to the pile-driving operation (e.g., 10 meters [33 feet]), and then at an appropriate interval (i.e., 115 meters [380 feet] for impact driving or 6.4 meters [21 feet] for vibratory driving) from the pile being driven. The longer interval will allow for the expected falloff of higher frequencies as the range increases.

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2 Hastings, M.C., and A.N. Popper. 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.

3 NMFS (National Marine Fisheries Service). 2016. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Department of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-55, 178 p.

Each location will be monitored live to determine actual sound levels in the field. 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 recording 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.

Ambient underwater sound levels will be measured for at least one minute prior to initiation of pile driving, as well as in the absence of construction activities. Ambient levels will be reported as SEL and include a representative spectral analysis. The contractor will inform the hydroacoustic specialist when pile driving is about to start.

Underwater sound levels will be monitored at least during the first full day of pile driving. If impact driving is used, 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, 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.

Ten percent of all impact pile driving will 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 1 lists the equipment components that will be used to monitor underwater sound pressure levels.

The construction contractor will supply the hydroacoustic specialist with the substrate composition, hammer model, and size; depth the pile is driven and blows per foot for the piles monitored. Hammer energy settings will also be recorded by the contractor, 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 at least 10 to 10,000 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) or equivalent. Quality recordings using a digital audio recorder would be made during attended measurements.

The SLM will be used to establish the 187 dB cumulative SEL zone and to approximate the Level A and Level B marine mammal hazard zones in the field.

Table 1
Equipment for Underwater Sound Monitoring

Item	Specifications	Quantity	Usage
Hydrophone	Minimum Sensitivity – 211 dB ± 3 dB re 1 V/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.

The peak pressure RMS sound pressure level and SEL will be measured using an SLM. The SLM has the ability to measure the Z-weighted peak sound pressure levels over the relative short periods (e.g., time constant of 35 milliseconds). The SLM can closely approximate the unweighted SEL of each pile strike by measuring the 1-second equivalent sound energy level ($L_{eq\ (1\text{-}sec)}$) using the linear integration setting. The SLM also approximates the unweighted $RMS_{90\%}$ of each pile strike by measuring the maximum (using the L_{max} setting) with the SLM detector set to Z-weighted "impulse." Note that underwater pile strike acoustic events have durations typically between 50 and 100 milliseconds, so use of the "impulse" setting to approximate RMS sound pressure levels for impact pile strikes would likely provide a higher level.

All measurement equipment used would be required to have a frequency response of ±1 dB from 10 Hz to 10,000 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.

CALIBRATION

Calibration of measurement systems will 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 will 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 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 to the beginning of the digital audio recordings that will be used. The system calibration status will 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 will be recorded in water-resistant field notebooks. Notebook entries will include operator's name, date, time, calibration notes, measurement positions, pile-driving information, system gain setting, 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 will be set such that pile-driving sounds above 191 dB_{peak} can be properly measured at 10 meters.

DATA RECORDING AND REPORTING

In coordination with the construction contractor and onsite marine mammal specialist, the hydroacoustic data consisting of Peak sound levels single strike SEL levels and accumulated SEL levels will be recorded and submitted to NMFS and CCC on a regular basis (e.g., daily or weekly) and/or at the completion of the pile driving work. These will be considered preliminary data and include:

- The observed typical and maximum peak pressures as recorded in field notebooks or depicted from 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 30 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 will include:

1. Size, type, and identification of piles

2. Description of the sound attenuation device including design specifications

3. The impact hammer force used to drive the piles

4. A description of the monitoring equipment and a summary of the methods used to monitor sound

5. The distance and orientation between hydrophones and pile

6. The depth of the hydrophone

7. The depth of water in which the pile was driven

8. The depth into the substrate that the pile was driven

9. The physical characteristics of the bottom substrate into which the piles were driven

10. The total number of pile strikes per pile, the total number of strikes per day, and the interval between strikes

11. Environmental conditions including wind direction and velocity, onsite swell direction and height, and presence or absence of chop and/or whitecaps

12. Ambient sound levels prior to driving

13. The ranges and means for peak, $RMS_{90\%}$, and SELs for each pile

14. The results of the hydroacoustic monitoring, including the frequency spectrum, peak and RMS and $RMS_{90\%}$ SPLs, and single-strike and cumulative SEL

15. A description of any observable fish, marine mammal, or bird behavior in the immediate area, as recorded by the biological monitor(s). If possible, correlation between observed fish, marine mammal, or bird behavior and underwater sound levels occurring at the time will be noted.