ACCESS NUMBER: 31054

STUDY TITLE: Refining and Revising the GOM OCS Region High Probability Model for Historic Shipwrecks

REPORT TITLE: Refining and Revising the Gulf of Mexico OCS Region High Probability Model for Historic Shipwrecks, Volume I: Executive Summary, Volume II: Technical Narrative, and Volume III: Appendices

CONTRACT NUMBER: 1435-01-00-CT-31054

SPONSORING OCS REGION: Gulf of Mexico

APPLICABLE PLANNING AREA: Gulf of Mexico

FISCAL YEAR(S) OF PROJECT FUNDING: 2000; 2001

COMPLETION DATE OF REPORT: March 2004

COST(S): FY 2000 $161,004; FY 2001 $259,507

PROJECT MANAGER: Stephen R. James, Jr.

AFFILIATION: Panamerican Consultants, Inc.

ADDRESS: 15 South Idlewild Street, Memphis, Tennessee 38104

PRINCIPAL INVESTIGATOR*: Charles E. Pearson

KEY WORDS: Gulf of Mexico, shipwreck, probability model, survey, magnetometer, line spacing

BACKGROUND: For 20 years, the Minerals Management Service (MMS) has required cultural resources assessments for oil and gas leases in the northern Gulf of Mexico. In 1989, the Texas A&M Research Foundation completed a study for the MMS to identify high probability areas and establish remote sensing survey guidelines and equipment requirements most appropriate for locating historic shipwrecks on Federal lands in the Gulf of Mexico Region (GOMR). Over the years, deficiencies in the 1989 model of historic shipwreck distributions and occurrences have been noted, plus new remote sensing technologies have been developed that have application to the MMS program of offshore surveys. The present study was undertaken to refine the model of shipwreck distributions presented in the 1989 study and reevaluate the survey strategies and instrumentation recommended.

OBJECTIVES: (1) To update and expand the existing MMS GOMR shipwreck database by examining primary and secondary sources for shipwreck information; (2) To determine the spatial correlation between shipwreck locations in the updated shipwreck database and recorded seafloor hang sites and sidescan sonar targets and

anomalies representing potential shipwrecks identified during previous OCS lease block surveys. Then, to ground-truth selected locations where hang sites and reported shipwreck locations appear to correlate to determine if hang sites are shipwrecks; (3) To conduct a marine magnetometer survey over several verified shipwreck sites using both the “industry-standard” proton precession magnetometer and the new cesium magnetometer, as well as two other types to determine whether there is a significant difference in their performance in detecting shipwrecks and to assess whether changes are warranted in MMS GOMR survey methodology; and (4) Based on the results from objectives (1), (2) and (3) prepare a revised predictive model for shipwrecks in the GOMR, and recommend survey instrumentation and strategies that would be the most effective in locating these shipwrecks.

DESCRIPTION: The study area consists of the entire MMS Gulf of Mexico Region (GOMR). The study encompassed four principal tasks. Task 1 involved research to collect information to reevaluate and expand the shipwreck data collected in the 1989 study and to develop a new database of shipwrecks in the GOMR. Task 2 involved the correlation of shipwreck data with other sorts of submerged object data from the GOMR, such as reported snag and hang data and unidentified objects identified during offshore remote sensing surveys. This task included diving on selected offshore targets to determine their identity. Task 3 involved conducting magnetometer surveys at selected shipwreck target locations at different intervals and speeds using differing equipment and survey strategies in order to assess how each instrument recorded the same wreck site, and if differences were present, determine if these findings predicated changes to the current MMS GOMR survey methodology. Task 4 involved the analysis of collected data, the development of a revised model of shipwreck occurrences in the GOMR, and the recommendation of survey instrumentation and strategies that would be the most effective in locating these shipwrecks. As part of Task 4, all of the information on shipwrecks collected during Task 1 was entered into a relational database (Microsoft Access) and incorporated into a GIS program (ArcView) that can serve as a tool for MMS personnel for the continued assessment and monitoring of shipwreck data in the GOMR.

SIGNIFICANT CONCLUSIONS: The identification of high probability areas requiring archaeological survey for historic shipwrecks derived from the 1989 study was flawed because of the poor reliability of the positions of loss for so many historic vessels. Shipwrecks with very unreliable positions of loss should be eliminated from use in the identification and delineation of high probability areas in order to strengthen any effort to “predict” wreck location in the GOMR. Besides revealing that all magnetometers performed well in the field trials, field investigations found that the current 50m survey was effective in recording all study wreck types, but that it is unlikely to be effective in identifying all wreck types in the GOMR such as earlier wrecks containing less iron or small wooden vessels. Therefore, it is recommended that a closer spaced interval should be considered by the MMS for employment in high probability areas. The G-866 is somewhat antiquated with respect to newer digital magnetometer models and changes should be made to the NTL that will accommodate digital technology.

STUDY RESULTS: Shipwreck frequencies in the GOMR have increased over time. Approximately 41 percent of all shipwreck losses with known dates of loss have occurred in the past 25 years and slightly over 77 percent have occurred in the past 50 years. This pattern is in large part a reflection of the great increase in the number of vessels operating in the Gulf of Mexico in the past 50 years, particularly fishing (shrimping) vessels, recreational craft, and vessels associated with the offshore oil and gas industry. Additionally, this pattern is a reflection of the underreporting of losses during earlier historic periods. Twentieth century fishing vessels, principally shrimp trawlers, comprise the largest class of vessels reported lost in the GOMR. The preservation potentials for shipwrecks in various areas in the GOMR appear to be somewhat better than had been anticipated by the 1989 study.

Areas where historic shipwrecks are most likely to occur and where remote-sensing survey should be conducted prior to development were identified. The delineation of these "high probability areas" relied on densities of reported shipwrecks and on the reliabilities assigned to positions of loss. Broad high probability zones were delineated where shipwreck densities were 25 or more within 0.5-degree areas. Reported shipwrecks with very poor or unknown reliabilities of position of loss were eliminated from this analysis. Other high probability areas were delineated relying on the reported locations of specific vessels and their assigned reliability of location. All lease blocks containing reported or discovered shipwrecks assigned the highest reliability rating of position are classified as high probability lease blocks. Additionally, all lease blocks containing the positions of reported shipwrecks assigned a good to moderate reliability of position are considered as high probability lease blocks. Further, following the lead of the 1989 study, because of the potential for some error in the actual positions of these losses the eight contiguous lease blocks around the one containing the vessel position are classified as high probability blocks.

Field investigations revealed that all magnetometers performed well in the survey trials, including the G-866, one of the “industry-standards” that we feel at this time has become antiquated although functional in most respects. Specific findings of the field investigations indicate that: 1) the order of which instrument records the highest amplitude appears generally to remain relatively constant, with the SeaSPY and G-877 exchanging places followed by the G-881 and then the G-866; 2) the 50-m interval is unlikely to be effective in identifying all wreck types in the GOMR, especially earlier wrecks containing less iron or small wooden vessels or parts of wooden vessels that produce smaller magnetic signatures. Therefore, it is recommended that in order to provide better detection capability for all types of shipwrecks, especially earlier wrecks which might be the most historically significant types within the GOMR, a closer spaced transect interval, such as the 30-m interval, should be considered by the MMS for employment in high probability areas; 3) given the computer-driven, digital nature of all instruments today, NTL requirements appear now to be outmoded and in need of revision at least for those magnetometers that are totally digital; 4) the investigation highlighted the submersible base station’s potential as an offshore tool in the collection of data for post-processing of magnetic survey data. Because of the release mechanism failure more in-field research is needed before we will recommend its use;

and 5) because contouring presents critical analytic data, it is recommended that even without the use of a base station, offshore magnetometer survey data should be contoured in situations where a survey is conducted as a single unit (i.e., not split over multiple days).

STUDY PRODUCT(S): 1. REPORT, 2. ACCESS DATABASES, 3. ARCVIEW GIS DATA

ACCESS NUMBER: 31054