Central Atlantic Wind Energy Areas

Proposed Survey Activities

Survey Method	Use	Description
High-resolution Geophysical	Shallow hazards Archaeological Bathymetric charting Benthic habitat	Sub-bottom profiler Side-scan sonar Multibeam echosounder Magnetometer
Geotechnical/Sub-bottom Sampling	Geological	Vibracores Deep borings Cone penetration tests
Biological	Benthic habitat	Grab sampling Benthic sled Underwater imagery Sediment profile imaging
	Avian	Aerial digital imaging Visual observation from boat or airplane
	Bat	Ultrasonic detectors installed on survey vessels used for other surveys
	Marine fauna (marine mammals and sea turtles)	Visual observation from boat or airplane
	Fish	Direct sampling of fish and invertebrates

High-Resolution Geophysical Survey Equipment and Methods

Survey Method	Use	Description
Sub-bottom Profiler	Collect geophysical data on shallow hazards, archaeological resources assessments, and subsurface sediments	Typically, a high-resolution CHIRP System sub-bottom profiler is used to generate a profile view below the bottom of the seabed, which is interpreted to develop a geologic cross-section of subsurface sediment conditions under the track line surveyed. Another type of sub-bottom profiler that may be employed is a medium penetration system such as a boomer, bubble pulser, or impulse-type system. Sub-bottom profilers are capable of penetrating sediment depth ranges of 3 m to greater than 100 m, depending on frequency and bottom composition.
Side-scan Sonar	Collect geophysical data on shallow hazards and archaeological resources assessments	This survey technique is used to evaluate surface sediments, seafloor morphology, and potential surface obstructions. A typical side-scan sonar system consists of a top-side processor, tow cable, and towfish with transducers (or "pingers") located on the sides, which generate and record the returning sound that travels through the water column at a known speed.
Multibeam Echosounder	Bathymetric charting	A depth sounder is a microprocessor-controlled, high-resolution survey-grade system that measures precise water depths in both digital and graphic formats. The system would be used in such a manner as to record with a sweep appropriate to the range of water depths expected in the survey area. Multibeam bathymetry systems may be more appropriate than other tools for characterizing those WEAs containing complex bathymetric features or sensitive benthic habitats, such as hardbottom areas.
Magnetometer	Collect geophysical data on shallow hazards and archaeological resources assessments	Magnetometer surveys detect and aid in the identification of ferrous or other objects having a distinct magnetic signature. The magnetometer sensor is typically towed as near as possible to the seafloor and anticipated to be no more than approximately 6 m above the seafloor.

For more information on BOEM's Renewable Energy Program, visit www.boem.gov/Renewable-Energy

Central Atlantic Wind Energy Areas

Proposed Survey Activities

Geotechnic and Benthic Survey Methods

Survey Method	Use	Description
Bottom-sampling Devices	Penetrate depths from a few centimeters to several meters	A piston core or gravity core is often used to obtain samples of soft surficial sediments. Unlike a gravity core, which is essentially a weighted core barrel that is allowed to free-fall into the water, piston cores have a "piston" mechanism that triggers when the corer hits the seafloor. The main advantage of a piston core over a gravity core is that the piston allows the best possible sediment sample to be obtained by avoiding disturbance of the sample. Shallow-bottom coring employs a rotary drill that penetrates through several feet of consolidated rock. Drilling produces low-intensity, low-frequency sound through the drill string. This methods does not use high energy sound sources.
Vibracores	Obtain samples of unconsolidated sediment; may also inform the interpretation of features identified through the high-resolution geophysical surveys	Vibracore samplers typically consist of a core barrel and an oscillating driving mechanism that propels the core barrel into the sub-bottom. After the core barrel is driven to its full length, it is then retracted from the sediment and returned to the deck of the vessel. Typically, core samples range up to 6 m long with 8 cm diameters in size, although some devices obtain samples up to 12 m long.
Deep Borings	Sample and characterize the geological properties of sediments at the maximum expected depths of the structure foundations	A drill rig is used to obtain deep borings. The drill rig is mounted on a jack-up barge supported by four "spuds" that are lowered to the seafloor. Geologic borings can generally reach depths of 30–61 m within a few days (based on weather conditions). The acoustic levels from deep borings can be expected to be in the low-frequency bands and below the 160 dB threshold established by the National Marine Fisheries Service to protect marine mammals.
Cone Penetration Test (CPT)	Supplement or use in place of deep borings	A CPT rig would be mounted on a jack-up barge similar to that used for the deep borings. The top of a CPT drill probe is typically up to 8 cm in diameter, with connecting rods less than 15 cm in diameter.