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KEY WORDS: Western Gulf; Texas; baseline; biology; benthos; sediment; grain size; monitoring; hydrography; currents; hydrocarbons; infauna; trace metals; suspended matter

BACKGROUND: The Gulf of Mexico Outer Continental Shelf (OCS) holds vast potential for increasing domestic oil and gas production. To maintain the environmental integrity of the area under exploration and exploitation, the Bureau of Land Management (BLM) initiated a national OCS Environmental Studies Program. The program was designed to provide information to enable the BLM to make responsible management decisions regarding OCS oil and gas activities.

OBJECTIVES: (1) To determine any spatial and temporal impacts to the immediate environment resulting from oil and gas activities; and (2) To assess biological, physical, chemical, geological, and meteorological aspects of the environment.

DESCRIPTION: The monitored rig site was located in Mustang Island Area Block 775, south of Port Aransas, Texas. The oil rig was located at 27°44'21.12"N Lat, 96°42'58.86"W Long. The site was located within the South Texas OCS (STOCS) baseline study area that covered approximately 19,250 km^2 and was bounded by the

Texas coastline, the Mexico-United States international border on the south, and the 96°W Long line to the east. This rig monitoring was part of the overall STOCS study program.

This document reports findings from each portion of the three-part study (pre-drilling, 25-27 September 1976; during-drilling 7 and 14 January 1977; and post-drilling, 28 February and 1-2 March 1977). The multi-faceted study involved hydrography, sediment chemistry, biology, and chemical tissue analysis. Sampling stations were located at intersections of transects emanating from the drillsite and concentric circles at 100, 500, 1,000, and 2,000 m around the drillsite. Additional stations 100 m from the rig in the sediment plume and 100 m from the rig opposite the sediment plume were sampled for the during-drilling survey. Hydrographic data were collected by a Plessey salinity/temperature/depth profiling system and Nansen bottles equipped with reversing thermometers. Currents were measured with an Endeco current meter. A modified Martek transmissometer recorded transmissivity. Nansen bottles were used to collect 1-l water samples for low molecular weight hydrocarbon analysis. Niskin bottles were used to collect 30-l water samples for trace metals and suspended sediment analysis. Infauna (i.e., macro- and meio-) and sediments were collected by a Smith-McIntyre grab. Sediments were analyzed for hydrocarbons, trace metals, and texture. Macroepifauna and demersal fish were collected by otter trawl for taxonomy, high molecular weight hydrocarbons, and trace metals analyses.

SIGNIFICANT CONCLUSIONS: Exploratory drilling activities had biological, chemical, and physical impacts on the immediate area of the drillsite, however, the spatial and temporal extent of impacts could not be exactly determined. Overall effects of exploratory drilling are probably limited both spatially and temporally. Drilling platforms are not considered a significant source of light hydrocarbons, unless a catastrophic event occurs (e.g., blowout). Production platforms are a more prominent source of light hydrocarbon contamination than exploratory platforms.

The rig location was in relatively close proximity to Port Aransas and associated shipping lanes, which complicated data interpretation. Because of data interpretation complications, causative factors for observed effect could not be conclusively determined.

STUDY RESULTS: Current data indicated longshore motion predominantly to the south, although three current reversals occurred during the study. The tidal component of the current was insignificant. A pycnocline was evident only during the post-drilling survey (February). A nepheloid layer was present near bottom during the pre-drilling survey. No transmissometer data were available for the other surveys due to equipment failure.

No low molecular weight hydrocarbon anomalies were observed during water chemistry analyses. All trace metal levels except cadmium and zinc fell within established ranges. Three clay minerals (illite, kaolinite, and montmorillonite) were detected in suspended sediment samples. Lead levels within sediments increased two-fold after drilling. Barium, cadmium, and zinc showed a marked increase at the drillsite following drilling

operations. Variation in trace metals levels were only observed at the drillsite. No conclusive evidence of sediment oil contamination was present. Sediment texture differences occurred between pre-drilling and post-drilling surveys, however, causative factors could not be conclusively determined. Foreign material deposition was evident due to drilling operations.

Lower meiofaunal populations and higher harpacticoid/nematode ratios were found down current of the rig. The invertebrate epifauna and macroinfauna assemblages remained relatively similar throughout the study, however, slight differences were detected. These differences were attributed to drilling operations and seasonality. Direct impact on benthic populations was most prominent at the drillsite. Demersal fish populations and biomass declined between pre-drilling and post-drilling surveys, however, data were not statistically definitive.

There was an indication of low level petroleum contamination of epifauna during the post-drilling survey.

STUDY PRODUCT: University of Texas Marine Science Institute. 1977. Environmental Studies, South Texas Outer Continental Shelf, Final Report Rig Monitoring Program, 1976. A final report to the U.S. Department of the Interior, Bureau of Land Management Gulf of Mexico OCS Office, New Orleans, LA. NTIS No. PB81-127698. Contract No. 14-12-0001-29126. 457 pp.

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