

USE OF HIGH-RESOLUTION GEOPHYSICAL AND GEOTECHNICAL TECHNIQUES FOR SELECTING ARTIFICIAL REEF SITES ON THE LOUISIANA CONTINENTAL SHELF

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ABSTRACT

With the inception of the Louisiana Artificial reef Program in 1986, a viable alternative to complete platform removal is now available to offshore oil and gas operators — the conversion of "rigs to reefs." However, before oil and gas platforms can be sited on the Louisiana continental shelf as artificial reefs, hazardous and unstable geologic conditions (natural hazards) and pipelines and other subsea production equipment (technological hazards) must be identified and assessed. Natural and technological hazards to artificial reef emplacement include faults; shallow accumulations of over-pressured gas; gas seeps or vents; thixotropic (gel-like) bottom sediments; irregular and steep seafloor topography; scarps; relict open and buried channels; hurricanes and major storms; mass wasting or seafloor erosion in the form of debris flows, turbidity flows, rotational and translational slumping and sliding in areas, such as the Mississippi delta region and the outer continental shelf and slope; and pipeline and other subsea marine equipment.

Natural and technological hazards can be identified and assessed from data acquired from high-resolution geophysical techniques (3.5- to 7.0-kHz sub-bottom profiles, single-channel seismic, 105-kHz side-scan sonar). Seismic acoustic reflection

characteristics observed in areas being considered for artificial reef sites include continuous parallel reflectors (pelagic to hemipelagic sedimentation), discontinuous parallel reflectors (probable turbidite deposition), chaotic and semi-transparent to transparent reflectors (related to mass wasting processes), and acoustic wipe-out zones (indicative of gas accumulation or seepage). Geotechnical techniques are used to determine the lithological and physical properties of the sediments and for correlation with the geophysical data. Data obtained through these techniques are used to develop a series of geological hazard maps, cross-sections, and pipeline and platform location maps at each prospective artificial reef site. Also, construction of echo character maps from 3.5- to 7.0-kHz sub-bottom profiles provides an analysis or evaluation of near-bottom sedimentation processes such as debris or turbidity flows.

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