



POTENTIAL EFFECTS ON MARINE LIFE FROM PILE DRIVING SOUND

TRIDENT SUPPORT FACILITIES EXPLOSIVES HANDLING WHARF (EHW-2)

SOUND IN THE WATER FROM PILE DRIVING

Potential effects on marine species from sound in the water generated by pile driving construction activities were analyzed in the Draft Environmental Impact Statement (EIS). Three scenarios of pile driving sound were evaluated:

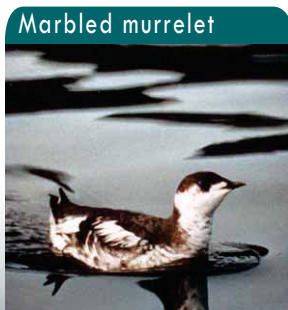
- Impact hammer pile driving (impulsive sound)
- Vibratory pile driving (continuous sound)
- Both impact hammer and vibratory pile driving (combined impulsive and continuous sound)

Depending on energy levels, both impulsive and continuous sound could have the potential to cause behavioral disturbance of, or injury to, marine species. Impulsive sound has greater potential than continuous sound to cause injury. Mathematical methods were used to estimate the combined sound levels resulting from impact hammer and vibratory pile driving occurring at the same time.

EVALUATING THE EFFECTS OF UNDERWATER SOUND ON MARINE SPECIES

The U.S. Navy evaluated the potential effects of pile driving sound on the following marine species, including species listed under the Endangered Species Act:

- Marine fish
- Marine mammals
 - Seals and sea lions (pinnipeds)
 - Porpoises, dolphins and whales (cetaceans)
- Marine birds



Marbled murrelet

Harbor seal pup
Photo credit: NOAA

MODELING POTENTIAL EXPOSURES TO MARINE SPECIES

The Navy's proposed use of vibratory and impact pile driving equipment would create underwater and airborne sound impacts within the second Explosives Handling Wharf action area. The Endangered Species Act and Marine Mammal Protection Act define impacts on protected species in terms of "take," which is determined based on potential effects on protected species. In the Draft EIS, the Navy evaluated potential effects on species from underwater sound using sound modeling methods and species exposure criteria based on the best available science and consultations with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service.

The Navy modeled the three scenarios of sound to evaluate the potential effects on marine species. Exposures were not calculated for marine fish because data is unavailable from which to determine the density of fish; however, the distances over which fish could be injured or disturbed were determined.

MODELING PROCESS

The Navy estimated impacts on marine fish, marine mammals and marine birds, and calculated exposures for marine mammals and marbled murrelets using the following process:

Identify sound source levels for impact hammer pile driving and vibratory pile driving



Calculate combined source levels for impulsive and continuous sounds



Determine propagation loss for impact hammer sound, vibratory sound and combined sound



Determine zones of injury and disturbance for marine fish, marine mammals and marine birds



Determine densities of marine mammals and marbled murrelets



Calculate potential exposures for marine mammals and marbled murrelets