BOEM
Bureau of Ocean Energy Management

FACT SHEET

Geological and Geophysical (G&G) Surveys

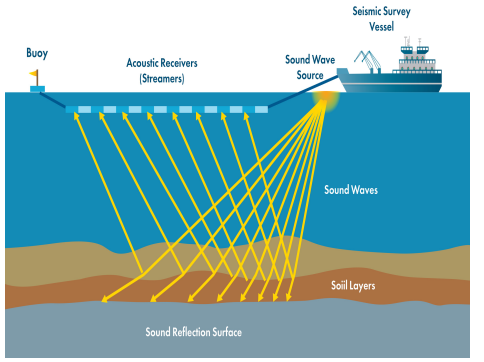
Why Are Geological and Geophysical (G&G) Surveys Conducted?

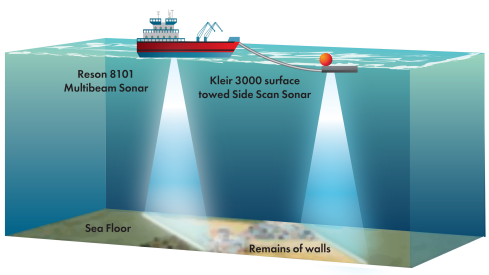
G&G surveys are conducted to: (1) obtain data for oil and gas (O&G) exploration and production, (2) aid in siting offshore (i.e., O&G, renewable energy) structures, and (3) locate marine mineral resources. More specifically, G&G surveys are necessary to make informed decisions about O&G resources, engineering decisions regarding the construction of offshore projects, and informed estimates regarding the composition and volume of sand and gravel resources. Such data are also used to ensure the proper use and conservation of Outer Continental Shelf (OCS) energy resources and the receipt of fair market value for the leasing of public lands.

What Types of G&G Surveys Are Conducted for BOEM-related Activities?

Deep Penetration Seismic Airgun Surveys for O&G Exploration. These surveys are conducted by vessels towing an array of airguns that produce low frequency sound pulses that penetrate deep into the subsurface and are then reflected and recorded by receivers to image deep geological features. Deep penetration seismic surveys are often acquired prior to the drilling phase of O&G exploration. These types of surveys are not appropriate for siting renewable energy structures or locating sand resources.

High Resolution Geophysical (HRG) Surveys for O&G Exploration, Renewable Energy Siting, and Sand and Gravel Resource Identification. HRG surveys use sound waves that are reflected off subsea structures to collect data on conditions both at the seafloor and the shallow subsurface. HRG equipment generally include off-the-shelf marine sonars and survey equipment (e.g., multi-beam echo sounders, side scan sonars, sub-bottom profilers). HRG systems usually use higher frequencies than those used in seismic airgun surveys and image smaller structures with a higher level of detail.





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What Are the Potential Impacts to Marine Life?

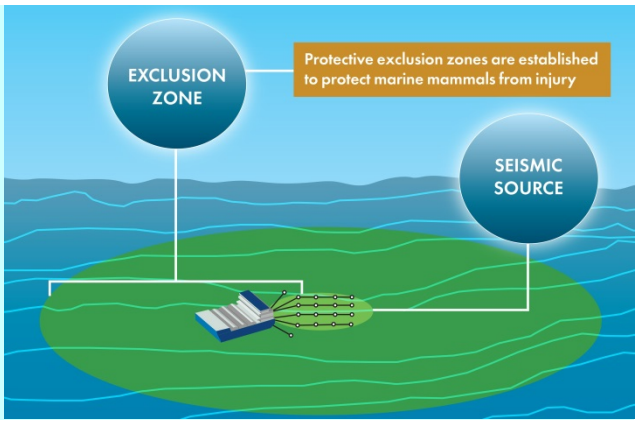
Some marine species rely on sound to communicate and gain information about their environment that is critical to survival and reproductive success. Human-made (anthropogenic) sound can affect certain species of marine life in a variety of ways, from minor behavioral modifications to major impacts, such as permanent or temporary hearing loss. The potential for impacts is largely tied to: (1) the individual animal (species, age, hearing range, prior exposure to sound source), (2) what the animal is doing at the time of exposure (feeding, migrating, mating), (3) the context and characteristics of the sound being heard, and (4) other physical environmental factors.

Seismic airgun surveys produce broadband, low-frequency sounds. Such sounds are within the hearing range of a number of marine mammals, and protection measures are especially important when conducting these activities because of their potential impacts to marine life.

HRG sound sources generally operate in discrete frequency bands and for shorter durations than seismic airgun surveys. Although different marine mammal species can be classified as low, mid and high frequency hearers, no marine mammals hear frequencies above 200 kHz, so only a few HRG sources (i.e., sub-bottom profilers, boomers and sparkers) are detectable by marine mammals. HRG surveys put out less energy than seismic airguns and operate in smaller areas. Therefore, the size of the area impacted by sound is much smaller, though they can impact marine animals at close ranges (mostly within 200 meters). No injury to marine mammals or sea turtles is expected from these sound sources, as sound has been shown to diminish rapidly with distance from the sound source.

How Does BOEM Help to Ensure Marine Life Is Protected From Potential Impacts?

BOEM has worked with the National Oceanic and Atmospheric Administration (NOAA) Fisheries and other agencies to identify protection measures that focus on: (1) avoiding injury from exposure to airgun and HRG sound sources to marine animals in close proximity to the source, and (2) reducing the potential for behavioral disruption. Examples may include, but are not limited to, the following:



- **Exclusion zones around vessels**. Operators establish an “acoustic exclusion zone” for each survey, so that the zone is clear of any marine mammals and sea turtles for a certain amount of time before acoustic sound sources can be operated.
- **Visual monitoring by trained protected species observers**. Protected species observers continuously monitor the exclusion zone for marine mammals and call for immediate shut down of sound sources if marine mammals are detected within or approaching this exclusion zone.
- **Ramp-up Procedures.** Airguns and HRG equipment (when technically feasible) are slowly ramped-up, rather than turned on immediately at full power, so that animals have an opportunity to move away from potentially disturbing levels of sound.
- **Passive acoustic monitoring (PAM).** Nighttime or poor visibility operation is allowed only when passive acoustics are used. Today’s PAM systems include detection, classification, and localization software capabilities that allow PAM observers to hear a marine mammal vocalize, determine its location, and classify species type.
- **Time-area closures to protect North Atlantic right whales (NARW) and sea turtles.** For airgun surveys, seasonal time-area closures are in place to protect NARWs within their designated critical habitat and select areas within their migration route and calving and nursery grounds.