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REMOTE SENSING SURVEY FOR THE GRAND ISLE RE-EVALUATION STUDY AND THE DREDGING OF BAYOU RIGAUD AND MARSH CREATION AREAS, JEFFERSON PARISH, LOUISIANA

FINAL REPORT
JANUARY 2005

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

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REMOTE SENSING SURVEY FOR THE GRAND ISLE RE-EVALUATION STUDY AND THE DREDGING OF BAYOU RIGAUD AND MARSH CREATION AREAS, JEFFERSON PARISH, LOUISIANA

Final Report

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Co-Principal Investigator

by

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January 2005

for

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New Orleans District
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ABSTRACT

This report presents the results of a Phase I Marine Archeological Remote Sensing Survey of the Grand Isle Re-evaluation Study, and the dredging of Bayou Rigaud and marsh creation areas in Jefferson Parish, Louisiana. R. Christopher Goodwin & Associates, Inc. conducted this investigation on behalf of the U.S. Army Corps of Engineers, New Orleans District (USACE-NOD) on September 19-22 and November 7-8, 2002, and May 12-17, 2003. The study was undertaken to assist the USACE-NOD in satisfying its responsibilities under Section 106 of the National Historic Preservation Act of 1966, as amended. All aspects of the investigations were completed in accordance with the Scope-of-Work, and the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* (Federal Register 44, 1983).

The survey area for this project consisted of six survey blocks. Block One, Bayou Rigaud, is a proposed dredging area measuring 22,176 ft by 200 ft wide (6,760 by 61m, 41.2 ha [101.8 ac]). Block Two, Grand Isle, measures 13,728 ft by 500 ft (4,180 by 152 m, 63.8 ha [157.6 ac]). Block Three comprises Fifi One, Fifi Two, and Fifi Clip; Block Three is located behind Fifi Island and encompasses a proposed breakwater alignment for the Grand Isle and Vicinity Hurricane Protection Project and a proposed disposal area (Fifi Clip). It measures 12,672 by 500 ft (3,860 by 152 m, 58.9 ha[145.5 ac]) and 3,000 by 880 ft (914 by 268m, 24.5 ha [60.6 ac]) for Fifi Clip. Block Four, south of Fifi Island, is approximately 3,917 by 572 ft (1,194 by 174m, 20.8 ha [51.4 ac]). Finally Block Five, also south and adjacent to Fifi Island, is approximately by 2,000 by 663 ft (610 by 202 m, 12.3 ha [30.4 ac]). A sixth area was added as a modification to the original scope of work and is located north of Bayou Rigaud and southwest of Fifi Island. It consisted of a survey block approximately 6,600 by 1,300 ft (1,022 by 396 m, 79.7 ha [197 ac]). In total, approximately 130 linear mi (209 km, 301.2 ha [744.3 ac]) of seabed were surveyed.

The objectives of this study were to identify specific targets that might represent significant submerged cultural resources within the project area, and provide the USACE-NOD with management recommendations for such resources. These objectives were met with a research design that combined background archival investigations and a marine archeological remote sensing survey.

The survey utilized a differential global positioning system (DGPS); a digital recording side scan sonar, a recording proton precession magnetometer, and hydrographic navigational computer software. The survey was conducted with a lane spacing of 50 ft (15.2 m) to ensure the greatest detail in coverage. The survey techniques ensured that any abandoned or wrecked historic vessels in the survey area would be detected.

The marine remote sensing survey registered a total of 1,005 individual magnetic anomalies, and 59 acoustic anomalies. From these anomalies, 179 possible target clusters were identified. Of these target clusters, 34 potentially represented submerged cultural resources and were examined to provide the USACE-NOD with recommendations. The remaining targets likely represented areas of scattered modern debris; no further study of these targets was recommended. None of the targets investigated represented a significant cultural resource and no further investigations were warranted or recommended.

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ACKNOWLEDGEMENTS

R. Christopher Goodwin & Associates, Inc., gratefully acknowledges the assistance of the numerous individuals from outside agencies and institutions who contributed to the Grand Isle Re-Evaluation Study, and the Dredging of Bayou Rigaud and Marsh Creation Areas Project. We particularly would like to thank the U.S. Army Corps of Engineers, New Orleans District's Ms. Joan Exnicios for her generous support and expert guidance. Additionally, the authors would like to thank the Louisiana University Marine Consortium (LUMCON) for the use of the *R/V Coli* survey vessel. Captains Samuel LeBouef and Craig LeBouef deserve special thanks for their expertise in captaining the vessel and the extra time and help they provided the survey crew on this project.

Special thanks also are due to the staff of the Louisiana Department of Culture, Recreation and Tourism, Office of Cultural Development, Division of Archaeology and Historic Preservation. Particular thanks also are extended to Mr. Steven Verry of NOAA for providing a prompt response to our request for information from the Automated Wreck and Obstruction Information System.

CHAPTER I

INTRODUCTION

This report presents the results of the Phase I Marine Remote Sensing Cultural Resources Survey of the Grand Isle Reevaluation Study. R. Christopher Goodwin & Associates, Inc. conducted the investigations on behalf of the United States Army Corps of Engineers, New Orleans District (USACE-NOD) from September 19-22, November 7-7, 2002, and May 12-17, 2003). This work was undertaken as part of the planning process related to the proposed construction of a breakwater, as well as dredging activities, and the deposition of dredge deposit in spoil areas. The current study took place entirely in Jefferson Parish, Louisiana, and included the area adjacent to Fifi Island, and the northern shore of Grand Isle; the dredging and marsh creation areas along Bayou Rigaud, also are included.

In keeping with the New Orleans District's mission to preserve, document, and protect significant cultural resources, a magnetic and acoustic remote sensing survey was undertaken to locate potential archeological remains and in so doing, assist the USACE-NOD in satisfying its responsibilities under Section 106 of the National Historic Preservation Act of 1966, as amended. All aspects of the investigations were completed in compliance with the Scope-of-Work; with 36 CFR 800, "Protection of Historic Properties;" with the Abandoned Shipwreck Act of 1987 (43 U.S.C. 2101 – 2106); with Abandoned Shipwreck Guidelines, National Park Service; with National Register Bulletins 14, 16, and 20; with 36 CFR 66; and with the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* (Federal Register 44, 1983).

The survey area for this project consisted of six survey blocks. Block One, Bayou Rigaud, is a proposed dredging area measuring 22,176 ft by 200 ft wide (6,760 by 61m, 41.2 ha [101.8 ac]). Block Two, Grand Isle, measures 13,728 ft by 500 ft (4,180 by 152 m, 63.8 ha [157.6 ac]). Block Three comprises Fifi One, Fifi Two, and Fifi Clip; Block Three is located behind Fifi Island and encompasses a proposed breakwater alignment for the Grand Isle and Vicinity Hurricane Protection Project and a proposed disposal area (Fifi Clip). It measures 12,672 by 500 ft (3,860 by 152 m, 58.9 ha[145.5 ac]) and 3,000 by 880 ft (914 by 268m, 24.5 ha [60.6 ac]) for Fifi Clip. Block Four, south of Fifi Island, is approximately 3,917 by 572 ft (1,194 by 174m, 20.8 ha [51.4 ac]). Finally Block Five, also south and adjacent to Fifi Island, is approximately by 2,000 by 663 ft (610 by 202 m, 12.3 ha [30.4 ac]). A sixth area was added as a modification to the original scope of work and is located north of Bayou Rigaud and southwest of Fifi Island. It consisted of a survey block approximately 6,600 by 1,300 ft (1,022 by 396 m, 79.7 ha [197 ac]). In total, approximately 130 linear mi (209 km, 301.2 ha [744.3 ac]) of seabed were surveyed. The following coordinates delineate the survey areas (in State Plane) starting at the southwest corner:

Block One (Bayou Rigaud):

3708321.68 E X 272712.26 N
3708138.15 E X 272834.62 N
3721020.76 E X 284412.14 N
3721204.29 E X 284243.91 N

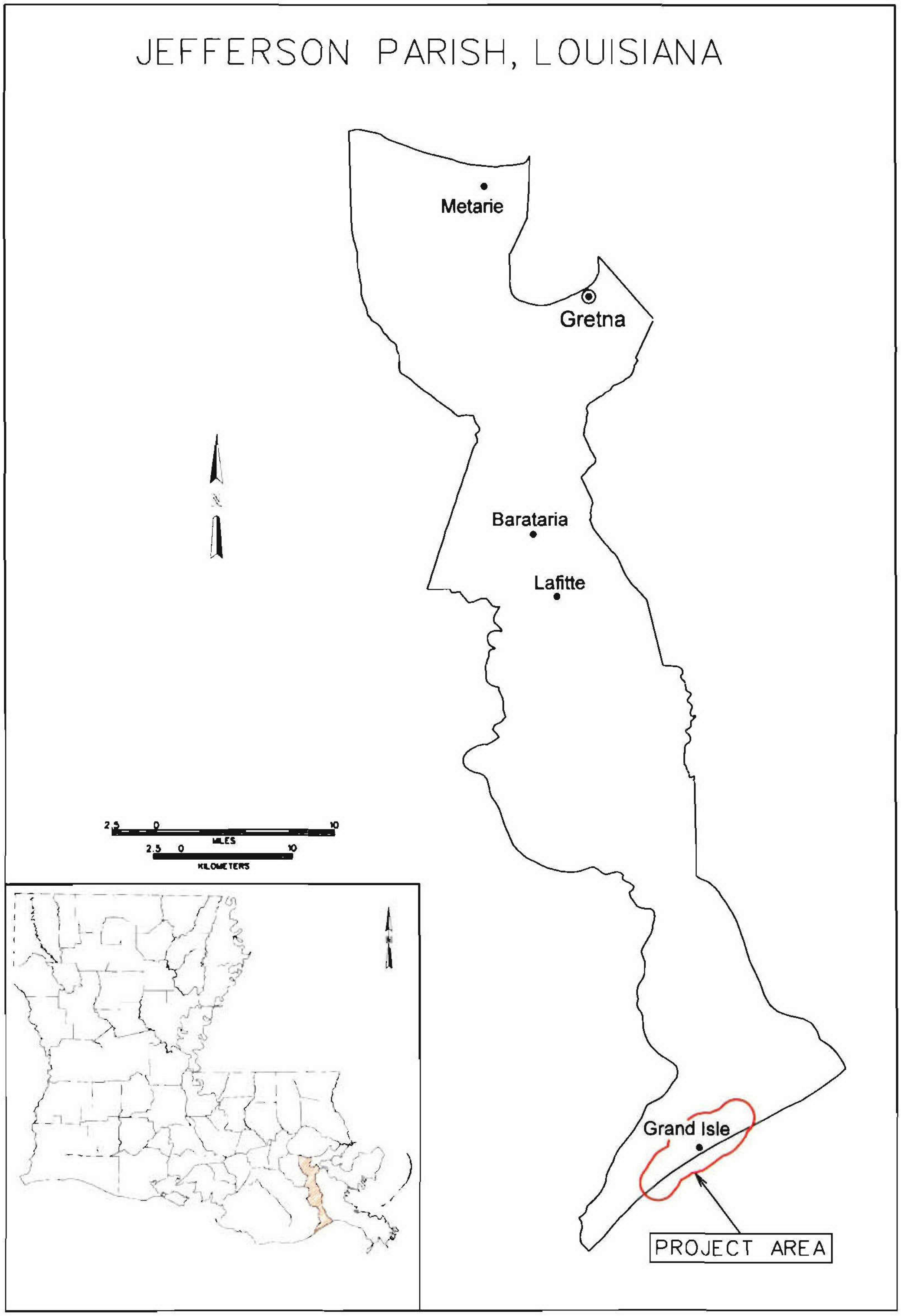

Figure 1. Map of Louisiana with project location marked.

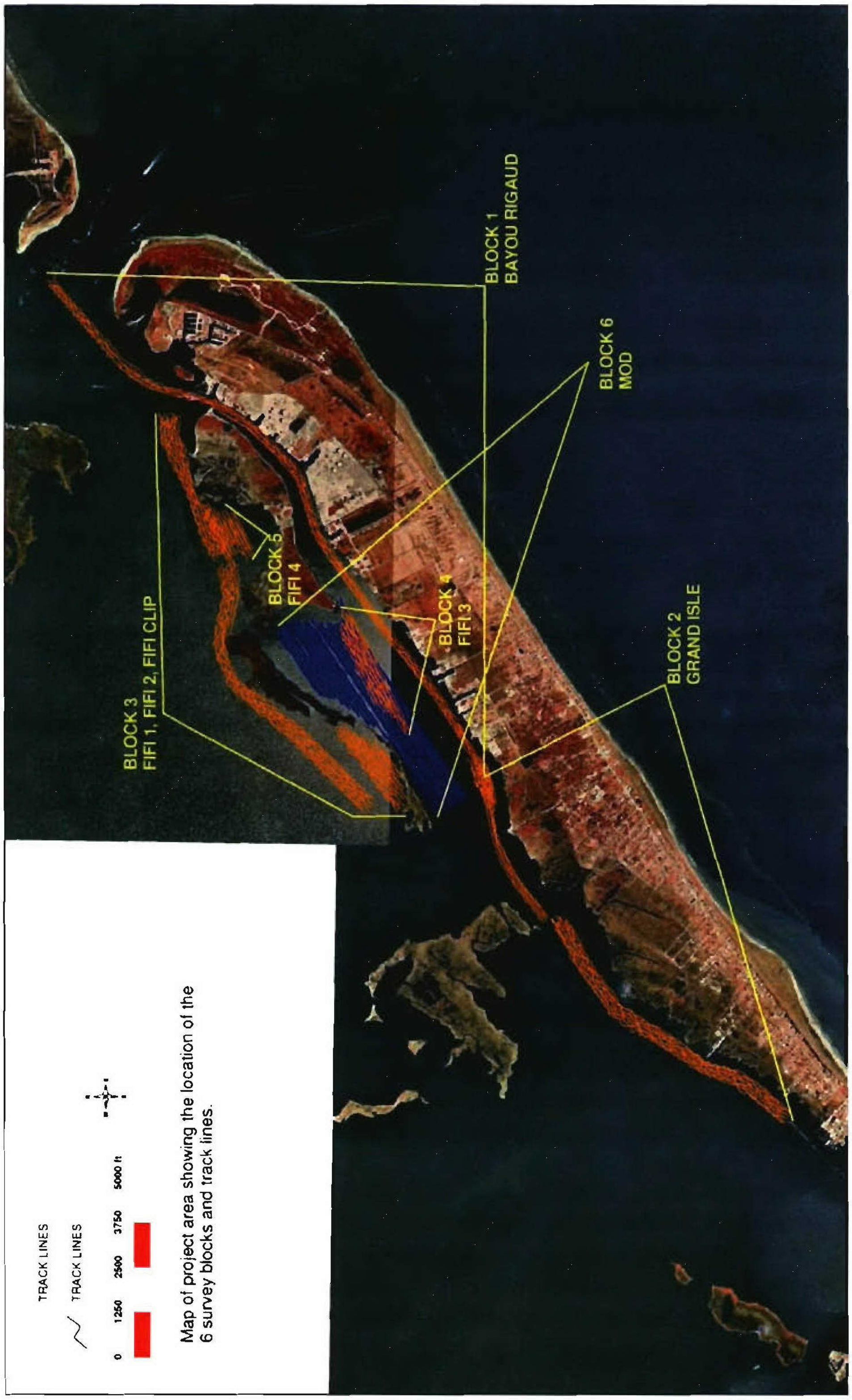

Figure 2. Map of project area showing the location of the six survey blocks and track lines.

Block Two (Grand Isle):
3697724.46 E X 263454.22 N
3697281.71 E X 263818.83 N
3707419.94 E X 272557.11 N
3707533.12 E X 272073.53 N

Block Three (Fifi One, Fifi two, and Fifi Clip) (irregular survey area):
3706036.00 E X 274597.20 N
3706133.10 E X 275632.87 N
3710683.93 E X 279715.09 N
3717237.77 E X 281262.53 N
3717237.77 E X 280752.78 N
3707625.47 E X 274708.68 N

Block Four (Fifi Three) (irregular survey area):
3708009.38 E X 274048.26 N
3708342.99 E X 275157.68 N
3709623.10 E X 277392.06 N
3711244.57 E X 278160.13 N
3712330.72 E X 276096.43 N

Block Five (Fifi Four):
3713519.88 E X 277980.21 N
3712678.40 E X 279129.16 N
3714690.40 E X 280110.88 N
3714668.83 E X 278492.65 N

Block Six (MOD) (irregular survey area):
3706529.00 E X 272624.00 N
3705860.00 E X 273740.00 N
3708738.00 E X 277062.00 N
3710927.00 E X 279449.00 N
3711018.00 E X 278502.00 N
3711998.00 E X 276308.00 N

Research Objectives and Design

The objectives of the Grand Isle Reevaluation Study remote sensing survey were to identify all submerged and visible watercraft and other maritime related cultural resources in the project area; whenever possible, to assess the National Register of Historic Places (NRHP) eligibility of identified resources, applying the criteria for evaluation (36 CFR 60.4 [a-d]); and to provide the USACE-NOD with management recommendations for such resources. These objectives were addressed through a combination of archival research and field survey. The background study and history of the project area were researched through examination of archeological site files for the State of Louisiana, local historical literature files, previous cultural resources investigations conducted in the vicinity of the project area, historic maps, relevant primary map and microfilm records, and secondary literature.

Field survey of the project area was conducted from a 19-ft research vessel leased from the Louisiana University Marine Consortium (LUMCON). Mr. Samuel LeBouef and Mr. Craig LeBouef captained the vessel. All parallel track lines or transects were spaced at 50 ft (152 m) intervals. The first project area, located at Bayou Rigaud, was divided into 5 parallel track lines or transects. The survey area at Grand Isle was divided into 11 parallel track lines. Behind Fifi Island, the survey area consisted of 18 track lines that ran parallel to the axis of the survey block. In the fourth area, 48 track lines were run at the same interval as the other survey areas. The fifth area was surveyed along 45 track lines. The sixth area, which was added as a modification, consisted of 65 track lines. Many of the track lines in the fourth, fifth, and sixth areas could not be run due to the shallow water. The equipment array used for the Grand Isle Reevaluation Study survey included a DGPS, a proton precession marine magnetometer, a side scan sonar, and a fathometer. Data were collected and correlated by a laptop computer using hydrographic survey software. Data were inventoried, post-processed and analyzed to identify specific targets within the project area that might represent significant submerged cultural resources.

R. Christopher Goodwin, Ph.D., served as Principal Investigator for this project. Mr. Jean B. Pelletier, M.A., served as Project Manager and directed all aspects of data collection and its subsequent analysis, with the assistance of Remote Sensing Specialists, K. Harley Meier, M.A., Samuel Turner, Ph.D., Walter L. Graves, B.A., and Jesse B. Kulp, B.A. Katy Coyle, M.A. wrote the history for the study. Rebecca Sick, M.A., R.P.A., authored the natural and prehistoric settings research. David Stitcher, B.A., executed the graphics and Ms. Heidi Post produced the report.

Organization of the Report

This report develops the natural and historical contexts of the project area as the basis for analysis and interpretation. The geological and natural settings of the project area are discussed in Chapter II. Chapter III discusses the prehistoric cultural setting of the area. Chapter IV is a review of the major historical themes that influenced the region, while Chapter V is an examination of the previously conducted research of the project vicinity. Chapter VI reviews research methods and sources used during archival and archeological research and the instrumentation and methods employed during the field survey. Chapter VII presents the results of the archival research effort and the survey results. A summary of the study and management recommendations is provided in Chapter VIII. Appendix I contains resumes of key project personnel, while an inventory of identified acoustic anomalies, magnetic anomalies and target clusters is included as Appendix II.

CHAPTER II

NATURAL SETTINGS

Introduction

This chapter focuses on the natural and anthropogenic forces and elements that may have played a role in the development of prehistoric and historic lifeways on Grand Isle, Jefferson Parish, Louisiana. The intent of this discussion is to examine the role of the natural environment in the settlement patterns of the region, and more specifically, the effects of natural forces on the placement and taphonomic history of the study region. Floral communities present in the region also are reviewed in this chapter, as are the faunal communities that probably were available to the residents of Grand Isle, Jefferson Parish, Louisiana.

Natural Settings

Because of the dynamic nature of the Mississippi River deltaic plain, both prehistoric and historic inhabitants of the Grand Isle area were forced to select specific locations to establish the communities from which they could exploit the rich and varied natural resources of the region. In addition, the dynamic deltaic processes determined how the archeological deposits that accumulated in association with these communities, were either preserved or destroyed. Therefore, in the deltaic plain, there should exist a strong relation between the distribution of archeological deposits, specific deltaic landforms, and subsequent depositional and erosional pressures.

Grand Isle consists of a linear landscape feature that trends from northeast to southwest. It separates the large, estuarine Barataria Bay to the north from the Gulf of Mexico to the south (Figure 3). Barataria Bay occupies the southern end of a large interdistributary basin that lies between the modern meander belt of the Mississippi River to the east and the major, abandoned Bayou Lafourche distributary to the west (Kosters 1989).

In this region, the Mississippi River deltaic plain forms a substantial part of southeastern Louisiana. It is defined by the deltaic distributaries and intratidal wetlands of the delta lobes (subdeltas). Along the coast, it also includes features and areas where deltaic deposits have been reworked by marine processes, such as barrier islands. Barataria Pass, formerly known as Grand Pass, lies between the barrier islands of Grand Isle to the west and the westernmost of three islands that form the Grand Terre complex to the east (Figure 3). It is located in extreme southeastern Jefferson Parish, Louisiana, approximately 75 km (47 mi) south of New Orleans and 72 km (45 mi) west of the active mouth of the Mississippi River (Head of Passes).

Grand Isle essentially is coincident with the community of Grand Isle, one the very few permanently occupied communities on or within a few kilometers of the Gulf shoreline in Louisiana. The town has a permanent population of approximately 1,500, most of whom are employed in the tourism, seafood, and oilfield industries. Seasonally, however, the population may swell to several times that number.

Grand Isle is a low, slightly undulating sandy, island with an elevation of only 1.8 to 2.1 m (6 to 7 ft) above sea level (NGVD) (Conaster 1969). Three types of terrain generally exist on this island. Specifically, they consist of an active beach with dunes, a zone of beach ridge accre-

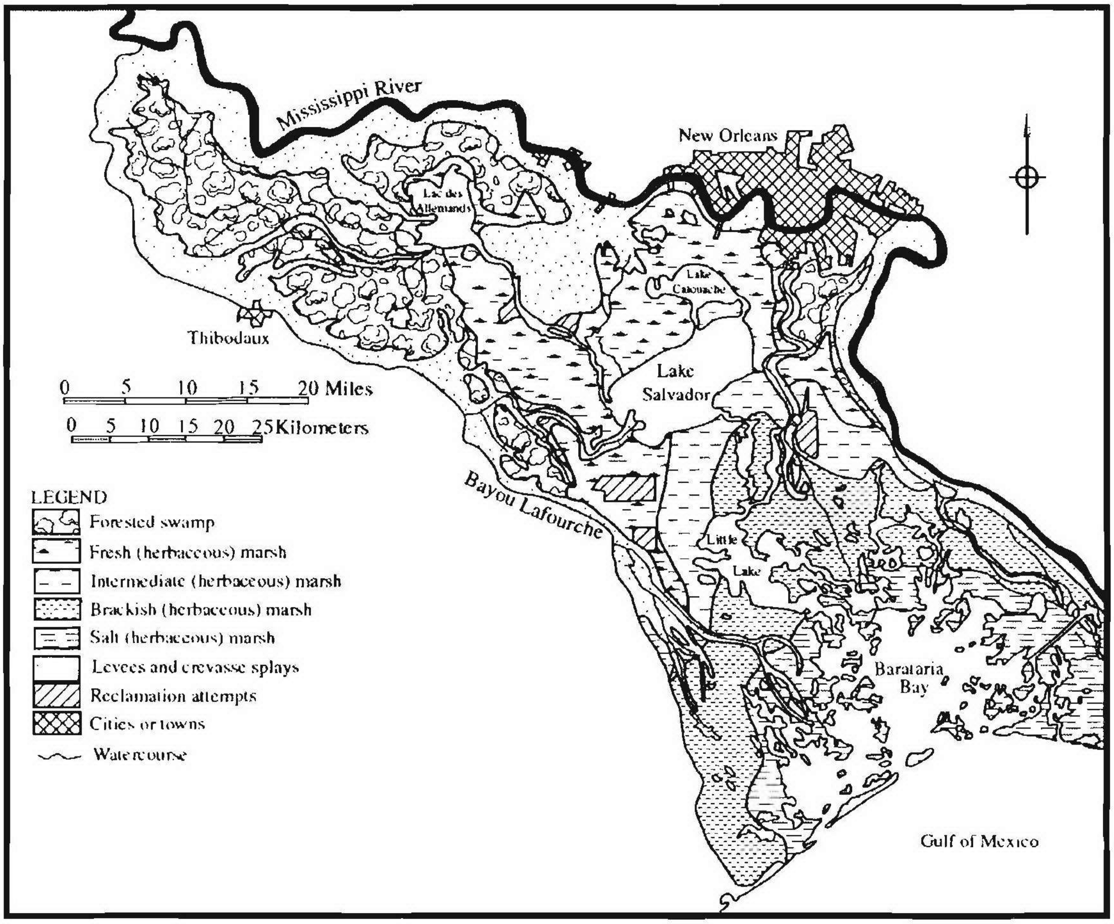

Figure 3. **Physiographic map of the Barataria Basin (Modified and redrawn from Kosters 1987 with permission).**

tion and washover deposits, and a bay-side zone of intratidal wetlands. These terrains are difficult to discern on Grand Isle due to urbanization and industrialization. The beach and seaward margins of Grand Isle have been modified heavily by artificial beach nourishment, groins constructed to catch longshore sediment drift, and a jetty built at the east end of the island in 1958 (Penland et al. 1986).

Geomorphic Overview

The low, flat deltaic plain environment and landscape in which Grand Isle is located has had a profound effect on where and how humans have lived and subsisted in both prehistoric and historic times. Wetlands are vast and plentiful in the region, but habitable land is scarce. Changes in the physical landscape and biological communities due to extremely rapid geomorphic processes have been dramatic even in relatively recent times. Elevation differences of as little as a few centimeters can make a difference between habitable and uninhabitable conditions, and these areas are changing constantly. Thus, an understanding of the character and rates of the natural processes and the resulting geomorphic setting are critical to predicting where populations may have lived, how they subsisted, and how and where their cultural remains may be preserved. This section describes the natural processes that are at work in the immediate site area, the evolving natural landscape, and the nature of man/land relationships through time.

There is a voluminous body of technical literature available to call upon for a description of the structural framework, geologic processes, sedimentary architecture, environments of deposition, and chronology of the project vicinity. Similarly, there is a substantial body of published and unpublished data on the geomorphology of the region that is directly applicable to geoarcheological investigations. The following pages review both comprehensive syntheses (Autin et al. 1991; Saucier 1994; Saucier and Snead 1989), and recent project-specific geomorphic evaluations in the immediate project area (Saucier 1996, 1997).

Regional Physiography

Physiographically, Grand Isle is situated in the Mississippi River deltaic plain subsection of the Lower Mississippi Valley section of the Gulf and Atlantic Coastal Plain Province of North America (Murray 1961). The deltaic plain consists of a near-sea-level, flat alluvial plain of approximately 39,960 km^2 (15,430 mi^2) in area. This plain is dominated by long, low, narrow distributary ridges that are separated by broad interdistributary wetlands (intratidal swamps and marshes). This area contains the Lafourche Delta Complex, the Barataria Interlobe Basin, and the Interdistributary Marsh physiographic features. Each of these features is described below.

Lafourche Delta Complex

In the central part of the deltaic plain, there is an unusually complex pattern of southeastward-trending, branching, and sometimes interconnected distributaries that constitute the Lafourche Delta Complex (also sometimes referred to as subdelta or delta lobe), one of several major deltaic plain components. Locally, the area, which includes Grand Isle, is referred to as the Barataria Interlobe Basin. As far as the island is concerned, several physiographic elements are especially significant. The Barataria Interlobe Basin is a 150 km long basin that lies between the natural levees of Bayou Lafourche to the southwest and the natural levees of the Mississippi River to the northeast (Goodwin et al 1982). The basin opens into Barataria Bay, and consists of brackish and saline marsh, as well as open water.

Each of the deltaic distributaries of the Lafourche complex once conveyed Mississippi River discharge, carried a significant suspended sediment load, periodically overtopped its banks during seasonal floods, and built prominent natural levees that constitute the topographic ridges. When the distributaries were active, the stream channels were considerably larger than the present ones, which are now underfit streams with insignificant flow. These distributaries also are "perched" streams in that they are isolated from adjacent wetlands by flanking natural levee ridges.

The prominent Lafourche ridge forms a drainage divide that separates the Terrebonne Coastal Region from the Barataria Basin to the east and north. The natural levee ridge that flanks Bayou Lafourche is the largest and most prominent in the area, averaging approximately 1.5 km (0.9 mi) in width and with crest elevations immediately adjacent to the bayou of approximately 2.1 m (7 ft) above sea level (NGVD). From the crests, the levee surfaces on each side of the channel slope gently outward to the elevation of the adjacent wetlands which is only about 0.3 to 0.6 m (1 to 2 ft) above sea level. The topographically prominent levees along the nearby Bayou Blue distributary are considerably smaller, indicating a smaller original discharge and/or a shorter length of activity, and an older age (reflecting the progressive effects of subsidence). The Bayou Blue ridge has a total width of only approximately 400 m (1,300 ft), and the highest crest elevations are only approximately 0.9 m (3 ft) above sea level. Irrespective of these small dimensions, the levees have provided the only permanently habitable and arable land in the area.

Barataria Interlobe Basin

As mentioned above, Grand Isle lies within the Barataria Interlobe Basin. The apex of the basin is found at Donaldsonville, Louisiana, where Bayou Lafourche branches off the Mississippi River. From this point, the Barataria Interlobe Basin extends southward for approximately 150 km (240 mi) to Grand Isle, and it widens to approximately 50 km (80 mi) at the Gulf of Mexico. The topography of the basin is marked by lakes, lacustrine deltas, distributary channels, natural levees, drainage channels, and extensive swamps and marshes. The vegetation within the area ranges from forested fresh water swamp at its apex to treeless salt water marsh along its gulfward edge (Kosters 1989).

The Barataria Interlobe Basin is a large interdistributary basin that lies between the still subaerial portions of the Lafourche delta complex to the west, the Plaquemines delta complex to the east, and the Metairie-St. Bernard delta complex to the north (Figure 3). At various times, crevasse splays, deltaic distributaries, and even the Bayou des Families delta lobe of the Metairie-St. Bernard delta complex have covered portions of the Barataria Interlobe Basin. Only the youngest of these delta splays, distributaries, and lobes have not subsided entirely beneath the marsh, swamp, and open water that covers the Barataria Interlobe Basin (Kosters 1989).

Open bodies of water also are a major characteristic of the Barataria Interlobe Basin. They vary greatly in size from ponds that measure only a few meters (tens of feet) in diameter to large intra-basin lakes such as Lac des Allemands, Little Lake, and Lake Salvador. The sizes of the water bodies (e.g., the bays, lakes, and drainage channels) typically increase from north to south until they merge to create the large interdistributary bays such as Barataria Bay, Bay des Ilettes, and Caminada Bay, that fill the gulfward portion of the basin (Figure 3) (Kosters 1989).

Interdistributary Marsh

Within Barataria Bay, the interdistributary marsh is comprised of series of small islands that lie along the Barataria Bay Waterway. These islands consist of small, flat, and waterlogged patches of salt marsh. Between the north shore of Barataria Bay and Little Lake, the interdistributary marsh consists of irregular strips and expanses of flat wetlands. In this area, the marsh is riddled with lakes, bays, and tidal channels of varying sizes. The tidal channels vary in size from highly sinuous channels that measure only a few tens of meters in width and less than a kilometer in length to channels as large as Grand Bayou and Bayou St. Denis. The tidal channels, bays, and lakes fragment the interdistributary marsh into a number of irregular strips and blocks.

Within Barataria Bay, the interdistributary marshes are underlain by 2 to 3 m (6 to 10 ft) of peat, peaty clay, clayey peat, and muck. These deposits bury older delta plains and deposits of both the Bayou Blue delta lobe of the Lafourche Delta Complex and the older Bayou des Families delta lobe of the Metairie-St. Bernard delta complex. These sediments represent accumulations of organic and inorganic sediments in interdistributary marshes and bays over the last several hundred years (Frazier 1967, Levin 1990, 1991).

North of Barataria Bay in the area of Bayou St. Denis and Little Lake, the interdistributary marshes are underlain by 50 to 150 cm (20 to 60 inches) of peat and clayey peat. These sediments overlie approximately 5 m (16 ft) of organically-poor, parallel-laminated mud that contains large pieces of macerated plants and numerous thin, silty sand layers. Koster (1989) believes that these sediments represent a period of rapid accumulation of prodelta deposits associated with the development of the Lafourche Delta Complex followed by the slow, in-place accumulation of organic-rich interdistributary marsh sediments.

Geologic Setting and Processes

In the project vicinity, the Mississippi River deltaic plain overlies the northern portion of the east-west trending Gulf Basin, a deep structural trough where the continental crust (Paleozoic basement rocks) has been depressed and where mostly unconsolidated sediments of fluvial, estuarine, and marine origin have accumulated to a thickness of tens of thousands of meters. The northern flank of the Gulf Basin is characterized not only by prevailing subsidence but also by east-west trending zones of active growth faults and the diapiric intrusion of salt to form piercement-type salt domes (Murray 1961).

More specifically, the deltaic plain is the surface manifestation of a relatively thin, seaward thickening prism of Holocene deltaic and shallow marine deposits that overlies Pleistocene deposits of similar origin and still older ones with depth (Kolb and VanLopik 1958). Where rivers like the Mississippi and the Pearl carved deeply entrenched valleys into the Prairie complex during periods of lower sea levels, the Holocene prism in coastal Louisiana is usually separated from the Prairie complex by a thick zone of Pleistocene glacial outwash. Called the substratum, this zone consists of tens of meters of mostly sands and gravels deposited by braided streams.

In general, the prism of Holocene topstratum deposits represents a series of distinctive onlapping sedimentary cycles initiated by upstream diversions of river flow, each cycle being the correlative of a discrete delta complex (Figure 4). Each cycle is characterized by sediments laid down in multiple environments of deposition ranging from fresh water to saline in the dynamic zone of interaction where the river emptied into the Gulf. As illustrated in Figure 5, the cumulative result of multiple cycles has been the net buildup and seaward buildout of the delta plain. In turn, each delta complex consists of a series of delta lobes, a lobe being defined as that portion of a complex that formed during a relatively short period of time and that can be attributed to a single or discrete set of delta distributaries (Saucier 1994). Because of the prevailing influence of subsidence and sea level rise, each lobe typically has experienced a constructional or progradational phase in which fluvial processes dominate, and a subsequent destructional or transgressive phase in which marine processes become progressively more dominant. The particular environments that are represented in the site area are discussed in the next section of this chapter.

To understand the reasons for delta cycles, the sedimentary architecture of complexes and lobes, and the nature and distribution of depositional environments, it is necessary to recognize the prevailing influence of subsidence and sea level rise, especially during the waning of the last major continental glaciation and the resulting Holocene sea level transgression. The five basic factors involved in subsidence are true or actual sea level rise, sinking of the basement rocks due to crustal processes, consolidation of the thick sedimentary sequence in the Gulf Basin, local consolidation of nearsurface deposits due to desiccation and compaction, and tectonic activity. The relative roles of each of the factors are discussed at length by Kolb and VanLopik (1958) and are not repeated here; rather, attention is focused on the net result of the processes and the response of the deposits and landforms in the project area.

Since the geologic history of Grand Isle from an archeological perspective involves only the last 2,000 years, it is sufficient to say that most geologists believe sea level was *at most* only a few meters lower than its present level at that time (Penland, Suter and McBride 1987). Sea level rose slowly thereafter and attained essentially its present level between 3,000 to 3,500 years ago (Saucier 1994). Prior to that time, sea level rise was a major component of subsidence and rates were probably on the order of 6.0 mm/yr. However, since about 3,500 years ago, with sea level relatively stationary, the regional subsidence rate in the study area is estimated at approximately 1.1 to 1.5 mm/yr. Although this rate is quite low compared to the entire Holocene (i.e., the last 12,000 years), nevertheless it has been responsible for significant landform and ecological changes in the site vicinity--changes that at least indirectly had an influence on prehistoric human activities.

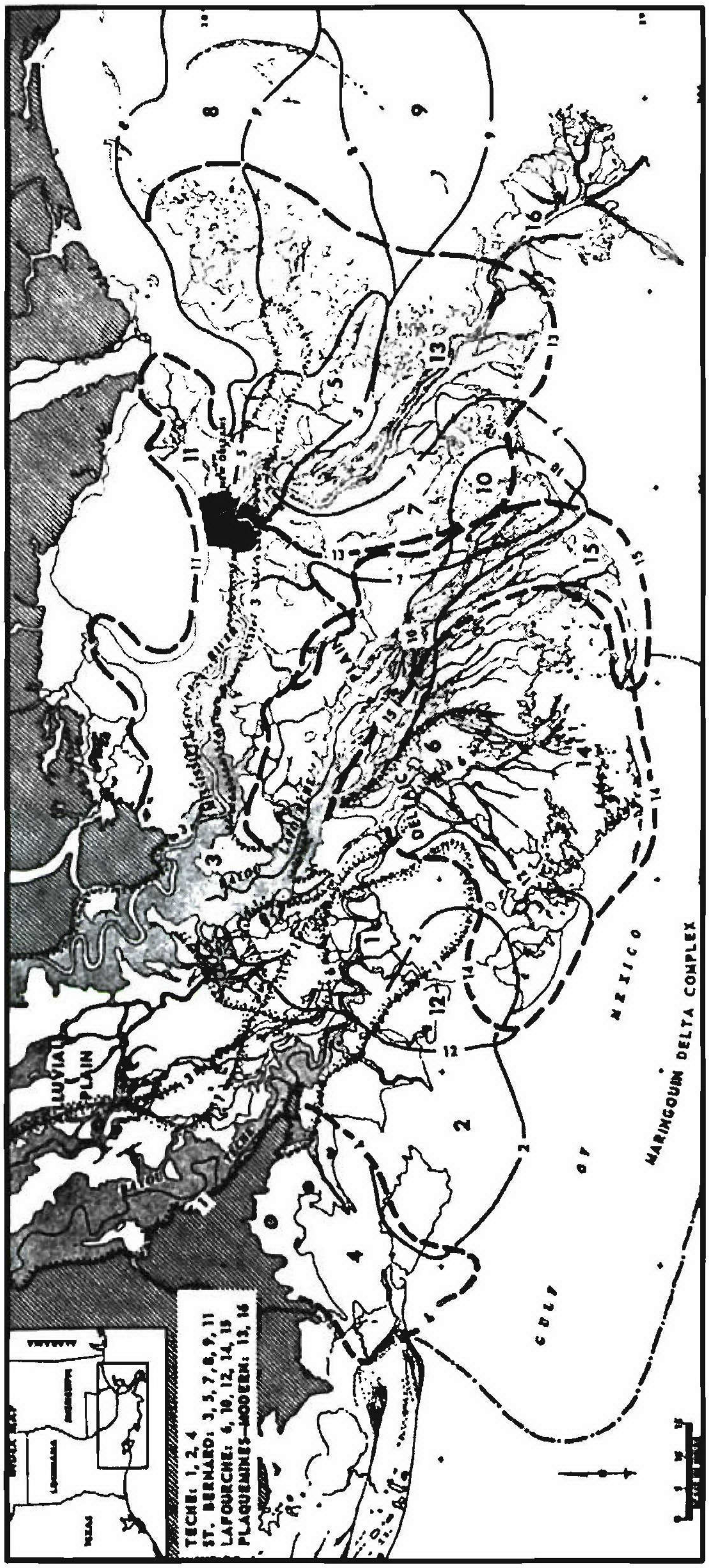

Figure 4. Delta complexes and lobes formed by the Mississippi River during the Holocene (Frazier 1967).

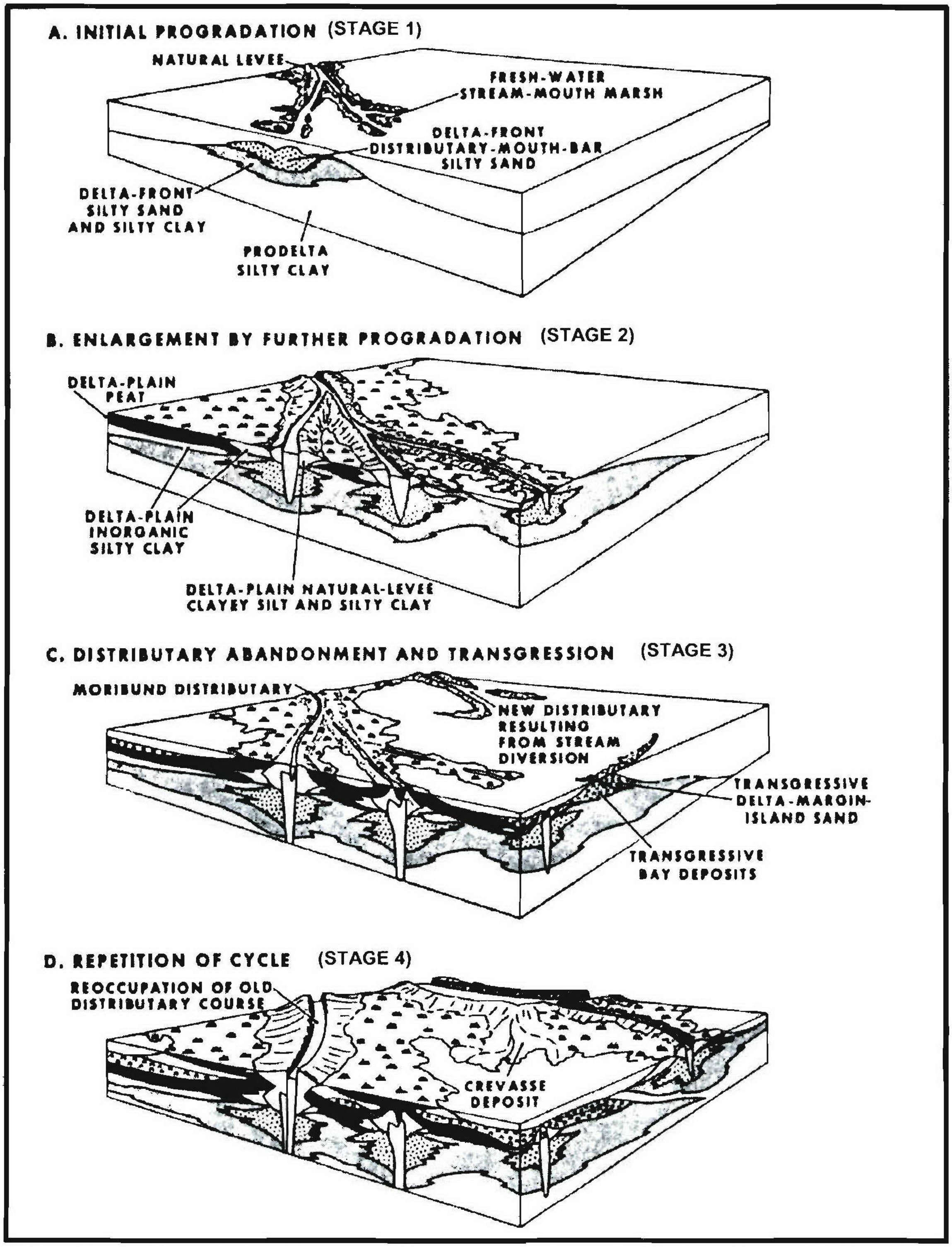

Figure 5. Depositional environments and sedimentary facies associated with the four typical phases of a delta lobe cycle (Frazier and Osanik 1965).

Deltaic Geomorphic Processes

Before a description of the particular depositional environments in the project area can be made, it is necessary to discuss briefly the various stages in the growth (progradation) and decay (abandonment and transgression) of a delta lobe in order to appreciate its landscape dynamics (Figure 5). A cycle begins with an upstream avulsion, possibly initiated as a major crevasse, in which river flow and fluvial sediment are introduced into a shallow basin between older lobes or complexes (Figure 5). Initial sedimentation consists of prodelta silty clays that are deposited basinwide from materials carried in suspension during major floods (Figure 5A). Off the mouth of a newly formed channel, delta-front silty sands and silty clays accumulate rapidly and the water shoals. As the channel reaches a given point, distributary mouth bars accumulate rapidly and deltaic sediments emerge in the form of mudflats and bars. These are vegetated rapidly with freshwater marsh species. During the following years and decades, the marsh is inundated periodically during floods and the suspended sediment, mostly silts and clays, accumulates along the sides of the active distributary channel, beginning the process of natural levee growth. The mouth of the distributary advances seaward, mostly during major floods when rates of progradation may be on the order of several hundred meters per event.

During the next stage in the cycle (Figure 5B), as the distributary mouth advances past the given point, the distributary channel grows wider and deeper to accommodate increased discharge. Concurrently, the natural levees subside into the softer underlying deposits but still achieve net growth (increased height and width) through the addition of new sediments. The natural levees soon acquire their typical prism or wedge cross-sectional shape. It is during this stage that extensive freshwater marshes essentially replace shallow brackish water in the interdistributary basins and peat and highly organic clays begin to accumulate under the influence of progressive slow subsidence.

While the deltaic lobe is still enlarging, natural levee growth occurs by way of sheet flooding during high water stages and the occasional concentration of flow in small crevasses. As the delta lobe nears maximum enlargement (latter part of stage B, Figure 5) and natural levees approach maximum height, crevasses become much less numerous, although those that form are larger and more persistent. They occur along distributaries in a lobe, but they also may occur upstream along the trunk channel. Each crevasse consists of one or more distributary-like channels that radiate from a breach in the natural levee and that divert flood flow from the distributary into the adjacent interdistributary wetlands. If flow is renewed during multiple flood events, the crevasse channels develop their own natural levee ridges. Thus, each crevasse system is in effect a miniature delta lobe.

Throughout the stage of lobe enlargement, natural levee ridges are large enough to support deciduous hardwood forests in all but the most Gulfward or distal ends of the distributaries, where occasional inundation by brackish water allows only salt-tolerant shrub growth. The end of the stage of lobe enlargement marks the maximum extent of freshwater conditions in the interdistributary wetlands. In addition, because river discharge through the lobe is nearing its maximum, there are appreciable amounts of turbid flood water reaching the interdistributary basins through crevasses, and the consequent deposition of appreciable amounts of clays. Because of these factors, the upper parts of the interdistributary basins are able to support cypress-tupelo swamps. Swamp forest vegetation also occurs toward the central part of the lobes in bands between the distal flanks of the natural levee ridges and the fresh to brackish marsh toward the centers of the basins. In both swamps and marshes, the accumulation of peats and organic matter helps maintain the near-sea-level surface elevation as regional subsidence continues.

After a delta lobe builds seaward over a period of centuries and it essentially fills an estuarine area, conditions of stream gradient, channel hydraulic efficiency, and other factors begin to favor an upstream diversion or avulsion. When this eventually takes place, the delta lobe enters a stage of abandonment and deterioration; with declining discharges, sedimentation rates (both organic and inorganic) are no longer able to exceed or even keep pace with subsidence rates. Several important changes in physiography, environments, and geomorphic processes begin to occur as shown in Figure 5C.

At the proximal end of the lobe, the most noticeable change is the progressive downstream filling (shallowing and narrowing) of abandoned distributary channels. Over a time frame measured in decades to a few centuries, the channels in that area evolve into slackwater streams or in some cases swamp-filled depressions. At the distal end of the lobe, changes are much more dramatic and rapid. Nearshore processes of wave action and longshore currents in the Gulf begin to erode and rework distributary mouths, and the coarser sediments accumulate in beaches and spits that begin to migrate landward. Slightly farther inland, subsidence and salt-water intrusion begin to take their toll. Brackish marsh evolves into saline marsh in interdistributary basins and begins to break up as tidal channels, lakes, and bays enlarge and become more numerous. Along the distributaries, natural levees subside progressively more from south to north, and they are encroached upon laterally by the adjacent wetlands. The hardwood forests of the levees give way to cypress-tupelo swamp, and swamp areas die out and are replaced by brackish marsh. Longitudinally, at the distal ends of the distributaries, levees eventually disappear beneath sea level and may be discernible for a while only by marsh drainage and slight differences in marsh vegetation types.

Reconstruction of the history of the deltaic plain indicates that delta lobe deterioration can proceed to widely varying degrees before a new cycle is initiated by an upstream river avulsion (Figure 5C). Moreover, the next cycle may affect an area adjacent to the old one or an entirely different part of the deltaic plain. Since subsidence is ubiquitous, eventually the decaying lobe, or the area that it occupied, will be overlapped by a new one.

Focusing on the erosional phase of an abandoned delta lobe (Figure 5D), Penland and Boyd (1985) have developed a three-stage evolutionary model (Figure 6). A lobe (or complex) is successively transformed from an erosional headland with flanking barriers (Stage 1) to a transgressive barrier island arc (Stage 2), and finally into a subaqueous inner shelf shoal (Stage 3). Subsidence of the abandoned delta plain and marine reworking are the key elements in driving the evolution of each barrier shoreline in Louisiana. Subsidence causes changes in sediment supply and in the physical process environment which, in turn, induces the sequential stages observed during the evolution of deltaic barrier shorelines. An erosional deltaic headland sediment source is the key factor in the interpretation of barrier shoreline genesis.

The Bayou Lafourche coastal barrier system represents the largest example of an erosional headland with flanking barriers (Stage 1) on the Louisiana coast. The barrier system consists of the Bayou Lafourche erosional headland, the Caminada-Moreau coast, and two nearly symmetrical sets of flanking barriers. These barriers are the Caminada Pass spit and Grand Isle to the east and the Timbalier Islands to the west (Figure 3). These barriers have developed since the abandonment of the Bayou Lafourche distribuatry. The shoreface has retreated, actively reworking the distributary bodies of Cheniere Caminada. The sediment dispersal pattern consists of longshore sediment transport divergence from the central erosional headland, and sediment accumulation downdrift in marginal spits, flanking barrier islands, and tidal inlets both east and west of the erosional headland.

Depositional Environments

Largely as a result of the geologic study by Conaster (1969, 1971), considerable data are available on the six depositional environments of Grand Isle, Jefferson Parish, Louisiana. The most conspicuous elements of the island are the active beaches. These are low, gently sloping features composed of fine sand with shells and shell fragments. The beaches surrounding Grand Isle have been enlarged extensively by groins and artificial beach nourishment; thus they now have a width of approximately 601 m (2000 ft) at the northeast end of the island as compared with an early historic-period width of less than 100 m (328 ft). Behind the beach is a low dune ridge measuring approximately 15 m (50 ft) in width and only 1.8 to 2.1 m (6 to 7 ft) in height. The dunes on the island consist of fine to very fine sand, and are sparsely vegetated with beach grasses and have suffered major damage as a result of hurricane storm waves. Submarine bars (or offshore bars) are present offshore from the beaches of Grand Isle and they extend seaward for as much as

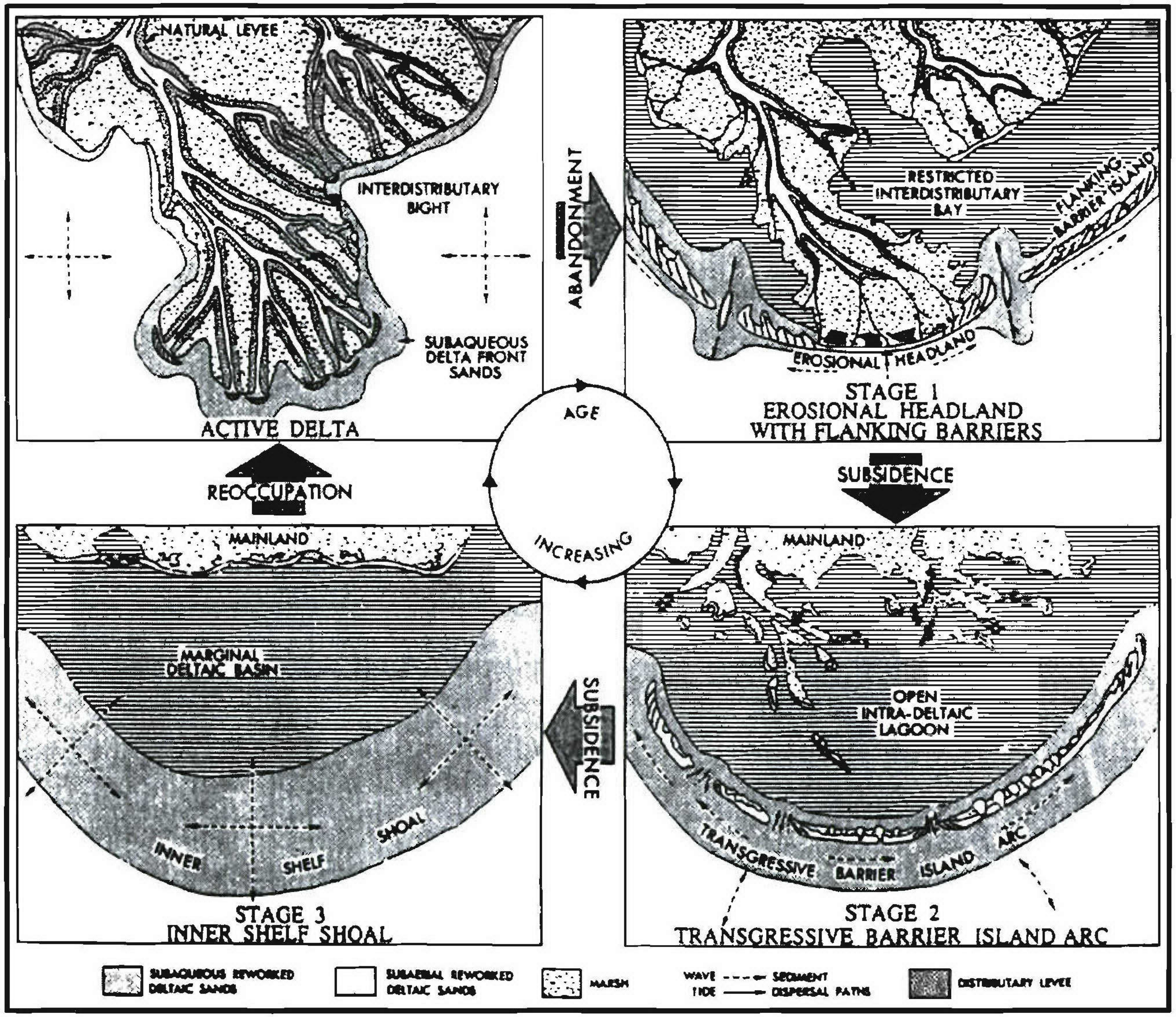

Figure 6. Three typical stages in the transgressive depositional history of an abandoned Mississippi River delta complex (Penland et al. 1981).

3,000 m (9,840 ft) off the eastern end of the island. The bars generally are submerged, but they may become emergent at very low tide.

Behind and inland from the dune ridge, the landscape of Grand Isle consists of tracts of narrow, linear accretion ridges separated by narrow swales. The ridges measure approximately 1.2 m (4 ft) in hight, and as many as 35 ridge units are present. Each ridge represents a shoreline position of a beach and dune ridge that was stable for a brief interval during an overall period of seaward buildout. The pattern of ridges and swales indicates the direction of net island growth; which in the case of Grand Isle, has been to the northeast. Especially on the southwestern half of the island, the accretion topography is veneered with washover-fan deposits. These are sheet-like sand deposits created when storm surges broke through the dune ridge and flowed across the island into the adjacent bay waters.

Marsh deposits on the bay side of Grand Isle probably are underlain by washover deposits that were laid down in shallow water and subsequently colonized by brackish-water vegetation during tidal cycles. However, it cannot be dismissed that some remnants of interdistributary deposits of the distal end of the Lafourche Complex delta lobe against which barrier island accretion has taken place still exist.

Subsurface Stratigraphy

Conaster (1969, 1971) has investigated the stratigraphy of the upper 97 m (320 ft) of the subsurface of Grand Isle using the logs of more than 100 stratigraphic borings. The sedimentary sequence of the island consists dominantly of prodelta clay; however the deposits are interrupted by four sand units that have both local and regional significance. The units are discussed below, from deepest and oldest to the shallowest and youngest.

The deepest, or "D" sand, is regionally extensive and it occurs at a depth of 62 to 75 m (204 to 245 ft). It is composed of fine to medium sands with both silt and gravel lenses. The thickness of this unit was not determined, but regional correlations suggest that it may measure approximately 36 m (120 ft) in thickness where it occurs at the east end of Grand Terre. This sand is interpreted as late Pleistocene to early Holocene strand plain deposits that were laid down by transgressing seas as sea level rose at the end of the last glacial stage.

The "C" sand attains a maximum thickness of 3.4 m (11 ft) and it occurs at a depth of 28 to 29 m (93 to 95 ft). It consists largely of silty fine sand and it has been interpreted as representing near shore sediments that were deposited offshore from an early lobe of the Lafourche Delta Complex.

The "B" sand deposits occur at a depth of 6.7 to 11.3 m (22 to 37 ft). They occur only beneath Grand Isle, and they are not regionally widespread. The morphology and sedimentary characteristics of this unit indicated that it is an older barrier island deposit that resulted from the erosion of an early Lafourche delta lobe.

The "A" sand is the youngest and shallowest unit, ranging in thickness from 4.6 to 9.7 m (15 to 32 ft). The relatively thicker portions of this barrier island unit are near Barataria Pass, probably indicating a slight migration of the pass to the northeast. The soils consist of fine sands deposited on the beach and in nearshore marine environments. Offshore, the deposits thin progressively and are not present beyond 6 m (20 ft) of the shore.

Georcheological Considerations

The landforms identified within the project area are associated with the Barataria Basin and Lafourche Delta Complex, and are no more than 2,000 years old. Prior to that time, the project area was either covered by the Gulf of Mexico or by an older delta complex. If an older delta complex existed in this area, it subsequently was buried by the Lafourche Delta Complex. Since the earliest habitable landforms identified in the project reach date from no more that 2,000 years ago, archaeological sites dating from late in the prehistoric period (specifically, the Marksville, Troyville-Coles Creek, Plaquemine, and Mississippian) or from the historic period may be expected.

Flora Within the Project Region

Given the sandy soils present on Grand Isle, floral communities are somewhat limited. As the salinity of the water surrounding the island has increased, the diversity of plant species has decreased (Chabreck 1988). The dominant dune vegetation on Grand Isle consists of a combination of marsh hay cordgrass (*Spartina patens*), bitter panicum (*Panicum amarum*), beach morning glory (*Ipomea stolingera*), and seashore dropseed (*Sporobolus virginicus*) (Mendelssohn 1985). Also found on Grand Isle are dune elder (*Iva imbricate*), seashore paspalum (*Paspalum vaginatum*), beach tea (*Croton punctatus*), seaside goldenrod (*Solidago sempervirens*), sea oats (*Unioloa paniculata*), and pennywort (*Hydrocotly bonariensis*) (Mendelssohn 1985). Needlegrass rush (*Juncus roemerianus*), seashore saltgrass (*distichilis spicata*), smooth cordgrass (*Spartina alternaflora*), bushy sea-oxeye (*Borrichia frutescens*), saltwort (*Batis maritima*), Virginia samphire (*Salicornia virginica*), black mangrove (*Avicennia nitida*), and bigleaf sumpweed (*Iva frutescens*) also are found on Grand Isle (Matthews 1983). However, it is important to note that some areas on Grand Isle lack vegetation entirely.

Fauna Within in the Project Region

Faunal species in the bayou and marsh zones of the Mississippi River Delta are various and abundant, with species habitat ranging from aquatic to semi-aquatic to terrestrial. Generally, the diversity of taxonomic groups is greatest in the fresh marsh areas, and gradually decreases as salinity increases (Gosselink 1984:63-64). For example, while 18 species of amphibian inhabit both swamp and freshwater marsh, only five inhabit brackish marsh; 24 species of reptile are found in freshwater marsh, while only four inhabit saltwater marsh (Gosselink 1984:64). On the other hand, levels of salinity do not appear to affect species variety in either mammals or birds, as each class tends to retain uniform diversity across the region. While 84 species of birds and 14 species of mammals are found in freshwater marsh, 89 species of birds and 10 species of mammals are found in brackish marsh; and 92 species of birds and eight species of mammals are found in saltwater marsh (Gosselink 1984:64). The diversity of birds, however, varies with the migratory season.

Because plant production is concentrated along the marsh periphery, fish, mollusk, and crustacean activity also tends to be concentrated more densely in peripheral areas (Gosselink 1984:63). Fresh water mollusks and crustaceans found in the vicinity of Grand Isle include freshwater clam and brackishwater clam (*Rangia cuneata*), freshwater mussel (Unionidae), river shrimp, and swamp crawfish (Table 1). Freshwater game and nongame fish found in the project area include gar (*Lepisosteus* spp.), catfish (Ictaluridae), bass (*Micropterus* spp.), drum (*Aplodinotus grunniens*), and sunfish (*Lepomis* spp.) (Table 2). Reptiles and amphibians found in the Mississippi River Delta marshes include salamanders (Caudata), frogs (Ranidae), alligator (*Alligator mississippiensis*), turtles (Testudinata), water snakes (*Nerodia* spp.), and pit vipers (Viperidae) (Table 3). According to Gosselink (1984:64), reptiles and amphibians follow the same habitat diversity patterns as fish; that is, as salinity decreases, species variation increases.

As noted above, bird species are found uniformly across fresh, brackish, and saltwater marsh areas. Waterfowl such as grebes (Podicipedidae), ducks (Anatidae), and geese (Anserrinae); wading birds like heron (Ardeidae), egret (*Egretta* spp.), and stork (*Mycteria americana*); shore birds such as the spotted sandpiper (*Actitis macularia*); fishing birds like gulls and terns (Charadriiformes), and the belted kingfisher (*Ceryle alcyon*) all are present in abundance (Table 4). Predatory birds such as kestrels (*Falco sparverius*), owls (*Strix* spp.), and falcons (Falconiformes), also are found in the region. The majority of birds, however, are present in the area only from around October until March or April, due in part to the fact that the Mississippi River Delta is the winter home to some five million migratory birds (Gosselink 1984:68-71). This phenomenon also accounts for the large range of species variation found in the area.

Both semi-aquatic and fully terrestrial mammals are present in the project area. Semi-aquatic mammals include muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), otter (*Lutra canadensis*), and nutria (*Myocastor coypus*) (Table 5). Although nutria were introduced to the region in the twentieth century, archeological evidence shows that muskrat is native to the area. Terrestrial mammals include white-tailed deer (*Odocoileus virginianus*), Louisiana black bear (*Ursus americanus luteolus*), rabbit (Leporidae), raccoon (*Procyon lotor*), squirrel (Sciuridae), and opossum (*Didelphis virginiana*), all of which are highly adaptable to both upland and marsh environments (Lowery 1974).

Table 1. Mollusks Present in Southeast Louisiana.

SUBFAMILY NAME	LATIN NAME	COMMON NAME
	Margaritiferidae	
Margaritiferinae	*Margaritifer hembeli*	Louisiana pearlshell
	Unionidae	
Anodontinae	*Pyganodon grandis*	Giant floater
	Anodontoides radiatus	Rayed creekmussel
	Strophitus subvexus	Southern creekmussel
Ambleminae	*Quadrula nodulata*	Wartyback
	Quadrula apiculata	Southern mapleleaf
	Pleurobema pyramidatum	Pyramid pigtoe
	Elliptio crassidens	Elephant ear
	Elliptio dilatata	Spike
	Elliptio arca	Alabama spike
	Fusconaia cerina	Gulf pigtoe
	Actinonaias ligamentina	Mucket
	Lampsilis satura	Sandbank pocketbook
	Lampsilis hydiana	Louisiana fatmucket
	Lampsilis claibornensis	Southern fatmucket
	Ligumia recta	Black sandshell
	Potamilus amphichaenus	Texas heelsplitter
	Obovaria olivaria	Hickorynut
	Obovaria unicolor	Alabama hickorynut
	Toxolasmus parvus	Lilliput
	Possibly Extinct Unionidae	
	Cyprogenia aberti	Western fanshell
	Villosa iris	Rainbow
	Lasmigona costata	Fluted shell
	Non-unionacean Clams	
	Dreissena polymorhpha	Zebra mussel
	Polymesoda caroliniana	Carolina marsh clam
	Rangia cuneata	Brackish-water clam
	Corbicula fluminea	Asiatic clam

Table 2. Fish Present in Southeast Louisiana.

LATIN NAME	COMMON NAME
Lepisosteus oculatus	Spotted gar
Lepisosteus osseus	Longnose gar
Lepisosteus spatula	Alligator gar
Amia calva	Bowfin, freshwater dogfish, grinnel
Alosa chrysochloris	Skipjack herring
Dorosoma cepedianum	Gizzard shad
Dorosoma petenense	Threadfin shad
Cyrinus carpio	Common carp, introduced
Notemigonus crysoleucas	Golden shiner
Ictalurus furcatus	Blue catfish
Ictalurus natalis	Yellow bullhead
Ictalurus punctatus	Channel catfish
Pylodictus olivaris	Flathead catfish
Morone chrysops	White bass
Morone mississippiensis	Yellow bass
Morone saxatilis	Striped bass
Centrarchus macropterus	Flier
Lepomis cyanellus	Green sunfish
Lepomis gulosus	Warmouth
Lepomis macrochirus	Bluegill
Lepomis marginatus	Dollar sunfish
Lepomis megalotis	Longear sunfish
Lepomis microlophus	Redear sunfish
Lepomis punctatus	Spotted sunfish
Lepomis symmetricus	Bantam sunfish
Micropterus salmoides	Largemouth bass
Pomoxis nigromaculatus	Black crappie
Aplodinotus grunniens	Freshwater drum
Gobionellus shufekdti	Freshwater goby

Table 3. Amphibians and Reptiles Present in Southeast Louisiana.

LATIN NAME	COMMON NAME
Ambystoma opacum	Marbled salamander
Ambystoma texanum	Smallmouth salamander
Notophthalmus viridescens	Central newt
Amphiuma tridactylum	Three-toed amphiuma
Siren intermedia	Lesser siren
Eurycea quadridigitata	Dwarf salamander
Bufo valliceps	Gulf coast toad
Bufo woodhousel	Woodhouse's toad
Acris crepitans	Northern cricket frog
Hyla cinerea	Green treefrog
Hyla crucifer	Spring peeper
Hyla squirella	Squirrel treefrog
Pseudacris triseriata	Upland chorus frog
Rana catesbeiana	Bull frog
Rana clamitas	Bronze frog
Rana grylio	Pig frog
Rana sphenocephala	Southern leopard frog
Gastrophryne carolinensis	Eastern narrowmouth toad
Alligator mississippiensis	American alligator
Chelydra serpentina	Snapping turtle
Macroclemys temminckii	Alligator snapping turtle
Kinosternon subrubrum	Eastern mud turtle
Sternotherus odoratus	Stinkpot
Pseudemys floridana	Missouri slider
Pseudemys picta	Southern painted turtle
Pseudemys scripta	Red-eared turtle
Deirochelys reticularia	Chicken turtle
Graptemys kohnii	Mississippi map turtle
Graptemys pseudogeographica	False map turtle
Trionyx spiniferus	Spiny softshell turtle
Anolis caroliniensis	Green anole
Coluber constrictor	Racer
Farancia abacura	Mud snake
Lampropeltis getulus	Speckled king snake
Nerodia cyclopion	Green water snake
Nerodia fsciata confluens	Broad-banded water snake
Nerodia rhombifera	Diamondback water snake
Regina rigida	Glossy crayfish snake
Storeria dekayi	Brown snake
Thamnophis sirtalis	Common garter snake

Table 4. Birds Present in Southeast Louisiana and their Peak Months.

LATIN NAME	COMMON NAME	SEASONAL PEAKS
Grebes and Waterfowl		
Podilymbus podiceps	Pied-billed grebe	Oct.-Apr.
Podiceps nigricollis	Eared grebe	Oct.-May
Dendrocygna bicolor	Fulvous whistling duck	Apr.-Sept.
Anser albifrons	Greater white-fronted goose	Nov.-Mar.
Anas strepera	Gadwall	Oct.-Mar.
Anas americana	American wigeon	Oct.-Apr.
Aythya collaris	Ring-necked duck	Oct.-Apr.
Aythya affinis	Lesser scaup	Oct.-Apr.
Bucephola albeola	Bufflehead	Nov.-Mar.
Lophodytes cucullatus	Hooded merganser	Nov.-Apr.
Oxyura jamaicensis	Ruddy duck	Nov.-Apr.
Porphyrula martinica	Purple gallinule	Apr.-Sept.
Gallinula chloropus	Common moorhen	Apr.-Nov.
Fulica americana	American coot	Sept.-Apr.
Chen caerulescens	Snow goose	Oct.-Apr.
Branta canadensis	Canada goose	Oct.-Feb.
Anas crecca	Green-winged teal	Oct.-Mar.
Anas rubripes	American black duck	Oct.-Mar.
Anas fulvigula	Mottled duck	Year-round
Anas platyrhynchos	Mallard	Oct.-Nov.
Anas acuta	Northern pintail	Oct.-Mar.
Anas discors	Blue-winged teal	Feb.-Apr.; Sept.-Nov.
Anas clypeata	Northern shoveler	Oct.-Apr.
Wading Birds		
Botarus lentiginosus	American bittern	Oct.-May
Ixobrychus exilis	Least bittern	Apr.-Sept.
Ardea herodotus	Great blue heron	Year-round
Casmerodius albus	Great egret	Mar.-Nov.
Egretta thula	Snowy egret	Mar.-Oct.
Egretta caerulea	Little blue heron	Mar.-Oct.
Egretta tricolor	Tricolored heron	Mar.-Nov.
Bubulcus ibis	Cattle egret, introduced (Africa)	Year-round
Butorides striatus	Green-backed heron	Mar.-Oct.
Nycticorax nycticorax	Black-crowned night heron	Mar.-Sept.
Nycticorax violaceus	Yellow-crowned night heron	Mar.-Sept.
Eudocimus albus	White ibis	Mar.-Sept.
Plegadis falcinellus	Glossy ibis	Year-round
Plegadis chihi	White-faced ibis	Year-round
Mycteria americana	Wood stork	Jun.-Sept.
Shore Birds		
Pluvialis squatarola	Black-bellied plover	Sept.-May
Himantopus mexicanus	Black-necked stilt	Mar.-Oct.
Recurvirostra americana	American avocet	Sept.-May
Tringa melanoleuca	Greater yellowlegs	Feb.-May; Aug.-Nov.
Tringa flavipes	Lesser yellowlegs	Feb.-May; Aug.-Nov.
Tringa solitaria	Solitary sandpiper	Mar.-Apr.; Aug.-Oct.
Catoptrophorus semipalmatus	Willet	Year-round
Actitis macularia	Spotted sandpiper	Mar.-Apr.; Aug.-Oct.
Numenius phaeopus	Whimbrel	Apr.-May
Limosa haemastica	Hudsonian godwit	Apr.-Jun.
Calidris pusilla	Semi-palmated sandpiper	Apr.-May; Sept.-Nov.
Calidris mauri	Western sandpiper	Aug.-May
Calidris minutilla	Least sandpiper	Aug.-Apr.
Calidris bairdii	Baird's sandpiper	Mar.-May; July-Oct.

Table 4, continued

LATIN NAME	COMMON NAME	SEASONAL PEAKS
Calidris alpina	Dunlin	Oct.-May
Calidris himantopus	Stilt sandpiper	Apr.-May
Limnodromus griseus	Short-billed dowitcher	Mar.-May; Sept.-Nov.
Limnodromus scolopaceus	Long-billed dowitcher	Oct.-May
Gallinago gallinago	Common snipe	Oct.-Apr.
Phalaropus tricolor	Wilson's phalarope	Apr.-May; July-Sept.
Fishing Birds		
Larus atricilla	Laughing gull	Year-round
Sterna nilotica	Gull-billed tern	Oct.-Apr.
Sterna caspia	Caspian tern	Year-round
Sterna forsteri	Forster's tern	Year-round
Childonias niger	Black tern	Apr.-Sept.
Ceryle alcyon	Belted kingfisher	Sept.-Apr.
Birds of Prey		
Circus cyaneus	Northern harrier	Sept.-Apr.
Falco sparverius	American kestrel	Sept.-May
Falco columbarius	Merlin	Sept.-May
Falco peregrinus	Peregrine falcon	Sept.-May; Endangered
Asio flammeus	Short-eared owl	Oct.-May
Other Marsh Birds		
Chordeiles minor	Common nighthawk	Apr.-Oct.
Coturnicops noveboracensis	Yellow rail	Oct.-May
Laterallus jamaicensis	Black rail	Nov.-Apr.
Rallus elegans	King rail	Year-round
Rallus limicola	Virginia rail	Oct.-Apr.
Porzana carolina	Sora	Sept.-May
Tachycineta bicolor	Tree swallow	Sept.-May
Riparia riparia	Bank swallow	Apr.-May; July-Oct.
Hirundo rustica	Barn swallow	Mar.-May; Aug.-Nov.
Corvus ossifragus	Fish crow	Year-round
Cistothorus platensis	Sedge wren	Oct.-Mar.
Cistothorus palustris	Marsh wren	Year-round
Anthus spinoletta	Water pipit	Nov.-Mar.
Geothlpis trichas	Common yellowthroat	Mar.-Oct.
Passerculus sandwichensis	Savannah sparrow	Oct.-Apr.
Melospiza georgiana	Swamp sparrow	Sept.-May
Dolichonyx oryzivorus	Bobolink	May
Agelaius phoeniceus	Red-winged blackbird	Year-round
Quiscalus major	Boat-tailed grackle	Year-round

Table 5. Mammals Present in Southeast Louisiana.

LATIN NAME	COMMON NAME	TERRESTRIAL	SEMI-AQUATIC
	Marsupiali		
Didelphis virginiana	*Opossum; rat de bois; topo, or raibua*	*X*	
	Insectivora		
Blarina brevicauda	Short-tailed shrew	X	
Cryptotis parva	Least shrew	X	
	Chiroptera		
Myotis austroriparius	Southeastern myotis	X	
Pipistrellus subflavus	Eastern pipistrelle	X	
Lasiurus borealis	Red bat	X	
Lasiurus seminolus	Seminole bat	X	
Lasiurus intermedius	Northern yellow bat	X	
Nycticeius humeralis	Evening bat	X	
Plecotus rafinesquii	Rafinesque's big-eared bat	X	
Tadarida brasiliensis	Brazilian free-tailed bat; guano bat	X	
	Lagomorpha		
Sylvilagus aquaticus	Swamp rabbit; cane cutter; cane jake		X
Sylvilagus floridana	Eastern cottontail	X	
	Rodentia		
Sciurus carolinensis	Gray squirrel; cat squirrel; *écureuil gris*	X	
Sciurus niger	Fox squirrel; chucklehead	X	
Glaucomys volans	Southern flying squirrel; *l'éscureuil volant*	X	
Oryzomys palustris	Marsh rice rat		X
Reithrodontomys fulvescens	Fulvous harvest mouse	X	
Peromyscus leucopus	White-footed mouse	X	
Peromyscus gossypinus	Cotton mouse	X	
Sigmodon hispidus	Hispid cotton rat	X	
Neotoma floridana	Eastern wood rat; pack rat; trade rat	X	
Ondatra zibethicus	Muskrat, *rat musqué*; *rata*, or *rata almizcle*		X
	Carnivora		
Canis rufus	Red wolf	X	
Ursus americanus	American black bear	X	
Procyon lotor	Raccoon; *chat sauvage; shoui* (Choctaw)	X	
Mustela vison	Mink; *belette; toni* (Choctaw); *iskixpa* (Biloxi)		X
Lutra canadensis	River otter		X
Felis rufus	Bobcat; pichou		X
	Artiodactyla		
Odocoileus virginianus	White-tailed deer, l'chevreuil	X	

Species diversity in the project area is high; however, the numbers of members of many of these species are diminishing rapidly (Table 6) (Louisiana Department of Wildlife and Fisheries 1997). The Louisiana black bear is a threatened species that is likely to become endangered in the near future. The Eastern diamondback rattlesnake (*Crotalus adamanteus*) is considered extremely rare in Louisiana, as is the alligator snapping turtle (*Macroclemys temminickii*) and the Eastern glass lizard (*Ophisaurus ventralis*). The great diversity of both migratory and stationary bird species in the project area accounts for the presence of the lark sparrow (*Chondestes grammacus*) and red-cockaded woodpecker (*Picoides borealis*), both of which are considered threatened by the Louisiana Natural Heritage Program of the Louisiana Department of Wildlife and Fisheries. Endangered or threatened shore and wading birds include the glossy ibis (*Plegadis falcinellus*), the white ibis (*Eudocimus albus*), the brown pelican (*Pelecanus erythrorhynchos*), the interior least tern (*Sterna antillarum athalassos*), the Caspian tern (*Sterna caspia*), the gull-billed tern (*Sterna nilotica*), the American oystercatcher (*Haematopus palliatus*), and the sooty tern (*Sterna fuscata*).

Human Utilization of Fauna

Archeological evidence of vertebrate use among indigenous populations along the

Table 6. Threatened or Endangered Animals in Louisiana.

LATIN NAME	COMMON NAME	CRITICAL	IMPERILED	RARE	NO CURRENT RECORD	TRANSITORY OR DISPERSED MIGRATORY
Mollusks						
Actinonaias ligamentina	Mucket				X	
Anodontoides radiatus	Rayed Creekshell		X			
Cyprogenia aberti	Western Fanshell				X	
Ellipsaria lineolata	Butterfly	X				
Elliptio crassidens	Elephant-Ear		X	X		
Elliptio dilatata	Spike		X	X		
Fusconaia ebena	Ebonyshell			X		
Lampsilis abrupta	Pink Mucket	X				
Lampsilis cardium	Plain Pocketbook	X				
Lampsilis ornata	Southern Pocketbook					
Lampsilis siliquoidea	Fatmucket	X		X		
Lasmigona complanata	White Heelsplitter	X				
Ligumia recta	Black Sandshell	X				
Margaritifera hembeli	Louisiana Pearlshell	X				
Obovaria Jacksoniana	Southern Hickorynut	X	X			
Obovaria olivaria	Hickorynut	X				
Obovaria unicolor	Alabama Hickorynut	X				
Pleurobema beadleanum	Mississippi Pigtoe		X			
Pleurobema Riddelli	Louisiana Pigtoe	X	X			
Pleurobema Rubrum	Pyramid Pigtoe		X			
Potamilus amphichaenus	Texas Heelsplitter				X	
Potamilus capax	Fat Pocketbook	X				
Potamilus inflatus	Inflated Heelsplitter	X				
Ptychobranchus occidentalis	Ouachita Kidneyshell	X				
Quadrula cylindrica	Rabbitsfoot	X				
Quadrula metanevra	Monkeyface	X				
Strophitus subvexus	Southern Creekmussel				X	
Strophitus undulatus	Squawfoot		X			
Villosa vibex	Southern Rainbow		X			
Pleurocera canaliculata	Silty Hornsnail		X			
Crustaceans						
Fallicambarus dissitus	Pine Hills Crawfish		X			
Fallicambarus macneesei	Old Prairie Crawfish		X			
Fallicambarus oryktes	A Crawfish		X	X		
Faxonella beyeri	Sabine Fencing Crawfish	X	X			
Faxonella creaseri	Ouachita Fencing Crawfish		X			
Oronectes blacki	Calcasieu Stream Crawfish		X			
Oronectes hathawayi	Teche Strem Crawfish			X		
Oronectes hobbsi	A Crawfish			X		
Oronectes maletae	Kisatchie Stream Crawfish		X			
Oronectes palmeris creolanus	A Crawfish		X			
Procambarus bivittatus	Ribbon Crawfish	X	X			
Procambarus elegans	A Crawfish		X			
Procambarus geminus	A Crawfish		X	X		
Procambarus jaculus	Javelin Crawfish	X	X			
Procambarus shermani	A Crawfish		X			
Procambarus viaeviridis	A Crawfish		X	X		
Insects						
Dryobius sexnotatus	Six-Banded Longhorn Beetle					
Dubiraphia parva	Little Dubiraphian Riffle Beetle	X		X		
Brachycercus flavus	Yellow Brachycercus Mayfly	X				
Leuctra szczytkoi	Schoolhouse Springs Leuctran Stonefly		X			
Chimarra holzenthali	Caddisfly	X				
Agarodes libalis	Caddisfly	X				
Cheumatopsyche morsei	Caddisfly	X				
Diplectrona rossi	Caddisfly	X				
Hydroptila ouachita	Caddisfly	X				

Table 6, continued

LATIN NAME	COMMON NAME	CRITICAL	IMPERILED	RARE	NO CURRENT RECORD	TRANSITORY OR DISPERSED MIGRATORY
		Fish				
Acipenser oxyrhynchus desotoi	Gulf Sturgeon	X				
Scaphirhynchus albus	Pallid Sturgeon	X				
Polyodon spathula	Paddlefish		X			
Alosa alabamae	Alabama Shad	X				
7Campostoma anomalum	Central Stoneroller		X			
Notropis boops	Bigeye Shiner			X		
Notropis buccatus	Silverjaw Minnow			X		
Notropis hubbsi	Bluehead Shiner		X			
Notropis potteri	Chub Shiner			X		
Notropis signipinnis	Flagfin Shiner			X		
Notropis welaka	Bluenose Shiner		X			
Phenacobius mirabilis	Suckermouth Minnow	X				
Cyprinella camura	Bluntface Shiner			X		
Cyprinella whipplei	Steelcolor Shiner		X			
Cycleptus elongatus	Blue Sucker					
Moxostoma carinatum	River Redhorse		X			
Notorus munitus	Frecklebelly Madtom			X		
Fundulus euryzonus	Broadstripe Topminnow		X			
Syngnathus scovelli	Gulf Pipefish					
Crystallaria asprella	Crystal Darter		X	X		
Ammocrypta clara	Western Sand Darter		X			
Etheostoma caeruleum	Rainbow Darter			X		
Percina Lenticula	Freckled Darter	X				
Percina macrolepida	Bigscale Logperch		X			
Percina aurora	Pearl Darter				X	
Percina copelandi	Channel Darter	X				
		Amphibians				
Ambystoma tigrinum	Eastern Tiger Salamander	X				
Amphiuma means	Two-Toed Amphiuma		X			
Hemidactylium scutatum	Four-Toed Salamander				X	
Plethodon serratus	Southern Redbacked Salamander	X				
Plethodon websteri	Webster's Salamander	X				
Plethodon kisatchie	Louisiana Slimy Salamander	X	X			
Pseudotriton montanus	Mud Salamander				X	
Pseudotriton ruber	Red Salamander		X			
Pseudacris ornata	Ornate Chorus Frog	X				
Pseudacris streckeri	Strecker's Chorus Frog	X				
Rana capito sevosa	Dusky Crawfish Frog				X	
		Reptile				
Caretta caretta	Loggerhead Sea Turtle	X				
Chelonia mydas	Green Sea Turtle					X
Eretmochelys imbricata	Hawksbill Turtle					X
Lepidochelys kempii	Kemp's Ridley Sea Turtle					X
Macroclemys temminckii	Alligator Snapping Turtle			X		
Dermochelys coriacea	Leatherback Sea Turtle					X
Graptemys oculifera	Ringed Map Turtle		X			
Graptemys gibbonsi	Pascogoula Map Turtle			X		
Malaclemys terrapin pileata	Mississippi Diamon-Backed Terrapin		X			
Terrapene ornata	Ornate Box Turtle	X				
Sternotherus minor peltifer	Stripe-Necked Musk Turtle	X				
Gopherus polyphemus	Gohper Tortoise	X				
Ophisaurus ventralis	Eastern Glass Lizard		X			
Eumeces septentrionalis	Southern Prairie Skink	X				
Carphophis amoenus vermis	Western Worm Snake	X				
Coluber constrictor etheridgei	Tan Racer					
Farancia erytrogramma	Rainbow Snake		X			

Table 6, continued

LATIN NAME	COMMON NAME	CRITICAL	IMPERILED	RARE	NO CURRENT RECORD	TRANSITORY OR DISPERSED MIGRATORY
Lampropeltis calligaster rhombomaculata	Mole Kingsnake		X			
Pituophis melanoleucus lodingi	Black Pine Snake	X				
Pituophis melanoleucus ruthveni	Louisiana Pine Snake			X		
Rhadinaea flavilata	Pine Woods Snake	X				
Micrurus fulvius fulvius	Eastern Coral Snake		X			
Crotalus adamanteus	Eastern Diamondbacked Rattlesnake	X				
		Birds				
Pelecanus erythrorhynchos	American White Pelican			X		
Pelecanus occidentalis	Brown Pelican		X			
Egretta rufescens	Reddish Egret		X			
Plegadis falcinellus	Glossy Ibis		X			
Ajaia ajaja	Roseate Spoonbill			X		
Lophodytes cucullatus	Hooded Merganser		X			
Pandion haliaetus	Osprey		X			
Elanoides forficatus	American Swallow-Tailed Kite	X	X			
Haliaeetus leucocephalus	Bald Eagle			X		
Accipiter cooperii	Cooper's Hawk		X			
Aquila chrysaetos	Golden Eagle	X				
Polyborus plancus	Crested Caracara	X				
Falco peregrinus	Peregrine Falcon		X			
Laterallus jamaicensis	Black Rail		X			
Grus americana	Whooping Crane				X	
Grus canadensis	Sandhill Crane	X				
Charadrius alexandrinus	Snowy Plover	X	X			
Charadrius melodus	Piping Plover		X			
Charadrius wilsonia	Wilson's Plover			X		
Haematopus palliatus	American Oystercatcher	X				
Numenius borealis	Eskimo Curlew				X	
Scolopax minor	American Woodcock	X				
Sterna antillarum athalassos	Interior Least Tern	X				
Sterna caspia	Caspian Tern	X	X			
Sterna nilotica	Gull-Billed Tern		X			
Sterna fuscata	Sooty Tern	X				
Columbina passerina	Common Ground Dove	X				
Asio flammeus	Short-Eared Owl		X	X		
Speotyto cunicularia	Burrowing Owl	X	X			
Picoides borealis	Red-Cockaded Woodpecker		X			
Campephilus principalis	Ivory-Billed Woodpecker				X	
Sitta carolinensis	White-Breasted Nuthatch		X			
Vireo bellii	Bell's Vireo				X	
Vireo gilvus	Warbling Vireo	X				
Vermivora bachmanii	Bachman's Warbler				X	
Dendroica cerulea	Cerulean Warbler	X				
Dendroica petechia	Yellow Warbler					
Helmitheros vermivorus	Worm-Eating Warbler			X		
Seirus motacilia	Louisiana Waterthrush			X		
Setophaga ruticilla	American Redstart			X		
Aimophila aestivalis	Bachman's Sparrow			X		
Ammodramus henslowii	Henslow's Sparrow			X		
Ammodramus savannarum	Grasshopper Sparrow			X		
Chondestes grammacus	Lark Sparrow		X	X		
		Mammals				
Sorex longirostris	Southeastern Shrew		X			
Lasionycteris noctivagans	Silver-Haired Bat	X				
Eptesicus Fuscus	Big Brown Bat		X			
Perognathus hispidus	Hispid Pocket Mouse		X			
Reithrodontomys humulis	Eastern Harvest Mouse			X		

Table 6, continued

LATIN NAME	COMMON NAME	CRITICAL	IMPERILED	RARE	NO CURRENT RECORD	TRANSITORY OR DISPERSED MIGRATORY
Mesoplodon densirostris	Tropical Beaked Whale					X
Ziphius cavirostris	Goose-Beaked Whale					X
Kogia simus	Dwarf Sperm Whale					X
Physeter macrocephalus	Sperm Whale					X
Stenella clymene	Short-Snouted Spinner Dolphin					X
Stenella coeruleoalba	Striped Dolphin					X
Stenella frontalis	Atlantic Spotted Dolphin					X
Delphinus delphis	Saddle-Backed Dolphin					X
Pseudorca crassidens	False Killer Whale					X
Globicephala macrorhynchus	Short-Finned Pilot Whale					X
Balaenoptera acutorostrata	Little Piked/ Minke Whale					X
Balaenoptera borealis	Sei Whale					X
Balaenoptera edeni	Bryde's Whale					X
Balaenoptera musculus	Blue Whale					X
Balaenoptera physalus	Finback Whale					X
Canis rufus	Red Wolf				X	
Ursus americanus luteolus	Louisiana Black Bear		X			
Bassariscus astutus	Ringtail					
Mustela frenata	Long-Tailed Weasel		X			
Spilogale putorius	Eastern Spotted Skunk		X			
Felis concolor coryi	Florida Panther	X				
Trichechus manatus	Manatee					X

Louisiana coast is sparse, and it is not yet known if sites in this region represent year-round or seasonal occupations (Larson 1980:20; Smith 1996:7; Webb 1981). The broad spectrum of flora and fauna within the coastal plain of southeastern Louisiana could support either large sedentary populations or intermittent hunting, fishing, and gathering camps, or both. Summaries of faunal analyses from Coles Creek, Plaquemine, and Mississippian sites in the Louisiana coastal zone show that selected fauna in the region were used for subsistence purposes (Brown 1984:106-107; Davis 1984; Smith 1995, 1996; Springer 1980:214-217). Although archeological recovery techniques and quantification methods have varied widely, gar, bowfin, catfish, alligator, turtles, muskrat, raccoon, and deer are the primary species mentioned in these studies.

The practice of prehistoric species selection has been elaborated by Swanton (1979), who discusses the utilization of various animals throughout the southeastern United States, including southeastern Louisiana. Swanton (1979:249) states that the mammals used most commonly by indigenous groups in southeastern Louisiana were deer and bear, primarily due to their multi-functionality. Besides food and clothing, other uses of animal products included horn tips for arrow points, needles, and glue; skin, sinew, and entrails for thread, fishnets, cords, and bowstrings; and claws for jewelry and hair ornaments. Other mammals often utilized by the indigenous peoples of southeastern Louisiana were beaver (*Castor canadensis*), raccoon, squirrel, panther, fox, wild cat (*Felis rufus*), muskrat, and rabbit; otter was used for ornamental clothing and shamanistic pouches (Swanton 1979:250).

Birds were used primarily for food and personal adornment. Ducks, geese, quail (Phasianidae), partridge, and pigeon were food sources, while eagle, crane (*Crus canadensis*), and Blue Heron (*Ardea herodias*) feathers were used for mantles, headdresses, and other types of ornamentation (Swanton 1979:251).

A wide variety of fish served as food sources, including bluefish, herring (Clupeidae), eel, mullet (*Mugil* spp.), sturgeon (*Acipenser fulvesnens*), trout (Salmonidae), pickerel, bass, gar, carp, sucker (*Castomidae*), and catfish. Fin bones and gar scales were used to point spears. Mollusks such as mussels, oysters (*Crassostrea virginica*), cockles, and snails (*Prisogaster niger*) were eaten, and their shells were used for shaping the insides of pots, hollowing canoes, and scraping bows. When mixed, shell ash and hot water was used as a depilatory (Swanton 1979:252).

Indigenous groups of southeast Louisiana also ate turtle (Swanton 1979:252), and turtle shells were employed as rattles that often were fastened around women's ankles. It is known from ethnographic accounts that alligator also was consumed by southeastern Louisiana Native Americans. A written account from 1758 documents a young Chitimacha slave girl killing an alligator with a wooden stick (Swanton 1979:332).

Historic period utilization of various fauna in southeastern Louisiana resulted from both the need to generate income and for subsistence. Trapping, hunting, and fishing not only were the primary means of income for these settlers and residents, but also were daily sources of food. While New Orleans quickly became a center for the fur trade after its founding in 1718, pelts typically were shipped down the Mississippi River from the Illinois and Upper Mississippi regions. Trapping as an income-derived occupation did not begin in earnest in Louisiana until the late 1800s; prior to this, duck hunting was more profitable (Lowery 1974:22; Davis 1985:157). Mink, otter, and raccoon pelts all were obtained from the Louisiana marshlands, as were alligator skins. Muskrat trapping began in earnest in Lafourche Parish around 1900, and by 1915 it had become the fur of choice (Lowery 1974:25; Davis 1985:57).

By 1912, trapping was so pervasive that sanctioned hunting seasons had to be established to prevent depletion of the resources. The 1920s saw increased demand for raccoon furs, the trend only to be replaced in the 1930s by wild mink (Lowery 1974:34). In the 1940s, following their 1938 introduction to southeast Louisiana, nutria quickly began to replace muskrat in both financial importance and population. Nutria quickly displaced the native muskrat through competition for the habitat.

Climate

The region surrounding Grand Isle in Jefferson Parish, Louisiana is characterized by a humid subtropical climate. Summers are long, hot, and rainy, but winters generally are mild and pleasant. Average annual precipitation is 164 cm (64 in), half of which falls during the April through September growing season. Local weather patterns are controlled primarily by prevailing southeasterly winds coming from the Gulf of Mexico. These winds average about 25 km per hour (10 mi per hour) during the spring and contribute to the formation of localized afternoon thundershowers, which occur throughout the spring and summer months. The summer and fall months also are subject to occasional tropical storms or hurricanes, which threaten the area every few years and can cause extremely heavy rains for one to three days. During the winter, cool fronts from the north usually are weakened or dissipate completely before reaching south Louisiana.

Based on data recorded from 1951 to 1979 in Reserve, Louisiana, daily average temperature peaks in July at 28° C (82° F), with an average maximum temperature of 33° C (91° F) (McDaniel 1987). Temperatures only occasionally exceed 38° C (100° F). Summer nighttime temperatures drop to about 24° C (75° F). July is also the wettest month, averaging 16.5 cm (6.5 in) of precipitation (McDaniel 1987). Winter temperature averages about 13° C (55° F), and may reach freezing (0° C) from November through mid-March, usually only after nightfall. Snowfall occurs in measurable amounts only about once every 20 years; however, when it does occur, it can exceed 5 cm (2 in) (McDaniel 1987; Matthews 1984).

CHAPTER III

PREHISTORIC OVERVIEW

Introduction

The cultural sequence of Louisiana traditionally has been divided into three stages: the Paleo-Indian, the Archaic, and the Woodland (Neuman 1984). These stages, defined by certain technological and economic traits, imply evolutionary development; however, the cultural historical sequence is described accurately by these divisions of prehistory, regardless of whether one is a proponent of cultural evolution or not. Therefore, the three-stage system is utilized in this report to organize the prehistory of the area.

The proposed project area lies within Management Unit V, as defined in Louisiana's Comprehensive Archaeological Plan (Smith et al. 1983:93-112). That Management Unit is composed of 14 parishes located in the southeastern portion of the state. They include Pointe Coupée, West Baton Rouge, Iberville, Ascension, Assumption, St. James, St. Charles, St. John the Baptist, Lafourche, Terrebonne, Jefferson, Orleans, St. Bernard and Plaquemines Parishes. The entire management unit falls within the Holocene period alluvial deposits of the four major deltaic lobes that have shaped southeastern Louisiana.

As previously discussed, geomorphological evidence indicates that the landforms in the vicinity of the proposed project area, and Grand Isle itself, are not more than 2,000 years old; therefore, archeological sites older than the Woodland stage are unlikely to occur there. There is little reason to expect that Paleo-Indian or Archaic remains will be discovered within the vicinity of Grand Isle. The discussion of the Paleo-Indian and Archaic stages is provided only as a prologue to the description of the Woodland cultures of the region.

Paleo-Indian Stage (10,000 – 6,000 B.C.)

Paleo-Indians, the earliest inhabitants of Louisiana, may have arrived in the region as early as 12,000 B.C.; however, the earliest Paleo-Indian remains found in the state date from 10,000 B.C. (Smith et al. 1983; Webb et al. 1971). Information pertaining to Paleo-Indian life-ways is imprecise, but it generally is agreed that they formed highly mobile band level groups that relied to some degree on hunting of now-extinct Pleistocene megafauna (e.g., mammoth, mastodon, and bison) and on foraging.

The lithic tools composing the Paleo-Indian tool inventory include large, thin, bifacially-worked, fluted lanceolate projectile points, as well as bifacial cleavers, core handaxes, knives, drills, end scrapers, side scrapers, and spokeshaves (Smith et al. 1983). Lithic tools exhibit high quality workmanship, with evidence of fine flaking, retouching, basal grinding, and thinning (Smith et al. 1983). Paleo-Indian projectile point types recovered from Louisiana include Angostura, Clovis, Dalton, Eden, Pelican, Plainview, San Patrice, Scottsbluff, and Quad.

Near the end of the Pleistocene, the climate warmed, signaling a shift in food resources and forcing Paleo-Indian peoples to adapt to the developing environment of the region. The late Paleo-Indian tool assemblage reflects this adaptation. While the early Paleo-Indian tool assemblage consisted primarily of projectile points manufactured from exotic materials, late Paleo-Indian tools included knives, scrapers, chisels, gravers, drills, and adzes, most of which were made from locally available materials. In addition, overall projectile point size decreased, indicating a greater reliance on smaller game, such as deer. Finally, Late Paleo-Indian sites have been found in greater numbers, suggesting a population increase (Neuman 1984).

At approximately 8,000 B.C., a technological complex known as San Patrice first appeared in northwestern Louisiana, eastern Texas, and southern Arkansas (Webb et al. 1971). San Patrice sites date from 8,000 to 6,000 B.C.; they initially were defined on the basis of two projectile point types: one lanceolate (San Patrice, *var. Hope*), and one side-notched (San Patrice, *var. St. Johns*) (Webb 1946). Unifacial tools such as Albany side scrapers and other side scrapers, end scrapers, gravers, drills, raclettes, scaled pieces, burins, and retouched flakes also are included in the San Patrice tool inventory (Webb et al. 1971).

San Patrice and Dalton sites are distributed more widely than those of their earlier Paleo-Indian counterparts. San Patrice sites have been found on margins of upland terraces overlooking river valleys, lakes, and streams, and along the small streams that dissect the uplands. South Louisiana sites with San Patrice or Dalton components include the Da Dump Site (16SL59), and the Edwin Mott Site (16SL42), both located in St. Landry Parish (Smith et al. 1983). San Patrice projectile points also have been recovered from Avery Island (Gagliano 1964, 1967). To date, no Paleo-Indian artifacts have been recovered from southeastern coastal Louisiana.

San Patrice appears to have been contemporaneous with the Dalton complex recognized in adjacent states. Close technological and morphological affinities between the San Patrice and Dalton complexes have led some archeologists to suggest that these sites are related and comprise the Dalton horizon (Ensor 1986). Both Dalton and San Patrice points, which appear to be derived from Clovis prototypes, have a pentagonal outline and a concave base that has been ground smooth and also thinned and fluted (Neuman 1984).

In Louisiana, Paleo-Indian finds occur most commonly in Tertiary uplands and upland/floodplain bluff areas. Areas within the more recent floodplains of the Atchafalaya, Mississippi, and Red rivers or their tributaries generally are considered the least probable areas for containing Paleo-Indian remains (Neitzel and Perry 1977). Paleo-Indian sites are unlikely to occur in these areas because the deposits comprising the landforms post-date this era. Although most Paleo-Indian projectile points found in Louisiana have been recovered from the surface of sites in the northwest portion of the state, some Paleo-Indian artifacts have been recovered from coastal Louisiana sites.

The Salt Mine Valley Site (16IB23), on Avery Island in Iberia Parish, contains an apparent deeply buried Paleo-Indian component. During the 1860s strip mining of the salt dome, deeply buried lithic tools and basketry fragments were recovered in association with the remains of extinct fauna, including mastodon, mammoth, horse, bison, and sloth. Limited testing throughout the site area during the early 1960s produced nondiagnostic tools and bipolar chipped cores at depths of approximately 6 m (20 ft). While the original analysis of collected data suggests that initial occupation of the site dates from the early Paleo-Indian period (Gagliano 1964), subsequent analysis indicates that the site may not have been occupied until late in the Paleo-Indian stage (Gagliano 1967).

Archaic Stage (6,000 – 1,500 B.C.)

During the Archaic stage, subsistence systems became more diverse, fostering the development of quasi-permanent settlements (Neitzel and Perry 1977). The size, content, and distribution of Archaic sites suggest that site occupation corresponded to seasonal availability of select natural resources. Archaic peoples exploited a home range delimited by the seasonal availability of nuts, fruits, fish, game, and other natural resources (Muller 1983).

Archaic peoples utilized a variety of materials for tool manufacture. They also incorporated new techniques for polishing and grinding granitic rock, sandstone, slate, steatite, and scoria. In addition, shell and bone were exploited throughout the latter half of the Archaic stage. A wide variety of side-notched, corner-notched, and side-stem projectile points are associated with the Archaic stage.

The Archaic period is subdivided into the Early, Middle, and Late Periods. Each of these periods, from the earliest to latest, is characterized by a change in climate, change in substance strategies, and population increase (Neuman 1984).

Early Archaic Period (6,000 – 5,000 B.C.)

Early Archaic cultural manifestations resemble those defined for the terminal Paleo-Indian stage in content and distribution; however, some innovations that were made during the earlier period evolved into the characteristic traits of the Early Archaic Period. These include variations of projectile point types and an increase in the level of sedintism. Terminal Paleo-Indian sites in Louisiana often are identified as basal components on Early Archaic sites, indicating an in situ development for the Early Archaic (Servello 1983).

Despite these apparent similarities, Early Archaic peoples exploited a wider variety of resources than did their Paleo-Indian predecessors. They hunted smaller animals such as whitetail deer, raccoon, bear, dog, groundhog, squirrel, fox, beaver, bobcat, skunk, mink, muskrat, porcupine, wild turkey, passenger pigeon, goose, duck, and various aquatic and semiaquatic species (Neuman 1984; Walthall 1980).

In addition, late Paleo-Indian and Early Archaic projectile point styles such as Angostura-like, San Patrice, and Dalton have been found throughout Louisiana; however, very few Early Archaic components have been isolated within the state. Several Early Archaic projectile point types and associated horizons have been defined for areas throughout the southeastern United States, including the Big Sandy, Kirk, and Bifurcate Horizons.

The Big Sandy Horizon is characterized by a distinctive projectile point type. Big Sandy points have been recovered from Florida to Texas in the Southeast, and from as far north as the Great Lakes. The Big Sandy point is characterized by its steep triangular blade and serrated edges. Side-notching and utilization of a similar chipped stone tool assemblage suggests continuity with Dalton and San Patrice. Big Sandy sites also exhibit multiple activity areas (Walthall 1980).

The Kirk Horizon is characterized by a wide variety of stone tools and projectile points associated with the forested portions of eastern North America. The projectile point varieties are medium-sized, corner-notched, and deeply serrated; they often exhibit beveling along the blade. The chipped stone tool assemblage of the Kirk Horizon is similar to that of the preceding Big Sandy Horizon. A substantial inventory of wood and bone working tools is associated with Kirk Horizon sites (Purdy 1973; Waller 1976).

Middle Archaic Period (5,000 – 3,000 B.C.)

By 3,000 B.C., climatic and environmental conditions were much like those of the present. The scheduling of economic activities in the southeast shifted at that time to include shellfish (Walthall 1980). A new emphasis on aquatic and riparian resources (shellfish, fish, reptiles, and amphibians) indicates a trend toward maximization of local resources (Smith et al. 1983).

In the Southeast, population estimates show an increase over previous levels; however, these larger groups appear to have been less mobile than earlier populations (Muller 1983). Two settlement pattern types have been identified for the Middle Archaic: (1) a centrally-based wandering pattern from both base and satellite camps, and (2) a restricted wandering pattern. In the centrally-based wandering pattern, the central base camp was occupied for both subsistence and maintenance activities, while satellite sites were occupied for resource procurement. Floodplain sites containing thick midden deposits represent quasi-permanent or permanent habitations. Small special activity sites generally are located on floodplains, on terraces, and in upland settings along tributary streams. These sites apparently were chosen for their proximity to selected exploitable resources, including game, nuts, and chert. The restricted wandering pattern involved no base camp; groups moved from one locale to the next as resources became available.

Middle Archaic artifact assemblages of the southeastern cultural area are characterized by a plethora of stemmed, broad-blade projectile points that probably were used in conjunction with the *atlatl* (spear thrower). Heavy grinding and nutting stone tools and tools such as axes, adzes, wedges, and gouges indicate that Middle Archaic peoples were well-adapted to southern hardwood forests. Bone fish hooks, net sinkers, and plummets reflect increasing reliance on aquatic resources.

Middle Archaic manifestations recognized in Southern Louisiana include the Amité River phase. The Amité River phase was defined in the Amité Basin in the upper deltaic region of Louisiana (Gagliano and Saucier 1963). It represents an adaptation to the upland woodlands and is characterized by earth middens and camp areas and it may include conical earth mounds. Sites are located on stream valley margins and along beaches and estuaries. Ground stone and bone commonly were used for manufacturing a variety of tools. Local gravels served as a source for chipped stone artifacts (Gagliano 1967). Williams, Shulma, Kent, Wells, Almagre, and Gary projectile point types were common.

Remains of human burials have been observed at various Middle Archaic sites within the southeastern culture area. Burials are both flexed and extended, with few or no grave goods (Muller 1983). These simple interments and the lack of grave offerings imply an egalitarian social organization.

Late Archaic Period (3,000 – 1,500 B.C.)

The Late Archaic period is marked by the settlement of previously uninhabited or sparsely populated areas, suggesting an increase in population throughout the Southeast. Macrobands made up of approximately 30 or more people were formed during spring and summer; during the winter, these groups split into microbands to exploit nearby environments (Jenkins and Krause 1986; Muller 1983). Late Archaic projectile point types recognized from southern Louisiana include various expanding, contracting, and straight stem forms: Yarbrough, Carrollton, Gary, Shulma, Palmillas, Morhiss, Kent, Pontchartrain, Marshall, Webb, Hale, Ellis, Marcos, Wells, Williams, and Frazier. Shell, bone and stone pendants; musical tube pipes; and a variety of other artifacts are associated with the Late Archaic. During the Late Archaic, regional variations intensified, and extensive exchange relationships developed between regions. Subsistence practices were scheduled around the seasonal availability of key species; deer, fish, nuts, and shellfish were of primary importance. Late Archaic peoples probably practiced limited horticulture of such native cultigens as sunflower, marshelder, and various gourds and squashes.

Archaic-style projectile points commonly are found throughout the state; however, few of Louisiana's discrete, intact archeological deposits dating from the Archaic have been excavated systematically, analyzed, and comprehensively reported (Neuman 1984). The Banana Bayou Mound, tested in 1962, is an exception.

The Banana Bayou Mound (16IB24) is located at the southern basal edge of Avery Island. Testing of the mound indicated that it was constructed in two stages. Charcoal recovered from a lens on the surface of the primary mound dated from 2,490 B.C. $\pm$ 260 years, nearly a thousand years prior to the estimated beginning of Poverty Point culture. Charcoal also was recorded in lenses within and underlying the primary mound. Its presence suggests the construction of structures on the mound. While few artifacts were located during excavation, a number of amorphous fired clay objects were recovered, that were similar in color and consistency with those recovered from Poverty Point and Tchefuncte sites (Gagliano 1967). It is unclear, however, whether this site actually dates from the Late Archaic period, or from the later Poverty Point cultural period (1,500 to 500 B.C.).

Gagliano (1967) also has proposed a Late Archaic Copell phase for south-central Louisiana. This phase was based on data collected from the Copell Site (16VM102), a prehistoric cemetery in Vermilion Parish that was excavated by Henry Collins in 1926. Numerous interments were recovered at that time, including some that were lying on yellow and red colored pigments (Neuman 1984). Cultural traits from the Copell Site subsequently were described by Ford and Quimby (1945). Both Collins and Ford and Quimby, assigned a Tchefuncte affiliation to the site based on collected artifacts, data, and physical anthropological data from the burials. However, since no ceramic sherds were recovered during the excavations at Copell, Gagliano (1967) suggested a Late Archaic period affiliation. Additional testing is necessary to date the site accurately, and to determine whether or not the proposed Copell phase is a legitimate, definable south-central Louisiana cultural phase.

Poverty Point Culture (1,500 - 500 B.C.)

Both the Poverty Point period and culture are named after the type site (16WC5) located in West Carroll Parish, Louisiana. Poverty Point culture is characterized by the appearance of baked clay balls, a microlithic stone tool industry, and extensive earthworks (Ford and Webb 1956; Kuttruff 1975; Webb 1968). At the time of its construction, the Poverty Point Site was the largest earthwork in the Americas. The site is composed of six segmented ridges measuring 15.2 to 45.7 m (50 to 150 ft) in width, and is octagonal in shape. Several other Poverty Point mounds are scattered throughout the immediate site area. The largest of these, Mound A, may have been constructed to resemble a bird effigy. Numerous clay balls recovered from the site have been identified as "cooking balls," used after heating to warm liquids; these objects appear to represent substitutes for stone, which is scarce in the lower Mississippi River Alluvial Valley. The artifact assemblage at Poverty Point includes tools and resources made from raw materials originating from Alabama, Arkansas, Tennessee, Ohio, Indiana, and Illinois, as well as steatite vessels originating from Georgia and North Carolina, and copper originating from Michigan. Fiber-tempered ceramics appear late in the period.

Poverty Point artifacts reflect an increase in exchange activity, which began during the Middle and Late Archaic periods. The presence of non-utilitarian items such as lapidary work, panpipes, and animal effigies in stone and shell, as well as the presence of massive civic-ceremonial architecture, all reflect a hierarchical social organization.

Very little subsistence information has been obtained from the Poverty Point Site itself; however, specialization in the procurement of deer and fish continued from Late Archaic times. Gibson (1978) suggests that redistribution, or the centralized collecting and reallocation of economic produce during Poverty Point times, represents an alternative to seasonal movement. This strategy ensured a year-round food supply. Analysis of faunal remains recovered from the Poverty Point component of the nearby J. W. Copes Site (16MA47) unequivocally indicates a hunting and foraging economy (Jackson 1986, 1991).

Distributional studies also demonstrate that Poverty Point sites were located in areas ideal for the intensive exploitation of forest-edge resources. Poverty Point sites typically are distributed linearly along the Mississippi River Valley and three of its major tributaries: the Arkansas River, the Ouachita River, and the Yazoo River. Typical Poverty Point locations include Quaternary terraces or older land masses overlooking major stream courses, major river levees of active or relict river channels, river/lake junctions, and coastal estuaries or older land surfaces located in the coastal marsh (Neuman 1984; Gagliano and Saucier 1963). The position of the Poverty Point type site on Maçon Ridge overlooking Bayou Maçon has led some to suggest that the location of the site allowed the inhabitants to exploit, if not control, the flow of trade goods between other communities (Muller 1983; Neitzel and Perry 1977; Smith et al. 1983). Poverty Point sites along the Vermilion River in Lafayette Parish are believed to represent a number of chiefdoms responsible for the coordination and redistribution of resources in that area (Gibson 1975). The percentage of inhabitants of the coastal area participating in Poverty Point culture, however, remains uncertain.

In southeastern Louisiana, Bayou Jasmine phase and Garcia phase sites represent Poverty Point period sites that exhibit a continuation of earlier Archaic-like culture with the addition of some Poverty Point-like traits. Both phases suggest seasonal and specialized adaptations to marsh environments. Bayou Jasmine phase sites are located on the western shore of Lake Pontchartrain, and along natural levee ridges of the Mississippi River distributaries. The phase, named after the Bayou Jasmine site (16SJB2) in St. John the Baptist Parish, is typified by *Rangia* shell and earth middens, by an artifact assemblage that includes Poverty Point baked clay objects, by a lithic subassemblage that does not exhibit the classic Poverty Point microlithic assemblage, and by the use of bone artifacts. Pontchartrain projectile points occasionally are recovered from these sites. Faunal remains recovered from Bayou Jasmine sites include small animals such as muskrats, birds, and fish, as well as some deer and bear. Radiocarbon dates from the Linsley Site (16OR40), a Bayou Jasmine phase shell midden located south of Lake

Pontchartrain, cluster around 1740 B.C., very early in the Poverty Point sequence (Gagliano and Saucier 1963).

The Bayou Jasmine Site (16SJB2) was discovered in the late 1950s during road construction. Much of the site was buried beneath 1.8 to 2.4 m (6 to 8 ft) of marsh and swamp deposits, along a submerged natural levee of a former Mississippi River tributary, near its mouth at Lake Pontchartrain. Artifacts from the site area were collected from the associated construction spoil piles. The limited data collected at that time formed the basis for the Bayou Jasmine phase of Poverty Point (Duhe 1976; Gagliano and Saucier 1963; Gagliano 1964). In 1974, the site was rediscovered during construction of Interstate 55. Based on field observations, the site extended along either side of the bayou for a distance of at least 91 m (300 ft) and back from the bayou for at least 18 m (60 ft). The observed shell deposits measured 5.5 to 6.1 m (18 to 20 ft) in thickness. Numerous artifacts were collected from spoil piles along a work canal (Duhe 1976), and limited subsurface testing was conducted within a 2.1 by 15 m (7 by 50 ft) steel sheet piling cofferdam constructed around the excavation area (Neuman 1976). Based on the analysis of collected faunal and floral remains, the shell midden appeared to represent a seasonal coastal occupation that probably was utilized during the summer months. Numerous fish, turtle, and alligator remains were collected, along with a substantially smaller percentage of mammal remains. Very few bones from migratory birds such as geese and ducks were recovered, suggesting limited late fall and winter occupation of the site (Duhe 1976).

A large quantity of bone fishing equipment was recovered from Bayou Jasmine, along with some wood and plaited cordage. This equipment included fish hooks, fish gorges, fishing line weights, bone projectiles, perforated harpoons, a harpoon finger rest, harpoon float neck valve plugs, and a carved wooden spool probably used for holding cordage. Clay cooking balls also were common, and a small quantity of lithic material was recovered from the site area, including flake tools and Jaketown perforators. The flakes probably were used for processing the riverine resources. Very few items made of non-local materials were recovered; these included two hematite objects (a bead and a probable plummet), a few quartz crystals, and steatite. Three human burials, and an associated dog burial, were located. Duhe (1976) concluded that this site represented a seasonal (summer) fishing station, supplemented with harvesting of *Rangia cuneata*, and limited hunting of small mammals and deer. Data from this site provide the most complete information about coastal Poverty Point sites collected to date.

Contemporaneous with Poverty Point sites are Garcia phase sites. These sites are located along the eastern shore of Lake Pontchartrain. The Garcia site (16OR34), the type site for the Garcia phase, contained a beach deposit of *Rangia* shells and midden debris. The Garcia phase artifact assemblage differs substantially from the earlier Bayou Jasmine assemblage. The assemblage lacks Poverty Point baked clay objects, but includes a typical Poverty Point lithic complex. Associated projectiles include Pontchartrain, Gary, and Macon points, as well as a number of other projectile point types. Various cores and blades, large flake scrapers, groundstone objects, schist and gneiss slabs, quartz crystals, cut bone, and non-local lithic materials also are common (Gagliano 1964; Gagliano and Saucier 1963). While no dates have been obtained for the Garcia phase, an artifact comparison with other Poverty Point sites suggests that this phase postdates the Bayou Jasmine phase (Jeter and Williams 1989).

Woodland Stage (1,500 B.C. - A.D. 1,700)

In Louisiana, the Woodland Stage is composed of six cultural units: Tchefuncte, Marksville, Troyville-Coles Creek, Caddo, Plaquemine, and Mississippian. These groups span a time period ranging from 1,500 B.C. to historic contact. It was during the Woodland Stage that ceramic vessels and clay objects first were manufactured by the same peoples who also constructed burial mounds and temple mounds. Horticultural practices intensified and there is evidence of a greater reliance on second line food resources. In addition, use of the bow and arrow became widespread during Troyville-Coles Creek, as is evidenced by the presence of smaller projectile points. No Caddo sites are known in the coastal region; Caddo sites are confined to the northwestern portion of the state, and to nearby portions of adjacent states. Caddo culture, therefore, is not discussed in this section.

Tchula Period/Tchefuncte Culture (500 B.C. - A.D. 100)

The Tchula period is characterized by the first widespread use of pottery, albeit in the context of a Late Archaic-like hunting and gathering tradition within a Late Archaic-like tool inventory (Neuman 1984; Smith et al. 1983). While the extensive inter-regional trade network associated with the Poverty Point culture may have broken down, the Tchula period showed an increase in population and an intensification of intra-regional relationships. The specific elements of Tchefuncte culture were identified at the Tchefuncte Site (16ST1) on the north shore of Lake Pontchartrain in St. Tammany Parish (Ford and Quimby 1945; Rivet 1973; Weinstein and Rivet 1978).

Within this period, Tchefuncte culture evidences the earliest widespread use of ceramics in the Lower Mississippi Valley (Ford and Quimby 1945). Lacking local antecedents in Louisiana, Tchefuncte ceramics may have originated from the Stallings Island and Orange complexes of the Georgia-Florida coast (Speaker et al. 1986). Tchefuncte ceramic assemblages include both plain and decorated wares with soft and chalky paste and they are tempered with either sand or clay. A variety of vessel forms occurs, many with flat bases or with foot supports. Fabric and cord impressions, punctations, narrow and wide line incisions, and simple rocker stamping decorations commonly appear on these vessels. Tchefuncte Plain, Tchefuncte Incised, Tchefuncte Stamped, Lake Borgne Incised, Orleans Punctated, and Tammany Punctated are common soft-paste ceramic types. Alexander Incised and Alexander Pinched are two common sandy wares (Rivet 1973; Toth 1977).

Late Archaic or Poverty Point projectile point types found in Tchefuncte contexts include Gary, Ellis, Delhi, Motley, Pontchartrain, Macon, and Epps (Smith et al. 1983). Tchefuncte assemblages also include boatstones, grooved plummets, mortars, sandstone saws, bar weights, scrapers, and chipped celts. Socketed antler points, bone awls, fish hooks, and bone ornaments also are associated with Tchefuncte components.

Tchefuncte sites have been classified as coastal middens or inland villages and hamlets. Settlements reflecting coastal adaptations usually are located near the slack-water environments of slow, secondary streams that drain bottomlands, floodplain lakes, and in littoral settings (Neuman 1984). Coastal site locations seem best suited for exploiting a variety of fresh and brackish water resources (Shenkel 1984), particularly *Rangia cuneata*. Inland sites were oriented towards exploitation of terrace and floodplain habitats; their inhabitants were less reliant on brackish water resources (Shenkel 1984).

The majority of coastal Louisiana Tchefuncte sites are clustered within the Pontchartrain Basin in the southeast, and around Grand Lake in the southwest. In the Pontchartrain Basin, the sites generally are situated on natural levees and relict beach ridges such as the New Orleans Barrier Island Trend south of Lake Pontchartrain. The chenier ridges in southwestern Louisiana also were settled during this period. No Tchefuncte sites are known within St. Bernard, Plaquemine, and Terrebonne Parishes, reflecting the recency of these landforms (Jeter and Williams 1989).

Several Tchefuncte phases have been identified within southern Louisiana. The Pontchartrain phase encompasses the margins of Lake Pontchartrain and Lake Maurepas. It is characterized by a variety of poorly made sandy wares, including Tammany Punctated, *var. Cane Bayou*, Tchefuncte Plain, *var. Mandeville*, Tchefuncte Stamped, *var. Lewisburg*, Tchefuncte Incised, *var. Abita Springs*, Lake Borgne Incised, *var. Ponchitolawa*, and Mandeville Stamped, *var. Mandeville*. Other artifacts include Pontchartrain and Kent projectile points, clay tubular pipes, bone points, and some Poverty Point-like clay cooking balls (Jeter and Williams 1989). The preponderance of freshwater fish remains at sites such as Big Oak Island (16OR6) and Little Oak Island (16OR7) indicates a reliance on aquatic resources (Shenkel and Gibson 1974). Several Pontchartrain phase sites have been investigated, including Little Woods Middens (16OR1-5); Tchefuncte

(16ST1) (Ford and Quimby 1945); Big Oak Island (16OR6) (Ford and Quimby 1945; Shenkel and Gibson 1974; Shenkel 1974, 1980, 1981); Little Oak Island (16OR7) (Ford and Quimby 1945; Shenkel 1974, 1980, 1981); and a component of Bayou Jasmine (16SJB2) (Duhe 1976).

The Beau Mire phase, another Tchefuncte phase, was identified by Weinstein and Rivet (1978) at the Beau Mire Site (16AN17), located west of Gonzales along New River. This phase is characterized by earth midden sites situated along relict Mississippi River meanders or distributaries, including crevasse distributaries.

The Lafayette phase, recognized in the vicinity of Lafayette, Louisiana, is considered a transitional late Tchefuncte phase that was inspired by the Marksville culture (Toth 1977). Lafayette phase sites generally are situated along the edge of the Prairie Terrace overlooking the Atchafalaya Basin, and along the Bayou Teche/Mississippi River natural levees within that basin. This phase is characterized at the larger sites by circular earthen mounds. For example, Lafayette Mounds (16SM17), the type site for the phase, is located on the natural Bayou Teche/Mississippi River levee (Jeter and Williams 1989). It includes three low, conical burial mounds, the largest of which was excavated by Ford and Quimby (1945). Some small Lafayette phase satellite communities may occur along the Vermilion River (Jeter and Williams 1989).

Grand Lake phase sites occur further southwest, and represent a coastal adaptation (Gagliano et al. 1979). These sites generally are situated between Vermilion Bay and the Grand Lake area, and they extend northward along the Vermilion and Mermentau Rivers. They typically are comprised of shell middens. Grand Lake phase pottery types exhibit substantial differences from other coastal Tchefuncte phases. The sherds are thicker, more poorly made, and preponderantly sand-tempered. Unusual decorative techniques include folded lips, cane stamping, multiple incised lines oriented parallel to the rim, and angular incised lines (Jeter and Williams 1989). Morton Shell Mound (16IB3), a very extensive shell mound found near Weeks Island in Iberia Parish, includes deposits associated with Poverty Point through Plaquemine cultures, with dominant deposits dating from the Grand Lake phase (Neuman 1972). Examination of faunal and floral remains from Morton Shell Mound suggests that some coastal sites were occupied on a seasonal basis, usually during the summer and autumn, and possibly during the spring (Byrd 1976).

<u>Marksville Culture (A.D. 100 - 400)</u>

Marksville culture, represented by the Marksville Site (16AV1), is viewed as a localized version of the elaborate midwestern Hopewell culture (Smith et al. 1983). Burial practices and material goods reflect participation in a trade network identified as the "Hopewell Interaction Sphere" (Struever 1964). Marksville culture is marked by an intensification of ritual associated with mortuary activities, and a resurgence in inter-regional exchange of prestige items (Cantley et al. 1984).

Decorative motifs shared by Marksville and Hopewell ceramics include cross-hatching, U-shaped incised lines, zoned dentate rocker stamping, cord-wrapped stick impressions, bisected circles, and raptorial bird motifs (Smith et al. 1983). Other Marksville traits include a chipped stone assemblage of knives, scrapers, and drills; groundstone atlatl weights and plummets; bone awls and fish hooks; Gary projectile points; and, trade network items made of galena, mica, and copper. Treatment of the dead changed, with the construction of conical burial mounds surmounted by log tombs or platforms, and ossuaries. A fairly high level of social organization is indicated by the presence of log tombs, the abundance of grave goods accompanying interments, and the construction of conical burial mounds and geometric earthworks.

Because of detailed similarities in Marksville and Hopewell cultures (mound construction, burial patterns, and ceramics), some archeologists suggest that groups of Hopewellians physically relocated to the Marksville culture area (Muller 1983). Previously domesticated plant varieties, particularly pioneer annuals and other tropical cultigens such as squash and gourd, supplemented intensive riverine subsistence pursuits (Struever and Vickery 1973).

Marksville sites generally are located on the higher ground adjacent to rivers, or along floodplain lakes. Settlements were located along natural levees of rivers and distributary channels in the Mississippi Valley. Most Marksville sites are found within the Lower Mississippi Valley, along the Mississippi escarpment of Macon Ridge (Smith et al. 1983; Neitzel and Perry 1977). Houses were circular, fairly permanent, and possibly earth-covered.

Three basic types of Marksville sites have been identified within coastal Louisiana. Multiple mound ceremonial complexes usually were situated at the confluence of trunk channels and major crevasse distributary streams. These strategic locations served as trade and communication centers that provided ready access to a variety of environmental zones for the exploitation of food resources. Satellite residential communities, often featuring a single mound, were situated along the natural levees between stream junctures. Small seasonal resource procurement sites were scattered around these satellite communities to enhance the efficiency of obtaining food resources (Jeter and Williams 1989). Relict crevasse splays probably formed favored locations for the satellite communities.

Few Marksville sites are recorded within the coastal zone of Louisiana; most of these represent minor components within larger sites. For example, very few Marksville sites are known from around Lake Pontchartrain, possibly reflecting a relative abandonment of the area from Tchefuncte to Marksville times. Most of Lafourche and Plaquemine parishes do not contain Marksville sites, reflecting the recency of these landforms. Excavations at coastal Marksville sites have been limited to a few mound sites such as Coquille (16JE37), Boudreaux (16JE53), Big Oak Island (16OR6), and Magnolia Mound (16SB49); data collected at these sites primarily reflect mortuary practices rather than the daily life-ways of the Marksville culture (Jeter and Williams 1989).

In the Bayou Teche and saltdome region of south-central Louisiana, early Marksville sites are classified as Jefferson Island phase sites, while late Marksville sites are classified as Mandalay phase sites (Toth 1977). Tentative southwest coastal phases include the early Marksville Lacassine phase identified at Strohe (16JD10), in Jefferson Davis Parish; the late Marksville Veazey phase recognized in the Grand Lake region; and the late Marksville Lake Arthur phase in the Lake Arthur region (Jeter and Williams 1989).

Troyville-Coles Creek Culture (A.D. 400 – 1,100)

The Troyville-Coles Creek culture first was identified by Ford (1951) as a late Marksville - early Coles Creek manifestation. Troyville culture, named for the now largely destroyed Troyville mound group (16CT7) in Catahoula Parish, emerged around A.D. 400. Troyville marks the end of a general subsistence pattern that began in Archaic times; although various groups experienced periods of cultural efflorescence (Poverty Point, Marksville), these occurred within an Archaic economic milieu (Gibson 1978). Two technological advances associated with the early part of the Troyville-Coles Creek period that radically altered prehistoric lifeways were maize agriculture and the bow and arrow (Smith et al. 1983). Furthermore, the appearance of temple mounds and large ceremonial structures reflects the emergence of a priestly social class; such a class could not have existed without a stable economic base to support it (Smith et al. 1983).

During the Coles Creek period, the Native American population increased throughout coastal Louisiana. This increase is reflected in both the size and the number of sites in the area. Wetland niches exploited during earlier Tchefuncte times were re-inhabited during Troyville-Coles Creek times; however, subsistence pursuits differed (Gibson 1978). Troyville-Coles Creek subsistence was varied and adaptable to different locations. Smaller mammals and larger aquatic reptiles and fish were exploited during the later period. It has been suggested that the bow and arrow led to a higher hunter success ratio during this period (Gibson 1978). Fresh, brackish, and salt water environments were inhabited. Mussels, particularly *Rangia* sp, supplemented horticulture and hunting pursuits. Intensive exploitation of plants and slash-and-burn horticulture contributed to sedentism and community autonomy (Gibson 1978).

Settlement patterns in the coastal estuarine areas remained similar to those utilized by the preceding Late Archaic through Marksville cultures (Jeter and Williams 1989). Coles Creek sites were situated primarily along stream systems where soil composition and fertility were favorable for agriculture. Natural levees, particularly those located along old cutoffs and inactive channels, appear to have been the most desirable locations for settlement (Neuman 1984).

While there were regional differences between Troyville-Coles Creek subsistence and settlement patterns, certain ceramic styles were widespread. Extensive interaction with other groups living along the coast, particularly with Weeden Island cultures in Florida, are apparent (Brown 1984). Coles Creek Incised ceramics are typical of this culture. They are characterized by a series of incised lines placed below the rim of the vessel, and by a series of triangles impressed beneath those incised lines. Other ceramic types include Beldeau Incised, French Fork Incised, Mazique Incised, and Pontchartrain Check Stamped. Pottery styles exhibit marked differences; Pontchartrain Check Stamped proliferated in the coastal region (Gibson 1978). The number and variety of ceramics reflect an increase in the size and complexity of the culture. As Fuller writes,

> . . . there is an increase in the absolute number of components and in the size of corresponding pottery assemblages assignable to the Middle Coles Creek period. This change probably reflects a population increase and a broader range of adaptations to the various settings in the region . . . (Fuller 1985).

Troyville-Coles Creek culture is further characterized by the construction of large flat-topped pyramidal mounds arranged around an open plaza. These served both as burial mounds and as building platforms. Structures built atop the mounds typically were constructed of wattle and daub. Village areas located away from the ceremonial centers consisted of circular houses. This pattern suggests a change in social, political, or religious concepts. Gibson (1978) postulates that Troyville-Coles Creek sites having horticultural subsistence bases required compensatory adjustments in man-land relationships and in social and political institutions. During Troyville-Coles Creek times, status probably was conferred by differential access to prime agricultural lands.

Most large Troyville-Coles Creek sites contain one or more mounds. Troyville-Coles Creek mounds typically are larger, and exhibit more building episodes than earlier Marksville burial mounds. Burials occasionally are recovered from Coles Creek mounds; however, their primary function appears to have been ceremonial. At some Coles Creek sites, mounds are connected by low, narrow causeways; sometimes, multiple mound sites are associated with plazas. The complexity of Troyville-Coles Creek mound systems suggests a more complex social structure; a centralized authority and a sizable labor force must have existed to build, maintain, and utilize these mounds. The centralized authority probably consisted of a special religious class.

Recognized Troyville-Coles Creek phases in southeastern Louisiana include Bayou Cutler, Bayou Ramos, and St. Gabriel. The Bayou Cutler phase was identified from the Bayou Cutler I Site (16JE3) as an early Troyville-Coles Creek Phase; this site is located in Jefferson Parish, Louisiana (Kniffen 1936). Ceramics identified with this phase include: Coles Creek Incised *vars. Coles Creek and Chase*, Bledeau Incised, Chevalier Stamped, Pontchartrain Check Stamped *var Ponchartrain*, Evansville Punctated, *var. Rhinhart,* Mazique Incised, *var. Mazique*, and several varieties of French Fork Incised (Kniffen 1936).

The Bayou Ramos phase was described by Weinstein et al. (1978), using information obtained during the excavations at the Bayou Ramos I site (16SMY133) in St. Mary's Parish, Louisiana. The Bayou Ramos phase occurs primarily west of the Barataria Basin. Ceramics associated with this phase include: Avoyelles Punctated, *var. Avoyelles*, Beldeau Incised, *var. Beldeau*, Coles Creek Incised, *var. Mott*, Mazique Incised, *var. Mazique*, and Ponchatrain Check Stamped, *var. Tiger Island* (Weinstein et al. 1978).

The St. Gabriel Phase is considered a very late Troyville-Coles Creek phase that precedes the changes that would usher in the Plaquemine phase. The phase was identified from the St. Gabriel Site (16IV28) in Iberville Parish, Louisiana (Brown 1985). The St. Gabriel Site also had a Plaquemine component, which will be disucssed later in the text. Another St. Gabriel Phase site in Lafourche Parish, Louisiana, is the Bayou L'Ours Site (16LF54) which was excavated by Goodwin et al (1985). Ceramics that are identified with this phase include: Addis Plain, *var. Addis*, Coles Creek Incised, *var. Hardy*, Evansville Punctated, *var. Wilkinson*, Harrison Bayou Incised, var. *Harrison Bayou*, Mazique Incised, *var. Manchac*, and small amounts of Plaquemine Brushed, *var. Plaquemine* (Brown 1985, Weinstein 1987).

The Troyville-Coles Creek culture ended ca. A.D. 1100; however, like most other dates, this one does not imply a sudden termination of that cultural period. No sharp division occurred between Troyville-Coles Creek and the cultures that succeeded them.

Plaquemine Culture (A.D. 1,100 – 1,700)

In the Lower Mississippi Valley, the indigenous Plaquemine culture emerged from Troyville-Coles Creek culture by A.D. 1,100. Plaquemine culture maintained the same lifestyles as the previous Coles Creek cultures, except that agriculture seems to have become more important in the subsistence economy. Plaquemine ceramics were tempered with a variety of materials, including shell, and brushing became the most common decorative technique; engraving became popular later during this period. However, earlier decoration techniques persisted (Smith et al. 1983). Plaquemine Brushed, Harrison Bayou Incised, Hardy Incised, L'Eau Noire Incised, Manchac Incised, Mazique Incised, Leland Incised, and Evansville Punctate are common ceramic types of the Plaquemine culture.

In addition, Plaquemine settlement patterns reflected dispersed villages or hamlets surrounding the ceremonial centers. These settlement patterns remained basically unchanged from earlier Troyville-Coles Creek times (Smith et al. 1983). Rectangular house structures were constructed of wattle and daub, and site locations favored natural levees and the margins of the alluvial valleys. In southern Louisiana, salt mining, particularly at Avery Island, became an important part of the Plaquemine culture, and the importance of salt in the trade and subsistence networks of Plaquemine culture continued into the historic period.

In terms of its evolution, Plaquemine culture represents an indigenous development that emerged from earlier Coles Creek patterns. Plaquemine peoples continued the settlement patterns, economic organization, and religious practices established during the Coles Creek period; however, agriculture, socio-political structure, and religious ceremonialism intensified. Plaquemine sites are characterized by ceremonial sites with multiple mounds surrounding a central plaza, and by the occupation of dispersed villages and hamlets (Smith et al. 1983).

Plaquemine culture derives its name from the city of Plaquemine, Louisiana, situated near the type site, Medora (16WBR1), which was excavated by Quimby (1951). This site is a ceremonial center located on the Mississippi River floodplain at Manchac Point, south of Baton Rouge. A total of two mounds were excavated and recorded at the site. Mound A was constructed in four stages. The pre-mound stage represented the original living surface and associated features. The features included two circular house or temple rings measuring 13.7 m (45 ft) and 7.6 m (25 ft) in diameter, several pits, and hundreds of postmolds. The second stage of Mound A construction consisted of an ovoid mound measuring 30 m (100 ft) in diameter and 0.3 to 0.6 m (1 to 2 ft) height; this mound contained shallow pits, and many postmolds, some of which formed the square corner of a structure. The third stage of Mound A construction involved the addition of two truncated pyramidal mounds upon the initial mound, with a structure at the summit of each. During the fourth and final stage of construction of Mound A, a truncated pyramidal mound, measuring a 38.1 to 39. 6 m (125 to 130 ft) diameter and 3 m (10 ft) height, was built over the earlier mound complexes. Mound B was separated from Mound A by an approximately 122 m (400 ft) long plaza. It also was ovoid in shape and very similar to the initial mound associated with Mound A; it covered one or two pre-mound constructions (Quimby 1951).

Based on these excavations, Quimby developed a trait list to characterize Plaquemine culture. These traits included the construction of truncated, pyramidal (platform) mounds in association with an adjacent plaza; mounds built in stages; square or circular buildings (temples) associated with mounds; and, a distinctive pottery assemblage characterized by a comparatively high proportion of plain dishpan-shaped bowls, jars with brushed decoration, and plates with interior decoration (Quimby 1951:129).

Another Plaquemine culture ceremonial center reported by Quimby (1957), the Bayou Goula Site (16IV11), is situated on the west bank of the Mississippi River, near Bayou Goula, Louisiana. This site, excavated in 1941, consisted of two platform mounds dating from the Coles Creek to Plaquemine stage; it also produced a historic period component. These mounds probably were constructed during prehistoric times, and may not have been used during the early contact period, although occupation of the site continued into the early historic period. While the documents are inconclusive, the initial French contact with the aboriginal village at Site 16IV11 occurred either during Iberville's 1699 exploration of the Mississippi River, or at the time of the 1718 Paris concession (Quimby 1957; Giardino 1984).

Another Plaquemine period site is the St. Gabriel Site (16IV128), which is located on the Mississippi River natural levee northeast of St. Gabriel, Louisiana. This site also has a Troyville-Coles Creek Component. Woodiel (1980a, 1980b), assessing the 1977-1978 excavations at the site, determined it was a Plaquemine culture ceremonial center. At the time of its excavation, the site included a single earthen mound and a largely destroyed adjacent village site. The excavated mound was similar in character to those identified previously at the Medora Site and at Bayou Goula. It also was built in stages, and in association with buildings (temples). The St. Gabriel Site was located on the backslope of the natural levee of the Mississippi River, between the natural levee crest and the backswamps, and it was positioned adjacent to a probable prehistoric crevasse (water source). This placed the site near two distinct ecozones, the natural levee and the backswamp, allowing the inhabitants to exploit a wider variety of faunal and floral resources than would be available in a single ecozone. These food resources included large and small mammals, birds, turtles, fish, persimmon, honey locust seeds, and at least some corn. Woodiel notes that other prehistoric sites along the Mississippi River were situated in the vicinity of cut banks of meander loops (Woodiel 1980a, 1980b).

Mississippian Culture (A.D. 1,000 – 1,700)

Late in the prehistoric period, the indigenous Plaquemine culture was influenced by the Mississippian culture. Mississippian influence radiated from the middle Mississippi River Valley to southern Louisiana, east to central North Carolina, and north to the Great Lakes region (Haag 1971). Mississippian sites in Louisiana typically are located along the extreme southeastern coast, and in an isolated pocket in the northeastern part of the state (Neuman 1984). Mississippian culture continued to influence lifeways of southern Louisiana until contact with historic European cultures.

Mississippian subsistence patterns were based on the cultivation of maize, beans, squash and pumpkins; the collection of local plants, nuts, and seeds; and, the exploitation of various riverine and terrestrial species. Major Mississippian sites were located on fertile bottomlands of major river valleys; sandy and light loam soils usually composed these bottomlands. A typical Mississippian settlement consisted of an orderly arrangement of village houses surrounding a truncated pyramidal mound. These mounds probably served as platforms for temples or as homes for the elite. A highly organized and complex social system undoubtedly existed to sustain these intricate communities.

Mississippian ceramics were characterized by shell tempering, an innovation that enabled potters to create larger vessels with thinner walls (Smith et al. 1983:203). Ceramic vessels such as globular jars, plates, bottles, and loop- and strap-handled pots were used by Mississippian peoples. Decorative techniques included engraving, negative painting, and incising; modeled animal heads and anthropomorphic images also adorned ceramic vessels. Other Mississippian artifacts included chipped and ground stone tools; shell items such as hairpins, beads, and gorgets; and mica and copper items.

Contact Era

Although Hernando de Soto explored parts of Louisiana in the 1540s, it was not until the French entered the region in 1682 that the first information was recorded concerning Louisiana's native population. At that time, five Native American linguistic groups occupied southern Louisiana: Natchezan, Muskhogean, Tunican, Chitimachan, and Atakapan (Kniffen et al. 1987).

Natchezan Indians living in southern Louisiana included the Tensa and the Avoyel. The Tensas moved downriver from present-day Tensas Parish in 1706; they eventually settled around Mobile, Alabama, and were assimilated by other Indian groups in the area. The Avoyel resided along the Red River near Alexandria and Marksville; however, by 1805 they no longer existed as a group (Kniffen et al. 1987).

Muskhogean speakers comprised the greatest number of Indian groups, including the Houma, the Acolapissa, the Bayougoula, the Tangipahoa, the Okalousa, the Washa, and the Chawasha. The most prominent of these, the Houma, moved from west Mississippi to the vicinity of Angola, Louisiana. Their neighbors, the Tunica, drove them from that region, and a series of migrations brought them to the marshes of Terrebonne Parish where their descendants reside today. The Acolapissa once lived near the mouth of the Pearl River; however, they subsequently merged with the Houma and lost their tribal identity. The remaining tribes spread throughout southeastern Louisiana. Specifically, the Bayougoula lived on the west bank of the Mississippi River south of Plaquemine in Iberville Parish; the Tangipahoa resided in various parishes in southeastern Louisiana; the Okalousa lived in the upper Atchafalaya Basin; and the Chawasha and Washa occupied the area along Bayou Lafourche. All Muskhogean-speakers engaged in hunting, fishing, gathering, and agriculture for subsistence.

In 1706, the Tunica moved south from northwestern Mississippi and settled near the confluence of the Mississippi and Red Rivers. The Tunica became important French allies during the Natchez war of 1729, and fought the Yazoo and other tribes in 1731. When the French lost political control of the region, the Tunica fought the British as part of the Pontiac uprising in 1763 (Pritzker 2000). By 1800, they had migrated to the Avoyelles Prairie around Marksville (Smith et al. 1983).

Possibly related to the Tunica, the Chitimacha tribe lived along the lower Louisiana coast (Pritzker 2000). They controlled much of the upper Barataria Basin along both Bayou Lafourche and the Mississippi River. They were able to survive into the twentieth century largely because of their inaccessible location; the eastern Chitimacha were recorded in the area between the Atchafalaya and the Mississippi Rivers as early as 1702. At that time, they inhabited present-day Iberville, Assumption, St. James, Lafourche, St. Martin, and Terrebonne Parishes (Giardino 1984; Swanton 1946). Today, the Chitimacha reside along Bayou Teche near Charenton, Louisiana.

In 1700, Atakapan-speakers consisted of approximately 3,450 Atakapas and Opelousa. The Atakapas were thought to be the most primitive Native American group living in southern Louisiana during the Historic Contact period, since they continued to rely heavily on hunting, fishing, and gathering for subsistence (Kniffen et al. 1987). The Atakapas lived along three rivers in the southwestern part of the state: the Vermilion, the Calcasieu, and the Mermenteau. The lesser-known Opelousa lived near present-day Opelousas, in St. Landry Parish, Louisiana (Smith et al. 1983). Like most other Indian groups of Louisiana, these groups declined drastically during the late eighteenth and early nineteenth centuries, due to epidemic diseases and hostilities (Aten 1984).

CHAPTER IV

HISTORICAL PERSPECTIVE

Introduction

The currently proposed Grand Isle Underwater project is located adjacent to Grand Isle in Jefferson Parish, Louisiana. It runs west-to-east along Bayou Rigaud from roughly the Highway 1 bridge (across Caminada Pass), to the mouth of Barataria Pass. It also includes the north side of Fifi Island, just across Bayou Rigaud from the eastern end of Grand Isle. This chapter examines the broad historical trends that shaped coastal Louisiana, as well as specific cultural milieu of Grand Isle, Grand Terre, and Fifi Island from the era of exploration to the present.

Early Exploration

While the Spanish were the first Europeans to claim the Louisiana region, sources disagree on who first discovered the mouth of the Mississippi River, Alonso Álvarez de Pineda in 1519, or survivors of the Pánfilo de Narváez expedition in autumn 1528. One of the Narváez survivors, Alvar Núñez Cabeza de Vaca, included a description of the mouth of the Mississippi River and the southern Louisiana coastline in his account of the ill-fated expedition. Historians agree, however, that the first European to explore the Louisiana interior was Hernando de Soto. As De Soto led his expedition across the southeastern United States, the explorers crossed the Mississippi River near the present Tennessee/Mississippi state border in the spring of 1541. From that point, the expedition traveled westward, possibly as far as Oklahoma, before returning to the Mississippi. De Soto died somewhere along the river between Memphis and Baton Rouge in May, 1542.

Following de Soto's death, the survivors of the expedition unsuccessfully attempted an overland trek to Texas in order to reach the Spanish settlements in Mexico. They finally returned to the Mississippi, and journeyed downriver in seven "caravels," fishing boats akin to those used by Spaniards along the west coast of Africa in the same era (Figure 7) (Garcilaso de la Vega, De Soto account, quoted in Pearson et al. 1989:76). Vega includes the following description of the crude boats:

> Now our Spaniards made seven caravels, but not having an adequate supply of nails to construct decks that would shelter them completely, they covered in each of them only a part of the poop and the prow where they could place ship stores. In the center they carried some loose boards which provided a floor, and by removing one of these boards they were able to drain the water collected (quoted in Pearson et al. 1989:76).

From the mouth of the Mississippi they set sail across the Gulf of Mexico. Miraculously, they reached Vera Cruz in September 1543. Following these disastrous expeditions, Spain took no further action to strengthen her claim to the Lower Mississippi Valley; the Spanish left the region undisturbed for nearly 140 years (Davis 1971:27-28; McLemore 1973:91-100).

Next to explore the lower Mississippi was a French expedition under the leadership of Réné-Robert Cavalier, Sieur de la Salle. La Salle traveled down the Mississippi River from its confluence with the Illinois, probably in birchbark canoes, and reached its mouth in early April, 1682 (Figure 8). He and his men made camp roughly three leagues from the mouth of the river, then explored the various outlets for the next few days. With assurances from the Native American tribes encountered during the journey that they

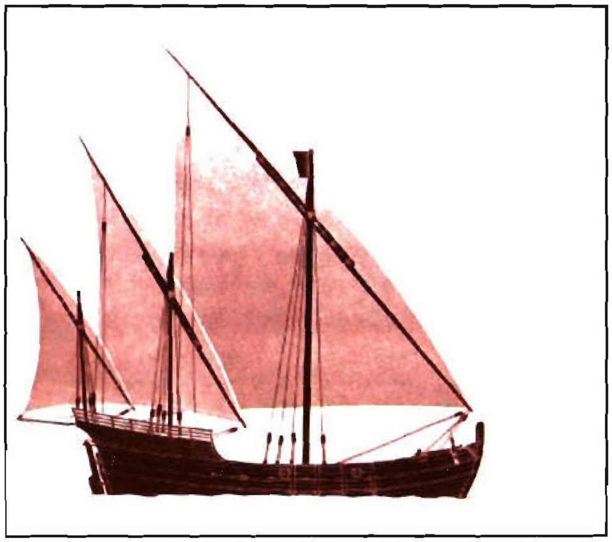

Figure 7. Although there were many designs for Exploration-era caravels, the hand-made boats described by DeSoto's fellow travelers might have resembled this crude fishing boat (excerpted from Munro, *Sailing Ships,* available online at http://website.lineone.net/~dee.ord/Tudors.htm).

Figure 8. This classic painting, *Ojibway Indian Spearing the Maskenozha (Pike)*, by Frank E. Schoonover, depicts a birchbark canoe, similar to the ones used by French colonists in Louisiana (painting held by the Rockwell Museum, Corning, NY, available online at http://www.tfaoi.com/mn/mn277.jpg).

were in fact "the first Europeans who have descended or ascended the River Colbert [Mississippi]," La Salle claimed all lands drained by the great river for Louis XIV, King of France, on April 9, 1682 (Davis 1971:28-29; French 1875:17-27).

Spanish maps indicate that explorers skirted the Gulf Coast at a close enough distance to map the area, but did not explore the Louisiana coastline sufficiently enough to produce detailed surveys. Their colonial attention was focused on Mexico (Evans et al. 1979:14). Not until the French regime arrived in *La Louisiane* did the coastal area experience any significant European exploration.

French Colonial Era

The French began colonization efforts in Louisiana in the late seventeenth century with the expedition of Pierre le Moyne, Sieur d'Iberville, who departed France in 1698 with four large ships and approximately 200 settlers. These ships included three frigates, the *Marin*, the *Badine* and the *François*, and one freighter, the *Voyageur* (the *Sea*, the *Lighthearted*, and the *Voyager*). Additionally, the party included several "biscayennes" (similar to Spanish "caravels," small, flat-hulled, masted ships) and feluccas (Figures 9 - 11). Iberville found the mouth of the Mississippi River in March 1699, but situated his headquarters, Fort Maurepas, to

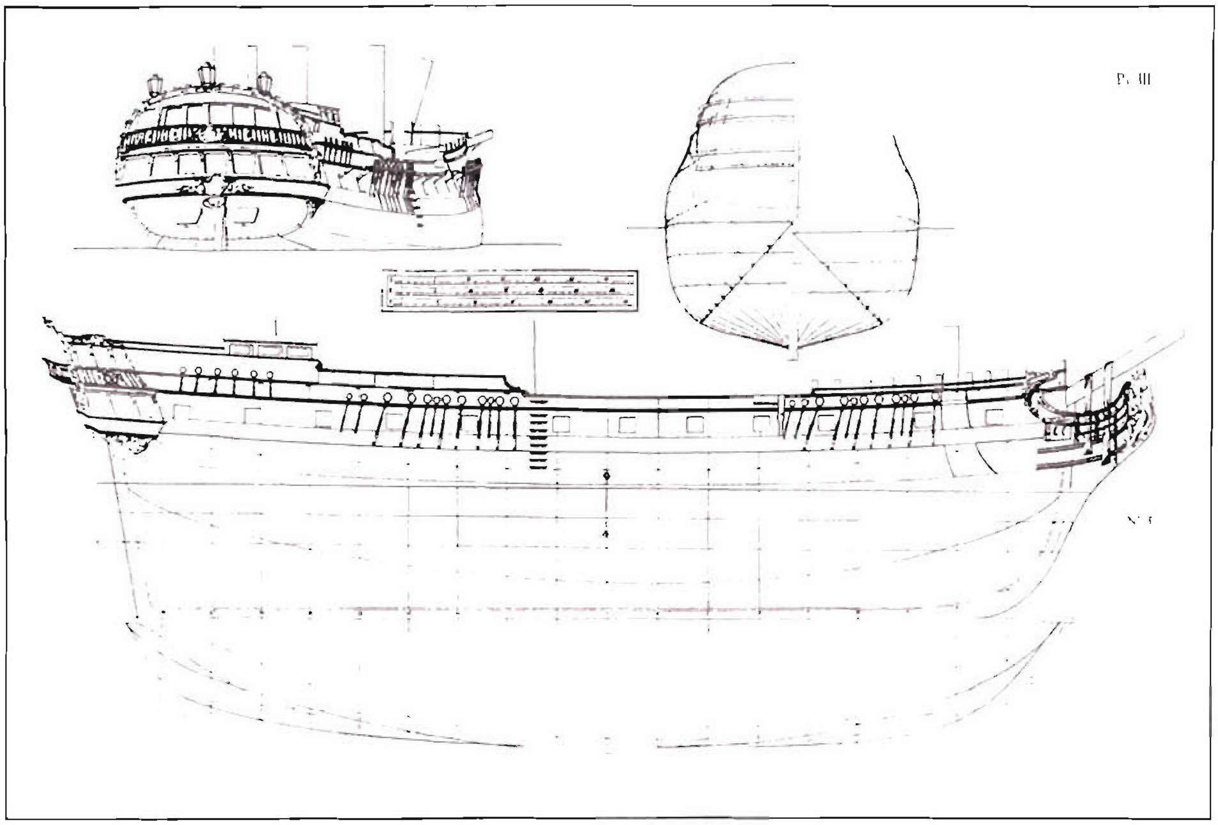

Figure 9. This drawing depicts an eighteenth century frigate, used for transoceanic voyages and hauling cargo (excerpted from Pearson et al. 1989).

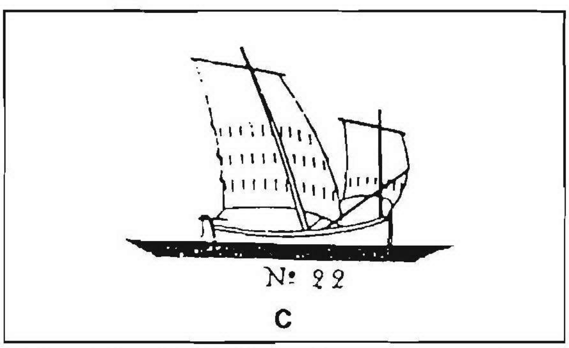

Figure 10. Small fishing boats, called "biscay-enne" by the French, were used around coastal Louisiana (excerpted from Pearson et al. 1989).

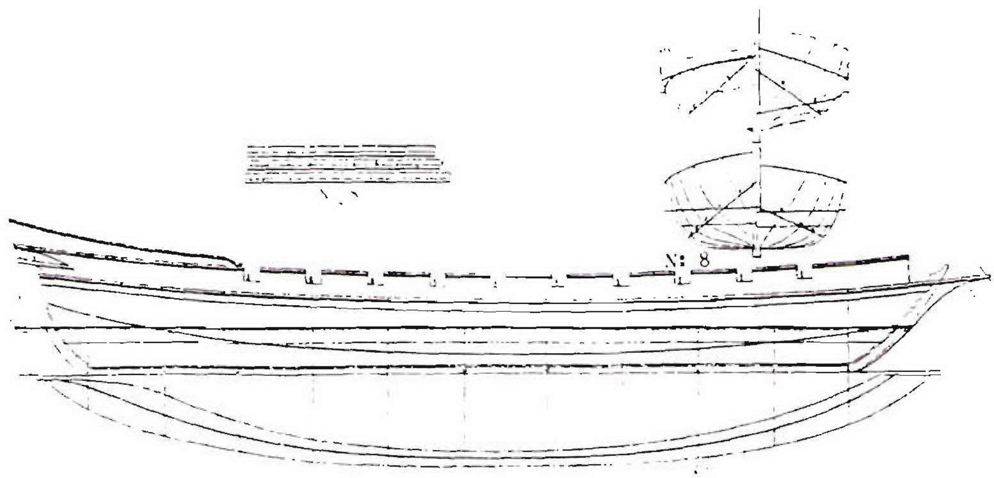

Figure 11. The initial French colonization party, led by Pierre le Moyne, Sieur d'Iberville, included several flat-hulled feluccas, similar to this drawing (excerpted from Pearson et al. 1989).

the northeast at Biloxi Bay (Davis 1971:39-41; Pearson et al. 1989:81). No maps or travelogues indicate that this initial French colonizing party conducted any extensive reconnaissance of the Grande Isle coastal area.

Colonial Travels by the Coast

Before returning to France for additional colonists and supplies, Iberville assigned his brother, Jean Baptiste le Moyne, Sieur de Bienville, command of the Mississippi explorations. During one of the Bienville scouting trips, he traveled to *la Fourche des Chetimachas* (the fork of, or on, the Chetimacha, now Bayou Lafourche), situated near present-day Donaldsonville in Ascension Parish. A mid-eighteenth century map depicts *la Fourche* in that same location at the head of the *Riviere des Chetimachas* (D'Anville 1752; Davis 1971:41; Devin 1719-1720; Goodwin et al. 1984:20).

No significant evidence of coastal exploration exists until the mid 1720s. Evans et al. (1979) cite a map of the Barataria region from 1722 as proof that the "inland route" from the Gulf of Mexico to New Orleans was in use during the early French period. Certainly, by the time Claude Joseph Villars Dubrueil built a canal connecting the Mississippi River to Bayou Barataria, the alternate route from the Gulf to the city was in use (Evans et al. 1979:14). During this time, the area behind "Grande Isle" (Large Island) and "Grande Terre" ("Large Land") was known as *Anse du Bois*, or Bay of the Wood(s). It has been widely speculated that this refers to the fact that the coastal islands were strewn with logs and driftwood, washed ashore in the tides. However, it is also possible that it referred to the large stands of cypress, called *chenières* by the French, that dotted both islands.

Water traffic during the early French period—indeed, throughout the entire colonial period—served as the primary means of both personal and economic transportation. Two different types of boats were utilized for different types of voyages: inland water courses and marine travel. For riverine travel, the French quickly adapted the use of the dugout canoe, or *pirogue*, from the Native Americans with whom they traded. These canoes were constructed of large, single cypress trees, from which the hull was "dug." They certainly also continued to use small batueaux, like those used by French trappers between Louisiana and Canada, and the deep-draft, rounded hull *chaloupes* (Figure 12). For overseas travel, either to other French colonies in the Caribbean, to the Atlantic seaboard, to Africa, or to France, several different types of ships could be found. In addition to frigates and freighters, like those brought with Iberville's initial colonial party, sloops, schooners, brigantines and barks would have been common along the coastline.

It is curious that most recent historical documentations of colonial watercraft along the coast of Louisiana have omitted any mention of slave ships. The first ship fitted out specifically to import slaves to the Louisiana colony was *Le Duc du Maine*, which arrived in 1719 with 250 men, women and children from the port of Juda (Whyda), on the "slave coast" (Hall 1992:63). Although records do not indicate what type of ship it was, officials from the Company of the Indies, who ran the colony of Louisiana by that time, estimated the ship could carry 500-600 slaves. It may have been a large frigate, specially adapted for traffic in humans (Figures 13 - 15). Over the next 12 years, 22 slave ships arrived in Louisiana, bringing almost 6,000 slaves to the "New World" (Hall 1992:59-60). By contrast, less than 2,000 white settlers lived in New Orleans, the Gulf Coast, or the Lower Mississippi River region in 1731 (Lachance [Hall database] 2000).

The colony of Louisiana struggled economically. It had little industry or commerce, and, while the agricultural yield increased over the years, French Colonial Louisiana never became self-sufficient. Added to the depressed economy were fears of native raids, shortage of

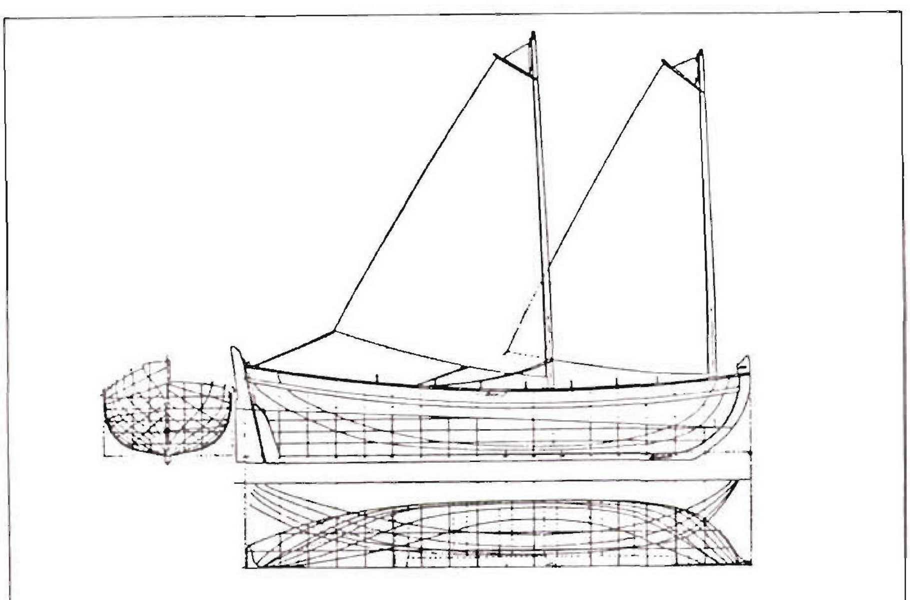

Figure 12. **Masted, deep hulled chaloupes were among the early French vessels used in Louisiana waters (excerpted from Pearson et al. 1989).**

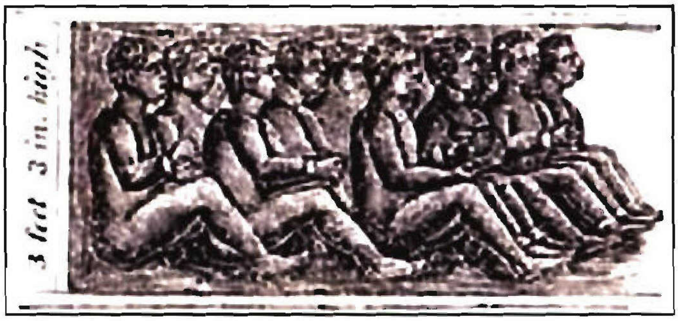

Figure 13. This woodcut, ***Interior of a Slave Ship***, depicts the inhuman conditions endured by African captives on their way from the "Slave Coast" of Africa to "La Louisiane" (excerpted from the publication, A ***History of the Amistad Captives***, New Haven Colony Historical Society, available online at http://www.pbs.org/wgbh/aia/part1/1h310.html).

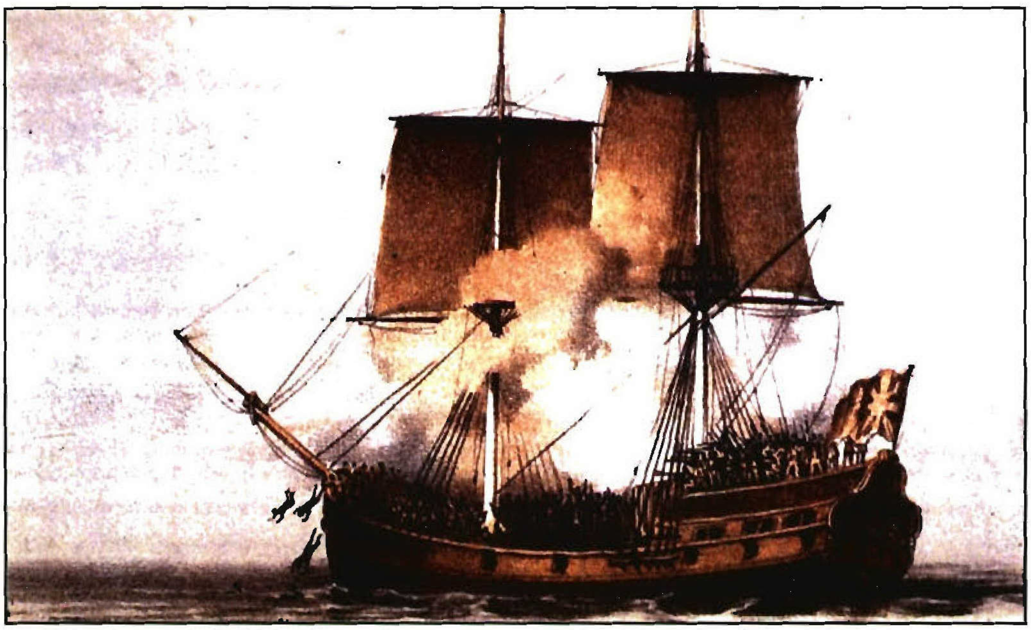

Figure 14. This William Fox painting, ***Revolt Aboard Slave Ship*** [1787], shows an insurrection aboard a frigate adapted for the slave trade, (excerpted from A Brief History of the Wesleyan Missions on the West Coast of Africa [London, 1851], available online at http://hitchcock.itc.virginia.edu/SlaveTrade/collection/large/E007.JPG).

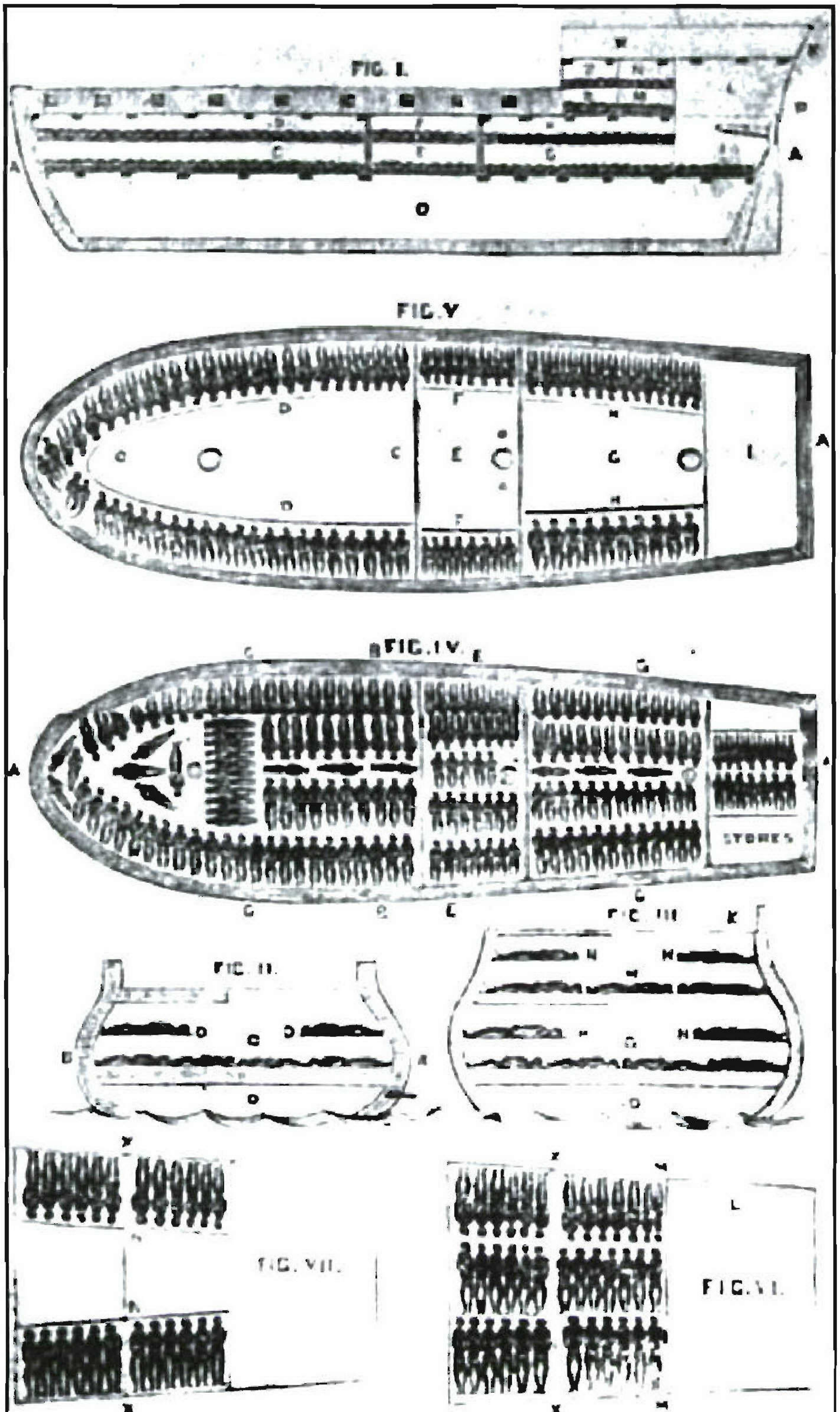

Figure 15. This sketch of the "British Slave Ship Brookes" [1789], depicts the design features particular to a slave ship (excerpted from the Broadside collection, Rare Book and Special Collections Division, Library of Congress [Portfolio 282-43], available online at http://hitchcock.itc.virginia.edu/SlaveTrade/collection/large/E014.JPG.

proper military support, and lack of promotion from the mother country. Following defeat in the Seven Years War, France ceded the struggling colony to Spain (Goodwin et al. 1984:20-21).

Spanish Colonial Era

Spain acquired the Louisiana colony west of the Mississippi River through the Treaty of Fontainebleau, which was signed on November 3, 1762. Nevertheless, not until 1767 did the Spanish assume control of Louisiana under the governorship of Alejandro O'Reilly (Davis 1971:70, 105). During the Spanish period, the first land grants down Bayou Lafourche were issued, with settlement slowly inching toward the coast. Not until two decades into the Spanish era would Grand Isle and Grand Terre become settled.

Along Grand Isle, Jaques Rigaud was the first concessionaire to receive a land grant, in 1781. Joseph Callet, François Anfrey, and Charles Dufresne joined Rigaud over the next 6 years (Figure 16). At the time of their land grants, Grand Isle was described as rather stark: "very low and devoid of timber, except [for] ...a chain of small oaks....there are two houses on these islands [Grand Isle and Chênière Caminada], kept only for hunting and fishing, which abounds" (Don José de Evia, quoted in Evans et al. 1979:19).

Local legend contends that Rigaud was the first to successfully establish a working plantation. In fact, the island is ill-suited to agriculture, prone to flooding with seawater, and very sandy. Rigaud apparently engaged in some staple crop agriculture, but primarily raised cattle, which he sold to New Orleans markets. Rigaud reportedly used a fishing lugger to take his goods to New Orleans (Evans et al. 1979:24) (Figure 17).

Acadian colonization of region between the Mississippi River and Grand Isle, most notable along Bayou Lafourche, flourished under Spanish rule. The historic *Lafourche des Chetimachas* settlement was located along the natural levees bordering both sides of upper and central Bayou Lafourche between the present-day communities of Napoleonville (Assumption Parish) and Raceland (in Lafourche Parish). In 1785, four of the seven Acadian immigrant "expeditions" brought settlers to the Lafourche post. The sparsely-populated Lafourche region apparently was preferred because its isolation from the larger Anglo-American settlements permitted the Acadians to maintain their traditional culture in their new land (Brasseaux 1985:35; 1987:97, 109-115).

Although an agrarian people, the Acadian settlers of lower Bayou Lafourche supplemented their farm production with fishing, hunting, and trapping, necessities in the marshlands. In the isolated Barataria region, which began along the east bank of Bayou Lafourche, smuggling also became a way of life for some of the inhabitants of the basin. In addition to hideouts, the wooded swamps offered timber resources for the more traditional occupations of shipbuilding and land-based construction. During the last years of Spanish colonial government, the first primitive canals were cut through the Lafourche marshes to aid these early settlers in their pursuits. Some canals were dredged for farmland drainage, others for trapping use (*traiñasses*), and still others for access to navigable waterways and to the port at New Orleans. Some of these early channels have been maintained and improved through the years and remain in use today (Davis 1985:150-152; Goodwin et al. 1984:21-22; Speaker et al. 1986:13-14, 57). For example, the Dubreuil Canal, which became the Company Canal, connected Bayou Barataria with the Mississippi River, and may have been a smuggling route during the late French-early Spanish eras. Certainly, it provided a route from the Gulf to New Orleans that bypassed the Balize and colonial customs officers as early as 1740 (Swanson 1975:152).

Smuggling became a major issue for the Spanish government largely because of their colonial economic policy. Spanish legislation attempted to crush established French commercial networks. Since a large percentage of Louisiana residents were of French descent, who had been residents of the colony for decades before the Treaty of Fountainebleau, this policy prompted vitriolic response from colonists. The local inhabitants sought to develop methods to circumvent Spanish authority, an extensive black market trade network developed in the Barataria district during the Spanish period. Two artificial canals connected the Mississippi River above New Orleans to bayou waterways that flowed into the Gulf of Mexico. Goods and

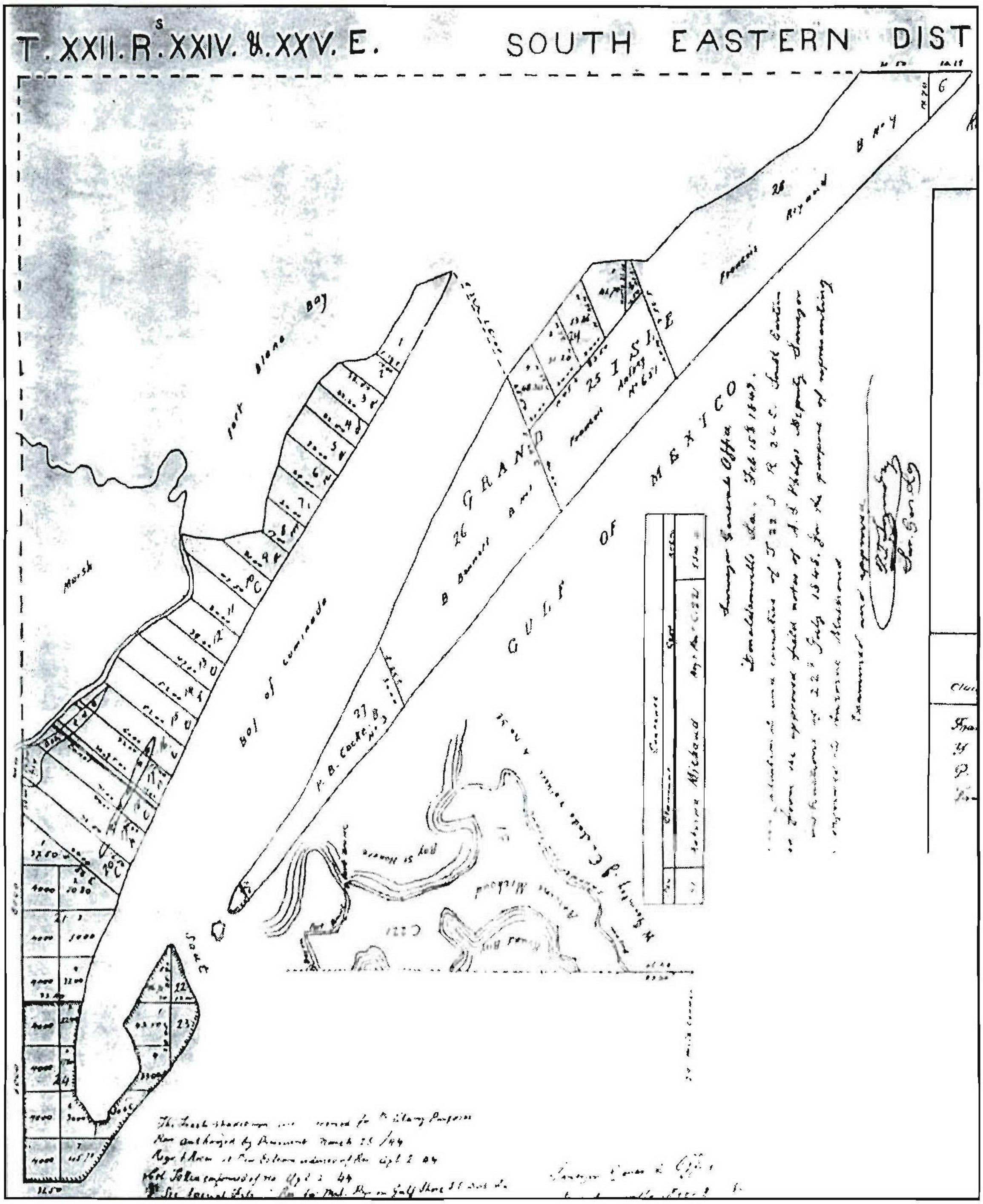

Figure 16. This 1849 survey, conducted by the Louisiana Surveyor General, depicts the original Grand Isle land grants (original surveys housed at the Louisiana State Land Office, Baton Rouge, LA).

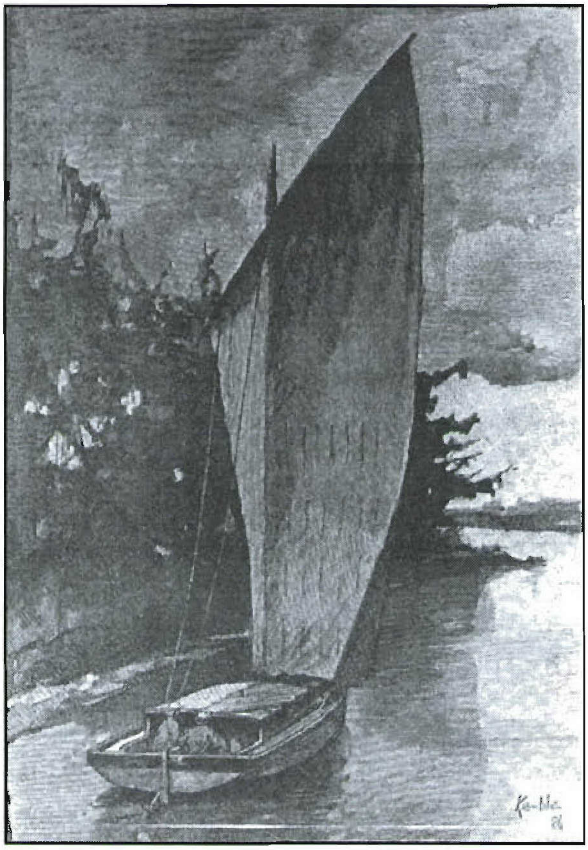

Figure 17. Small luggers, like this one, were used for more than a century by Barataria Basin fishermen (excerpted from Evans et al. 1979).

slaves shipped by this route bypassed both New Orleans and Spanish duties. In addition to Dubreuil's west bank canal, the waterway through the "Petit Desert" connected the Mississippi to Bayou Segnette. This route to the Gulf of Mexico was in use at least as early as 1794. Thus, the Barataria region witnessed a rapid expansion of smuggling in circumvention of Spanish political and commercial legislation.

Unlike Grand Isle, Grand Terre island, just east of Barataria Pass (or Grand Pass), possessed a deep-water bay on the leeward side of the island. This bay made Grand Terre accessible to much larger, ocean-going vessels. In turn, the anchorage made Grand Terre the geographic center of the smuggling trade along the coast. Although Grand Isle continued to be an integral locus for coastal smuggling, Grand Terre served as a central location for the transfer and sale of smuggled goods.

Certain key officials in the Spanish government recognized that Spain's own policy toward tariffs contributed to the overwhelming black market. According to the Spanish Minister to the United States, "goods from Spain arrived heavily surcharged" (quoted in Maygarden et al. 1995:18). Certainly, throughout the Spanish period, smugglers offered a wider variety of goods for better prices than could be obtained through legitimate channels.

Territorial Era

As part of the negotiations leading to the Louisiana Purchase (1803), Spain restored western Louisiana to France, which shortly thereafter conveyed the Louisiana Territory to the United States. On March 26, 1804, that portion of the Louisiana Purchase located below the thirty-third parallel was designated the Territory of Orleans. The following year, Orleans was partitioned into 12 counties, including the county of La Fourche [sic], which was bounded to the north by Acadia (encompassing Donaldsonville and uppermost Bayou Lafourche) and the German Coast counties, to the east by Orleans County, to the west by Attakapas County, and to the south by the Gulf of Mexico. In 1807, the territorial legislature reorganized the county system, further dividing the Territory of Orleans into 19 parishes. Grand Isle and Grand Terre, as well as the marshlands encompassed by the Barataria Basin, remained part of Orleans Parish. Approximately five years later, on April 30, 1812, the State of Louisiana was admitted to the Union, and the project area became part of Jefferson Parish upon its creation, in 1825 (Davis 1971:157-164, 167-169, 176; Ditto 1980:42; Goins and Caldwell 1995:41-42).

Piracy in the Early Nineteenth Century: Grand Isle, Grand Terre, and Barataria Bay

Even after the United States assumed control of the Louisiana Territory, smuggling did not abate; in fact, it could be argued that smuggling reached its peak, at least in terms of notoriety. Grand Isle, situated directly on the Gulf of Mexico, was one of the bases of operations for

Louisiana's most infamous character, the pirate (or privateer) Jean Laffite.[1] Laffite was so well-known in his own lifetime, and has become so infamous in death, that tales of both his heroism and depravity abound. The legacy has become so commingled with falsity that it is difficult to tease out the truth from the embellishment. According to Laffite scholar, Charles Ramsdell, Jr., "Jean Laffite belongs to folklore rather than History" (quoted in Laffite Journal, trans. Marshall 1999:35). In this murky legend of half-biography, half-fiction, even the historical sources used for research are contentious.

By far the most controversial source on Jean Laffite is his memoirs. Unearthed by a self-titled descendant of Laffite, John Andrechyne Laffite, the *Journal of Jean Laffite: The Privateer-Patriot's Own Story* came to light in the 1950s, and its discovery was met immediately with suspicion. John A. Laffite, it seemed, was an odd character, too uneducated to forge the *Journal*, but too much of a "freak" (Clyde H. Porter, recounted in Marshall 1999:17) to be treated as reliable. For more than twenty years, he shopped the manuscript around, gaining supporters and opponents until he finally found a buyer for the contentious record.

Currently, the *Journal* is housed at the Texas State Library and Archives, but still has less than reliable credibility. Regardless of the controversy surrounding the manuscript, ample reliable evidence of Laffite's activities in southeastern Louisiana in general, and the current project area in particular, is available. He is the namesake for a Louisiana town and a United States National Park, and an intriguing historical figure who still captures the imagination of those who study him.

Laffite was certainly active in Louisiana by 1805-06. He is variously reported to have had a warehouse, a store on Royal Street, a warehouse on Chartres Street, and a blacksmith's shop on St. Philip's Street, near the corner of Bourbon Street, all in New Orleans (Kendall 1941:14; Ramsay 1996:21). It is likely that he began his infamous career as a middle-man for more notorious and hardened pirates, such as Vincent Gambi (or Giambi or Gambio), Louis Chighizola, and Renato Beluche, selling the plunder of their exploits in legitimate concessions in the city. By 1809, however, his role in the economy of Louisiana began to change.

Louisiana had been sold to the United States in 1803. By that time, sugar and cotton had replaced rice and indigo as the most profitable crops in the territory, bringing huge profits to those planters who could produce large quantities of the cultigens. Such production, however, could only be achieved with a large labor force. The Constitution of the United States included a provision which banned the importation of slaves to Louisiana from outside the borders of the country by 1808; however, with an enormous influx of American planters into Louisiana, eager for their piece of the plantation economy, the interstate slave trade simply could not meet the extraordinary demand for bonded labor. Moreover, slaves sold in the markets in New Orleans cost between $600-$700, whereas smugglers charged $150-$200 (Remini 1999:27).

In the midst of this economic change came Jean Laffite, by then a seasoned entrepreneur, obtaining goods and slaves from pirates and selling them to both consumers and commercial dealers for huge profits. He was positioned perfectly to organize this makeshift operation of supply-and-demand economics into an efficient *subrosa* market.

Laffite became the "chief" of the band of "Baratarians," as the smugglers were called. Several of the pirates had letters of marque from Venezuela, La Plata (modern-day southern Peru), New Grenada, or Cartageña. These letters presumably should have allowed them to legitimately overtake and rob ships from countries unfriendly to the smugglers' "home base," namely Spain. In fact, the American government, by treaty with Spain, considered "every ship fitted out in the United States to act as a privateer against Spanish commerce, no matter what papers she possessed from other governments" to be a pirate (Kendall 1941:17). Consequently, the plunder from any such ship legally could not be sold in or through any American port, including New Orleans.

[1] Even the spelling of Laffite's name is controversial. He normally signed himself *Jean Laffite*, however, the National Park named in his honor in New Orleans is "Jean Lafitte."

In order to efficiently evade the huge American tariffs and embargoes on both the slaves and goods pilfered at sea, smugglers needed a base of operations away from both the Balize at the mouth of the Mississippi River and the port of New Orleans. Grand Terre and Grand Isle, barrier islands located approximately 80 km (50 mi) from either regulated area, provided just such a location. Collectively (and variously) called "Barataria," smugglers set up camp on these islands, where they could unload and store their cargo for more inconspicuous importation into the major Louisiana market.

Barataria was often called the "back door" to New Orleans in the eighteenth and nineteenth centuries (Figure 18). A seasoned and familiar sailor, in a shallow-draft boat such as a large pirogue, flatboat, chaloupe, or push-pole barge, could navigate his way from the Gulf of Mexico, up to Lake Ouacha (now called Lake Salvador), to Bayous Segnette or Barataria, through either the Dubreuil or "Petit Desert" canal, and eventually up the river to the city. For a year or two, this was the primary means of distributing goods and slaves confiscated by the Baratarians. Within a few years, however, legitimate merchants in and around New Orleans began to complain of the smugglers' practice to Governor Claiborne. The increased pressure led Laffite to adopt more clandestine means of distributing his ill-gotten gains. The Baratarians began to conduct auctions along the coast, at Grand Isle, Grand Terre, Chat Island, and opened a warehouse outside of the city, at a place called the Temple. In the city, the Laffites hired Jean Sauvinet as their "fence," or agent, for New Orleans sales (Kendall 1941; Remini 1999:28). No mention of "Fifi Island," then called Petit Isle, is made during the smuggling era.

The Temple, located on a small peninsula of land between Bayous Rigolettes and Perot, became the site for weekly auctions (Gagliano et al. 1979:4-79; 4-83). The site was approximately halfway between the Grand Terre/Grand Isle complex and New Orleans. Rather than the Baratarians risking their freedom by smuggling their pilfered slaves, wine, iron, armaments, and sundries into the city, by 1812, they invited their wealthy planter-clients to meet them outside the city in an open-air auction. Reportedly, the Temple was comprised of several buildings, including at least one baracoon, where slaves were held. The auctions were alleged to attract "merchants, dealers, and individual customers from New Orleans" (Ramsay 1996:32).

By 1812, Laffite and the Baratarians comprised several hundred men. According to one report (Kendall 1941:15), the buccaneers had "seventeen vessels—brigantines, schooners, and feluccas—all operating out of Barataria." Although there have been reports that the pirates built an elaborate fort on Grand Terre, recent work tends to dispel that notion as legend (Maygarden et al. 1995:45). Some 40 dwellings with thatched roofs, all of shoddy construction, were built on the island (Figure 19). They enjoyed great success during this period, selling as many as 400 slaves on a particularly good day at Grand Terre (Kendall 1941:15).

These accommodations outside New Orleans may have made Laffite and his fellow scofflaws less vulnerable to capture since it obviated the need to travel in and out of the city, but it did not reduce Governor Claiborne's resolve to stop the illegal traffic. By November, 1812, the United States District Attorney in New Orleans filed a petition against Jean, charging "violation of the revenue law" (Kendall 1941:17; Ramsay 1996:37). In April of the next year, Jean's brother Pierre was charged with more specific acts of piracy. Customs officials repeatedly set on Laffite ships, often to their own peril. When Claiborne posted a $500 reward for the capture of Jean Laffite in November, 1813, public tensions between the two escalated. The governor assailed the Baratarians as "banditti," and Laffite brashly published announcements of "rich prizes...lately brought to Grand Isle" (Ramsay 1996:46, 50).

The conflict between Laffite and Claiborne was heightened by the War of 1812, and the city's vulnerability to a British attack by water. Washington, D.C., had been captured and was held by the British, and rumors of dozens of the King's warships in Gulf waters plastered the front page of the city newspapers. Jean warned the governor of the vulnerability of the city through the Barataria pass, and offered his "services to defend" Louisiana. The governor, however, remained disdainful of Laffite and his Baratarians. In August, 1814, Pierre Laffite risked capture by the New Orleans government

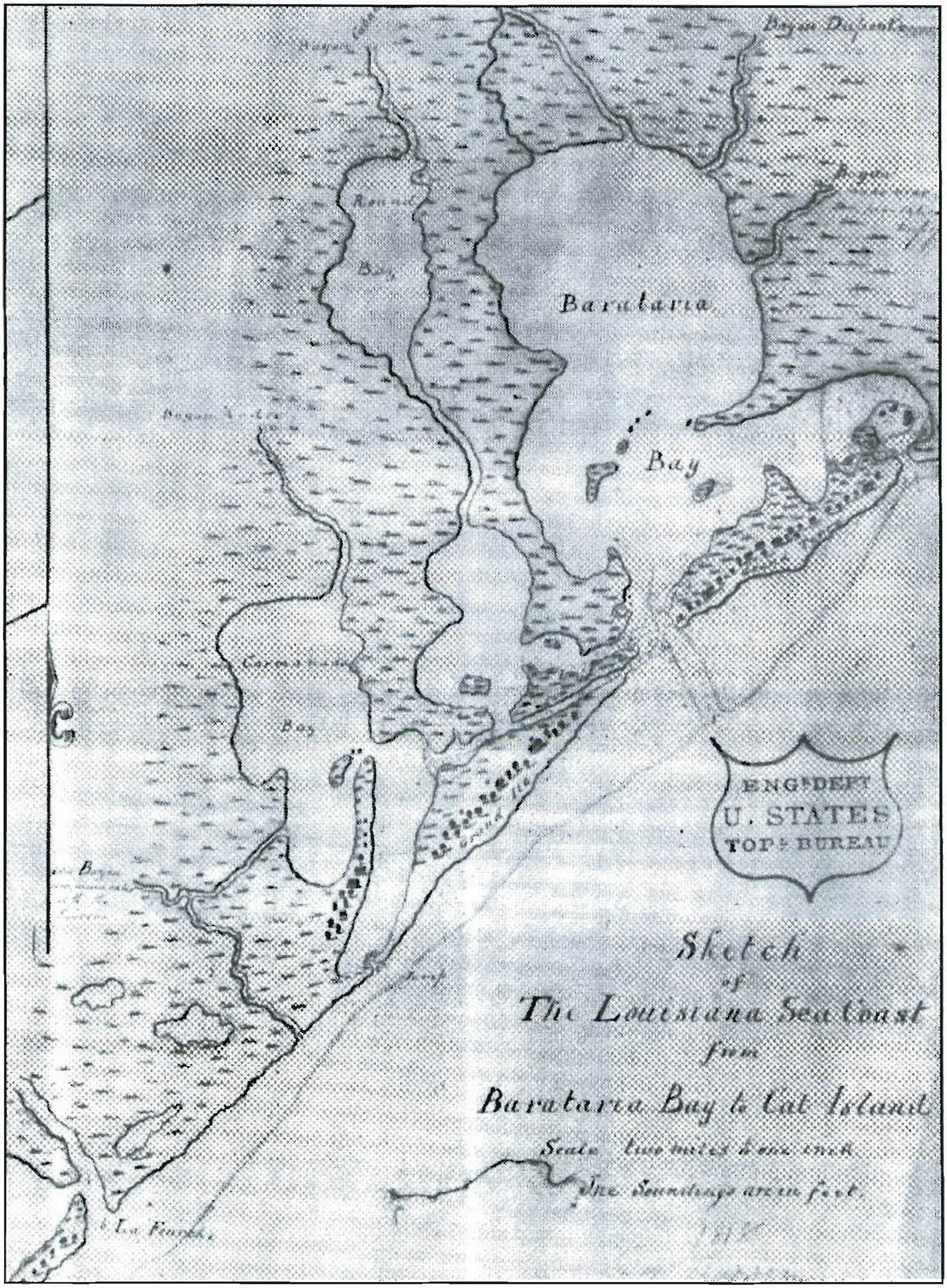

Figure 18. **This map of the Barataria Basin, ca. 1818, shows the "back door" to Louisiana, used by smugglers for over a century (excerpted from Evans et al. 1979).**

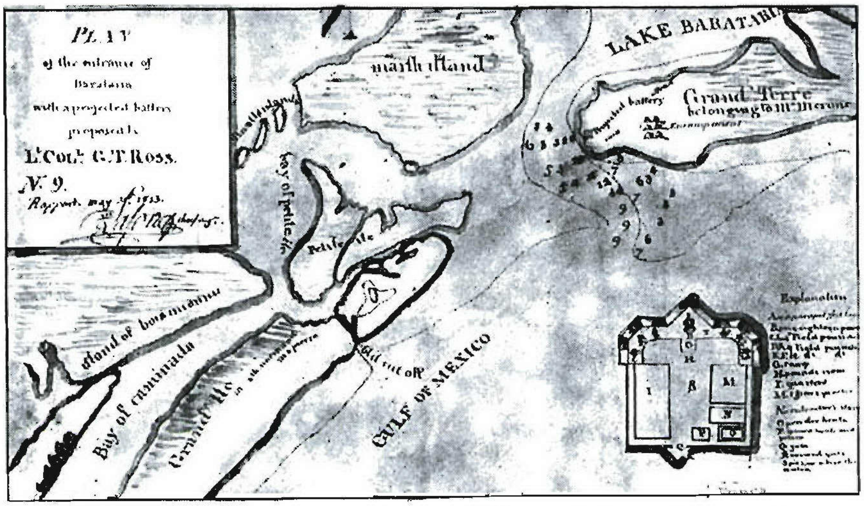

Figure 19. This map, drawn by Lt. Col. Ross, of Grand Isle and Grand Terre, ca. 1813, shows the Laffite "encampment" somewhat more centrally-located on Grand Terre Island than later sources indicate (excerpted from Evans et al. 1979).

by entering the city. The gamble did not go his way, and he was imprisoned in the Cabildo throughout the month.

Jean, meanwhile, was busy attending to business on the Gulf. On September 3, 1814, a British sloop anchored off Grand Terre, and several members of the British military approached the island in a dingy flying a white flag. With them, they carried a letter written by Lt. Col. Edward Nicholls, and endorsed by the crown, calling on Laffite "and [his] brave following to enter into the service of Great Britain" (Ramsay 1996:49). The letter was reported by many to include large cash incentives, however, this seems historically improbable. More likely, offers of rank, citizenship, and property in the colony after a British victory probably are more accurate.

Laffite stalled the British by requesting a few days to get his affairs in order. Whether he intended to assist them, or was simply buying time is a matter of significant debate, although the latter seems more likely. He dispatched a letter to Governor Claiborne, again offering his and his allies' services for the protection of Louisiana, and warning of an impending British naval attack. He also sent off the British letters to Jean Blanque, a longtime friend and New Orleans attorney, along with a request that his brother be given an early release from the Cabildo prison. Curiously, just three nights later, on September 6, 1814, Pierre Laffite escaped.

Ten days after the younger Laffite's escape, the British navy, led by Lt. Col. Nicholls, attacked Fort Bowyer on the Gulf Coast. Perhaps out of fear that Laffite would assist the crown, the very same day as the skirmish at Fort Bowyer, a fleet carrying the United States 44^{th} Infantry Regiment drew up to the bar by Barataria Pass. Led by the schooner *Caroline*, six gunboats and the tender *Sea Horse,* 71 men on the 8 vessels readied for the impending conflict. The pirates and privateers formed a battle line in the bay, used primarily to cover their immediate retreat. The Baratarians burned two schooners in the harbor, and fled up the Barataria bay in a collection of small vessels, along with the several hundred customers on the island for merchandise. Commodore Patterson, leader of the United States troops, reported capturing seven other schooners, one brig, one felucca, and 20 pieces of cannonade (Cusachs 1919:423-425). By the time the Federal troops landed at Laffite's settlement, the majority of residents had fled, and the leader himself was nowhere to be found. Two of the schooners and the felucca were so damaged that the invading forces scuttled them (Maygarden et al. 1995:47)

Curiously, by the time of the attack on Grand Terre, Governor Claiborne had significantly softened his view of the Baratarians. He had heard of Laffite's rejection of the British offer, and he asked Commodore Patterson to postpone the raid. In fact, Claiborne was distraught that the raid had effectively eliminated the first line of naval defense of Barataria Bay, a primary water approach to New Orleans. He immediately wrote to Andrew Jackson, suggesting that the General take "immediate possession...of Grand Terre, ...and...the place called 'the Temple'" (Ramsay 1996:59) (Figure 20). After some initial hesitancy on Jackson's part, he eventually agreed to meet with Jean Laffite, perhaps to discuss the protection offered by the men the future president once called "hellish banditti" (Ramsay 1996:60).

The circumstances of Laffitte and Jackson's meeting are unclear; however, it is certain that some of Laffite's men joined with General Jackson in defense of the city at the Battle of New Orleans. Additionally, many records suggest that Laffite supplied a number of armaments to Jackson's forces (see, e.g., Remini 1999:116). Certainly, Laffite was on Old Hickory's personal staff. In the days leading up to the decisive January 8, 1815 battle, Dominque Youx, Renato Beluche, and dozens of other reported Baratarians protected the river adjacent to the Chalmette battlefield with cannons. Laffite himself was dispatched with General Jean Humbert to the west bank of the river, to one end: "Carrying the enemy if necessary at the point of the Bayonet" (Remini 1999:162). When the gunsmoke from the fight settled, and the Americans had defeated the British, President Madison issued a presidential pardon for Laffite and the Baratarians.

The Louisiana Purchase and Antebellum Economic Development

Much of the coastal region, along with lower Bayou Lafourche, was surveyed by the Office of the U.S. Surveyor General during the 1830s and then resurveyed in the 1850s. No structures were depicted on the researched survey plats; however, canals, cultivated fields, and inland lakes appeared in several land claims. In the currently proposed project area, Petit Isle (Fifi Island) had a 6.9 ha (17 ac) lake on the north side, connecting to "pass Rigaud." That water-filled area, like all of the marshland, grew in time. Most of the remaining land, both private claim and public acreage, was designated "IMPRACTICABLE TREMBLING PRAIRIE" or "IMPASSABLE TREMBLING & OVERFLOWED PRAIRIE." By 1850, most "public sections" had gone to the State of Louisiana under the U.S. Swamp Land Acts of 1849 and 1850 (Louisiana Surveyor General 1857-1858; Wicker et al. 1993:6). Grand Isle, by that time, was broken into 5 large tracts, and 5 small tracts; the Rigaud and Anfrey families still owned half the island, along with P. B. Cocke and B. Bennett. The small tracts had been surveyed, but apparently were not yet sold (Figure 21). By this point, Petite Isle contained several houses, identified in one map as "Fifi's Houses," presumably belonging to Grand Isle resident Jacques "Fifi" Eagle (Figure 22).

Louis Chigizola also purchased property on the island, from Pierre St. Amant and François Rigaud. Chigizola, who was known as "Nez Coupé" ("Cut Nose") when he worked with Jean Laffite and the Baratarians, is widely believed to have introduced citrus farming to Grand Isle (Evans et al. 1979:35). Others, like Valentin Encalada, grew sugar, while many continued to raise livestock and fish commercially. The island remained sparsely settled throughout the antebellum period. Perhaps more notable is the fact that the island remained remarkably racially integrated during this era. For example, in 1810, 63 residents lived on Grand Isle, spread among in 10 family units. Fifteen islanders (24 percent) were free people of color, and the rest were white. No slaves were noted. By 1830, the population had grown to 107 individuals in 12 families, and the island remained remarkably integrated. 26 residents (24 percent) were free people of color, compared to only 17 slaves (16 percent), and 64 whites (60 percent). Nez Coupé lived with 8 free people of color who were probably his family, and his neighbor, F. Encar, a white man over 60, lived with two other white men, one white woman, four white children, and five free people of color. St. Anna was a free woman of color and the head of a household of nine free people of color. Jacques "Fifi" Eagle (Egle), who was also over 60, lived with a white

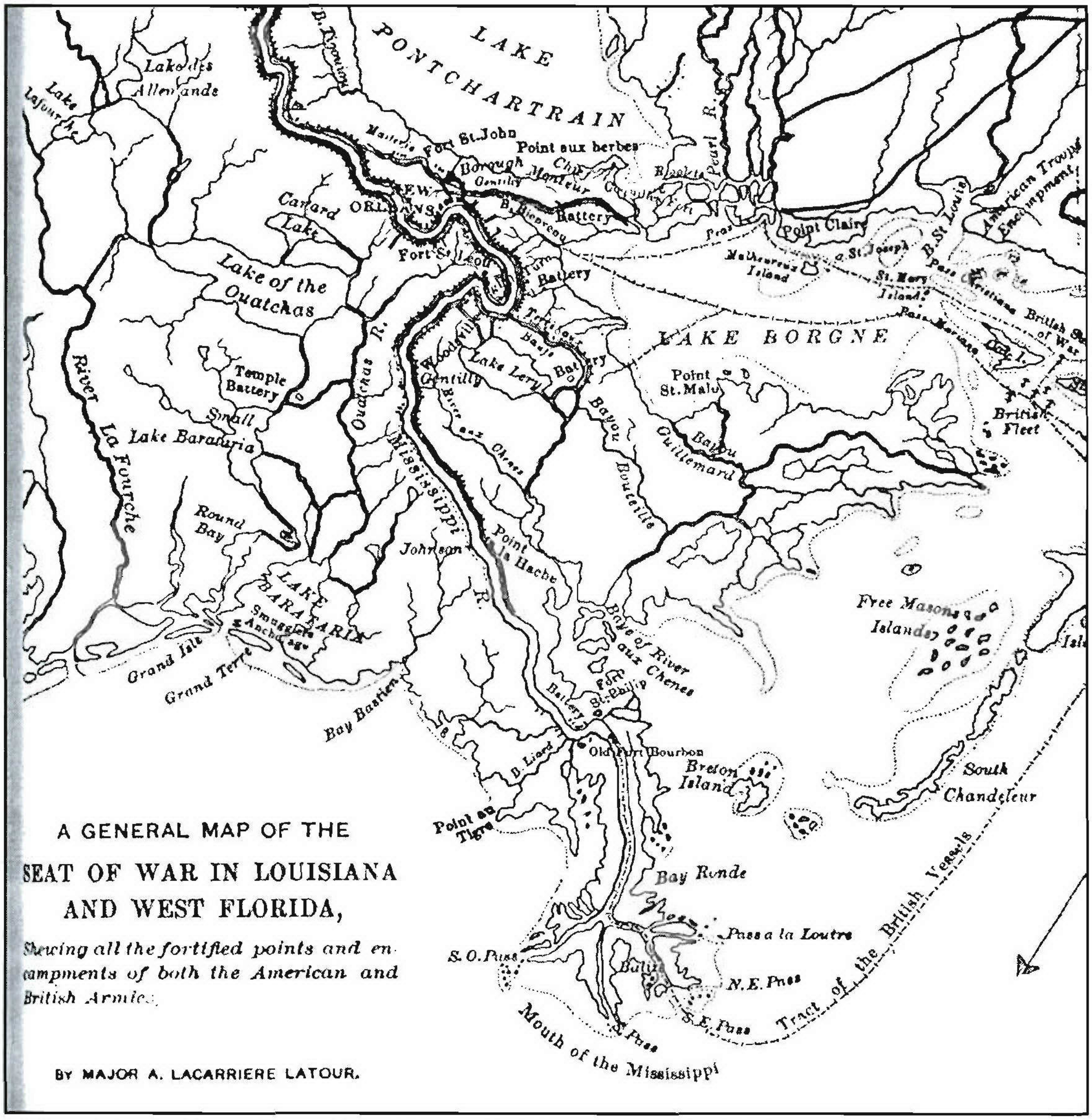

Figure 20. Latour's map from the War of 1812 shows not only the islands on the coast, but also the "Temple Battery" area where Laffite held auctions, and where "Old Hickory" sent the pirate on January 8, 1815 (excerpted from Casey 1983).

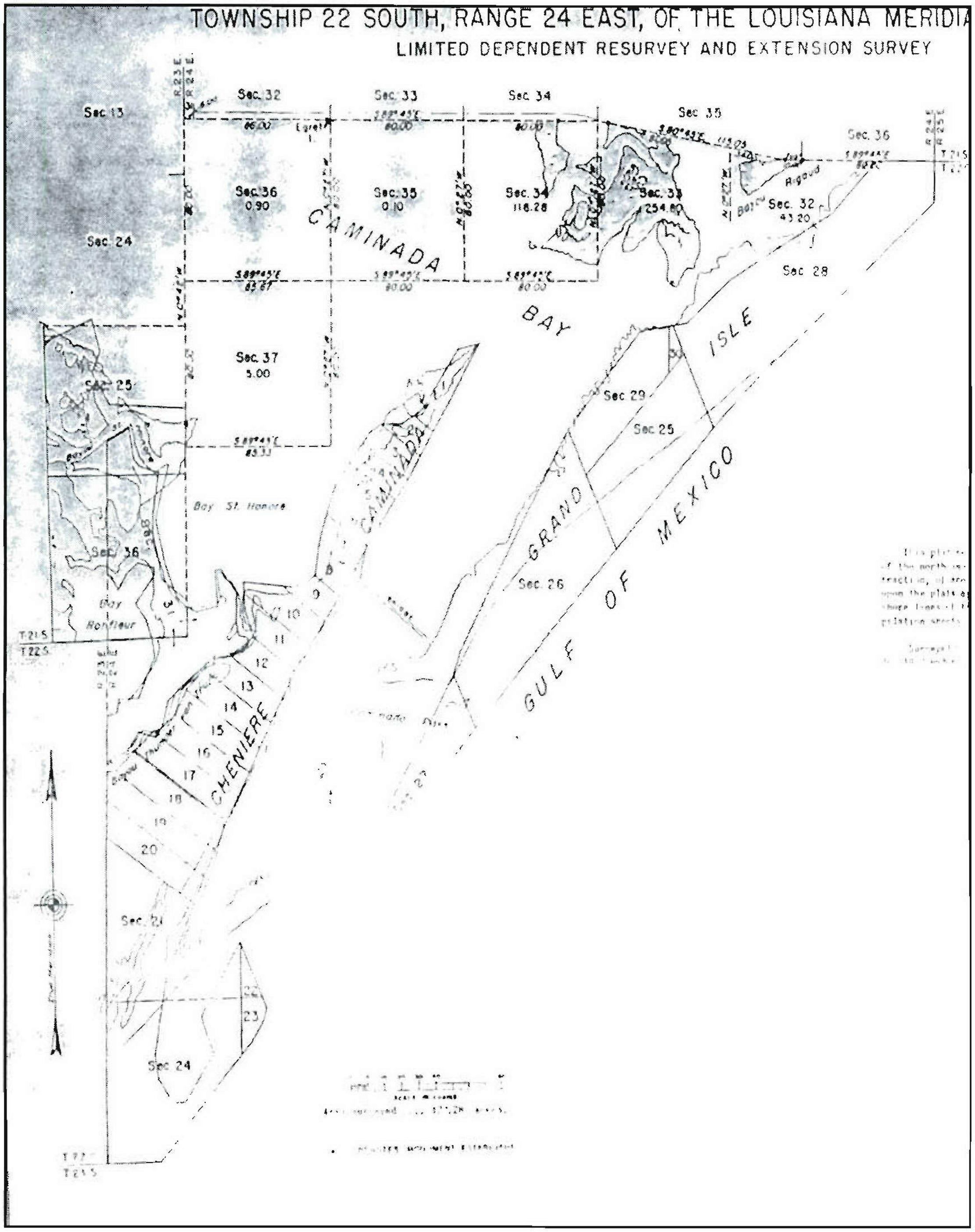

Figure 21. **Throughout the antebellum period, large landholdings dominated the Grand Isle landscape (from Louisiana Surveyor's Office maps, surveyed 1842, held by the Louisiana State Land Office, Baton Rouge, LA).**

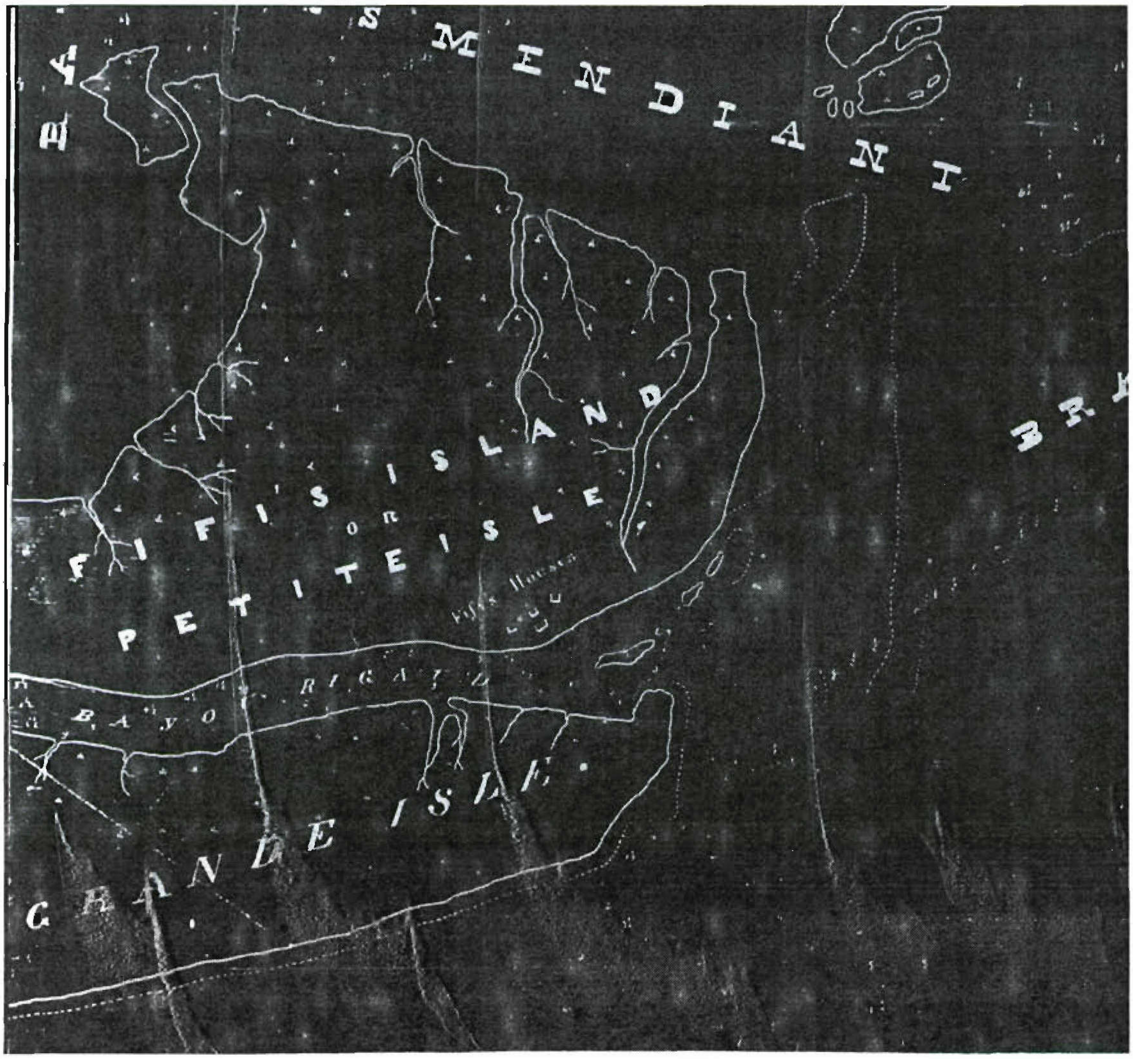

Figure 22. This map depicts "Fifi's Houses" in the area of the current project on Petite Island, which came to be known as "Fifi Island," ca. 1841 (J. G. Barnard, *Map of Grand Terre Island, Louisiana*, Map Division, Library of Congress).

woman in her 30s, three children, one male slave and one free woman of color (Evans et al. 1979:35-36). Although no documents indicate so, it seems likely that the small island just north of Grand Isle, originally called Petite Isle, evolved into "Fifi Island" due to some association with Eagle.

This antebellum integration was certainly not average in Louisiana. Moreover, it led to some equally unusual legal circumstances. François Rigaud, the only son of one of the original landowners, inherited some land from his father, Jacques, to which he added some additional land that he purchased from Pierre St. Amant. He married Adelaide Encalade, granddaughter of another original Grand Isle concessionaire, and they had nine children together. When she died in 1825, an inventory of the joint property indicates that they owned "3 pirogues with their sails, oars, rudders and other appurtenances," (which more accurately suggest luggers), five male slaves, and one female slave with her two children (Evans et al. 1979:37). 27 years later, François Rigaud began to sell small strips of his land to his children—including one parcel to Myrtil Plessala, a free man of color and son to Rigaud. Plessala immediately gave Françoise St. Anna, a free woman of color, permission to build a house on his property. It is not clear if St. Anna was his mother, his lover, or if she was even related to him at all. Nonetheless, integrated families were not unusual on Grand Isle (Evans et al. 1979:37-38).

In terms of maritime changes, the antebellum era spawned significant advances. Compared to earlier historic periods, the American Period of maritime history in the Gulf saw major design changes and the development of distinctive regional vessel types. Masted ships were improved to produce swift vessels; shipping eventually became more powerful with the introduction of engine power and steel hulls. The regions of technological innovation were centered in the Chesapeake Bay and in mid-century in New England.

Impetus to improve the swiftness of ships came from an environment of instability surrounding American shores during this time: there was no Navy to protect domestic ships, international conditions were unstable, and smuggling was a profitable trade. Consequently, small, fast vessels were most often employed through dangerous waters. For example, the "West Indies" sloop, developed during the previous period of history, was modified with a schooner rig and with raked masts. From the "West Indies," two further types were developed: one for coastal trade, and the other a larger deep water vessel. By 1820, the larger schooner type became known as the "Baltimore Clipper," and by the mid-1850s, shipyards in Philadelphia, Boston, New York, and other New England yards began building larger clipper ships, some as long as 57.9 m (190 ft). Production peaked between 1853-1854. At the same time, vessels larger than schooners also were being built with more iron and steel. A number of factors brought the production of large clipper ships to a halt, which also ruined the shipbuilding industry in the United States: the Depression of 1857, the Civil War, and competition from the railroads (Wilson 1983).

The Civil War in the Project Region

Although the District of the Lafourche (headquarters at Thibodaux) was occupied by Federal troops from 1863 through the end of the war, the only apparent military activity near the project vicinity consisted of the establishment of Confederate defensive positions along Bayou Lafourche (Bergeron 1985:198-206; Casey 1983:20, 72, 102; Davis 1971:253-265; Ditto 1980:43, 48). After Union forces captured New Orleans and Baton Rouge in 1862, military operations in Louisiana focused along Bayou Teche and the Red River, i.e., west of the current project area, and along the Mississippi River. There is no evidence of significant military activity within the project area; however, the proximity of local plantations to navigable waterways, such as Bayou Lafourche, Barataria Bay and, most importantly, the Gulf of Mexico, exposed those properties to transient military movement. While these plantations may not have been involved directly in much of that activity, they certainly fell in the pathways of passing troops moving from supply points to battlegrounds and from one campaign area to the next (Davis 1971:253-265).

Of course, the notable military installation in the project area was Fort Livingston, on the western end of Grand Terre, facing Barataria

Pass. At the outbreak of the war, the fort had no armaments and no troops (Figure 23). Casey (1983:108) indicates that Confederate troops took it over in early 1861, although whether in January or March is unclear. By July, Confederate General David Twiggs indicated that the fort was manned by two companies of volunteers. These may have been Companies G and H of the 1st Regiment of Louisiana Artillery. By September, 1861, several companies of the Orleans Battalion of Artillery were garrisoned at Livingston. In December of that year, 400 men manned one 32-pound rifled artillery piece, one 8-inch Columbiad, seven 24-pounders, two 24-pound howitzers, and four 12-pounders (Casey 1983:108).

On April 27, 1862, just two days after New Orleans fell to the Federals, and before Union General Benjamin "Beast" Butler had even arrived in the city, the U. S. Schooner Kittletinny arrived at Fort Livingston. There, they found fires burning piles of ammunition and provisions, set by the retreating Confederate troops. No troops had remained on the island, and the federal forces took control of the fort easily. However, with the fall of New Orleans, and control of the mouth of the river, any strategic importance of the island garrison became moot. Federal forces continued to keep a token force on site throughout the war, but the fort never saw any conflict (Casey 1983:108; Maygarden 1995:78-79).

Two other fortifications were near the project region: Fort Guion and Battery Temple. Battery Temple was located at the former location of Laffite's upper Barataria warehouse of the same name, on a peninsula between Bayou Perot and Bayou Rigollets. The fortification, engineered by Edward Buisson, cost the Jefferson Parish Police Jury $4,000, plus an additional $2,105 raised by local planters. In December 1861, C. S. A. Major General Mansfield Lovell noted he planned to man the battery with "two 32s and 100 men" (quoted in Goodwin et al. 1985:255). Apparently, the small garrison of Confederate forces remained until April 27, 1862. They retained few weapons and very little ammunition. When news of the fall of New Orleans reached the small battery, the troops stood down. They left "two small-caliber guns," presumably the 32s, there (Casey 1983:228).

The only fortification in the lower Bayou Lafourche region was Fort Guion, which was probably located outside of the modern town of Leeville. According to Casey, Fort Guion was "a small indented line water battery" established along lower Bayou Lafourche in late 1861; however, Bergeron refers to the garrison as an "earthwork" constructed in early 1862. Both sources agree, though, that in February 1862, the redoubt was manned by two Confederate companies (Companies A and F of the consolidated 22nd and 23rd Regiments of Louisiana Volunteers) and two 32-pounder artillery pieces. Approximately 4.8 km (3 mi) below the battery, a picket post was positioned at the confluence of Bayou Lafourche and Bayou Moreau (Bergeron 1985:198-199; Casey 1983:20, 72, 102).

Shortly following the establishment of Fort Guion, an inspecting officer reported, "The men are frequently in open rebellion, and complaints are made against the garrison for committing depredations on the property of the settlers on the bayou above" (Bergeron 1985:199). The riotous troops were sent back to New Orleans and replaced by a company from Fort Quitman in Terrebonne Parish. After the surrender of New Orleans in April of 1862, the transferred soldiers evacuated Fort Guion as ordered, but returned to their homes in that fallen city rather than continue Confederate service. Although no record has been found of the abandonment of Fort Guion, it has been suggested that the men probably demolished the garrison before leaving (Bergeron 1985:199; Casey 1983:72).

Research did not reveal the location of Fort Guion; however, the Banks map of 1863 noted the position of the picket, "supported up with logs," at the junction of Bayous Lafourche and Moreau. East of the post, the surveyor noted that the terrain was "sea marsh, passable for light troops, overflowed by very high tides." Given the picket location, Fort Guion probably was situated along the left descending bank of Bayou Lafourche in Township 21S, Range 22E, not far above the present-day community of Leeville, Louisiana (Casey 1983:305-306).

Postbellum Era and Early Twentieth Century

The years following the end of the Civil War were difficult for southern Louisiana. The economy throughout the state had been severely

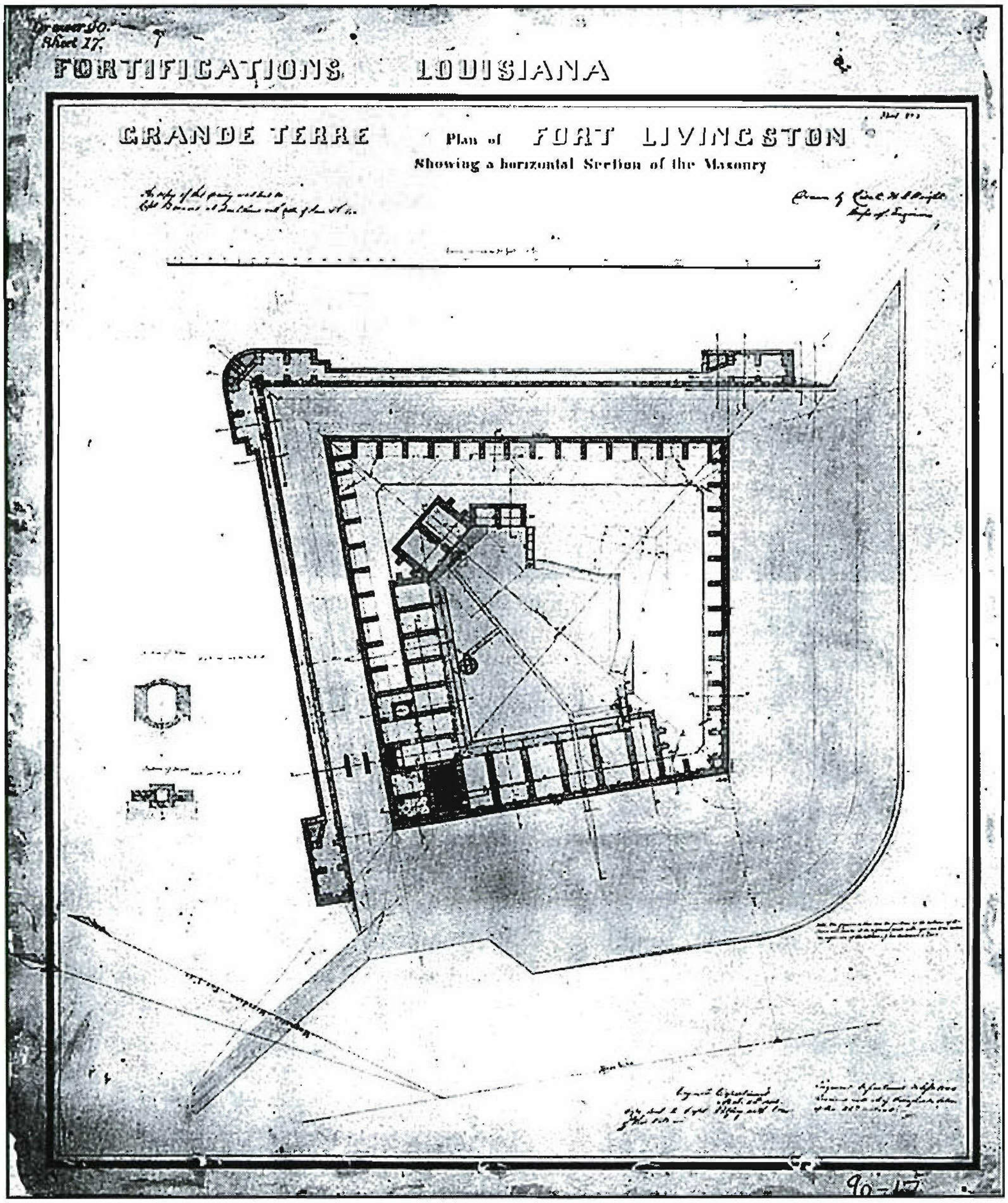

Figure 23. This plan for Fort Livingston on "Grande Terre" shows the huge size of the coastal stronghold (excerpted from Casey, 1983).

disrupted; plantations and farms, railroads and levees, businesses and homes all had been affected adversely by the war. During the postbellum period the entire state struggled to recover from the physical and economic effects of the conflict. Because the region was isolated from most of the military action, however, the Barataria Basin and Jefferson Parishes recovered more quickly from the effects of the Civil War than did other parts of the state. The war brought little change to the area settlers; there were no battlegrounds here, and the property depredations reported near Fort Guion were of relatively short duration. Most importantly, the sparse settlements, although agricultural, never were dependant upon a plantation economy.

The Barataria Basin continued as a shipping route throughout the postbellum period. Lockett (1969:130) noted the most frequently utilized routes between Barataria Bay and New Orleans immediately after the war:

> By Bayou St. Denis or Grande Bayou from the northwest corner of the bay to Little Lake, thence by Bayou Perot to Lake Ouasha [now Lake Salvador], and thence by canal to the river nearly opposite Carrollton, the whole distance being about sixty-five miles and the depth of water never less than four feet.
>
> From the north end of the bay Wilkinson's Bayou leads eastward towards the Mississippi and connects through a canal with the river at a distance of thirteen miles. Four feet can be taken through this route.
>
> Eight miles from the bay, Smugglers Bayou joins Wilkinson's Bayou and thence leading parallel to the river joins Barataria Bayou in a distance of twenty miles. Through this route four feet can be carried. Several other smaller bayous connect through canals with the river from the bayous just named.
>
> From the head of Little Lake about fifteen miles from Barataria Bay, Bayou Rigolets [sic] leads to the northward joining Bayou Barataria, of which it is the extension in a distance of nine miles and about eighteen miles from New Orleans by the latter bayou. Barataria Bayou is connected with the river by several canals, and from four to five feet may be taken through the bayou and the principal canals (Lockett 1969:130).

According to Harris (1881:165), the Bayou Barataria route was "strongly urged as the most desirable outlet for the shipping from New Orleans...prior to the construction of the southpass jetties" on the Mississippi. These routes still held only for smaller boats, barges, steamers, pushboats, and luggers, all with relatively shallow drafts.

A significant addition to the settlement of Barataria was the establishment of platform villages. These small fishing and fish processing communities were composed primarily of families of Filipino and Chinese descent. Narrow plantations and farms continued to line the banks of Bayous Barataria and des Familles. South of these were the "resorts of fishermen and duck hunters" (Harris 1881:165).

After the war and Reconstruction in the South, commercial shipping again appeared along the Gulf coast, but this time with a large foreign element. The new post-war traffic moved along coastal and direct routes to South America, Europe, the Caribbean and the eastern U.S. markets. New York no longer controlled the Gulf's commerce (Laing 1974). Although coastal maritime transportation was restricted by law to U.S. vessels during the latter part of the 19th century, the American merchant marine never recovered its pre-Civil War status, due to lost markets, and increased costs coming from insurance, crews, and ship building. Foreign merchants, who defined new traffic patterns to Gulf ports starting in 1885, captured a greater-share of Gulf trade.

After the Civil War, shipyards in New England took the lead in developing and perfecting the "down-Easters" by 1885. They were over 57.9 m (190 ft) long, but carried less sail than the clippers, had stronger sheer, and bore less decoration. But by 1900, they too were replaced by the newer technology of steamers, railroads, and smaller schooners that carried on coastal trade (Wilson 1983). In the Gulf, small coastal vessels (rigged as a sloop, schooner, brigantine or brig) carried on trade with other ports of the United States.

The large amounts of timber being produced in Gulf States were largely exported in schooners, some reaching 300 ft in length. With the introduction of iron and steel in shipbuilding, composite vessels of metal frames with wooden decks and masts were produced. The first iron-hulled schooner appeared in 1880. Completely wooden ships were still being built until World War I, when the demise of sailing craft occurred. Coastal trade was carried on in wooden schooners until after World War I, because they were inexpensive to build and maintain (Wilson 1983).

Until the competitiveness of railroads destroyed much of sailing's attractiveness, passenger ships were considered more comfortable, faster, safer, and cleaner than wagon travel. Sailing passenger vessels remained popular until the last quarter of the nineteenth century (Wilson 1983).

The Lumber and Shrimping Industries

The emergence of the cypress lumber industry in the late nineteenth century provided the most drastic change in land use patterns since the colonization the Barataria region. The Timber Act of 1876 provided the legal impetus for large scale lumbering practices throughout the great cypress stands of Louisiana (Norgress 1947). The Barataria Basin contained plentiful stands of cypress, and the Louisiana Cypress Lumber Company, founded by Joseph Rathborne in 1889, was the biggest harvester. This company pioneered the use of the pullboat. Before the invention of the pullboat, the industry relied on the seasonal overflow from the Spring runoff to float the logs to the bayous. This limited the number of logs and the time of year that they could be floated to the sawmills. The pullboat allowed for the removal of timber all year round. The pullboat used a steam engine that powered a winch with a chain that attached to the logs, dragging them out of the swamp to a dead end canal where they were gathered into a raft. The Louisiana Cypress Lumber Company was the largest cypress lumber company in the world in 1897 (Norgress 1947). By the first decade of the twentieth century, however, the cypress lumber industry was in full decline due to the exhaustion of the cypress stands.

Shrimping also emerged as a big business at the end of the nineteenth century. Like the timber industry, the shrimping industry created unique settlements and contributed to the basin's distinctive cultural milieu. One type of shrimping involved seining, or dragging nets through shallow water, usually in Barataria Bay. Most of the shrimpers were immigrants who provided labor by a system of indenture. They often held half ownership of the boat and catch, but rarely made enough to cover expenses of the materials provided by the company. These shrimpers formed camps along Barataria Bay and left evidence of their existence into the twentieth century. The stilt shrimping villages and drying platforms formed unique cultural configurations, inhabited by fishermen from the Philippines and China. The villages first were built in the late nineteenth century, and they were maintained into the early decades of the twentieth century.

Documented Filipino immigration to Louisiana began in the early nineteenth century, although it is believed that settlers arrived from the Philippines as early as 1765 (Espina 1979). According to tradition, these early immigrants were deserters who had been forced into labor on Spanish galleons. Southeastern Louisiana, particularly the Barataria region with its insular and estuarine setting, provided an environment not unlike parts of the Philippines. Indeed, the origin of the shrimp processing technology utilized on the platform villages of the Barataria region can be traced to the Pacific. The architecture and folk culture of these villages also were largely Filipino.

Oral tradition holds that a Filipino Village was established near Lake Borgne in St. Bernard Parish as early as 1765. This settlement, called St. Malo, existed in virtual isolation until the later nineteenth century (Bartlett 1977). The architecture of this settlement was described in an 1898 newspaper report:

> ...the houses are built on stilts, five or even ten feet above the ground, so that if the water rises it will not flood them. The posts are driven into the soil, but the houses are as fragile as those at Luzon, which tumble down with every earthquake. The roof is of palmetto latanier and moss, the exact counterpart of those to be seen in any picture of native villages in the Philippines. The dampness of the atmosphere -for the soil is water and the air is fog -has covered the roofs with a green fringe, which gives them the appearance of being centuries old (Daily States, June 5, 1898).

By the time the above account was written, similar platform villages had been established in the Barataria region. Filipino fishermen had moved into Jefferson Parish by the turn of the nineteenth century; some had joined Jean Lafitte's Baratarians. These privateers were pardoned in gratitude for their assistance to American forces during the Battle of New Orleans. The Filipinos, for the most part, returned to fishing after the War of 1812; some established platforms constructed on stilts for drying shrimp.

There is some disagreement over which platform village in Jefferson Parish was established first, Manila Village or Bayou Defond (Bartlett, 1977; Hansen 1971 [1941]:570). In either case, Manila Village was the largest and best known of the platforms (Figure 24). Named for the largest city in the Philippines, Manila Village was founded during the nineteenth century by a Filipino, Quintin de la Cruz. Its population expanded as Filipinos elsewhere in southern Louisiana learned of the settlement's existence:

> You see there are all different routes people took from down the river... someone would come around through Houma, Terrebonne Parish, Lafitte, Lafourche Parish. They came from all directions. Plenty originally came jumping ships down the mouth of the river... from what I was told they jumped ship on the river down there and they worked on these plantations and then they find out about Filipinos down there so they'd all come. So they wind up being so many Filipinos at Manila Village (William Pekinto, quoted in Goodwin et al. 1985:265).

Not all of the inhabitants of the platform villages were Filipino. Several of the platforms were inhabited primarily by Chinese workers. According to Hearn,

> Further seaward you may also pass a Chinese settlement: some queer camp of wooden dwelling clustering around a vast platform that stands above the water upon a thousand piles; -over the miniature wharf you can scarcely fail to observe a white sign-board painted with crimson ideographs. The great platform is used for drying fish in the sun; and the fantastic characters of the sign, literally translated, mean: "Heap-Shrimp -Plenty..." (Figure 25) (Hearn 1884:8).

Schoonover noted that the Bassa Bassa settlement was Chinese. He wrote, "the people who live here are all Chinamen. The village is called "Bassa Bassa," meaning –very low and very flat" (Schoonover 1911:85). Although the majority of the residents of the platform villages were Filipino or Chinese, French, Spanish, Mexican, and Irish immigrants also lived and worked on the Barataria platforms. Because very few Filipino women lived on the platforms, there was a great deal of intermarriage among the different ethnic groups.

The architecture and layout of the various platform villages were similar. Each village consisted of a large central platform, from which ran plank walkways to the individual houses and moorings:

> ...their dwellings do not face the big open platform that serves as the village square. But as we passed through the narrow way that separates two of the many storehouses bordering the platform, spread out before us was a wonderful and amazing decoration of thin silvery lines that seemed to rest upon the tops of the brown grass. These lines are narrow plank-built highways raised high above the treacherous marsh below. They cross and recross. Like the veins of a leaf, they lead from the platform to the homes to the small boat landings along the island bayou, and to the buildings far in the distance (Schoonover 1911:82).

The platforms were the industrial centers of the villages. They served as the processing locations for the shrimp caught by the platform's inhabitants or by other Baratarian fishermen:

> Each island is a sort of factory where the catch is brought and prepared for the world outside. And the factory is a simple affair. It consists of two huge iron cauldrons in which the shrimp are boiled, and an immense platform a hundred to two hundred feet square upon which they are dried. These platforms dominate the entire island -everything centers about them (Schoonover 1911:81).

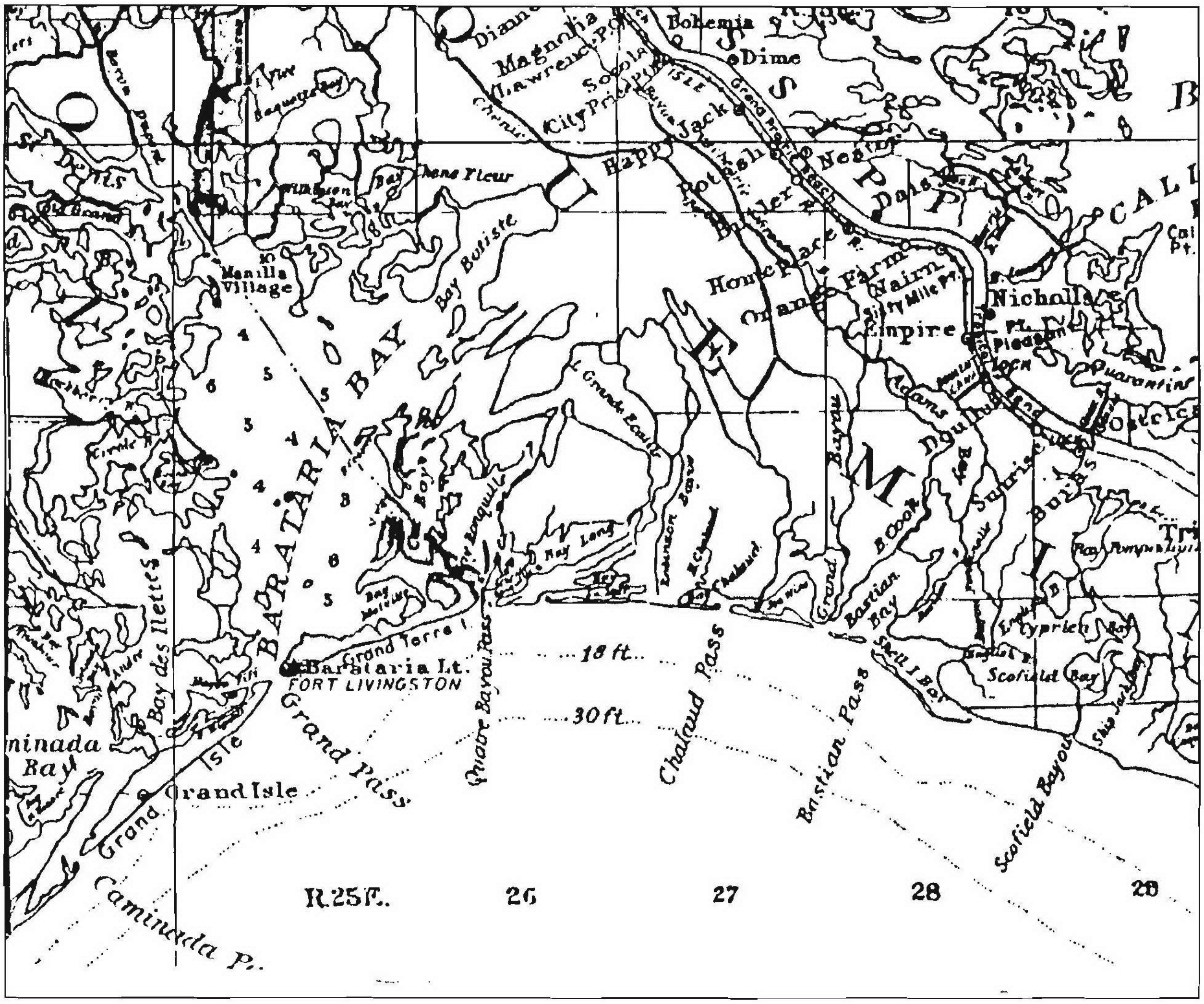

Figure 24. 1928 map from U.S. Engineer Office, New Orleans, shows Manila Village in the north extremity of Barataria Bay. Fifi Island is located just north of Grand Isle (original on file at the Map Division, Library of Congress).

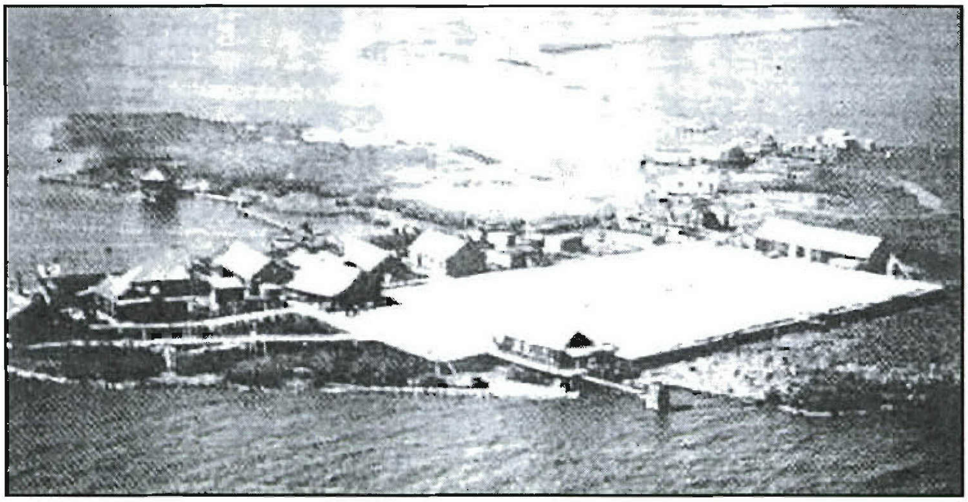

Figure 25. This is a photo of Manila Village shrimp factory and community, ca. 1950s (attributed to Marina Espina, available online at http://members.tripod.com/philipppines/no.html).

Drying the shrimp was a simple process. The fresh shrimp first were boiled in large cauldrons of salt water. Then the shrimp were spread out on the platform to dry for four to five days in the summer, 8-10 days in the winter. Each day, the shrimp were raked to insure even drying. If it rained, the shrimp were raked to the high end of the platform (which was constructed on a slight incline) and covered with tarpaulin. When the shrimp were dry, the "dancing of the shrimp" began:

> The platform is cleared of the workers, who go to long sheds, each man bringing out an affair that might be styled a pusher, a piece of smooth board some three feet long to which is attached a braced handle. Now they gather about the big red square (the shrimp) separate into groups, and push the dried shrimp into small, circular patches. The pushers are laid aside, the groups form a line of single file, and round upon the poor shrimp they dance. To the chant of the Mexican Indian, they crunch and grind the claws and armor from the shell-fish. They stop. It is enough. Large sieves are brought and the masses of shells and dried meat are thrown against these. A man pushes them up and down with the back of a rake. Soon there gathers at the bottom of the sieve a pile of broken shells and claws and a pile of dried shrimp meat (Schoonover 1911:82).

The Filipinos would sing native songs while dancing the shrimp, but the Chinese at Manila Village acquired and danced to a phonograph and record (W. Pekinto, quoted in Goodwin et al. 1985:267-68). The final step in preparing the shrimp was to pack them into barrels for shipping.

As noted above, Manila Village was founded by Quintin de la Cruz. His laborers received board and a salary of about twenty dollars per month. De la Cruz was a gambler. As a result, he became deeply indebted to Jules Fisher, who owned the shrimp factory in the current project area, on Fifi Island (Figure 26). Fisher took control of Manila village during the mid-1890s (W. Pekinto, quoted in Goodwin et al. 1985:268).

The population at Manila Village varied with the seasons. During peak season, or "shrimping time," there were over one hundred inhabitants of Manila Village; another fifty people lived at the "New" platform, which was about 0.8 km (0.5 mi) away. Actually, there were two seasons: the "first fishing" lasted from April until June 15, and then the "big season" lasted from August 15 until two weeks before Christmas. At other times of the year, the fishermen trapped muskrat (W. Pekinto, quoted in

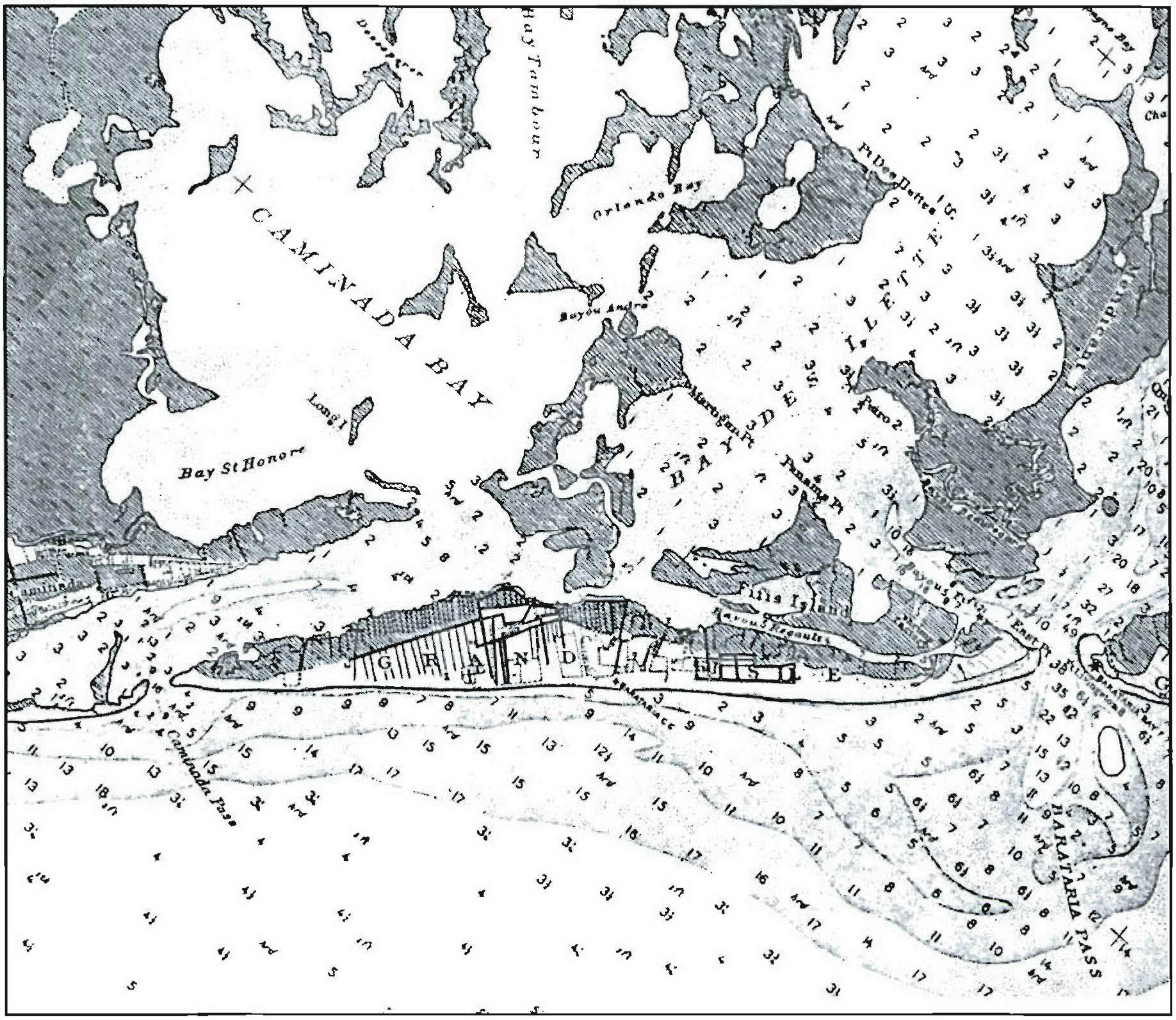

Figure 26. A "shrimp factory" is clearly marked on the southeastern corner of "Fifi's Island" in this 1902 ***Barataria Bay and Approaches*** map (original on file in the Louisiana Collection, Jones Hall, Tulane University, New Orleans, LA).

Goodwin et al. 1985:268). In fact, the charter of the Quong Sun Co., Inc., a Cantonese firm that owned the Bayou Defond platform, specified their interest in trapping:

> ...to receive, buy, collect, catch and ensnare fish, shrimp and all other animals of the water, fresh and salt; to receive, buy, collect, trap and catch, hides, furs, pelts, skins and animals bearing same; to prepare fish, hides, furs and pelts and package them for sale and distribution... (Salvador J. Roccaforte, June 15, 1923, NONA).

Charles T. Jackson, writing in 1914, described Manila Village during the off season:

> We were rousingly welcomed by the little group of men marooned at Manila. It was between seasons when there was nothing to do but mend seines, paintboats, and take care of camp. There were Charley, the cook, and "Scotty," one time Grandjean's fellow soldier in the Boer War; "portyghee Joe," the store man; Charley Stein, a one-time German sailor, now looking after the oyster-beds - along with a Malay, Italian, and Chinese half-breed or two -all eager to learn something from outside... two or three times a week some boat stopped at the platform, otherwise the stilt-dwellers were quite cut off from the earth (Jackson 1914:308-309).

On September 15, 1915, a storm hit Manila Village and the "New" platform, destroying the latter and all but five houses of the former. A few of the inhabitants were killed; ninety escaped on a sternwheeler. After this storm, both platforms were repaired and work resumed (W.Pekinto and S. Creppel, quoted in Goodwin et al. 1985).
The following year Jules Fisher created the Fisher Shrimp Co., Inc., which bought Manila village. The act of sale for this transaction provides a good description of the village:

> ...said portion of ground forms part of a large Island, bounded by Grand Bay Barataria,
>
> Little Lake, Grand Bayou and Bayou St. Denis and is known and designated as "Manila Village," also the fishing smacks: Creole Girl, Viscaya, Sadie Fisher, Biloxi, American Girl, Good News, Billy Santimeyer and Annie Fisher... also at Cabanashe (the post office), the following camps: American Girl Camp, Good News Camp, Billy Santimeyer Camp, Cecille Camp and Annie Fisher Camp, two dwelling houses, docks and all improvements on said property, together with all utensils... (Eraste Vidrine, July 19, 1916, NONA).

The store at Manila village contained stock worth $1200.00; an office; a kitchen with utensils; a warehouse; a boiling shed; an oil house; docks; a bathroom; a platform house; a drying shed; a 185 x 232 foot platform; three dwellings; and the camps known as Creole Girl, Viscaya, Sadie Fisher, and Biloxi. In addition, all furniture, utensils and appurtenances, which go to make up a drying plant, including bedding with ropes, knelling, etc., were conveyed. One 42 x 5 3/4 foot launch with a 28-horse power four cylinder Westmann Engine also was sold at that time (Eraste Vidrine, July 19, 1916, NONA).

Two other platforms were in the vicinity of the currently proposed project area. The Bayou Rigaud platform was located on Fifi Island, in the southeast corner on the bayou side (Figure 27). The Fisher Shrimp Company eventually owned this platform. It is presumably the same company that eventually purchased Manila Village (Tobin Aerial Maps, 1955, JPCC; Hansen 1971 [1941]:570). The other shrimp platform near the current project area was the Bayou Bruleau (Mosquito Bayou) platform, just north of Fifi Island, on John Popp Island, now known as Beauregard Island. The Quong Sun Company, the same enterprise that owned the old Bayou Defond platform, owned this platform.

Shrimp shucking machinery became available during the 1920s, ending the tradition of "dancing the shrimp" (Figure 28). As the industry became increasingly mechanized, fishermen gradually abandoned the platforms and moved to the mainland. By the time Hurricane Betsy struck in 1965, all the platforms except Manila Village long since had been abandoned. That hurricane destroyed Manila Village completely, and its few remaining residents never returned.

Prior to 1930, hurricanes probably shaped the development of the Barataria Basin more than any other force, natural or manmade. The Great Gulf Storm of 1893 and the Leeville hurricanes of 1909 and 1915 were among the storms that dramatically affected life in the area. Chênière Caminada, sometimes referred to as

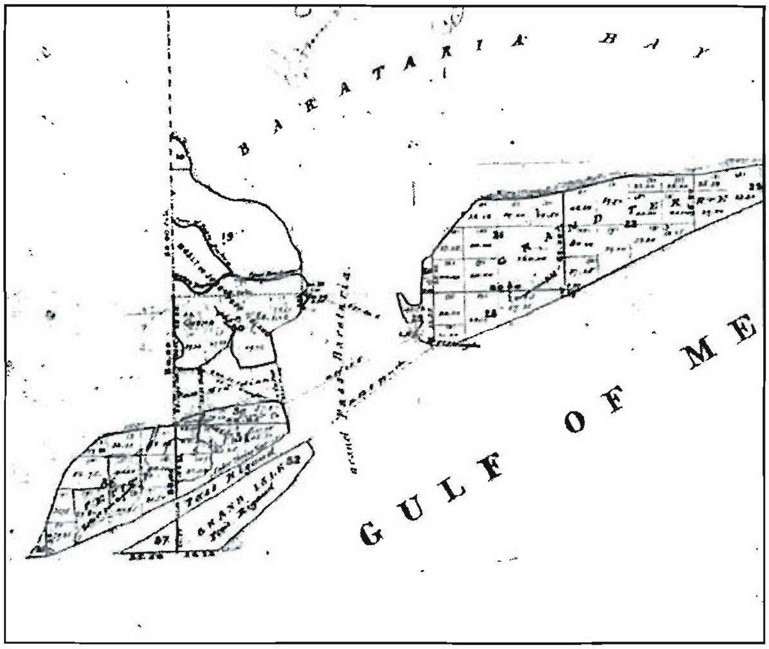

Figure 27. The location of the Bayou Rigaud shrimp drying platform is faintly identified as the property of the "Fisher Shrimp Co (Estate L. Fisher)" on this original Township plat from the Jefferson Parish Clerk of Courts [undated].

Figure 28. "Dancing the shrimp," the traditional method of removing the dried meat from the shells, gave way to mechanized cleaning in the 1920s (photograph from Williams et al. 1992).

Caminadaville, was a Barataria peninsula located just west of Grand Isle and east of Pass Fourchon. Following the destruction of the once-thriving fishing village at Caminada during the 1893 hurricane, many of its survivors migrated up Bayou Lafourche to the first high ground they reached. This *chênière*, or oak ridge, evolved into the hamlets of Leeville and Missville. After the Leeville hurricanes of 1909 and 1915, these little communities also were abandoned. Discouraged by floods and the destruction of their farmland through saltwater incursion, those storm survivors who did not quit Barataria permanently, moved upstream to the next "sweet water" ridge, located at Golden Meadow. That town developed, in large part, due to the influx of hurricane-devastated families from the lower Barataria Basin (Figure 29) (Ditto 1980:66, 69-70, 93-97; Rogers 1985:97-107).

Old established families, like the Cheramies, Rigauds and the Chighizolas (descendants of Louis "Nez Coupé" Chighizola), who had lived on the island since settlement in the 1780s, began to dominate the permanent community again. They continued to earn their living from the sea by fishing, shrimping, and cultivating oysters. Most of these modest families lived off the sea, carrying their bounty to the markets of Golden Meadow, Raceland, Donaldsonville, and New Olreans in luggers (Figure 30). Notably, throughout the late nineteenth and early twentieth century, vessels in the Barataria Basin did not change much. The early twentieth century saw most commercial shrimpers, oyster luggers and trawlers switched to gasoline engines, and in the later part of the century, to diesel. However, the layout of an oyster boat from ca. 1933 (Evans et al. 1979:98) does not differ much from modern boats serving the same purpose.

In Grand Isle, late nineteenth century was a period of economic change. As in lower Bayou Lafourche and the Barataria Basin, the effects of the Civil War had little impact on Grand Isle. The sugar industry had collapsed before the war, and, in many ways, the wholesale public auction of land on the barrier island created economic opportunity to develop the long-planned resort community. Immediately after the Civil War, hoteliers flocked to public sales and purchased land for resort development. Joseph Hale Harvey and Benjamin Marhot converted former plantation structures into tourist accommodations during the late 1860s (Figure 31). In order to improve business on his Harvey Canal and on Grand Isle, Harvey advertised steamer excursion trips to the Grand Isle Hotel.

The Gilded Age arrived on Grand Isle in the 1880s, when several hotels offered tourists the opportunity to stay beachside in "quaint" former slave cabins. Larger hotel structures were less modest. In 1888, P. F. Herwig purchased lots on Grand Isle and built the Hotel Herwig (Evans et al. 1979:87). The steamers *Grand Isle* and *Joe Webre* brought vacationers to Joseph Krantz's resort; Krantz introduced gambling to Grande Isle (Figure 32). In 1889, a business consortium headed by Krantz began construction of the New Orleans, Fort Jackson, and Grand Isle Railroad; the rail line cut travel time from New Orleans, and dramatically increased the island's tourist business. The next decade, Lafcadio Hearn, noted New Orleans journalist and writer, began to publicly extol the virtues of Grand Isle, and Kate Chopin's classic novel *The Awakening* used the island as a backdrop for the heroine's personal journey of discovery. The resort village so long in the planning finally arrived on Grand Isle in the early 1890s. In 1891-1892, a group of New Orleans developers built the large Ocean Club Hotel, a two-story Victorian structure, over 122 m (400 ft) wide, complete with gambling, billiards, surf-bathing, tennis, bowling alleys, 160 suites, and an observatory (Evans et al. 1979:89).

The Gilded Age did not last long. The fall of 1893 brought devastation to the entire Barataria Basin area, Grand Isle in particular. Late in the season, a devastating hurricane swept through the area, inundating the island with ten-foot waves. Winds gusting 282 km-per-hour (175 mi-per-hour) devastated houses, hotels, and every boat on water or land. Separated from Grand Isle by a small pass, called "the jump" by locals, the community of Chenière Caminada was home to over 1,200 residents on October 1, 1893. Many believed that the cold front that had passed through a few days earlier signaled the end of the tropical storm season. With no radios, electricity, or weather warning system in place, residents first indication that the storm was dan-

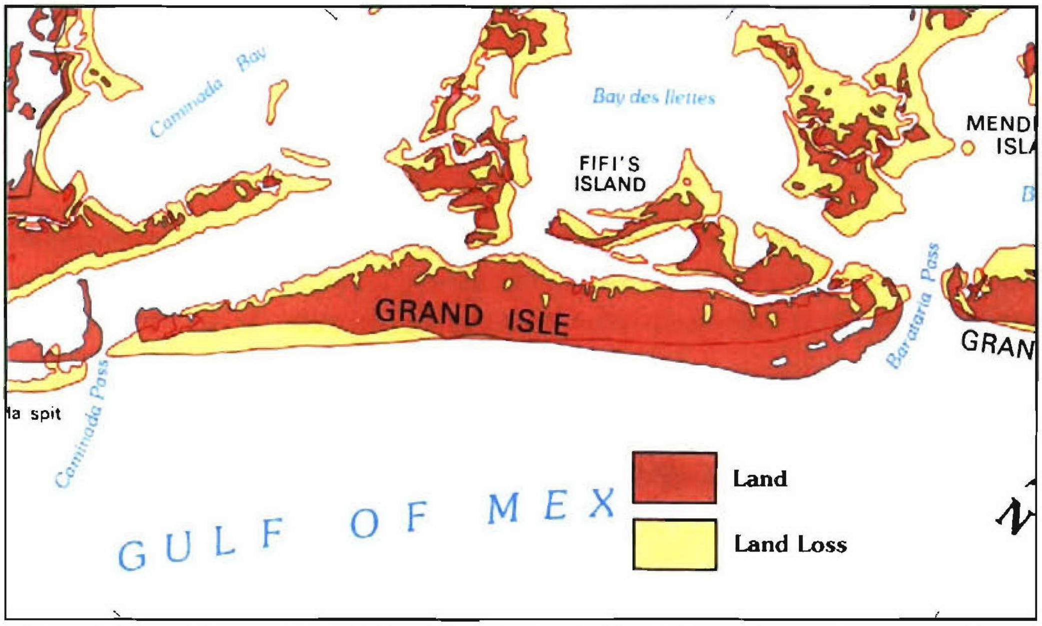

Figure 29. This graphic depiction of land loss in the Grand Isle project area is excerpted from Williams et al. 1992.

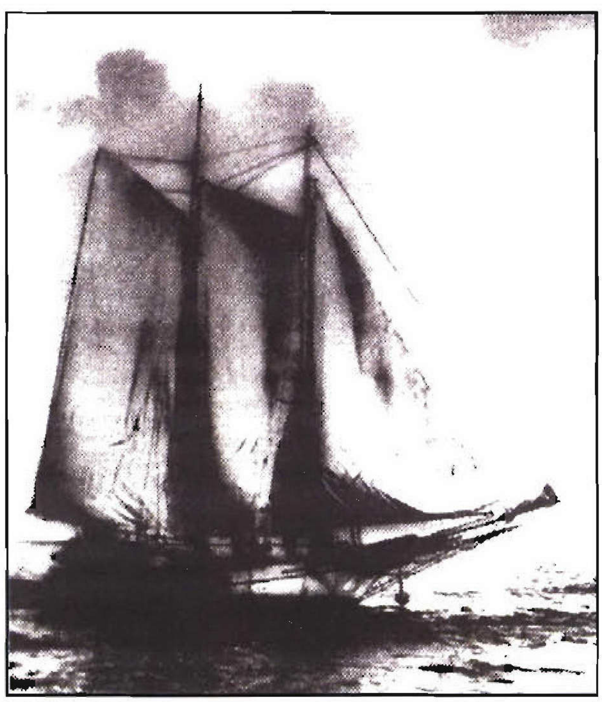

Figure 30. This photograph of an oyster lugger was taken in 1912 (excerpted from Evans et al. 1979).

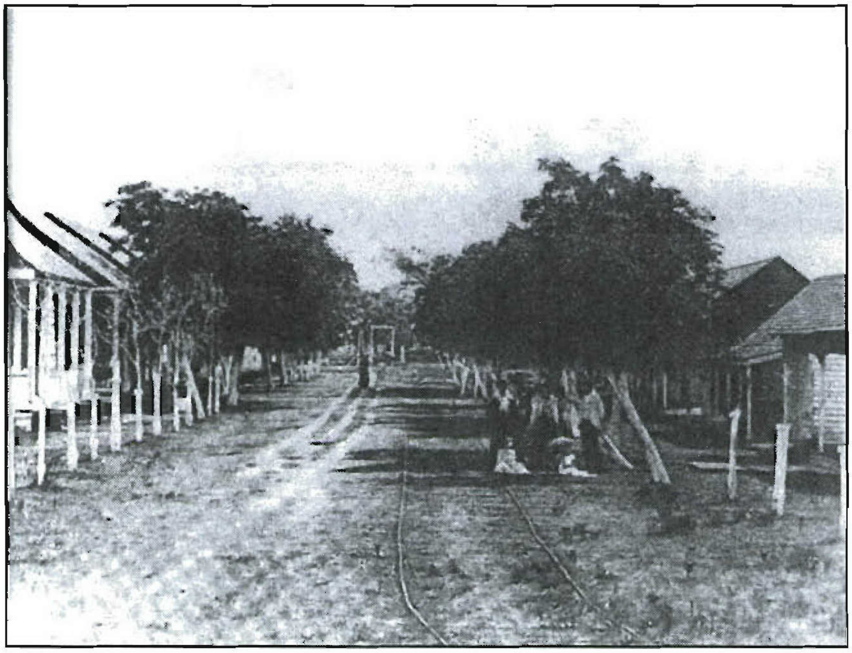

Figure 31. Joseph Harvey (of Harvey Tunnel fame) and Benjamin Marhot opened Grand Isle's first beach resort just after the Civil War, utilizing former slave cabins as "rustic" seaside cottages (excerpted from Evans et al. 1979).

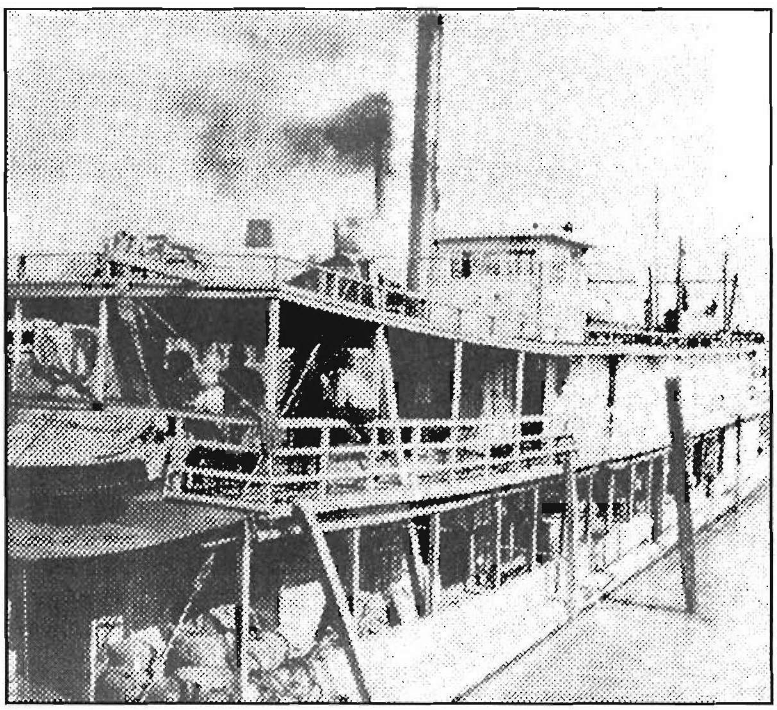

Figure 32. Steamers like the *Grand Isle*, depicted here in a turn-of-the-century photograph, brought tourists to the island (excerpted from Evans et al. 1979).

gerous was when the water started rising at 5 in the evening. Unfortunately, by that time it was too late to reach Fort Livingston, on Grand Terre, or even the relatively protected *cheniere* (oak stand) on nearby Grand Isle (Rogers 1981:12). The eye of the hurricane passed directly over the Chenière Caminada, destroying everything in its path. Between the gulf and Biloxi, Mississippi, more than 1600 people died in the storm. Over 500 residents on Caminada lost their lives, and only a handful of buildings were left standing. Grand Isle lost only 27 residents, although the structures on the island lay in ruins. The grand Ocean Club had survived only one season (Figure 33) (Reeves 1985:114; Rogers 1981:16, 28).

Cheniere Caminada was so devastated that the community members who survived the storm moved away. A few remained, but the legacy of the storm, death, and devastation proved too much for the community. A large number of families moved up Bayou Lafourche to the Golden Meadow area. Many of the Caminada families—the Griffins, Rouses, and Cheramies—had relatives along the left bank of the bayou close to Golden Meadow. Though the area experienced some settlement prior to the Civil War, the relative low, swampy marsh found in the region did not invite plantation settlement. Golden Meadow experienced even more growth when a 1915 hurricane destroyed the town of Leeville, a few kilometers closer to the Gulf of Mexico than Golden Meadow. Again, storm refugees fled up the bayou. Local legend has it that Levy Collins' house "floated out of Leeville ...and came to rest, intact, in Golden Meadow," whereupon he purchased the land and remained on that site (Rogers 1981:36).

Twentieth Century

In the twentieth century, the resort ideal so long planned for Grand Isle did come to limited fruition. Rather than large, opulent hotels, connected to New Orleans by steam ships and railroads, the island community developed a much more modest trade, serviced by charter fishing businesses, small camps and weekend visitors. Highway 1, connecting the Bayou Lafourche region (and, consequently, New Orleans) with the Gulf Coast, was completed only in 1931, when a bridge to the island was built. An individual land speculator, Alfred Danzinger, acquired old hotel sites, as well as the eastern and western tips of the island. Even infamous Louisiana Governor and Senator Huey P. Long owned a beach-to-bay tract on the island (Tobin Aerial Maps, 1955, JPCC). Danzinger, the largest landowner on the island, did not attempt to sell any of the land, and his death in 1948 began a mass trend of subdivisions. Vacation camps for Louisiana's wealthier residents sprang up along the beachfront (Figure 34). For the next two decades, the island grew not only with the rise of resort camps, but with the offshore oil industry as well. Currently, on the eastern tip of the island, several major oil companies maintain

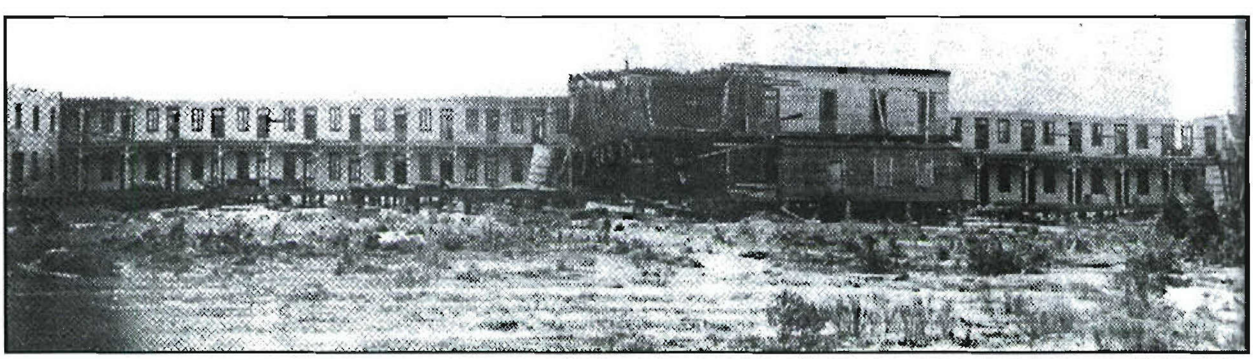

Figure 33. The lavish Ocean Club Hotel lasted only one season before it was destroyed by a hurricane (excerpted from Evans et al. 1979).

Figure 34. When the Highway 1 bridge over Caminada Pass was completed in the 1930s, bathers flocked to the beach for weekend relaxation (photograph excerpted from Williams et al. 1992).

large plants and helicopter pads, used to transport workers to the oil rigs which dot the gulf horizon.

Modern Era

Canal improvements have continued to be vital to the economy of lower Jefferson Parish and the Barataria Basin through the twentieth century. Small plantation canals have been expanded for flood control, as well as for transportation, new channels have been constructed for land drainage and reclamation, and shallow *traiñasses* continue to be "dragged" through the marshes for the passage of trapping pirogues. In addition to these traditional marsh passages, canals have been cut for the exploitation of petroleum, the newest industry in the region (Davis 1985:150-160).

Petroleum canals crisscross the Barataria Basin, and particularly the Grand Isle area today. The oil boom hit the region in 1930, when the first well of Lafourche Parish's Leeville Field "came in." Seven years later, there were 98 producing wells in that petroleum field. The first oil discovered in Jefferson Parish was found in the Lafitte area east of Lake Salvador in 1935; four years later, the first well in the Barataria vicinity was completed in 1939. Numerous oil and gas fields now blanket the region, and after a brief slump, drilling has again resumed in recent years. Rapid petroleum expansion took place during and immediately after World War II, and in the 1950s, offshore sulfur mines joined the oil fields. The first petroleum canals were cut as service routes to the wells; today, though, pipeline routes appear to dominate the petroleum network in the coastal region of southeastern Louisiana. Not only do these channels transport domestic petroleum products across lower Lafourche and Jefferson Parishes, but, with the development of Port Fourchon (the Louisiana Superport, just west of Chenière Caminada), designed to support deepwater tankers, foreign oil also can be conveyed through these parishes to American markets (Ditto 1980:29-30, 70; Thoede 1976:12-13). The Port of Grand Isle, a similar design for a deep-water port, is in development right now.

Conclusion

Pirates and Acadians, sugar, freemen and slaves, hotels and hurricanes; the history of the currently proposed project area delineates marked social as well as economic adaptation. But the residents of the project region have been acutely aware that their lives and livelihoods are always at the mercy of the tides and the winds. The barrier island's purpose has always been to soften the blow for the mainland, and Grand Isle has been no exception. As both Tropical Storm Isadore and Hurricane Lili recently showed, levees and preparation cannot deter the sure erosion wrought by wind and tides. Grand Isle now lives and dies by tourism, oil industry and commercial shrimping. The town swells to huge proportions on summer weekends, and during fishing rodeos. But, despite all the changes since the era of Jean Laffite and the Baratarians, the Cheramies, Rigauds, Encaladas and Chighizolas still call Grand Isle home.

CHAPTER V

PREVIOUS INVESTIGATIONS

Introduction

The present chapter provides background contextual information about previous archeological and architectural investigations completed within the general vicinity of the project area. This information was sought in order to ensure that any previously recorded cultural resources situated within the current study area were relocated during fieldwork. The chapter is divided into three sections. The first contains a review of previous cultural resources surveys completed within 8 km (5 mi) of the currently proposed project item. The second section presents a review of previously recorded archeological sites located within 2.4 km (1.5 mi) of this study area. Finally, a description of previously recorded standing structures located within 2.4 km (1.5 mi) of the project parcel is presented. The information contained in this review was based on a background search of data currently on file at the Louisiana Department of Culture, Recreation and Tourism, Office of Cultural Development, Divisions of Archaeology and Historic Preservation, in Baton Rouge.

Previously Conducted Cultural Resources Surveys Located within 8 km (5 mi) of the Currently Proposed Project Area

A total of 10 previously completed cultural resources surveys and archeological inventories were identified within 8 km (5 mi) of the currently proposed project area (Table 7). These investigations resulted in the identification of 78 archeological sites as well as 221 magnetic and 17 acoustic anomalies. While a total of 10 previously recorded sites (16JE49, 16JE123 - 16JE129, 16JE144, and 16JE296) were located within 2.4 km (1.5 mi) of the currently proposed project area, none was situated within the currently proposed area of potential effect. All 10 identified surveys were conducted in portions of Jefferson Parish and they are presented here in chronological order.

In 1978, Coastal Environments, Inc., of Baton Rouge, Louisiana, conducted a Phase I cultural resources survey and archeological inventory of the Barataria, Segnette, and Rigaud waterways on behalf of the U.S. Army Corps of Engineers, New Orleans District (Gagliano et al. 1979). The project was undertaken prior to proposed dredging of the waterways and spoil deposition. The survey consisted of bankline examination by boat, pedestrian survey, probing, and auger testing of approximately 70.4 km (44 mi) of bayou water courses. During the course of this survey, 77 prehistoric and historic period archeological sites (16JE1 - 16JE3, 16JE7 - 16JE9, 16JE12 - 16JE18, 16JE34 - 16JE36, 16JE46, 16JE49, 16JE53 - 16JE56, 16JE60, 16JE66, 16JE68, 16JE80, and 16JE82 - 16JE132) were identified. Of these, 27 (16JE1, 16JE2, 16JE12 - 16JE18, 16JE46, 16JE53, 16JE83, 16JE92, 16JE115 -16JE120, 16JE122, and 16JE126 - 16JE132) were reported to be outside of the (then) proposed Area of Potential Effect.

Of those sites located in the survey area, only Sites 16JE3, 16JE36, 16JE49, 16JE60 and 16JE68 were assessed as significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]); however, no

Table 7. Previously Completed Cultural Resources Surveys Located Within 8 km (5 mi) of the Proposed Project Area.

FIELD DATE	REPORT NUMBER	TITLE/AUTHOR	INVESTIGATION METHODS	RESULTS AND RECOMMENDATIONS
		Jefferson Parish		
ca. 1978	22-732	*Cultural Resources Survey of the Barataria, Segnette, and Rigaud Waterways, Jefferson Parish, Louisiana* (Gagliano et al. 1979)	Records review, boat survey, pedestrian survey, and soil borings	A total of 77 sites were identified during this survey (16JE1 - 16JE3, 16JE7 - 16JE9, 16JE12 - 16JE18, 16JE34 - 16JE36, 16JE46, 16JE49, 16JE53 - 16JE56, 16JE60, 16JE66, 16JE68, 16JE80, and 16JE82 - 16JE132). Of these sites, 19 (16JE7, 16JE35, 16JE54 - 16JE56, 16JE80, 16JE84 -16JE86, 16JE88, 16JE93, 16JE98, 16JE104 - 16JE106, 16JE110 - 16JE112, and 16JE124) were assessed as potentially significant. In addition, Site 16JE49 had previously been listed on the National Register. Additional testing was recommended for 19 of the potentially significant sites. The remaining sites were assessed as not significant and no additional testing was recommended for these sites.
1978	22-465	*Cultural Resources Survey of Grand Isle and Vicinity, Jefferson Parish, Louisiana* (Stout and Ryan 1978)	Records review and pedestrian survey	No cultural resources were identified and no additional testing was recommended.
1979	22-642	*Cultural Resources Survey and Assessment of the Old U.S. Coast Guard Station, Grand Isle, Louisiana, Jefferson Parish* (Beavers and Lamb 1979)	Records review, pedestrian survey, and limited subsurface investigation	No cultural resources were identified and no additional testing was recommended.
1980	22-656	*A Magnetometer Survey of the Proposed Borrow Area for Beach Erosion Control, Grand Isle, Louisiana* (Texas A&M University 1980)	Records review and marine magnetometer survey	Identified nine magnetic anomalies (E-1 – E-9) of which six (E-1 – E-6) were situated within the proposed project area. Of these, only one (Anomaly E-6) was assessed as potentially significant and additional testing was recommended.
1984	22-912	*Remote Sensing Survey of the Fort Livingston Offshore Borrow Area, Jefferson Parish, Louisiana* (Stout 1984)	Electronic systems survey, including magnetometer, depth sounder, and positioning system	A total of 28 magnetic anomalies were identified within the survey area. These anomalies were not assessed as to their significance; however, no additional testing was recommended.
1984	22-1000	*Preserving the Past for the Future: A Comprehensive Archeological and Historic Sites Inventory of Jefferson Parish, Louisiana* (Goodwin et al. 1985)	Records review, pedestrian survey, shovel testing, and probing	Inventoried 126 previously recorded sites (16JE1 - 16JE24, 16JE34 - 16JE40, 16JE43 - 16JE71, 16JE73 - 16JE138) and identified four sites (no site numbers provided). Of these, Sites 16JE2, 16JE3, 16JE11, 16JE17, 16JE18, 16JE21, 16JE22, 16JE35, 16JE36, 16JE38, 16JE45, 16JE60, 16JE68, 16JE85, 16JE122, 16JE129, 16JE130, and 16JE138 were assessed as potentially significant; however, additional testing was only recommended for Sites 16JE17 and 16JE18.
1984 and 1986	22-1155	*A Cultural Resources Evaluation of Plantation Landing* (Castille and Weinstein 1986)	Records review, pedestrian survey, and shovel testing	Identified cultural resources associated with the Barataria Plantation/Grand Isle Hotel (Site 16JE144). These resources dated from the mid – late 19th century reported. The authors noted that the site was eligible for nomination to the National Register and avoidance was recommended. If avoidance was not possible, it was recommended that a data recovery be completed.
1990	22-1438	*Remote Sensing Survey of Two Borrow Areas for the Grand Isle and Vicinity Project, Jefferson Parish, Louisiana* (Saltus and Pearson 1990)	Records review and marine remote sensing survey	Identified 21 magnetic anomalies; however, none of these were believed to represent cultural resources. No additional testing was recommended.

Table 7, continued

FIELD DATE	REPORT NUMBER	TITLE/AUTHOR	INVESTIGATION METHODS	RESULTS AND RECOMMENDATIONS
1995	22-1769	*Cultural Resources Investigations on Grand Terre Island, Jefferson Parish, Louisiana* (Maygarden et al. 1995)	Records review, pedestrian survey, probing, auger testing, shovel testing, magnetometer survey, metal detector survey, and canal wire drag	Previously recorded sites 16JE127, 16JE128, and 16JE129 were relocated. In addition, 10 magnetic anomalies were identified (Anomalies 1 – 10). Sites 16JE128 and 16JE129 as well as Anomalies 7 – 10 were assessed as eligible for nomination to the National Register of Historic Places and avoidance or additional testing was recommended. Site 16JE127 and Anomalies 1 – 6 were assessed as not significant, and no additional testing was recommended.
1999	22-2365	*Phase I Marine Archeological Remote Sensing Survey of the Barataria Pass, Ocean Dredge Material Disposal Site, Jefferson Parish, Louisiana* (Pelletier et al. 2001)	Records review and marine remote sensing survey	Identified 25 target clusters, which consisted of a total of 163 magnetic and 17 acoustic anomalies. Of these 25 targets, only two (Targets 6 and 19) were described as possible shipwrecks. Avoidance or additional testing of these two targets was recommended. The remaining 23 targets were assessed as not significant and no additional testing was recommended.

additional testing of these sites was recommended. In addition, Gagliano et al. (1979) reported that Site 16JE49 (Fort Livingston) had previously been listed on the National Register of Historic Places during August of 1974. A total of 19 sites (16JE7, 16JE35, 16JE54 - 16JE56, 16JE80, 16JE84 -16JE86, 16JE88, 16JE93, 16JE98, 16JE104 - 16JE106, 16JE110 - 16JE112, and 16JE124) were assessed as potentially significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]). Of these, additional testing was recommended for Sites 16JE80, 16JE85, 16JE86, 16JE93, 16JE98, 16JE104 - 16JE106, 16JE110, 16JE111, and 16JE124, while no additional testing was recommended for the remaining potentially significant sites. The remaining 26 sites identified within the study area were assessed as not significant under the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]), and no additional testing was recommended.

Of the 27 sites identified by Gagliano et al. (1979) beyond the Area of Potential Effect, Sites 16JE2, 16JE46, 16JE83, 16JE92, 16JE128, and 16JE129 were assessed as significant while Site 16JE132 was assessed as potentially significant. Sites 16JE53, 16JE115 - 16JE120, 16JE122, 16JE126, 16JE127, 16JE130, and 16JE131 were assessed as not significant. The significance of Sites 16JE1 and 16JE12 - 16JE18 was not assessed. No recommendations for additional testing were reported for any of the sites located beyond the proposed project area. Of the 77 archeological sites identified during survey, a total of eight (Sites 16JE49 and 16JE123 – 16JE129) are located within 2.4 km (1.5 mi) of the currently proposed project area, these are discussed below.

The U.S. Army Corps of Engineers, New Orleans District, completed a Phase I cultural resources survey and archeological inventory during April of 1978 of a 12.1 km (7.5 mi) long portion of the south shore of Grand Isle prior to the proposed construction of a sand fill dune and berm (Stout and Ryan 1978). In addition, the location of a proposed stone jetty was investigated. A pedestrian survey conducted along two parallel transects which were spaced 10 m (32.8 ft) apart failed to identify any cultural resources. No additional testing of the proposed project areas was recommended.

During March of 1979, Richard Beavers and Teresia Lamb conducted a Phase I cultural resources survey and archeological survey of the Old Coast Guard Station situated on Grand Isle within Jefferson Parish, Louisiana (Beavers and Lamb 1979). The parcel, which measured 0.3 ha (0.7 ac) in size, was surveyed prior to its proposed transfer to unspecified local authorities. Pedestrian survey, augmented by limited subsurface investigation utilizing a trowel and an entrenching tool, failed to identify any cultural resources. No additional testing of the Old Coast Guard Station property was recommended by Beavers and Lamb (1979).

The Cultural Resources Laboratory at Texas A&M University, College Station, Texas, conducted a marine magnetometer survey of a proposed sand borrow area situated approximately 457.2 m (1,500 ft) off the south shore of Grand Isle in Jefferson Parish (Texas A&M University 1980). The area subjected to survey measured 111.3 ha (275 ac) in size. The magnetometer survey resulted in the identification of six magnetic anomalies (E-1 – E-6). Of these, only anomaly E-6 was assessed as potentially significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]). Avoidance or additional testing of this anomaly was recommended. The remaining five anomalies were assessed as not significant, and no additional testing was recommended.

The U.S. Army Corps of Engineers, New Orleans District, conducted a Phase I marine remote sensing survey during January of 1984 of a proposed 70 ha (173 ac) offshore sand borrow area located southeast of the western tip of Grand Terre Island, Jefferson Parish, Louisiana (Stout 1984). According to Stout (1984) the fill was to be utilized in an attempt to halt erosion at Fort Livingston (Site 16JE49). Magnetometer survey augmented by the utilization of a depth sounder resulted in the identification of 28 magnetic anomalies within the proposed project area. These 28 anomalies were not assessed applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]) by Stout (1984). In addition, it was noted that three areas measuring approximately 4 ha (10 ac) in size were identified as not containing any of these 28 magnetic anomalies. It was reported that these three areas would be utilized for sand borrowing and thus, no additional testing of the identified anomalies was recommended. Site 16JE49 is situated within 2.4 km (1.5 mi) of the currently proposed project area and it is reported on below.

In 1984, R. Christopher Goodwin & Associates, Inc., of New Orleans, Louisiana, compiled a comprehensive archeological and historical sites inventory of Jefferson Parish, Louisiana (Goodwin et al. 1985). Although historic period sites were emphasized, the condition and research potential of previously recorded prehistoric sites also was reviewed. A total of 126 previously recorded sites (16JE1 - 16JE24, 16JE34 - 16JE40, 16JE43 - 16JE71, and 16JE73 - 16JE138) were noted. Of these, 16 sites (16JE2, 16JE3, 16JE11, 16JE21, 16JE22, 16JE35, 16JE36, 16JE38, 16JE45, 16JE60, 16JE68, 16JE85, 16JE122, 16JE129, 16JE130, and 16JE138) were assessed as significant. Sites 16JE17 and 16JE18 were assessed as potentially significant and additional testing was recommended. In addition, limited field reconnaissance also was conducted, and cultural materials were collected from several sites identified in the parish. A total of eight sites (16JE49 and 16JE123 - 16JE129) reported on by Goodwin et al. (1985) are located within 2.4 km (1.5 mi) of the current project area and they are discussed in the section on sites below.

Coastal Environments, Inc., of Baton Rouge, Louisiana, completed a Phase I cultural resources survey and archeological inventory during 1984 and 1986 of a parcel situated on Grand Isle prior to proposed residential, commercial, and recreational development (Castille and Weinstein 1986). The authors did not note the overall size of the proposed project area, nor for whom the survey was conducted. Pedestrian survey augmented by shovel testing resulted in the identification of cultural materials and features, which were assigned site number 16JE144.

Site 16JE144 was described as consisting of the former location of Barataria Plantation, which was subsequently converted and utilized as a hotel. Castille and Weinstein (1986) noted that pedestrian survey and shovel testing confirmed the locations of the main house, as well as an associated outbuilding, the sugar house, slave quarters, a drainage machine, and a tram railroad bed. In addition, a possible privy feature was identified. It was suggested that Site

16JE144 dated from the mid – late nineteenth century and the site was assessed as potentially significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]). Castille and Weinstein (1986) recommended that the site be avoided; however, if avoidance was not possible, additional testing of Site 16JE144 was recommended. Site 16JE144 is situated within 2.4 km (1.5 mi) of the currently proposed project area and it is discussed below.

During 1990, Coastal Environments, Inc., of Baton Rouge, Louisiana, completed a marine remote sensing survey of two proposed borrow areas positioned offshore of Grand Isle (Saltus and Pearson 1990). The survey was conducted on behalf of the U.S. Army Corps of Engineers, New Orleans District. The first proposed borrow area (Clay Borrow Area) was situated north of Grand Isle within Bayou Rigaud, while the second proposed borrow area (Offshore Sand Borrow Area) was positioned approximately 914.4 m (3,000 ft) off the southern shore of Grand Isle. The overall sizes of the proposed borrow areas were not noted by Saltus and Pearson (1990). A marine magnetometer survey of the proposed Offshore Sand Borrow Area resulted on the identification of 21 anomalies (Anomalies 1 – 21); however, only six of these (Anomalies 2 – 6 and 19) were believed to represent submerged cultural resources. Saltus and Pearson (1990) noted that no anomalies that represented potential cultural resources were noted during the magnetometer survey of the proposed Clay Borrow Area.

Saltus and Pearson (1990) reported that Anomalies 2 – 6 and 19 had been investigated by a diver following their initial identification. Four of these anomalies subsequently could not be relocated, while it was suggested that the remaining two anomalies possibly represented modern debris. Anomalies 2 – 6 and 19 were assessed as not significant, and no additional testing of the proposed Offshore Sand Borrow Area was recommended. No recommendations were made concerning additional testing of the proposed Clay Borrow Area.

Earth Search, Inc., of New Orleans, Louisiana completed a Phase I cultural resources survey and archeological inventory during April of 1995 of a portion of Grand Terre Island in Jefferson Parish, prior to the proposed deposition of dredge spoil on and adjacent to the island (Maygarden et al. 1995). The survey, which was conducted on behalf of the U.S. Army Corps of Engineers, New Orleans District, encompassed an area measuring 1 x 4 km (0.6 x 2.5 mi). Pedestrian survey augmented by shovel testing, auger testing, probing, and remote sensing utilizing a magnetometer and a metal detector resulted in the relocation of previously recorded archeological sites 16JE127, 16JE128, and 16JE129 as well as the identification of 10 magnetic anomalies (Anomalies 1 – 10).

All three of the re-examined archeological sites contained historic period components. Maygarden et al. (1995) assessed Site 16JE127 as not significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]) and no additional testing was recommended. The remaining two archeological sites (16JE128 and 16JE129) were assessed as eligible for nomination to the National Register applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]). The authors recommended that both sites be avoided during proposed dredge placement activities; however, if avoidance was not possible, additional testing of Sites 16JE128 and 16JE129 was recommended. In addition, Maygarden et al. (1995) assessed Anomalies 1 – 3, Anomaly 5, and Anomaly 6 as not significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]); no additional testing of these five magnetic anomalies was recommended. Of the remaining four anomalies, Anomaly 4 was considered to be a portion of Site 16JE127, while Anomalies 7 – 10 were associated with Site 16JE129. As previously noted, Sites 16JE127 – 16JE129 are situated within 2.3 km (2 mi) of the currently proposed project area and they are discussed below.

R. Christopher Goodwin & Associates, Inc., conducted a Phase I marine archeological remote sensing survey during November of 1999 of the proposed Barataria Pass, Ocean Dredged Material Disposal Site (ODMDS), situated within Jefferson Parish (Pelletier et al. 2001). The survey was completed on behalf of the U.S. Army Corps of Engineers, New Orleans District, in support of the proposed dredging of the bar channel reach of the Barataria Bay Waterway and subsequent disposal of dredge material at this location. Pelletier et al. (2001) noted that the survey area consisted of one survey block, which measured approximately 773.7 m (2,538.2 ft) wide by 6,029.4 m (19,776.5 ft) long. In total, approximately 108.6 linear miles (174.8 km) of ocean bottom were subject to marine remote sensing survey. Magnetometer survey augmented by a side scan sonar survey resulted in the identification of 163 individual magnetic anomalies, and 17 acoustic anomalies.

From these anomalies, Pelletier et al. (2001) stated that 25 target clusters were identified. It was suggested that a total of two of these targets (Targets 6 and 19) possibly represented significant cultural resources or shipwrecks applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]), while two other targets (Targets 14 and 18) may have represented cable or pipeline segments. In lieu of avoidance, Pelletier et al. (2001) recommended additional testing of these four targets. The authors reported that the remaining 21 targets likely represented areas of scattered modern debris and no further study of these targets was recommended.

Previously Recorded Archeological Sites Located within 2.4 km (1.5 mi) of the Currently Proposed Project Area

A total of 10 previously recorded sites were identified within 2.4 km (1.5 mi) of the currently proposed project area (Table 8). Of these, sites 16JE49, 16JE125, 16JE127, 16JE128, 16JE129, 16JE144, and 16JE296 were described as containing historic period components, while Sites 16JE123 and 16JE124 consisted of both prehistoric and historic period artifacts. The remaining site (16JE126) reportedly consisted of an historic cemetery. None of these sites are situated within the Area of Potential Effect for the current project; all are discussed in site number order below.

Site 16JE49, situated within Section 29 of Township 21S, Range 25E, was described as the ruins of historic Fort Livingston. The site, which was listed in the National Register of Historic Places in August 1974, was officially recorded as an archeological site by Richard Weinstein in 1977 (Gagliano et al. 1979). Construction of the fort reportedly began in 1841 and it was occupied until the late 1800s. While the overall size of the site was not noted, a pedestrian survey of the area by Weinstein resulted in the collection of unspecified quantities of shell, bottle glass, fragments of pipe stem, buttons, and coins. While no recommendations concerning additional testing of Fort Livingston were reported, it was noted that the site was being impacted by ongoing erosion.

Site 16JE49 was revisited by R. Christopher Goodwin & Associates, Inc. during 1984 (Goodwin et al. 1985). According to data presented on the State of Louisiana Site Record Update Form, a pedestrian survey of the site area found it to be in the same condition as reported by Weinstein in 1977. No recommendations concerning additional testing of the site were reported; however, it was noted that erosion had continued to impact the site adversely.

Site 16JE123 was recorded by Weinstein in 1977 (Gagliano et al. 1979). The site, which was situated within portions of Section 37 of Township 21S, Range 24E and Section 28 of Township 22S, Range 24E, was described as a scatter of prehistoric and historic period artifacts. The overall size of Site 16JE123 was not noted. Pedestrian survey resulted in the collection of a single Baytown Plain prehistoric ceramic sherd. The recorder noted that shell and recent historic materials also were observed; however, it was not reported if any of these artifacts were collected. No possible cultural affiliations were suggested for either the prehistoric or the historic components identified at Site 16JE123 but the site was assessed as not significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]). No additional testing of Site 16JE123 was recommended.

Site 16JE123 was re-examined during 1984 by R. Christopher Goodwin & Associates, Inc. (Goodwin et al. 1985). Pedestrian survey augmented by probing of the recorded site area failed to identify any additional cultural materials. Goodwin et al. (1985) reported that the site area was being utilized for a barge dock and that Site 16JE123 had been completely destroyed. Site 16JE123 was not assessed, and no additional testing was recommended.

Table 8. Previously Recorded Archeological Sites Located Within 2.4 km (1.5 mi) of the Currently Proposed Project Area

SITE #	USGS 7.5' QUAD	SITE DESCRIPTION	CULTURAL AFFILIATION	FIELD METHODOLOGY	NRHP ELIGIBILITY	RECORDED BY
Jefferson Parish						
16JE49	Barataria Pass, La.	Historic Fort Livingston	Early – late 19th century historic period	Pedestrian survey	Listed on the National Register during August of 1974	Weinstein 1977; R. Christopher Goodwin & Associates, Inc. 1984
16JE123	Grand Isle, La.	Prehistoric and historic artifact scatter	Undetermined prehistoric and historic	Pedestrian survey	Not significant	Weinstein 1977; R. Christopher Goodwin & Associates, Inc. 1984
16JE124	Barataria Pass, La.	Prehistoric and historic artifact scatter	Undetermined prehistoric and historic	Pedestrian survey and probing	Potentially significant	Weinstein 1977; R. Christopher Goodwin & Associates, Inc. 1984
16JE125	Caminada Pass, La.	Historic artifact scatter	Late 19th – early 20th century historic scatter	Pedestrian survey	Not significant	Weinstein 1977; R. Christopher Goodwin & Associates, Inc. 1984
16JE126	Grand Isle, La.	Historic Our Lady of the Isle Cemetery	Late 19th century – present	Pedestrian survey	Not significant	Weinstein 1977; R. Christopher Goodwin & Associates, Inc. 1984
16JE127	Barataria Pass, La.	Historic artifact scatter	19th century historic period	Pedestrian survey, shovel testing, auger testing, probing, and remote sensing survey	Not significant	Weinstein 1977; R. Christopher Goodwin & Associates, Inc. 1984; Santeford 1995
16JE128	Barataria Pass, La.	Historic artifact scatter	Early 19th century historic period	Pedestrian survey, shovel testing, probing, and magnetometer survey	Eligible	Weinstein 1977; R. Christopher Goodwin & Associates, Inc. 1984; Santeford 1995; Saltus and Godzinski 2001
16JE129	Barataria Pass, La.	Historic artifact scatter and sugar house ruins	19th century historic period	Pedestrian survey, shovel testing, auger testing, probing, and metal detector survey	Eligible	Weinstein 1977; R. Christopher Goodwin & Associates, Inc. 1984; Santeford 1995; Wilson and Godzinski 2001
16JE144	Caminada Pass, La.	Historic artifact scatter and building foundations	19th century historic period	Pedestrian survey	Eligible	Weinstein 1984; Mann 2001
16JE296	Barataria Pass, La.	Remains of a boat frame	Undetermined historic	Pedestrian survey	Potentially significant	Poitevent and Godzinski 2001

Site 16JE124 also was identified by Weinstein during 1977 (Gagliano et al. 1979). The site was situated within Section 31 of Township 21S, Range 25E and it was described as scatter of *Rangia* shells, historic period artifacts, and the ruins of a fish and/or shrimp processing plant. In addition, a single Baytown Plain prehistoric period ceramic sherd was noted, but not collected. The overall size of the site was not reported and no cultural materials were collected during pedestrian survey. While no possible cultural affiliation was reported for either the prehistoric or the historic period components identified at Site 16JE124, the site was assessed as potentially significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]); however, no specific recommendations concerning additional testing were provided on the site record form.

An attempt to relocate Site 16JE124 was made during 1984 by R. Christopher Goodwin & Associates (Goodwin et al. 1985). According to information presented on the State of Louisiana Site Record Update Form, a pedestrian survey augmented by probing of the reported location of Site 16JE124 failed to identify any cultural resources. It was suggested that the site had been destroyed by erosion since it was recorded in 1977. Site 16JE124 was not specifically assessed applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]) and no recommendations concerning additional testing of the site were noted on the site record form.

Site 16JE125 was identified within Section 28 of Township 22S, Range 24E and it was characterized as an historic artifact scatter of unspecified size. The site was recorded during 1977 by Weinstein. Pedestrian survey resulted in the observation of an unreported quantity and type of historic period artifacts; none of the cultural materials were collected. It was suggested that Site 16JE125 possibly represented the former location of a camp or residence that dated from the late nineteenth to early twentieth century. Site 16JE125 was assessed as not significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]) and no additional testing of the site was recommended.

R. Christopher Goodwin & Associates, Inc. attempted to relocate Site 16JE125 during 1984 (Goodwin et al. 1985). Pedestrian survey of the recorded location of the site failed to identify any cultural resources and it was suggested that Site 16JE125 probably had been destroyed due to ongoing erosion. Site 16JE125 was not assessed applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]) and no recommendations concerning additional testing of the site were reported.

Site 16JE126, the historic Our Lady of the Isle Cemetery, was recorded by Weinstein in 1977 (Gagliano et al. 1979). The cemetery was situated within Section 28 of Township 22S, Range 24E but the overall size of the cemetery was not noted. Pedestrian survey identified an unspecified number of tombs, the oldest of which dated from 1882. No cultural materials were recovered from Site 16JE126. In addition, the recorder noted that the cemetery was still in use at the time of its recordation. Site 16JE126 was assessed as not significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]) and no additional recordation or testing of the site was recommended.

In 1984, R. Christopher Goodwin & Associates, Inc. completed a site record update form for Site 16JE126 (Goodwin et al. 1985). The form noted that the cemetery was unchanged since its initial recordation and that it continued to be utilized. Goodwin et al. (1985) concurred with the assessment of Site 16JE126 as not significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]), and no additional testing or recordation of the site was recommended.

Site 16JE127 was identified within Section 21 of Township 21S, Range 25E during a 1977 pedestrian survey by Weinstein (Gagliano et al. 1979). The site reportedly measured 46 x 91 m (150.9 x 298.6 ft), and it was described as a scatter of oyster shell and brick. It was suggested that the site possibly represented the former location of residential structures; however, no potential date of occupation was reported. Site 16JE127 was assessed as not significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]), and no additional testing of the site was recommended.

Site 16JE127 was reinvestigated by R. Christopher Goodwin & Associates, Inc. during 1984 (Goodwin et al. 1985). According to data provided on the State of Louisiana Site Record Update Form, pedestrian survey of the area resulted in the identification of a concentration of bricks and oyster shell; however, none of these materials were collected. It was suggested that Site 16JE127 had been destroyed by ongoing dredging activities and erosion. No statements regarding the significance of the site were reported; however, no additional testing of Site 16JE127 was recommended.

Site 16JE127, subsequently was relocated during a 1995 Phase I cultural resources survey and archeological inventory of Grand Terre Island that was conducted by Earth Search, Inc. (Maygarden et al. 1995). According to information presented on the State of Louisiana Site Update Form completed by Lawrence Santeford during June of 1995, pedestrian survey augmented by shovel testing, auger testing, probing, and a metal detector survey resulted in the collection of historic period ceramic sherds, glass sherds, metal, and faunal materials. It was suggested that Site 16JE127 represented a nineteenth century historic period occupation. Site 16JE127 was assessed as not significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]), and no additional testing of the site was recommended.

Site 16JE128 was situated within Section 21 of Township 21S, Range 25E. Originally recorded in 1977 by Richard Weinstein (Gagliano et al. 1979), the site was described as a 70 m (229.7 ft) long oyster shell midden situated along the shoreline. In addition, a scatter of historic period artifacts was noted offshore. Pedestrian survey resulted in the collection of historic period ceramic sherds, glass bottles, ceramic pipe fragments, and gunflints. It was suggested that Site 16JE128 possibly represented the location of a settlement occupied by Jean and Alexandre Frederic Lafitte on Grand Terre Island between 1806 and 1814. Site 16JE128 was assessed as potentially significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]), and additional testing of the site was recommended.

R. Christopher Goodwin & Associates, Inc. re-examined Site 16JE128 during 1984 as part of a Phase I survey of previously recorded archeological sites situated within Jefferson Parish (Goodwin et al. 1985). According to data presented on the State of Louisiana Site Record Update Form, pedestrian survey augmented by probing of the site area resulted in the identification of a 40 m (131.2 ft) long *Rangia* shell lens; however, no historic period artifacts were noted. It was suggested that Site 16JE128 had been destroyed by pipeline canal construction activities.

Subsequently, Earth Search, Inc., reinvestigated Site 16JE128 during 1995 as part of a cultural resources survey of Grand Terre Island (Maygarden et al. 1995). According to information presented on the State of Louisiana Site Update Form, Site 16JE128 measured approximately 70 x 140 m (229.7 x 459.3 ft) in size. Pedestrian survey augmented by shovel testing, auger testing, probing, and magnetometer survey of the site area resulted in the identification of an historic period artifact scatter that included historic period ceramic sherds, bottle glass, kaolin pipe stem fragments, brick, metal fragments, gunflints, and faunal materials. In addition, wooden posts, boards, and an unidentified box type feature constructed of wood were noted protruding from Barataria Bay. According to Maygarden et al. (1995) no cultural materials were collected from Site 16JE128. It was suggested that Site 16JE128 represented an early nineteenth century settlement possibly associated with Jean Laffite. Maygarden et al. (1995) assessed Site 16JE128 as eligible for nomination to the National Register applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]). It was recommended the site be avoided; however, if avoidance was not possible, additional testing of Site 16JE128 was recommended.

Subsequently, Saltus and Godzinski completed a site record update form during February of 2001 that summarized the results of additional testing which was completed at Site 16JE128 by Earth Search, Inc., of New Orleans (Maygarden et al. 2001). Shovel testing, probing, and a magnetometer survey resulted in the collection of historic ceramic shards, bottle glass sherds, clay pipe stem fragments, a gunflint, and animal bones. In addition, wooden posts and boards were noted offshore. It was suggested that Site 16JE128 dated from the historic Antebellum period and the site again was assessed as eligible for nomination to the National Register of Historic Places applying the criteria for evaluation (36 CFR 60.4 [a-d]). Mitigation of Site 16JE128 was recommended if the site was to be impacted.

Site 16JE129 originally was recorded by Richard Weinstein during 1977 (Gagliano et al. 1979). The site, located within Section 22 of Township 21S, Range 25E, was described as an historic period artifact scatter associated with the ruins of a sugar house. Although a pedestrian survey of the site area was conducted, no cultural materials were collected. It was suggested that the sugar house remains identified at Site 16JE129 were associated with Forstall Plantation which was in operation from ca. 1823 – ca. 1888. Site 16JE129 was assessed as potentially significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]) and additional testing was recommended.

Subsequently, Site 16JE129 was relocated by R. Christopher Goodwin & Associates, Inc., in 1984 (Goodwin et al. 1985). According to data presented on the State of Louisiana Site Record Update Form, pedestrian survey and probing of the site area was conducted; however, no cultural materials were collected. It also was noted that no recent disturbance to the site had taken place since its recordation in 1977. Site 16JE129 was assessed as potentially significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]), and the update form concurred with Weinstein's recommendation of additional testing.

Earth Search, Inc. completed additional testing of Site 16JE129 in 1995 during their survey of Grand Terre Island (Maygarden et al. 1995). It was noted that the site measured 213.4 x 457.2 m (700 x 1,500 ft) in size. Pedestrian survey augmented by shovel testing, auger testing, probing, and metal detector survey resulted in the collection of historic period ceramics, bottle glass, brick, mortar, metal fragments, and faunal material. In addition, the previously mentioned sugar house remains were noted. Maygarden et al. (1995) assessed Site 16JE129 as eligible for nomination to the National Register applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]). It was recommended the site be avoided; however, if avoidance was not possible, additional testing of Site 16JE129 was recommended.

Additional testing of Site 16JE129 was completed by Earth Search, Inc., during 2001 (Maygarden et al. 2001). According to data presented on a site record update form, which was completed by Wilson and Godzinski during February of 2001, pedestrian survey augmented by shovel testing, auger testing, probing, and limited unit excavation resulted in the collection of historic ceramic sherds, clay pipe stem fragments, bottle glass shards, metal, brick and mortar fragments, pieces of wood, and faunal material. Again, Site 16JE129 was considered to be eligible for nomination to the National Register applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]). It was recommended that data recovery be completed at the site if it was to be impacted.

Site 16JE144 was recorded by Weinstein in 1984 (Castille and Weinstein 1986). The site was situated within portions of Sections 25 and 29 of Township 22S, Range 24E and it was described as a scatter of historic artifacts identified during Phase I cultural resources survey and archeological inventory of a proposed residential development (Castille and Weinstein 1986). The brick foundations associated with a former plantation, which later was converted into a hotel, were noted. Site 16JE144 reportedly measured 400 x 800 m (1,312.3 x 2,624.7 ft) in size. Pedestrian survey resulted in the collection of unspecified quantities of historic ceramic sherds, glass shards, brick, metal, and slate. It was suggested that Site 16JE144 represented a nineteenth century historic period occupation and the site was assessed as potentially significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]). Additional testing of Site 16JE144 was recommended.

Subsequently, Rob Mann completed a site record update form during June of 2001 to report the results of a visual inspection of the Site 16JE144 area. Pedestrian survey resulted in the identification of historic ceramic sherds, glass shards, and bricks; however, none of these materials were collected. In addition, several brick foundations associated with the former plantation buildings were noted. Again, it was suggested that Site 16JE144 represented a nineteenth century historic period occupation and the site was assessed as potentially significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]). Additional testing of Site 16JE144 was recommended.

Site 16JE296 was recorded by Poitevent and Godzinski during February of 2001. The site was identified within an unspecified section of Township 21S, Range 25E during an archeological inventory of Grand Terre Island (Maygarden et al. 2001). Site 16JE296 was described as a portion of a boat frame consisting of the long beam and three cross beams which were noted during pedestrian survey. The site measured 10 x 20 m (32.8 x 65.6 ft) in size. No specific historic period was suggested; however, the site was assessed as potentially significant applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]) and additional testing of Site 16JE296 was recommended.

Previously Recorded Standing Structures Located within 2.4 km (1.5 mi) of the Currently Proposed Project Area

A review of the standing structure files located at the Louisiana Department of Culture, Recreation and Tourism, Office of Cultural Development, Division of Historic Preservation, Baton Rouge, failed to identify any previously recorded standing structures located within 2.4 km (1.5 mi) of the currently proposed project area.

CHAPTER VI

RESEARCH METHODS

Archival Methods

Archival research for the Grand Isle Re-evaluation Study project focused on identifying previously recorded sites of shipwrecks and other obstructions within and in the vicinity of the project area. The literature search involved reviewing various sources of information, including the Mineral Management Service's "Shipwrecks Contained in Lease Blocks" and "Shipwrecks Found in State Waters;" The NOAA AWOIS (Automated Wreck and Obstruction Information system) records; U.S. Coastal and Geodetic Service nautical charts; historic maps; U.S. Army Corps of Engineers reports; vessel directories; and reports of previous archeological investigations within the vicinity of the Grand Isle and Bayou Rigaud project area. These materials were obtained at the Library of Congress in Washington, D.C., and at the National Archives in Washington D.C. and at College Park, Maryland. Individual histories of recorded shipwrecks were researched at the National Oceanic and Atmospheric Administration, Silver Spring, Maryland.

Maps (U.S. Coastal and Geodetic Service)

Federally produced maps (Catalogue of Charts and Coast Pilots) are available at the National Archives and Library of Congress. These are surveys of ocean features beginning in the 1860s and continuing to the present. The maps are intended to guide ships through waterways by marking depths, given in fathoms, and buoy positions. The listing of wrecks and other obstructions, such as piles and dumping areas, began in the 1930s. The most complete nautical charts by the U.S. Coast and Geodetic Survey are the current charts, which detail every observable feature that may prove hazardous to ships. Chart No.11365, a U.S. Coastal and Geodetic Service chart used for navigation, includes locations of wrecks and obstructions in the vicinity of the project area.

Federal Record Groups (RG)

These records contain information pertinent to shipwrecks in the Gulf. The most pertinent Record Groups for this project are:

- *RG41*: established in 1854, the Records of the Steamboat Inspection Service, continue into the 20th century.

- *RG26*: the Records of U.S. Coast Guard are bound volumes of abstracts of wreck reports received from Collectors of Customs from 1874 to 1975 and original reports from 1908 to 1913. This record group also contains Reports of the U.S. Life-Saving Service. A microfilm copy of annual tables of reports of the Life-Saving Service is available for the years 1876 to 1914.

- *RG35*: the Records of U.S. Customs Service documents wrecks after 1874, the year in which Congress passed a law requiring owners of American vessels to report any casualty to the vessel to the Collector of Customs at the port at which the vessel was documented. One copy of the report was forwarded to the United States Life-Saving Service and one copy usually was copied into volumes.

- *RG36*: contains the volumes of copied casualty reports of the U.S. Customs Service.

- *Microfilm T-920*: U.S. Coast Guard assistance-rendered reports for the years 1916 to 1940

- *Microfilm T925*: Customs wreck reports from 1913 to 1939 are housed at the National Archives.

- *Microfilm T926*: an index to U.S. Coast Guard Casualty and Wreck Reports as well as the Life-Saving Service assistance-rendered reports. Reports of the U.S. Life-Saving Service are another source of shipwreck information. This service began in the Revenue Marine Division of the Treasury Department in 1871 and eight years later came under a general superintendent who reported directly to the Secretary of the Treasury. Regulations required Keepers of Life-Saving Stations to report assistance rendered by their stations to any vessel, crew, or person and sent the originals to the General Superintendent of the service. The stations retained a copy of the reports. Annual reports of the Life-Saving Service contain narrative reports of services and tables of casualties occurring near life-saving stations. A microfilm copy of these tables is available for the period 1876 to1914. An act of January 28, 1915 established the U.S. Coast Guard by consolidating the Department of the Treasury's Revenue-Cutter and Life-Saving Services. Perhaps for this reason, Coast Guard records include copies of Life-Saving Service assistance-rendered reports for the period 1901 to 1915. These are arranged by fiscal year by Life-Saving Service district.

Also with the Coast Guard records are microfilmed copies of assistance-rendered reports for the period 1916-1940. These are arranged by date of casualty in two groups: reports of assistance rendered and reports of miscellaneous services rendered. These 1916 to 1940 reports are available on National Archives Microfilm T-920 and, like the customs wreck reports, are indexed on National Archives Microfilm T-926. Other federal records also have shipwreck or associated maritime information. Some shipwreck data can be found in records of the Lighthouse Service (Records Group 26).

Directories of Vessels

These lists of wrecked vessels are compiled by federal and private institutions, both in the U.S. and abroad. The most comprehensive ones are:

- *Merchant Vessels of the United States*. The principal directory for American vessels began to be published by various government agencies in 1867. It is currently updated by the U.S. Coast Guard. The Merchant Vessels directory annuals contain names of shipping vessels under type of vessel (sailing, steam, unrigged, yachts, etc.), with details on rig, tonnage, dimension, when and where built, home port, and owner. Also listed is information on abandoned, or lost vessels.

- *Lloyd's List 1740-1970* lists vessel movements and casualties reported to Lloyd's. A microfilm index to the list cover the years 1838 to 1926. From 1927 on there is a card for each vessel's reported movements and casualties.

- *Lloyd's Weekly Shipping Index 1880-1917* lists the published voyage and engaged date of sailing for ocean-going steamers and sailing vessels. Also reproduced in the index are all casualty reports published during the previous week.

- *Lloyd's Missing Vessel Books 1873-1954* contains records of all vessels posted missing by the Committee of Lloyd's and gives details of vessels, masters, crews, voyage, and cargo.

- *Lloyd's Marine Loss Records 1939-1970* give details of all vessels lost with full reports as received at Lloyd's.

Secondary Sources

The following books with lists of shipwrecks also were examined to provide corroborative evidence for other sources examined for this report:

- *Beneath the Waters: A Guide to Civil War Shipwrecks* (Hemphill 1998);

- *Encyclopedia of American Shipwrecks* (Berman 1972);

- *A Guide to Sunken Ships in American Waters* (Lonsdale and Kaplan 1964);

- *Merchant Steam Vessels of the United States, 1790-1868* (Lytle and Holdcamper 1975);

- *Way's Packet Directory, 1848-1994* (Way and Rutter 1983);

- *Way's Steam Towboat Directory* (Way 1990);

- *Wreck List Information* (Hydrographic Office, U.S. Navy 1945).

Remote Sensing Investigations

The Grand Isle Re-evaluation Study marine remote sensing survey was conducted from a 19-ft research vessel leased from the Louisiana Universities Marine Consortium (LUMCON). Mr. Samuel LeBouef and Mr. Craig LeBouef captained the vessel. The project area consisted of six survey blocks, listed as Bayou Rigaud (Block One); Grand Isle (Block Two); Fifi One, Fifi Two, and Fifi Clip (Block Three); Fifi Three (Block Four); Fifi Four (Block Five); and an irregular survey area (Block Six).

The remote sensing survey was designed to identify specific magnetic or acoustic anomalies and/or clusters of anomalies that might represent potentially significant submerged cultural resources such as shipwrecks. The natural and anthropogenic forces that form such sites typically are scattered ferrous objects like fasteners, anchors, engine parts, ballast, weaponry, cargo, tools, and miscellaneous related debris spread across the bottom of a given body of water. These objects normally can be detected with a marine magnetometer, side scan sonar system, and fathometer that record anomalous magnetic or acoustic underwater signatures that stand out against the ambient magnetic or visual field. Two critical elements in the interpretation of such anomalies, which may also result from natural or modern sources, are their patterns and, in the case of magnetic anomalies, their amplitudes and durations. Because of the importance of anomaly patterning, accurate recording and positioning of anomaly locations is essential.

The equipment array used for the Grand Isle Re-evaluation Study survey included a DGPS, a proton precession marine magnetometer, a side scan sonar, and a fathometer (Figure 35). Data were collected and correlated via a laptop computer using hydrographic survey software.

Positioning

A Differential Global Positioning System (DGPS) was used to direct navigation and supply accurate positions of magnetic and acoustic anomalies. The DGPS system consisted of a Northstar 941XD with internal DGPS. The Northstar 941XD transmitted position information in NMEA 0183 code to the computer navigation system (version 7.0 of Coastal Oceanographics' *Hypack* software).

Hypack translates the NMEA message and displays the survey vessel's position on a computer screen relative to the pre-plotted track lines. During post-processing, *Hypack's* positioning files can be utilized to produce track plot

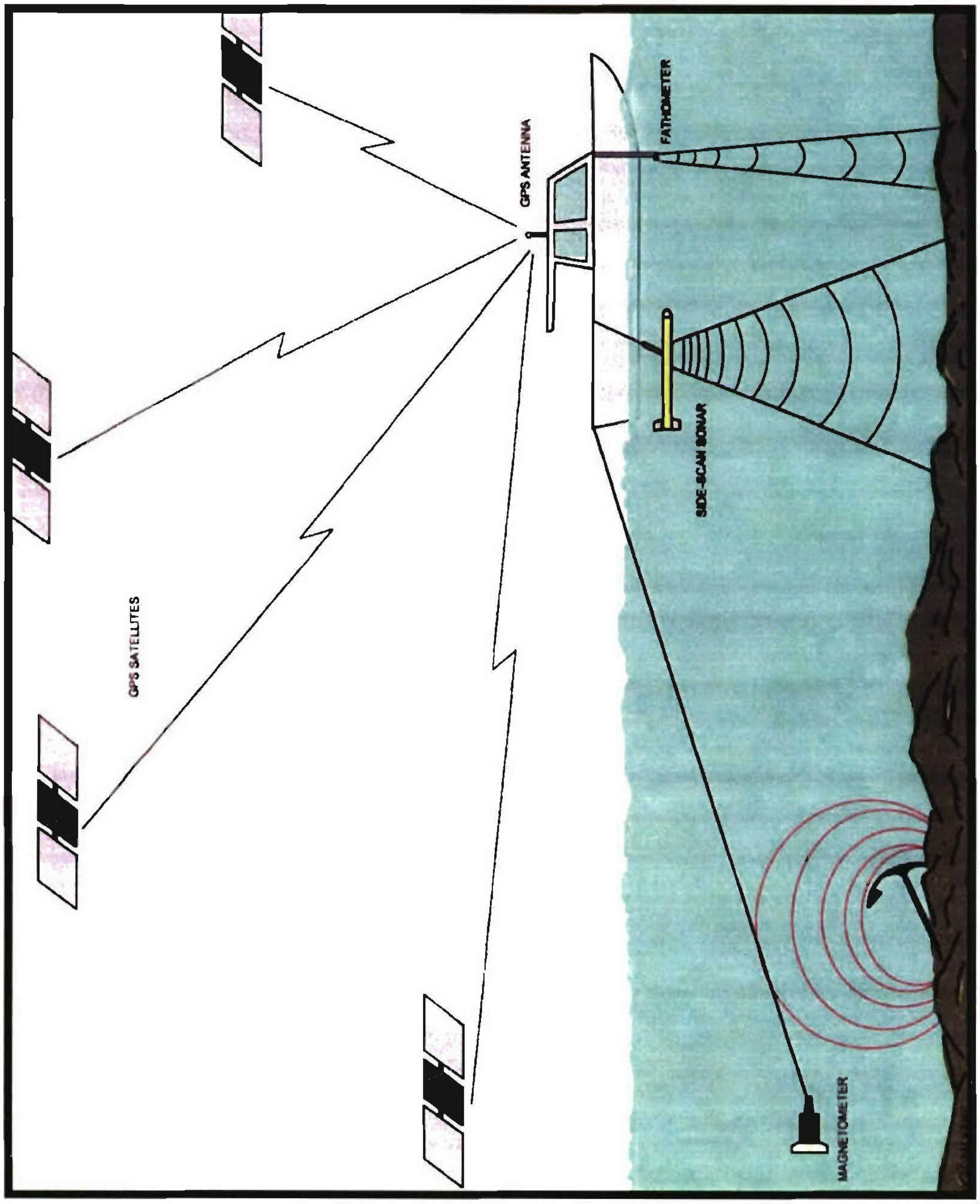

Figure 35. Array of equipment used during remote sensing survey.

maps and to derive the X, Y, and Z values used to produce magnetic and bathymetric contour plot maps. For the Grand Isle Re-evaluation Study marine remote sensing survey, positioning control points were obtained continuously by *Hypack* at one-second intervals. During the course of the survey, strong differential signals were acquired with a minimum noise-to-signal ratio.

Magnetometry

The recording proton precession marine magnetometer is an electronic instrument used to record the strength of the earth's magnetic field in increments of nanoTeslas or gammas. Magnetometers have proven useful in marine research as detectors of anomalous distortions in the earth's ambient magnetic field, particularly those distortions that are caused by concentrations of naturally occurring and manmade ferrous materials. Distortions or changes as small as 0.5 gammas are detectable when operating the magnetometer at a sampling rate of one second. Magnetic distortions caused by shipwrecks may range in intensity from several gammas to several thousand gammas, depending upon such factors as the mass of ferrous materials present, the distance of the ferrous mass from the sensor, and the orientation of the mass relative to the sensor. The uses of magnetometers in marine archeology and the theoretical aspects of the physical principals behind their operation are summarized and discussed in detail in Aitken (1961), Breiner (1973), Green (1990), Hall (1966, 1970), Tite (1972), and Weymouth (1986).

Individual anomalies produce distinctive magnetic "signatures." These individual signatures may be categorized as 1) positive monopole; 2) negative monopole; 3) dipolar or 4)-multi component (Figure 36). Positive and negative anomalies refer to monopolar deflections of the magnetic field and usually indicate a single source. They produce either a positive or negative deflection from the ambient magnetic field, depending on how the object is oriented relative to the magnetometer sensor and whether its positive or negative pole is positioned closest to the sensor. Dipolar signatures display both a rise and a fall above and below the ambient field; they also are commonly associated with single source anomalies, with the dipole usually aligned along the axis of the magnetic field and the negative peak of the anomaly falling nearest the North Pole.

Especially important for archeological surveys are multi-component anomalies. Multi-component or complex signature anomalies consist of both dipolar and monopolar magnetic perturbations associated with a large overall deflection that can be indicative of the multiple individual ferrous materials that comprise debris patterns typically associated with shipwrecks. The complexity of the signature is affected partially by the distance of the sensor from the debris and the quantity of debris. If the sensor is close to the wreck, the signature will be multi-component; if far away, it may appear as a single source signature.

A Geometrics G881A cesium vapor marine magnetometer with integrated altimeter was used to complete the magnetic survey of the Grand Isle Re-evaluation Study. The G881A is a 0.1 gamma sensitivity magnetometer that downloads magnetic data in digital format as numeric data files in *Hypack*. As the magnetic data are being collected, *Hypack* attaches the precise real-time DGPS coordinates to each magnetic reading, thus ensuring precise positioning control. The magnetometer was towed far enough behind the survey vessel to minimize the associated noise, which generally measured less than two gammas. A float was attached to the magnetometer sensor, so that a consistent depth below the water's surface could be maintained.

Acoustic Imaging

Over the past 25 years, the combined use of acoustic (sonar) and magnetic remote sensing equipment has proven to be the most effective method of identifying submerged cultural resources and assessing their potential for further research (Green 1990; Hall 1970). When combined with magnetic data, the near photographic-quality acoustic records produced by side-scan sonar systems have left little doubt regarding the identifications of some targets that are intact shipwrecks (Figure 37). For targets lacking structural integrity or those partially buried beneath bottom sediments, identification can be extremely difficult. Because intact and exposed wrecks are less common than broken and buried wrecks, remote sensing surveys generally pro-

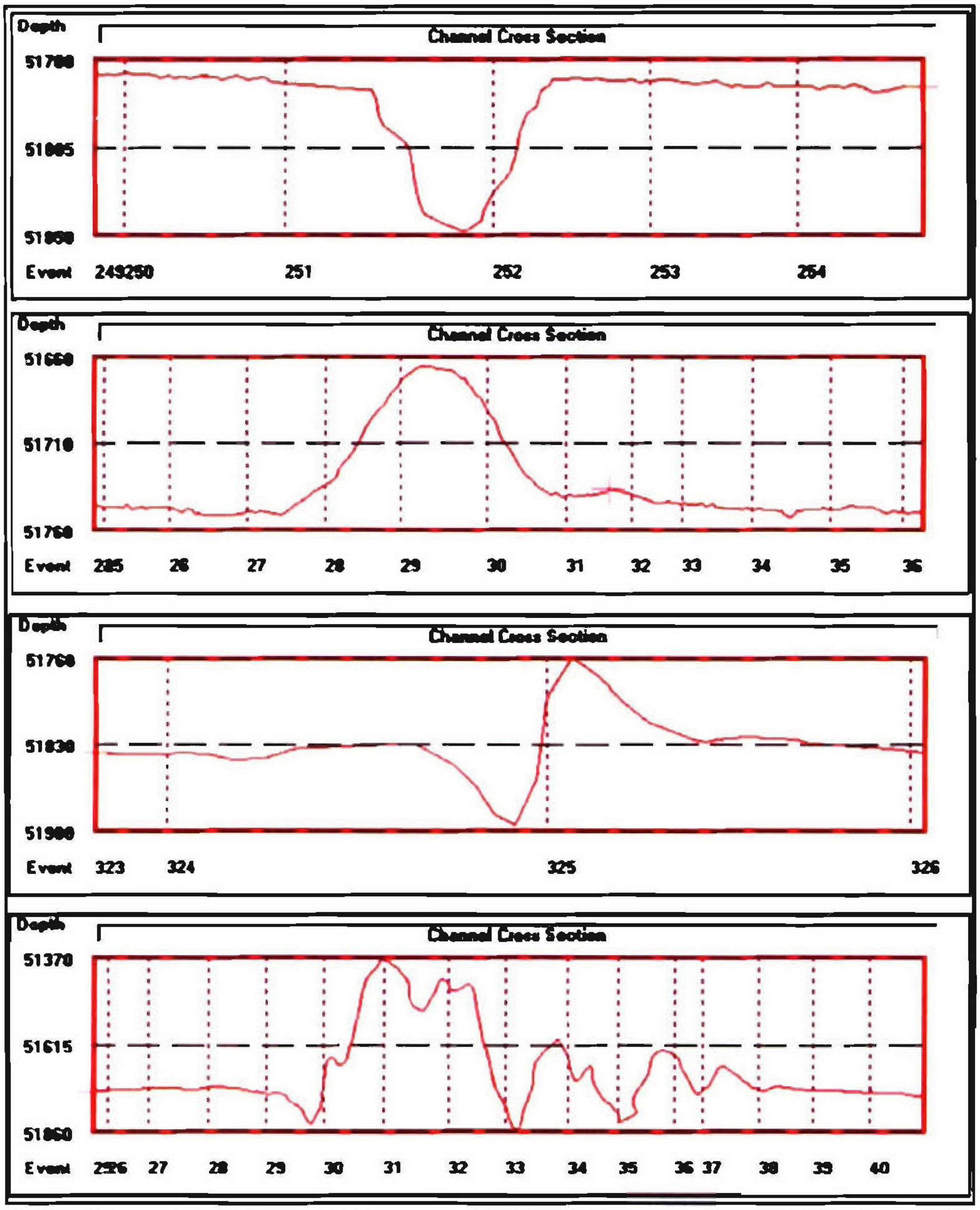

Figure 36. **Hypack magnetic data screen showing the four types of magnetic signals usually seen during a magnetic survey in order from the top: positive monopole, negative monopole, dipole, and multi-component.**

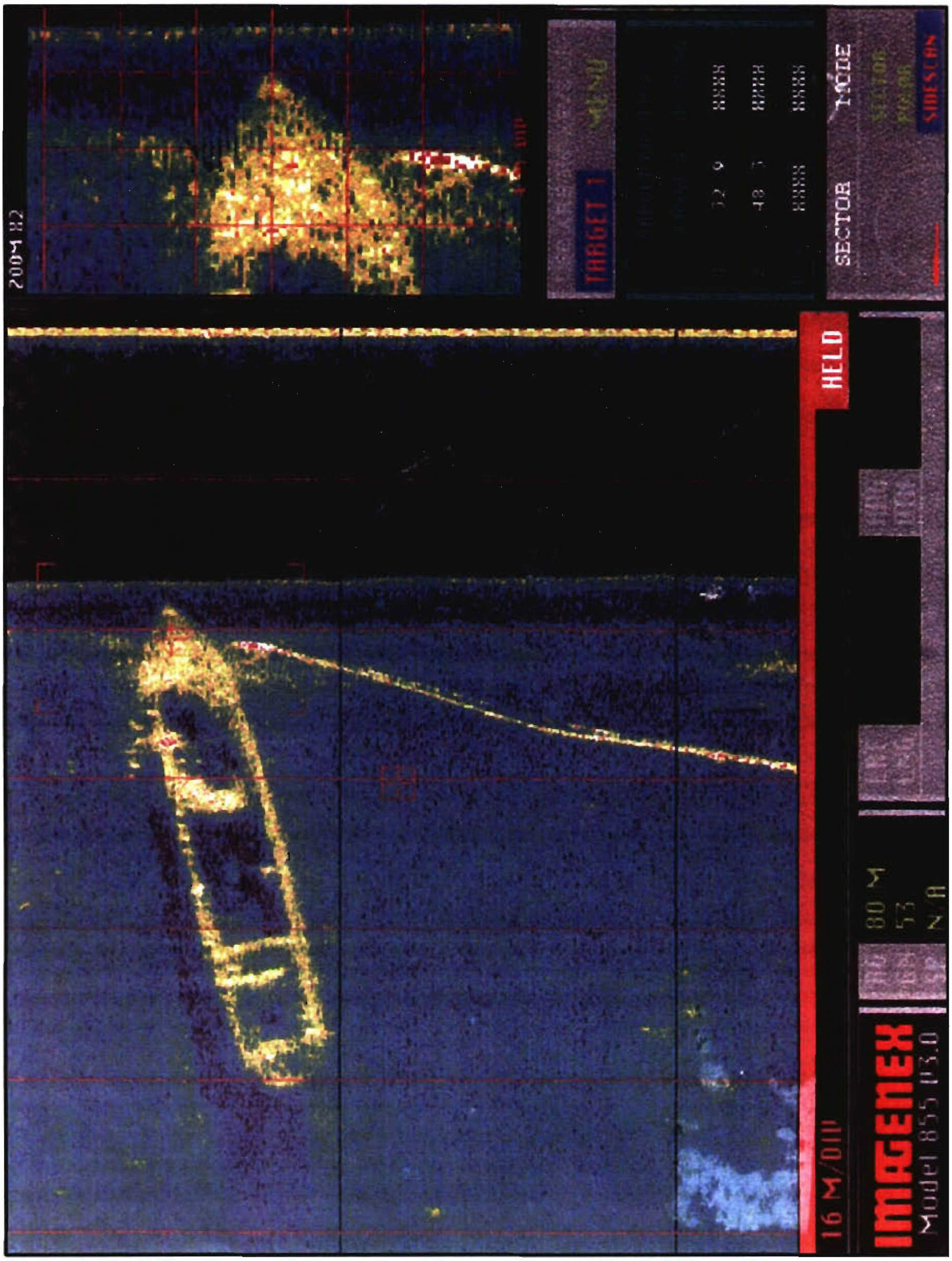

Figure 37. Example of a side scan image.

duce acoustic targets that require ground-truthing by divers to determine their identification and historic significance.

A MarineSonics 600 kHz color imaging digital side scan sonar system was utilized continuously during the Grand Isle survey to produce sonograms of the bottom on each transect within the project area. The MarineSonic system consisted of a towfish operating at a frequency of 600 kHz linked to a PIII processor that integrates the DGPS signals with the tow fish. The sonar was set at a range of 75 ft per channel, which yielded overlapping coverage of the study areas. Sonar data were recorded in a digital format on a 20-gigabyte hard drive. Streams of time-tags and latitudes/longitudes were attached continuously to the sonar data, to assist in post-processing correlation of the acoustic and magnetic data sets. Acoustic images were displayed on a VGA monitor as they were recorded during the survey, and an observation log was maintained by the sonar technician to record descriptions of the anomalies and the times and locations associated with each target. Potential targets were inventoried both during the survey and in post-processing.

The methodology employed during the survey produced favorable results, with reliable DGPS signals, low noise levels on the magnetometer, and clear acoustic images. All positioning and remote sensing equipment performed reliably throughout the survey. Regular and evenly spaced coverage of the entire survey area was achieved.

Survey Control and Correlation of Data Sets

The *Hypack* survey software provided the primary method of control during the survey. Survey lanes were planned in *Hypack*, geodetic parameters were established, and instruments were interfaced and recorded through the computer software. During the survey, the planned survey lines were displayed on the computer screen, and the survey vessel's track was monitored. In addition to providing steering direction for the helmsman, *Hypack* allowed the surveyors to monitor instruments and incoming data through additional windows on the survey screen.

All remote sensing data were correlated with DGPS positioning data and time through *Hypack*. Positions for all data then were corrected through the software for instrument layback and offsets. Positioning was recorded using Louisiana South State Plane grid coordinates, referencing the North American Datum of 1983 (NAD-83). The GRS-1980 ellipsoid was used in conjunction with a Lambert projection.

Remote Sensing Data Analysis

Magnetic and acoustic data were analyzed in the field while they were generated, and post-processed using *Hypack* and Autodesk's *AutoCAD* computer software applications. These computer programs were used to assess the signature, intensity, and duration of individual magnetic disturbances, and to plot their positions within the project area.

In the analysis of magnetometer data for this survey, individual anomalies were identified and carefully examined. First, the profile of each anomaly was characterized in terms of its pattern, amplitude, and duration. Amplitude and duration are quantified by magnetic deflection strength and the duration of the perturbation (Table 9). Second, the magnetic signatures of the anomalies were graphed in Golden Software's *Surfer* (Version 2000) to provide a visual aid for

Table 9. Duration and Magnetic Amplitude Deflection.

DURATION (SECONDS)		MAGNETIC AMPLITUDE	
< 10	Short	< 50 nT	Low
10 - 30	Medium	50 – 100 nT	Medium
> 30	Long	> 100 nT	High

interpretation. Magnetic data were correlated with field notes, so that deflections from modern sources such as channel markers could be identified. Although all anomalies with an amplitude greater than ten gammas were given a magnetic anomaly number for reference purposes and were tabulated, anomalies of larger amplitude (more than 50 gammas) and of longer duration (more than 30 seconds) generally are considered to have a higher likelihood of representing possible shipwreck remains, especially when such anomalies cluster together.

Side-scan sonar data were examined for anomalous acoustic targets and shadows that might represent potentially significant submerged cultural resources, and to correlate with any magnetic or bathymetric anomalies. The following chapter presents a discussion of those targets that represent potential cultural resources within the Grand Isle project area.

CHAPTER VII

RESULTS OF REMOTE SENSING SURVEY

As Chapter IV demonstrated, the waters of Bayou Rigaud and Bayou Fifi adjacent to Barataria Pass have been used consistently by watercraft since approximately 1718 when New Orleans was settled. Their occasional use by Spanish and French ships during the sixteenth and seventeenth centuries is also quite likely. Use of these waterways increased significantly after the Louisiana Purchase in 1803, and continued to do so during the twentieth century.

Today the fishing and oil production industries in the area use these waters extensively. Over the years, the vessels engaged in these industries have produced great quantities of ferrous debris that typically is cast overboard. This debris is found throughout the survey area in considerable quantity making the locale "noisy" in magnetic terms. For example, the shrimp season began during the survey on May 12-17, 2003; numerous recreational and professional fishermen were seen trawling in the immediate project area (Figure 38). Side-scan sonar records also show evidence of previous fishing activities as denoted by the numerous trawl scars (Figure 39). In addition to debris, numerous pipelines traverse the area, including oil pipelines, flow lines, and water lines.

The discussion that follows presents the results of the Phase I Maritime Archaeology Remote Sensing Survey for the Grand Isle Re-evaluation Study Project. A general overview is provided, followed by a description of the area and the significant targets located in the survey area. Figure 40 shows the spatial distribution of the target clusters. As noted in Chapter VI, anomalies were identified initially from individual trackline data sets. After clustering anomalies into groups, magnetic contours were produced and analyzed for those targets that may be impacted by the Grand Isle Re-evaluation Study Project.

General Overview of the Survey Results

A total of 1,005 magnetic anomalies were detected during the Grand Isle Re-evaluation Study remote sensing survey. Individual magnetic anomalies are quantified in Appendix II – Table 1. A total of 59 acoustic anomalies were recorded during the survey and are qualified in Appendix II – Table 2. Of the 179 total target clusters identified for this survey, only 11 targets had acoustic anomalies that corresponded with the magnetic data (Table 10; Appendix II – Table 3).

One wreck was identified just outside the project area. This wreck is located north of Bayou Rigaud in Survey Block 6, very near the shore in shallow water. It is only partially submerged and is still visible during high tide. The information on the NOAA charts gives the wreck a 'Position Approximate.' Because the water in which the wreck rests was too shallow to support the survey vessel, magnetic data were not obtained. However, the wreck produced a clear acoustic image (Figure 41). The coordinates of the wreck, when geocoded and overlain on the NOAA chart, fell precisely within the confines of the wreck image.

Of the 1,005 magnetic anomalies, 500 were not included in target clusters. The majority of these consisted of single, isolated, point source magnetic anomalies consistent with large to small ferrous debris associated with the fishing and oil industries that dominate this area. Many

Figure 38. Photograph showing recreational fishermen trawling within the project area.

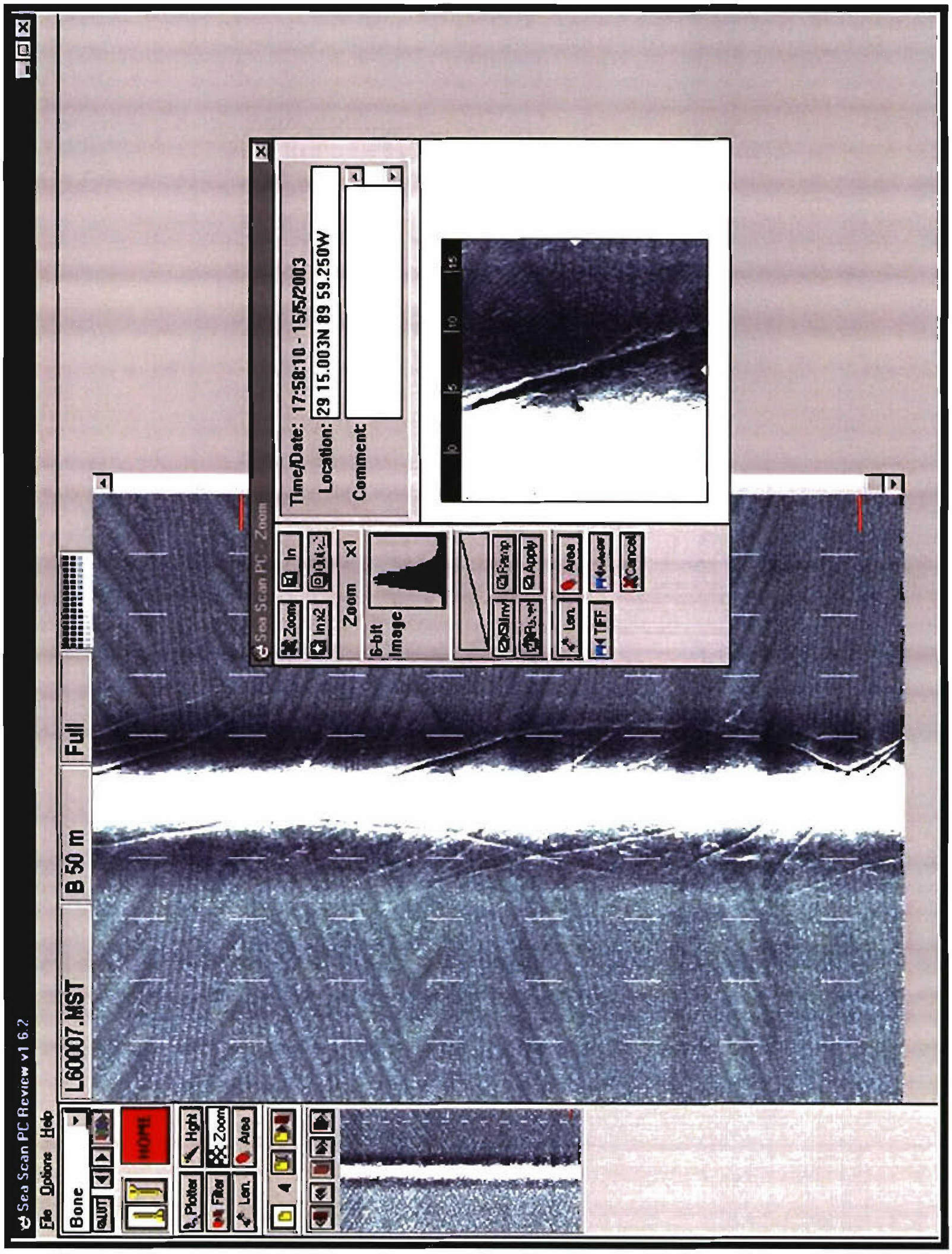

Figure 39. Acoustic image obtained during the survey showing trawl scars on the bayou's bed.

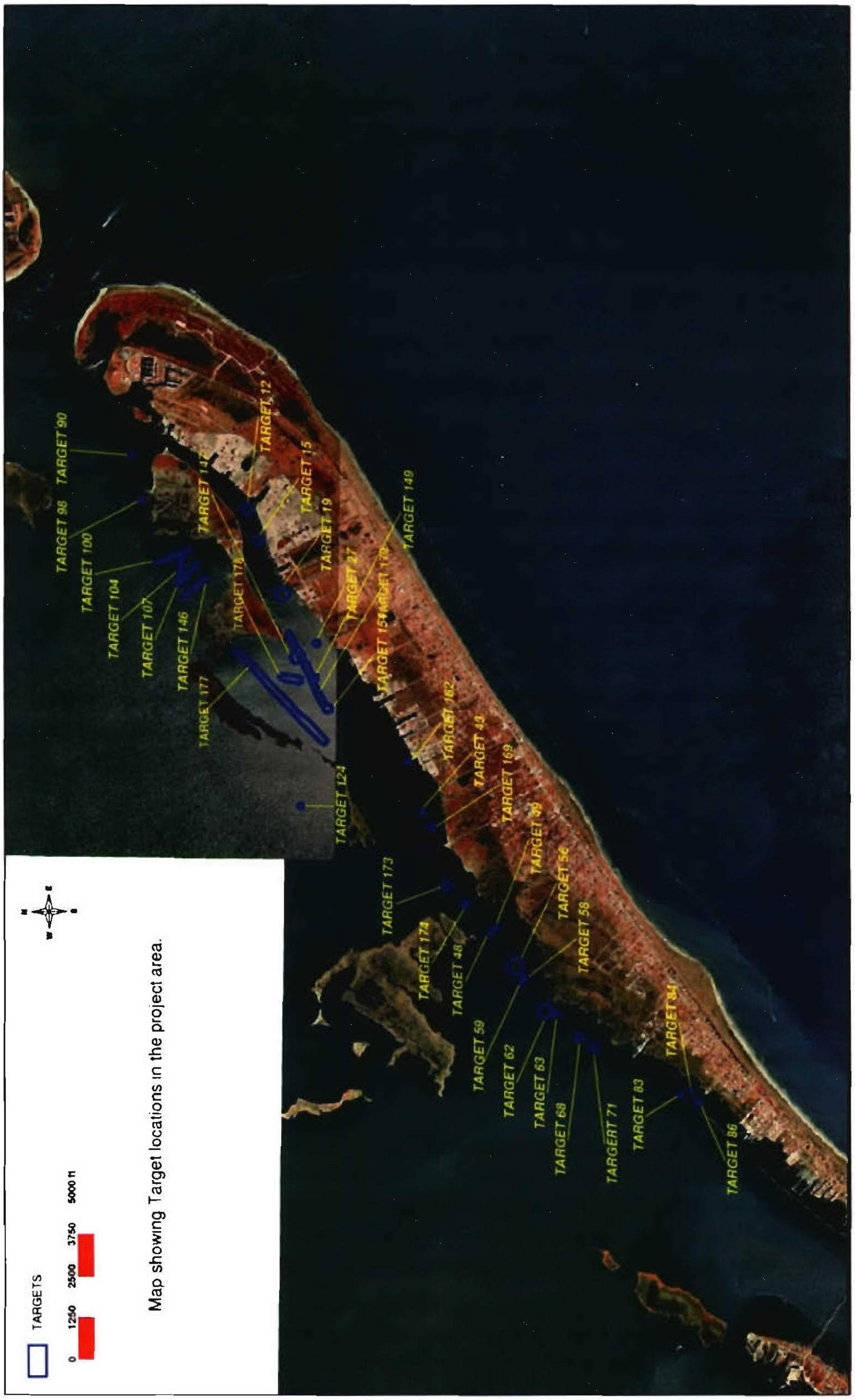

Figure 40. Map showing magnetic and acoustic target locations in the project area.

Table 10. Target Clusters.

TARGET	MAGNETIC ANOMALIES	ACOUSTIC ANOMALIES
T12	M44, M45, M46, M47,M48	
T15	M52, M53, M54	A11
T19	M64, M65, M66, M67, M68, M69	
T27	M88, M89	
T43	M169, M173, M176, M177	
T48	M211, M212, M213, M216	
T49	M198, M199, M204, M205, M208	
T56	M239, M240, M241, M242, M243, M244, M245, M246, M247, M250, M251	A14
T58	M258, M260, M261	
T59	M266, M267	
T62	M277, M278, M279, M280, M282, M283, M284, M287	
T63	M281	A18
T68	M302, M305, M306, M308	
T71	M318, M322	
T83	M378	A15
T84	M376	A19
T86	M384, M386, M388	A17
T90	M399, M400	
T98	M460	A26
T100	M492, M493, M494, M495, M496, M497, M498, M499, M500, M501, M502, M836, M841, M847, M848, M859, M860, M866, M867, M872, M873, M878, M879, and M884	
T104	M514, M519, M520, M851, M854, M858, M861, M865, M868, M871, M874, M877, and M880	
T107	M522, M524, M837, M840, M843, M846, M849, M852, M855, M857, M863, M864, M869, M870, M875, and M883	A51
T124	M629, M630, M631	
T146	M853, M856, M876, M881, M882 M838, M839, and M844	A58
T147	M807, M810, M812, M819, and M821	A44
T149	M800, M813, M827	A42, A46
T154	M806, M808	
T162	M770, M786	
T169	M767, M771, M773	
T173	M775, M781, M793, M796	
T174	M760, M776	
T177	M897, M899, M900, M901, M902, M903, M904, M905, M906, M907, M908, M913, M914, M923, M927, M934	
T178	M925, M936, M937, M941, M943, M951, M955, M957, M963, M964, M965	
T179	M981, M985, M992, M996, M1003, M1004, M1005	

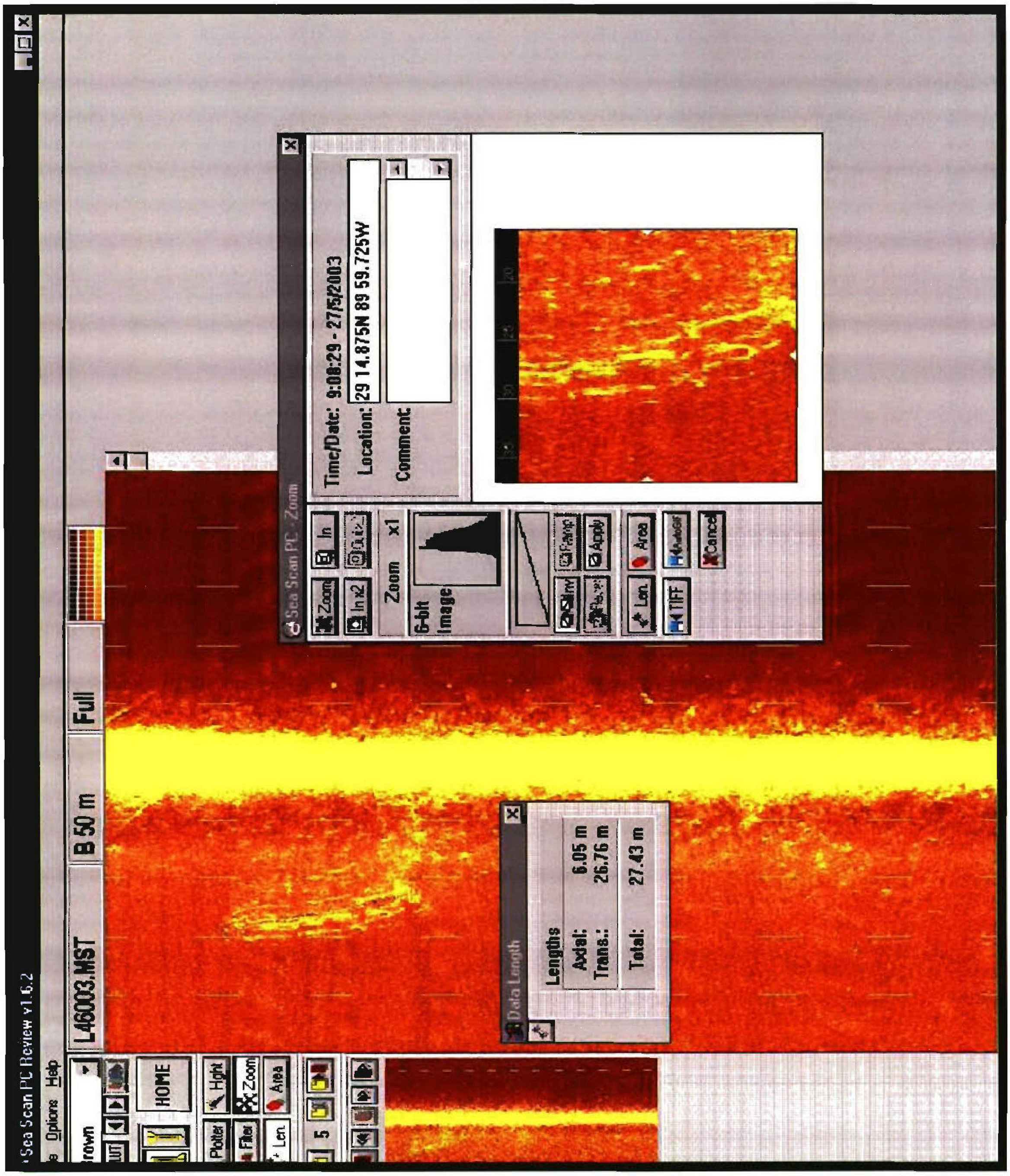

Figure 41. Acoustic image of known, charted wreck in the project's vicinity.

of these anomalies occurred along the shoreline in the vicinity of wharves and other dock works.

Of the 179 target clusters, 60 (T1, T3, T4, T5, T9, T10, T13, T14, T17, T20, T23, T25, T29, T30, T63, T67, T83, T84, T89, T96, T98, T101, T105, T108, T110, T111, T112, T113, T117, T118, T119, T122, T126, T127, T128, T132, T134, T135, T142, T148, T150, T151, T153, T155, T156, T157, T158, T159, T160, T161, T163, T164, T165, T166, T167, T168, T169, T171, T172, and T175) lacked spatial adjacency. These types of anomalies do not represent cultural resources and are more than likely isolated points of ferrous material. Ninety-one (91) of the targets had spatial adjacency but lacked a multicomponent signature generally seen in a cultural resource (T2, T6, T7, T8, T11, T16, T18, T21, T22, T24, T26, T28, T31, T32, T33, T34, T35, T36, T37, T38, T39, T40, T41, T42, T44, T45, T46, T47, T50, T51, T52, T53, T54, T55, T57, T60, T61, T64, T65, T66, T69, T70, T72, T73, T74, T75, T76, T77, T78, T79, T80, T81, T82, T85, T86, T87, T88, T91, T92, T93, T94, T95, T97, T99, T102, T103, T106, T109, T114, T115, T116, T120, T121, T123, T125, T129, T130, T131, T133, T136, T137, T138, T139, T140, T141, T143, T144, T145, T152, T170, and T176). These targets are not included in the discussion, as they do not represent cultural resources. However, it should be noted that some of the targets mentioned above are included in the target descriptions because they were correlated with an acoustic anomaly.

All targets discussed below were assessed for their significance as a cultural resource, applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]).

Target Descriptions

The following section provides discussions of each target that possessed special adjacency and a multi-component signature identified during survey. They are discussed in ascending numerical order.

Target #12

This target consists of five magnetic anomalies (M44, M45, M46, M47, and M48, Figure 42). M44, M46, and M48 all have dipolar signatures; M45 and M47 are multicomponents. M44 has a long duration of 60.1 seconds and a high amplitude of 8,928 gammas. M45 has a high magnetic perturbation of 7,414 gammas and a long duration of 98.1 seconds. M46 has a medium duration of 26 seconds and a high amplitude of 17,962 gammas. M47 has a high gamma value of 13,824 and a long duration of 52.1 seconds. M48 has a long duration of 40 seconds and a high magnetic perturbation of 14,068 gammas.

The high magnetic deflection and magnetic signatures of this target indicate the possibility of a cultural resource. However, the spatial adjacency as seen on five lines indicated a linear feature such as a pipeline, flowline, or debris field (Figure 43). The high magnetic deflection is due to the shallow water and the magnetometer passing close to the sea floor. This target does not represent a significant cultural resource. No further work is recommended.

Target #15

Target #15 is comprised of magnetic anomalies M52, M53, and M54 (Figure 44). M52 had a multicomponent signature, a high gamma value of 16,448, a long duration of 88.1 seconds, and was associated with the acoustic anomaly A11. M53 had a medium duration of 18 seconds, a high gamma value of 12,422 and was dipolar in nature. M54 was a negative monopole with a medium duration of 18 seconds, and a high magnetic perturbation of 8574 gammas. Spatial adjacency, as seen on three lines, and the multicomponent and dipolar signatures of two of the anomalies suggest that this target could represent a cultural resource. However, the magnetic contour map (Figure 45) clearly shows three isolated magnetic perturbations, and the acoustic image (Figure 46) shows a highly concentrated area of debris.

Target #15 is located on Bayou Rigaud adjacent to a large oil field servicing center. Taking into consideration the proximity of this target to the petroleum servicing area, the shallow water associated with the channel, and the contiguous debris band along the whole study area, along with the lack of side-scan imaging that showed no elements associated with a significant cultural resource, it is unlikely that this target represents anything other than debris. No further work is recommended.

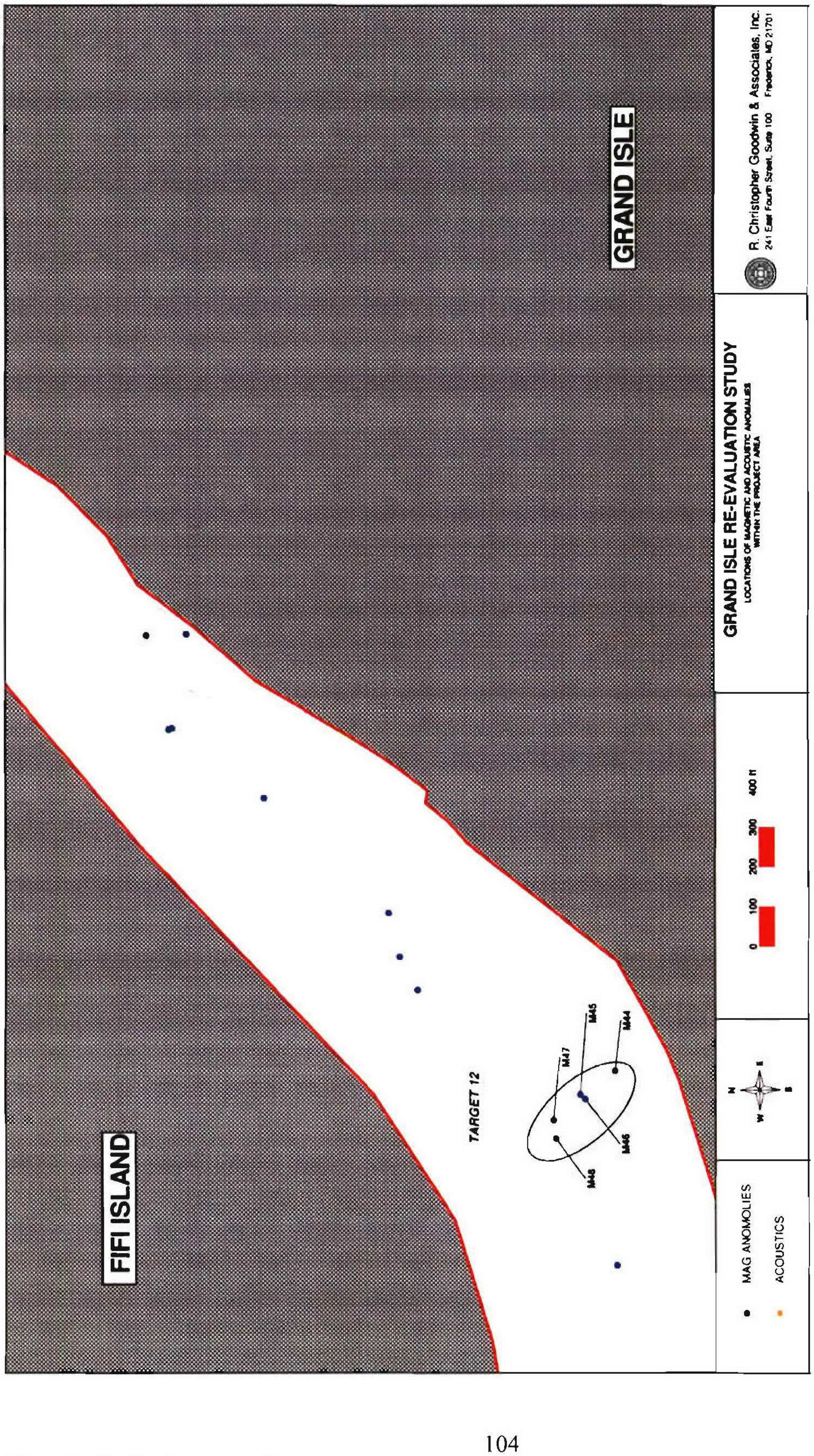

Figure 42. **Map showing location of Target #12.**

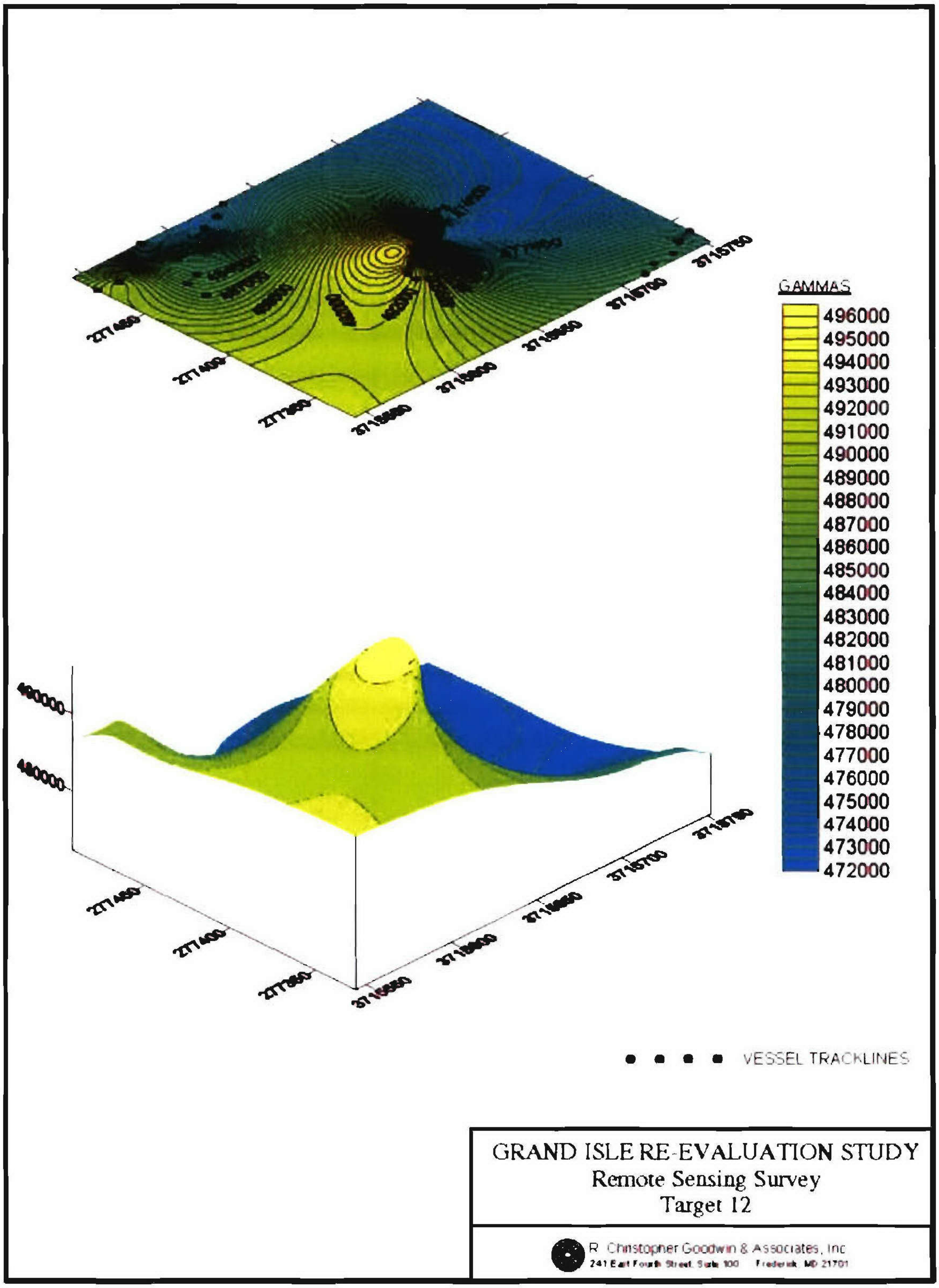

Figure 43. Magnetic contour map of Target #12.

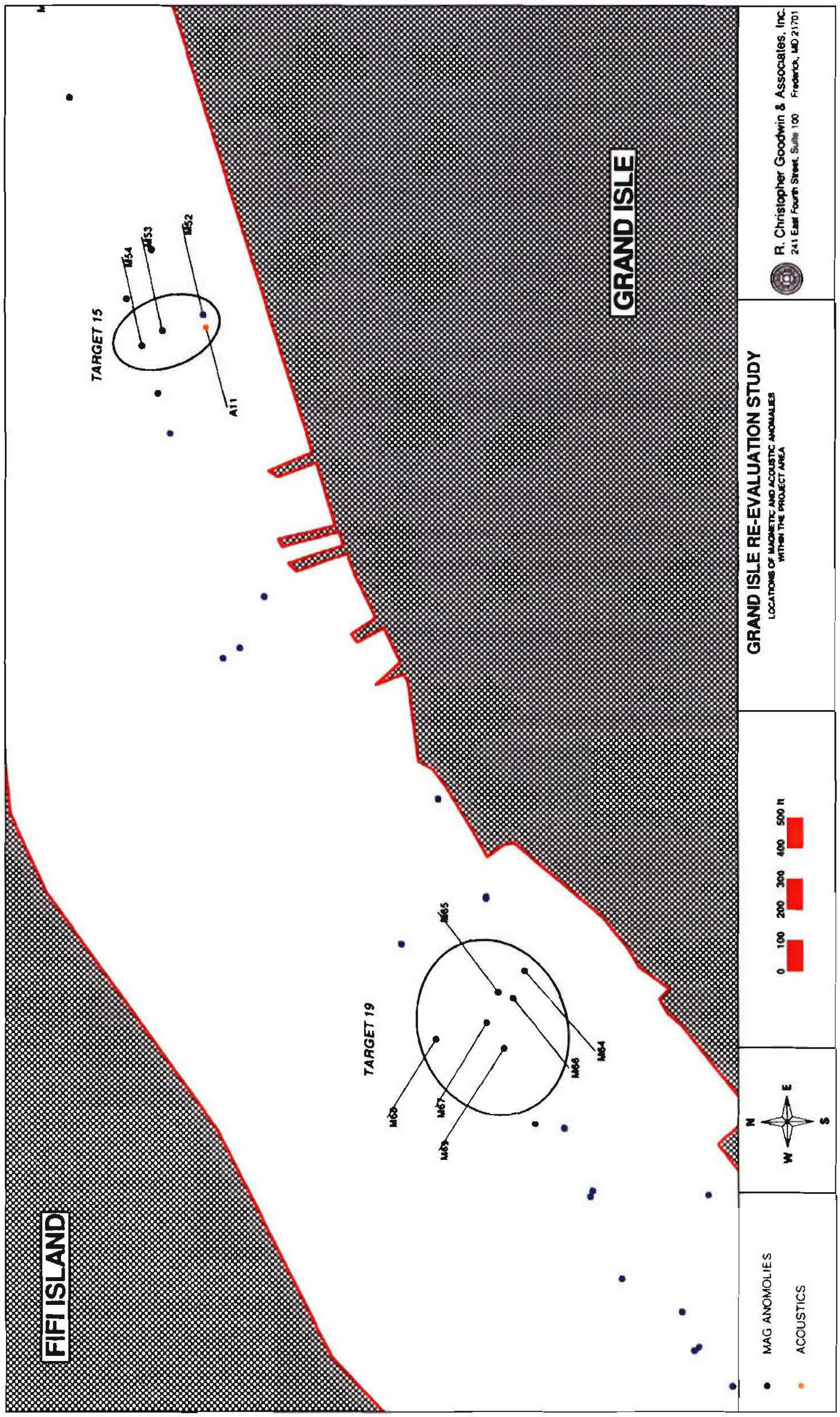

Figure 44. Map showing location of Targets #15 and #19.

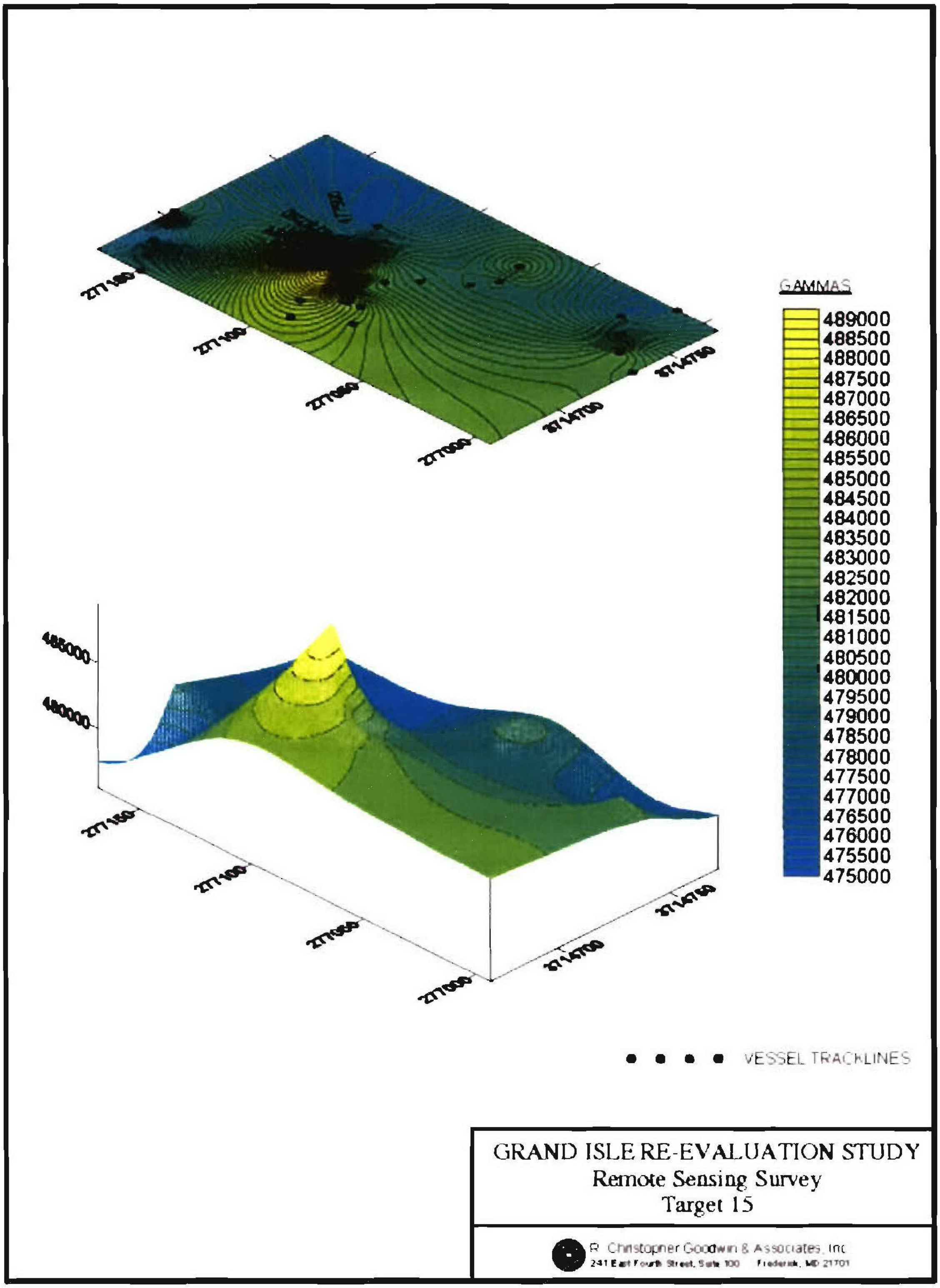

Figure 45. Magnetic contour map of Target #15.

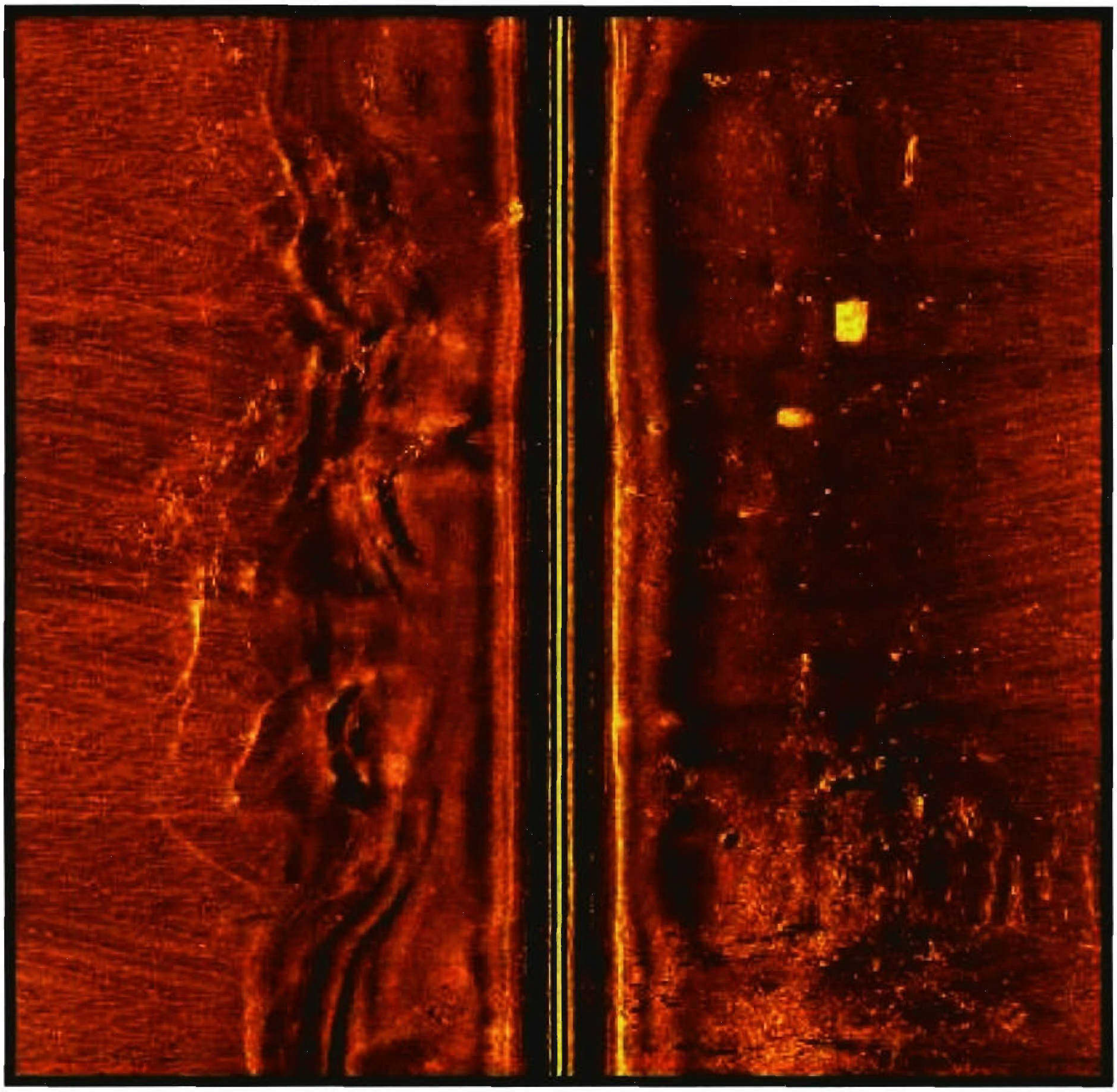

Figure 46. Acoustic image (A11) of Target #15.

Target #19

This target is made up of 6 magnetic anomalies (M64, M65, M66, M67, M68, and M69, Figure 44). M66 and M68 are multicomponents with long durations of 77.6 and 36 seconds and high amplitudes of 10,208 and 1,124 gammas respectively. M65 and M67 are dipolar in nature. M65 has a high gamma value of 968 and a medium duration of 15.5 seconds. M67 has a high magnetic deflection of 8,418 gammas and a medium duration of 28 seconds. M64 is a positive monopole with a high gamma value of 410 and a short duration of 10 seconds while M69 is a positive monopole with a deflection of 238 gammas and a medium duration of 12 seconds. Spatial adjacency is not really seen on more than one line in the magnetic contour map (Figure 47). Therefore, these anomalies are more consistent with isolated point source perturbations resulting from ferrous material, and as such do not constitute significant cultural resources. No further work is recommended for this target.

Target #27

Target #27 comprises magnetic anomalies M88 and M89 (Figure 48). M88 is a 2,712 gamma multicomponent with a long duration of 56.1 seconds. M89 has a dipolar signature with a long duration of 34.1 seconds and a high magnetic deflection of 4,884 gammas. Spatial adjacency is seen on two lines. This target was examined because multicomponent signatures and high gamma anomalies are typical of submerged cultural resources. However, when viewed in the magnetic contour map, Target #27 is more suggestive of ferrous debris and does not represent a significant cultural resource (Figure 49). No further investigation is recommended.

Target #43

Target #43 is made up of four magnetic anomalies (M169, M173, M176, and M177, Figure 50). M169 is a positive monopole with a short duration of 4 seconds and a high gamma value of 214. M173 and M177 both have dipolar signatures. M173 has a high gamma value of 1226 and a medium duration of 12 seconds. M177 has a short duration of 6 seconds and a high magnetic perturbation of 1242 gammas. The last anomaly to comprise Target #43 is M176, which has a multicomponent signature, a medium duration of 18 seconds and a high gamma value of 686. The magnetic contour map shows numerous point sources (Figure 51).

During the fieldwork, the surveyors noted daymarkers near this target. The lack of acoustic correlation and the presence of daymarkers near the target suggest that Target #43 does not represent a significant cultural resource. No further work is recommended.

Target #48

Four anomalies (M211, M212, M213, and M216) comprise Target #48 (Figure 52). With the exception of M212, which has a multicomponent signature, all are dipoles. All of the anomalies have high magnetic perturbations and low to medium durations. M211 has a high amplitude of 352 gammas and a medium duration of 14 seconds; M212 has a high magnetic perturbation of 2254 gammas and a medium duration of 26 seconds; and M213 has a medium duration of 22 seconds and a high amplitude of 2,112 gammas. The last to comprise this group is M216, which has a short duration of 10 seconds and a high gamma value of 3194. The magnetic contour map of this target shows numerous point sources (Figure 53).

While this target has many traits usually associated with that of a shipwreck, the shallow water, the lack of an acoustic correlation, and the amount of debris jettisoned or deposited from storms or from vessel traffic all suggest that this target most likely represents a small field of debris. There is no clear indication that this target is associated with a shipwreck. Because such a debris field does not meet the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]), no further work is recommended.

Target #49

This target is made up of five anomalies (M198, M199, M204, M205, and M208) (Figure 52), all of which exhibit high amplitudes. M198 has a multicomponent signature, a high gamma value of 2090, and a long duration of 36 seconds. M199 is dipolar in nature with a short duration of 8 seconds and a high amplitude of 2908 gammas. M204 has a short duration of 10 seconds, a high magnetic perturbation of 272 gammas and has a dipolar signature. M205 is a negative monopole with a very high gamma value of

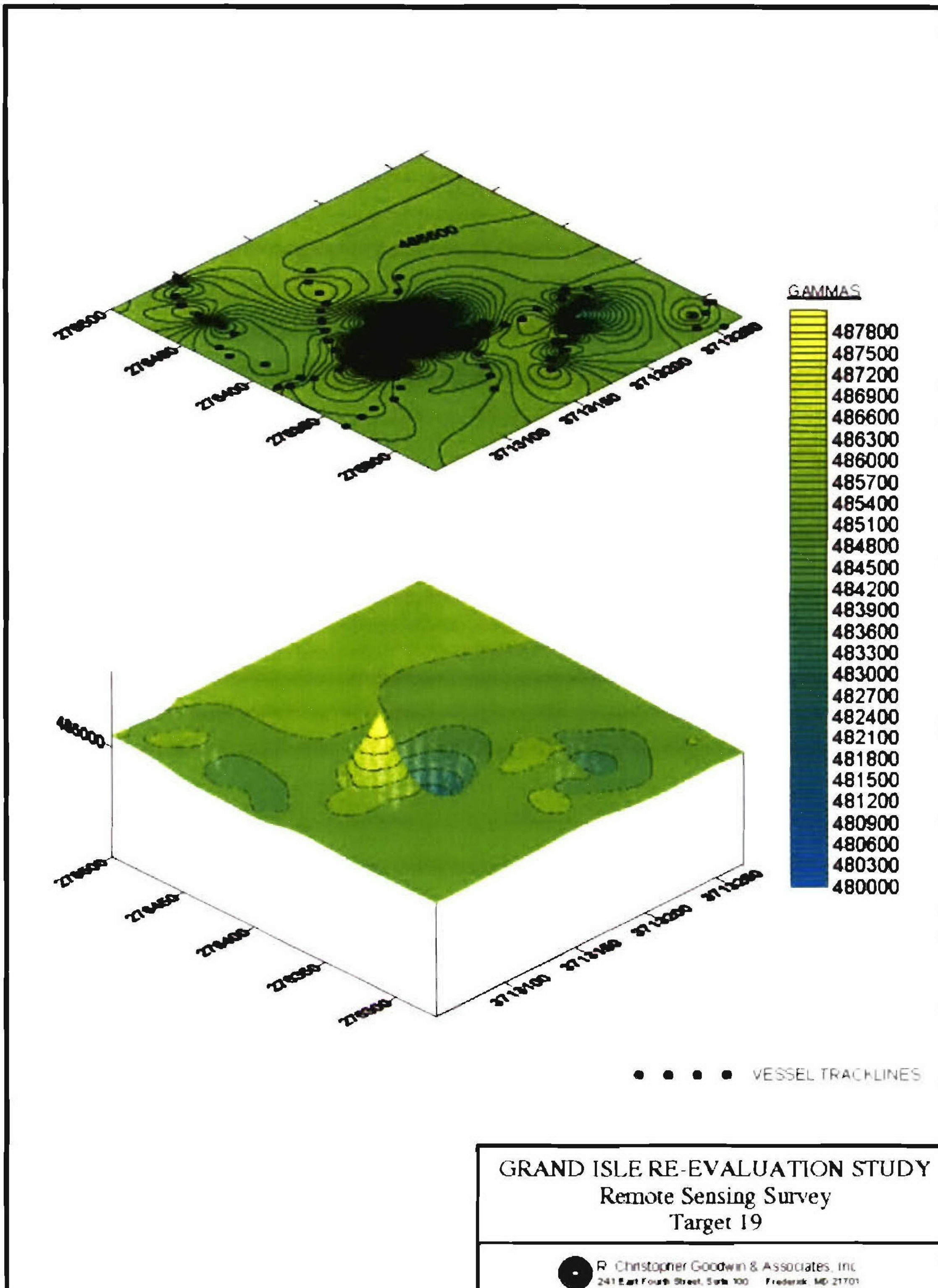

Figure 47. Magnetic contour map of Target #19

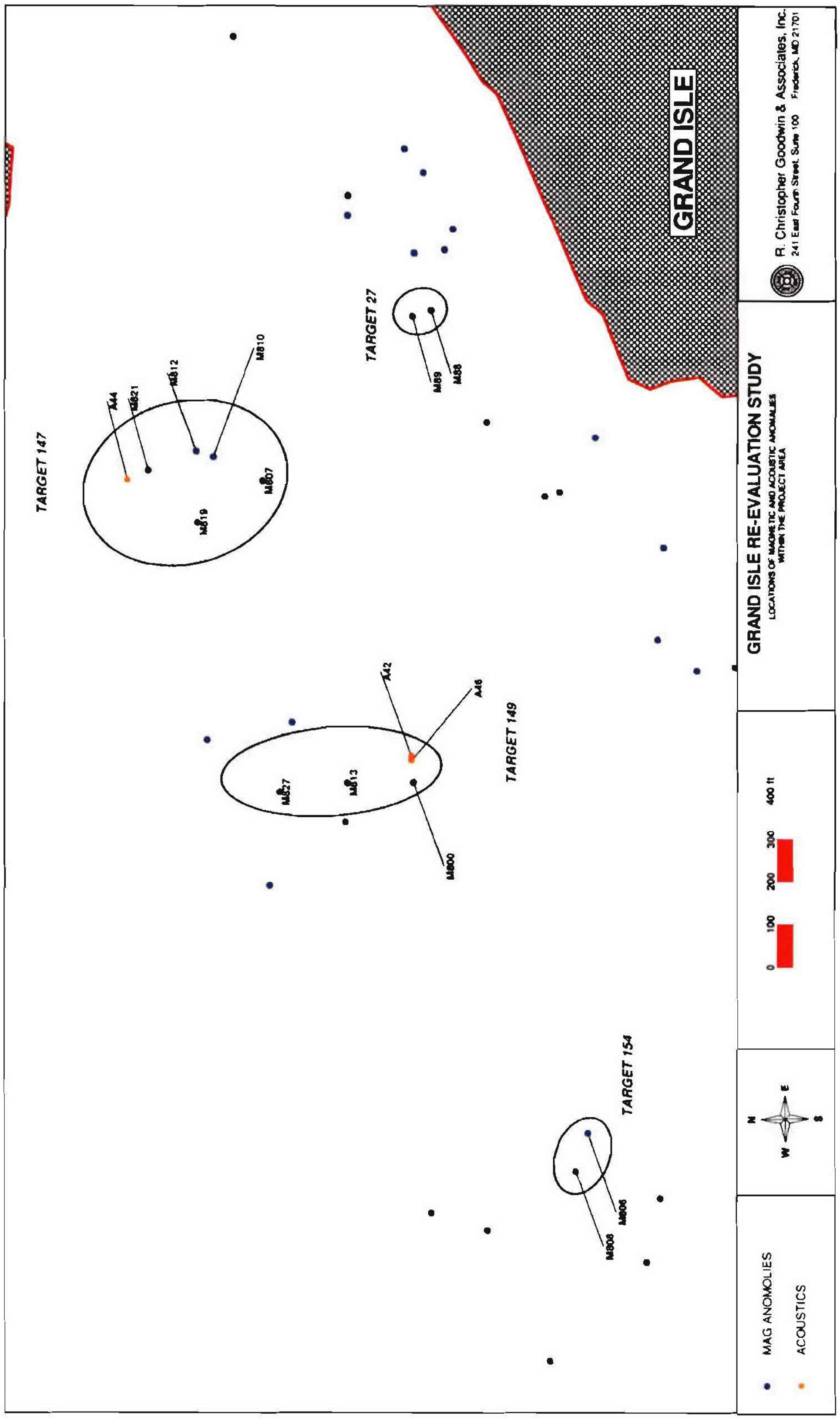

Figure 48. Map showing location of Targets #27, #147, #149, and #154.

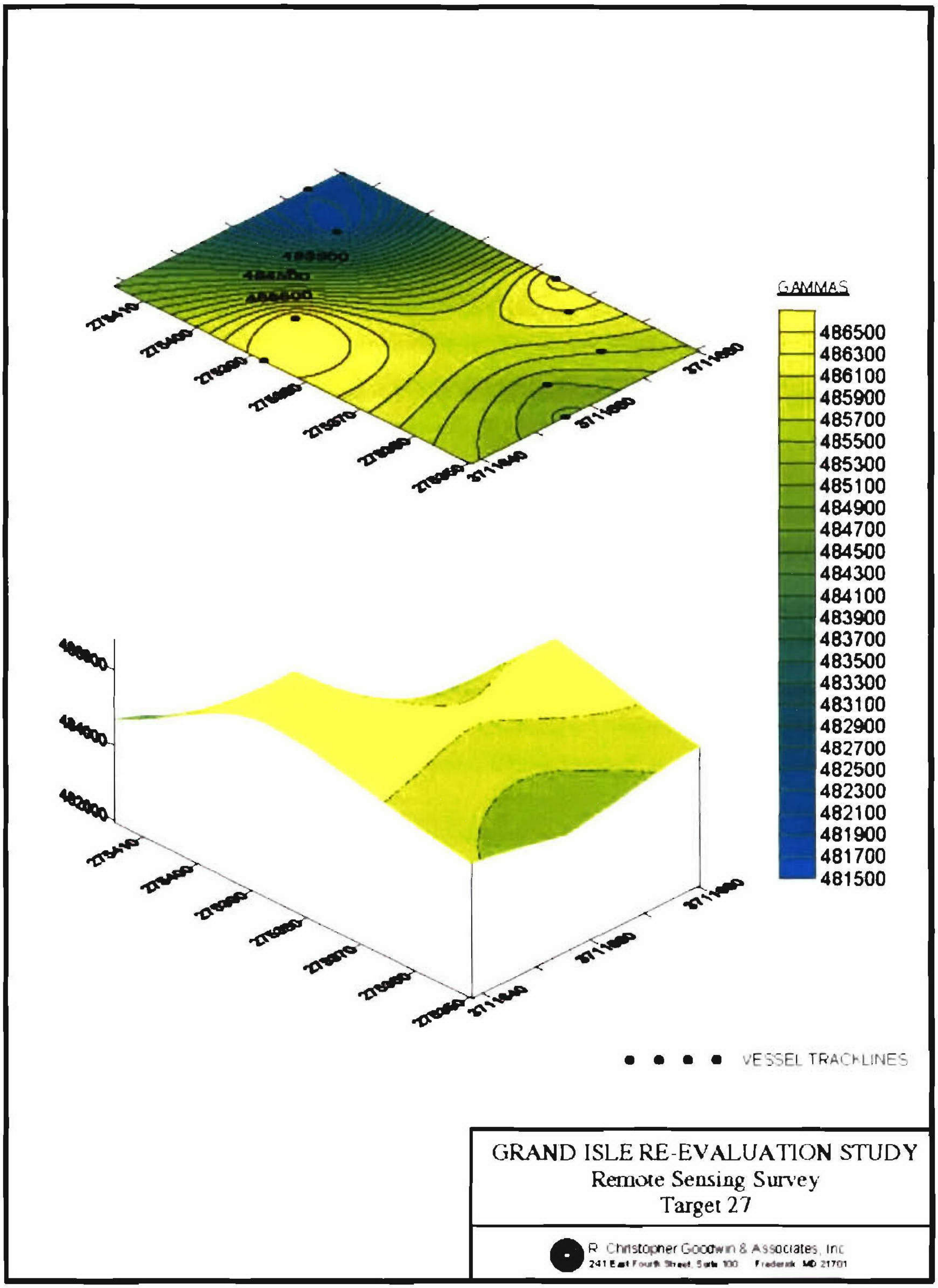

Figure 49. **Magnetic contour map of Target #27.**

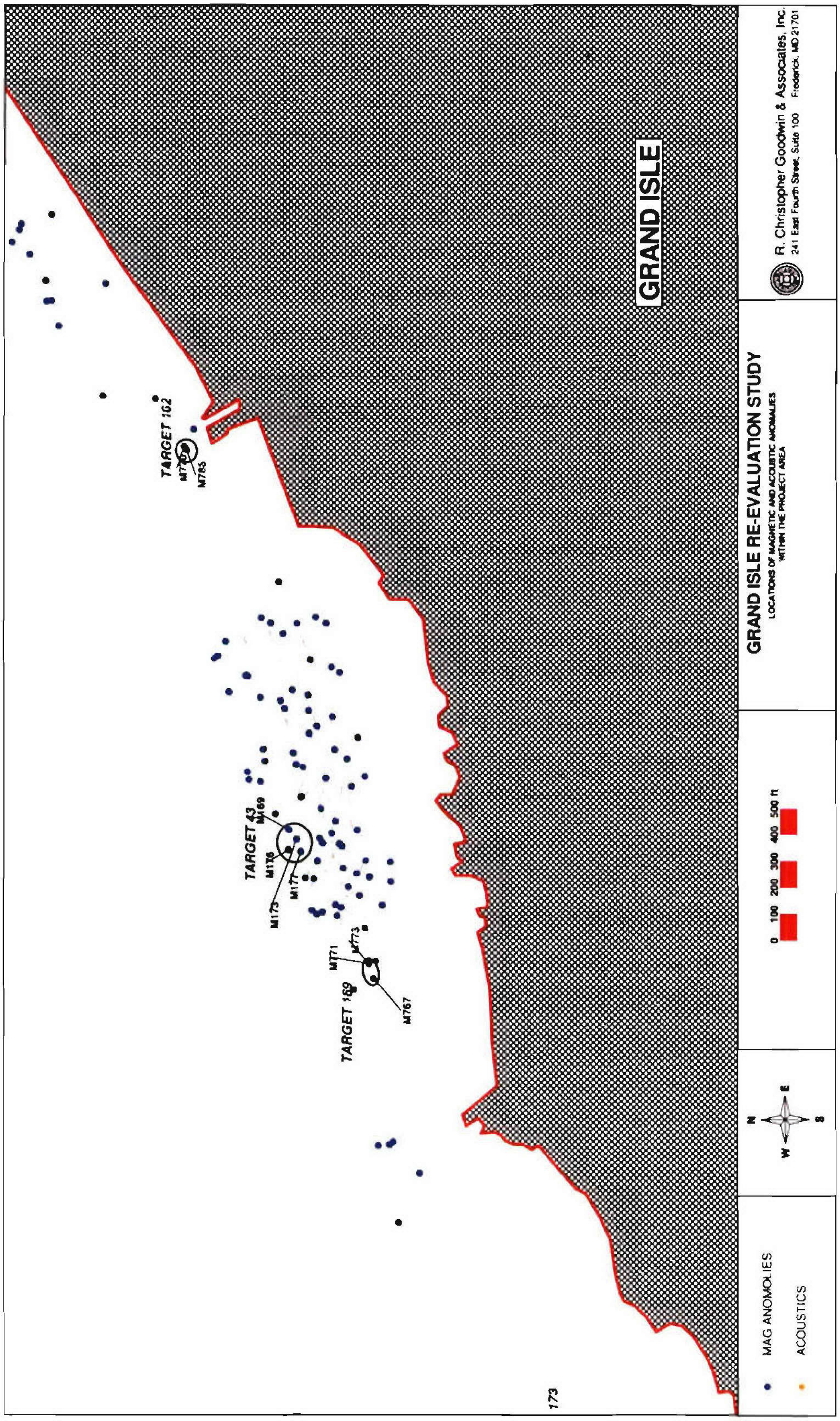

Figure 50. Map showing location of Targets #43, #162, and #169.

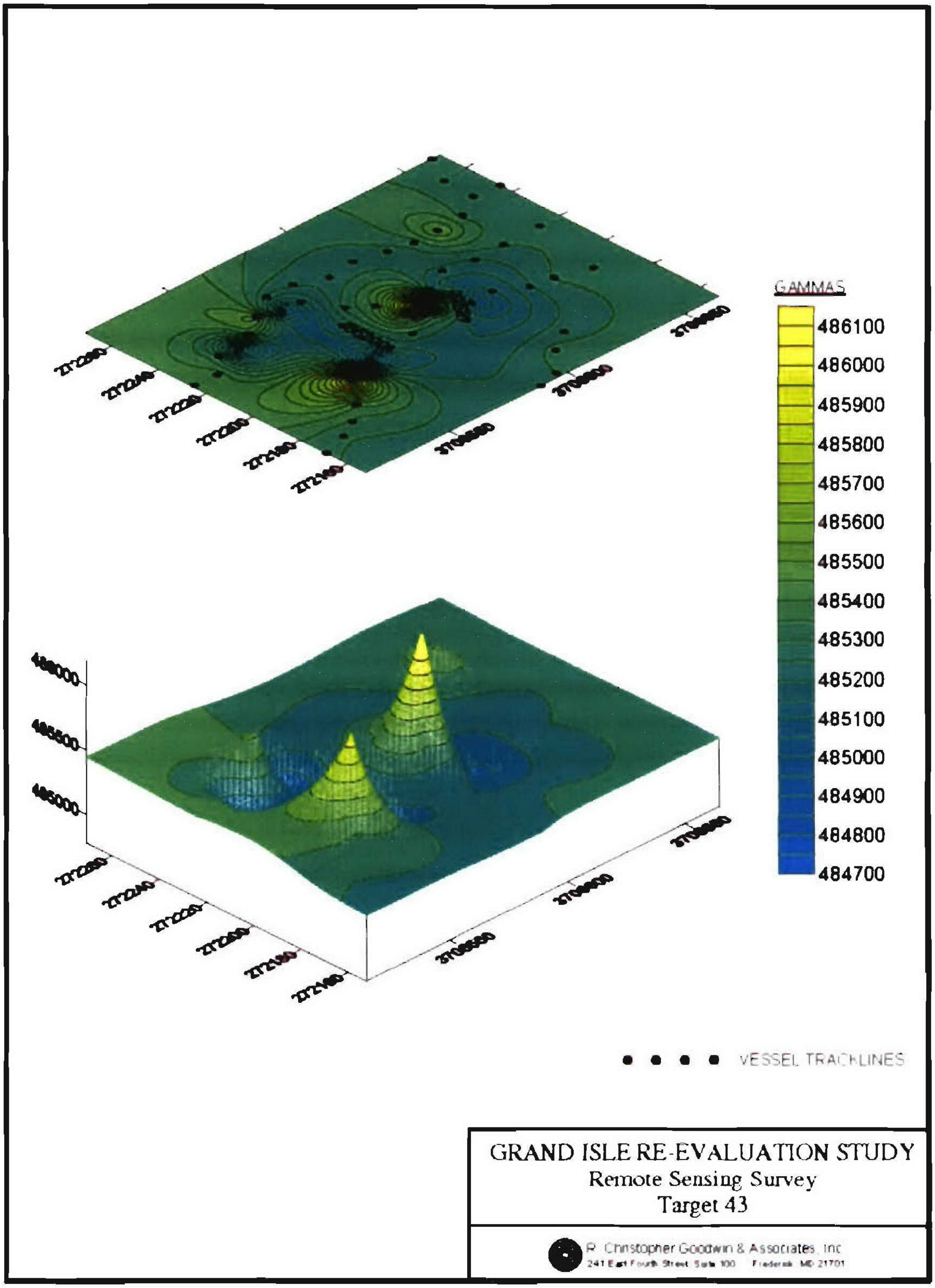

Figure 51. **Magnetic contour map of Target #43.**

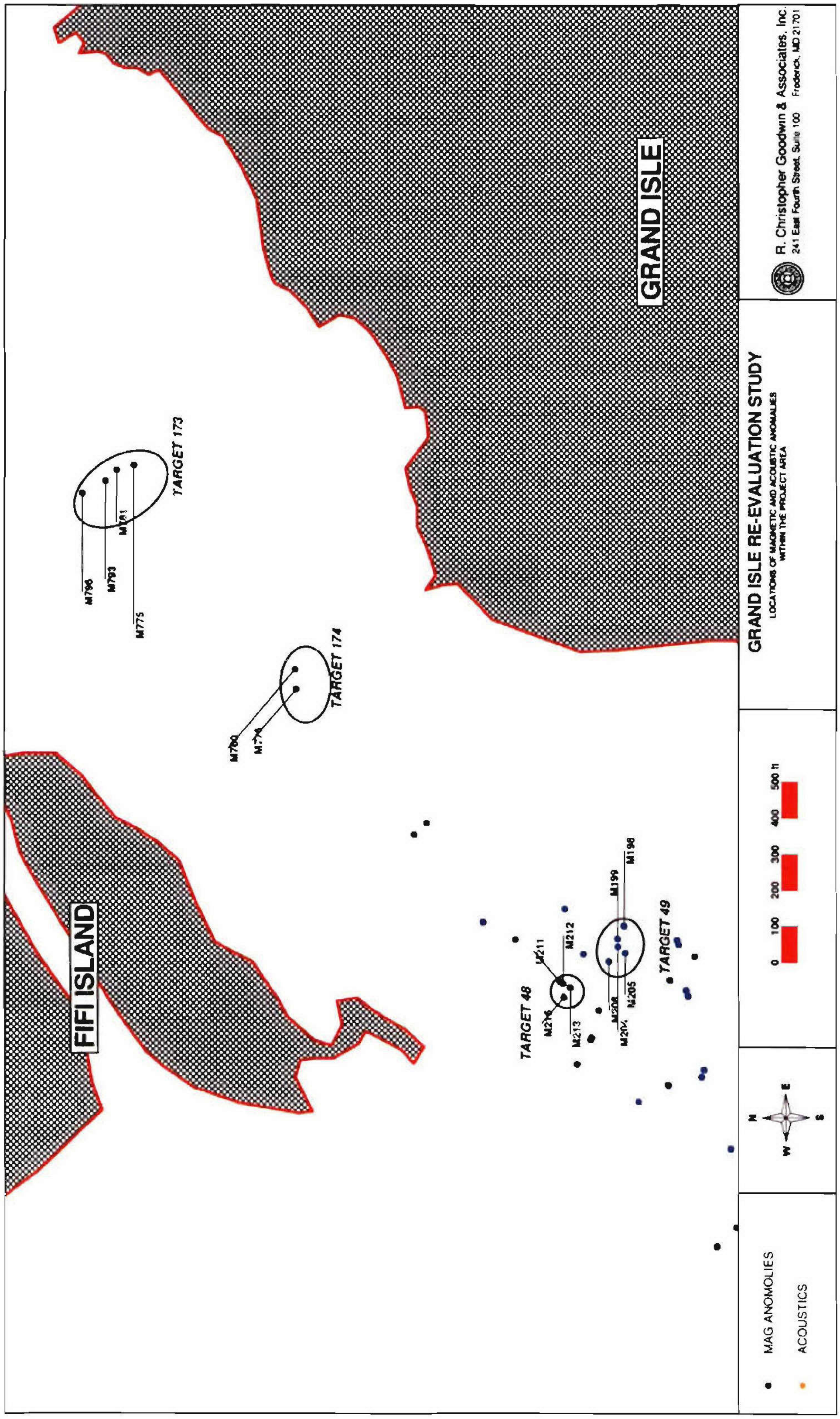

Figure 52. Map showing location of Targets #48, #49, #173, and #174.

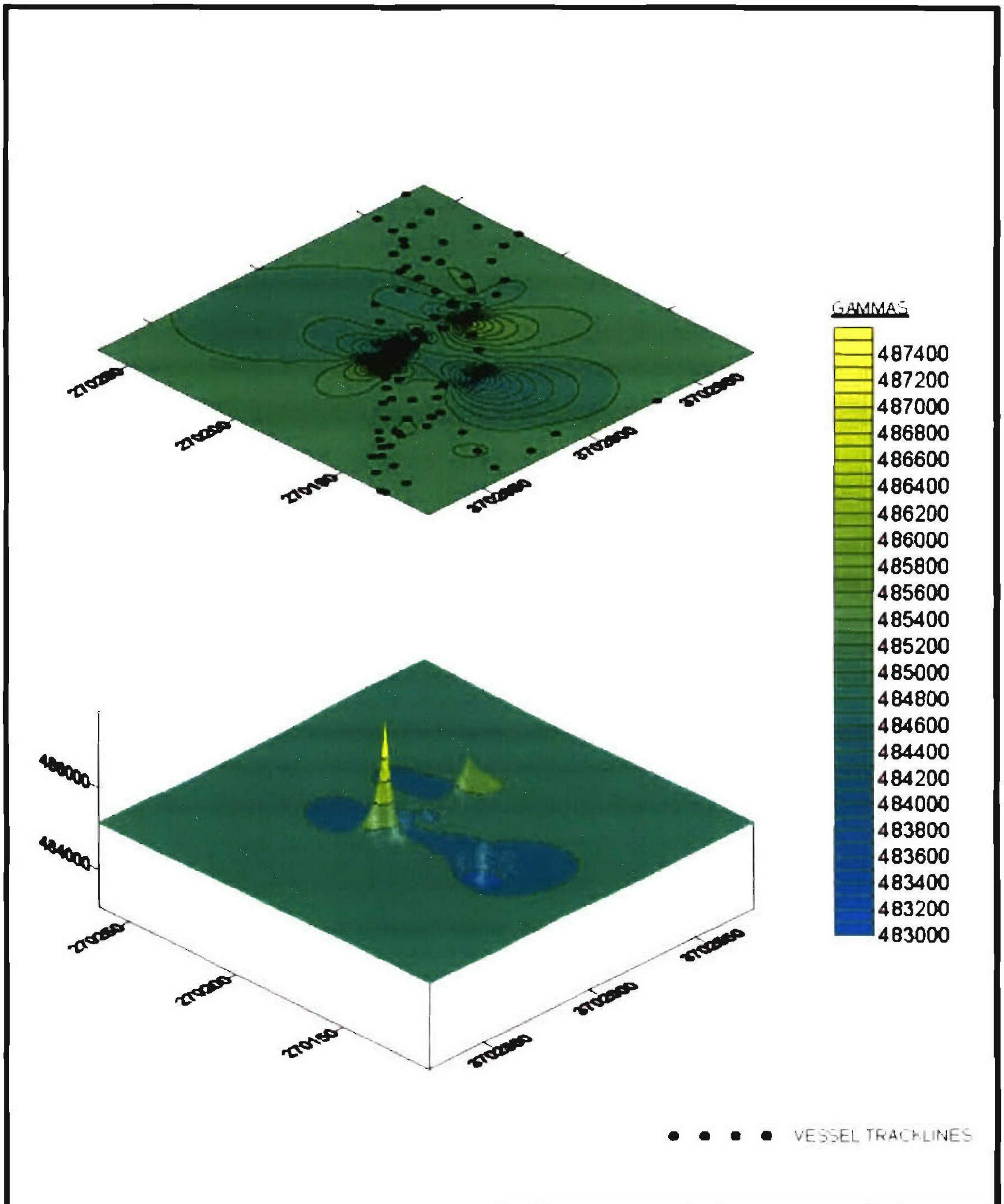

Figure 53. Magnetic contour map of Target #48.

418,174 gammas and a very short duration of 4 seconds. Finally, M208 has a short duration of 10 seconds, a high gamma value of 328, and is a negative monopole. The magnetic contour map shows a non-symmetrical point source (Figure 54).

The high gamma values and relatively short durations can be related directly to the shallowness of the water. The close proximity of the magnetometer to the sea floor can produce strong magnetic perturbations and very short durations. While in the field, the surveyors noted a breakwater and an assortment of debris lining the back near this target. Target #49 is an example of an isolated man-made object found in the project area and is not a significant cultural resource. No further investigation is recommended for Target #49.

Target #56

This target consists of 11 magnetic anomalies (M239, M240, M241, M242, M243, M244, M245, M246, M247, M250, and M251) (Figure 55) and one acoustic anomaly (A14). The magnetic perturbations range from 104 to 417,476 gammas and have durations from 4 to 36 seconds. M240, M242, M244, M245, and M247 are dipolar in nature. M239, M241, M243, M246, M250, and M251 have negative monopolar signatures. M239, M243, and M244 have amplitudes between 400,388 and 417,476 gammas. The rest of the magnetic anomalies have gamma values of less than 6,190.

This target was examined because it had spatial adjacency on nine lines, high magnetic perturbations, and an associated acoustic anomaly. When viewed on the magnetic contour map (Figure 56), a linear feature can be seen across numerous track lines. The side scan image (Figure 57) shows drag scars typical of a high traffic, shallow-water area. This feature likely represents pipeline segments buried in the sediment and is not indicative of a significant cultural resource. No further work is recommended at this location.

Target #58

Three magnetic anomalies make up Target #58 (M258, M260, and M261, Figure 55). M258 is a multicomponent with a medium duration of 16 seconds and a high amplitude of 6386 gammas. M260 has a medium duration of 22 seconds, a high magnetic perturbation of 8924 gammas, and is dipolar in nature. M261 is a negative monopole with a duration of 12 seconds and a gamma value of 734. The target viewed in Surfer shows a point source and a linear perturbation (Figure 58). The magnetic contour plot shows two distinct areas of magnetic deflection.

Anomalies M260 and M261 appear to be the same anomaly that appeared on two track lines because the survey lines intersected and crossed over the object. The areas of magnetic disturbance do not appear to be correlated with one another and are more than likely two areas of debris not associated with a significant cultural resource. No further investigation of this target is warranted.

Target #59

M266 and M267 comprise this target, which is located in Block One (Figure 55). M266 is a dipole with a medium duration of 18 seconds and a high amplitude of 8360 gammas. M267 has a long duration of 42 seconds, a high magnetic perturbation of 928 gammas, and has a multicomponent signature.

Target #59 in the magnetic contour plot shows an isolated point source that does not support the existence of a submerged cultural resource (Figure 59). Most likely, this target represents isolated debris jettisoned from a vessel rather than an intact, significant cultural resource. No further investigation of this target is warranted.

Target #62

This target is composed of 8 anomalies (M277, M278, M279, M280, M282, M283, M284, and M287) (Figure 55). Three of the anomalies have dipolar signatures (M278, M280, and M283), four have monopolar signatures (M277, M279, M284, and M287), and one is multicomponent (M282). Six anomalies (M277, M278, M279, M280, M281, and M284) have short durations of less than 10 seconds. M283 and M287 have medium durations of 24 and 22 seconds respectively. M279, M280, M282, M283, and M287 have high gamma values ranging from 276 gammas (M283) to 776 gammas (M287). M277 has a high perturbation of 1,748; M278 has a high perturbation of 1,320 gammas; and M284 has a high perturbation of 9,000.

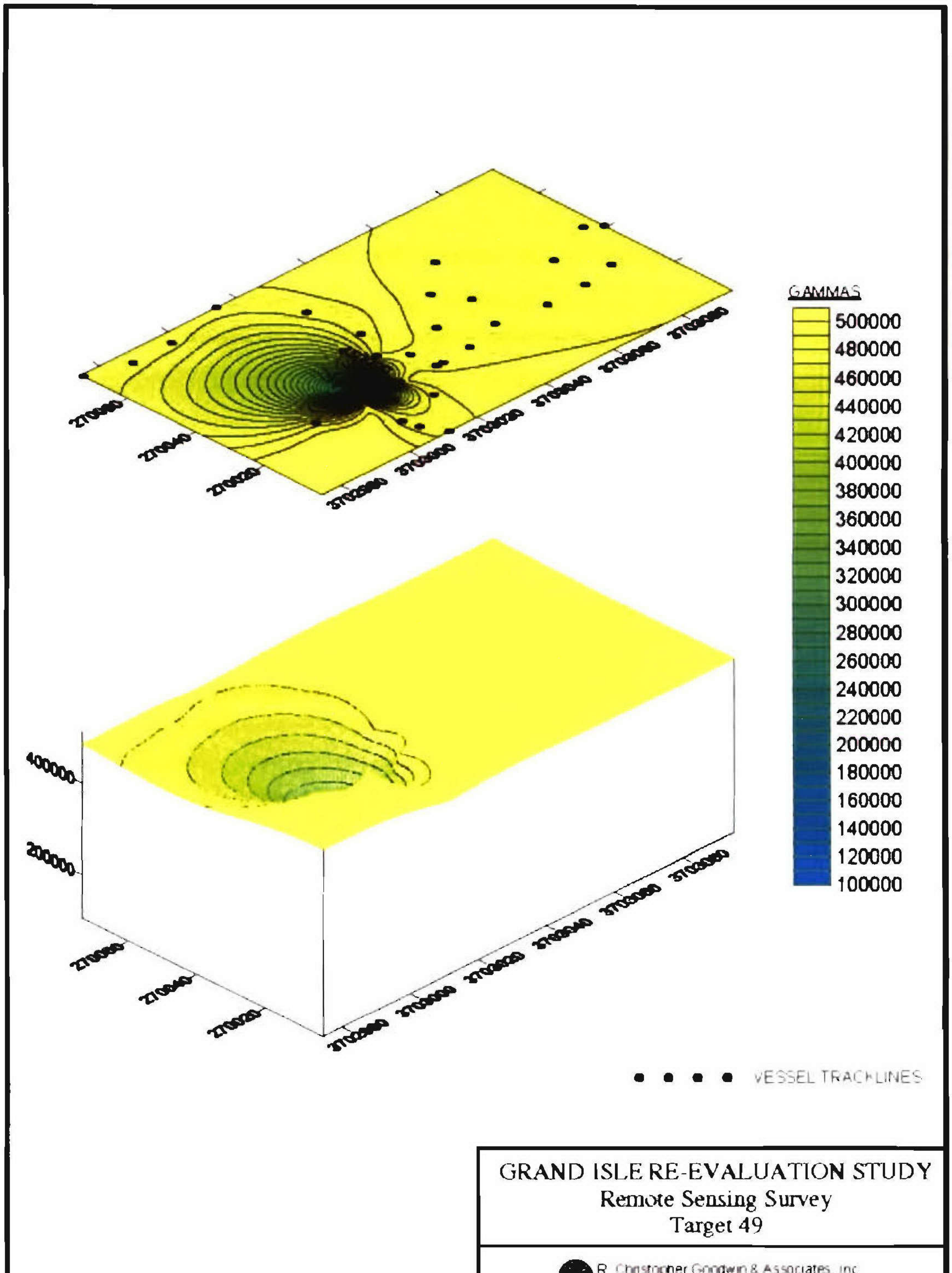

Figure 54. **Magnetic contour map of Target #49.**

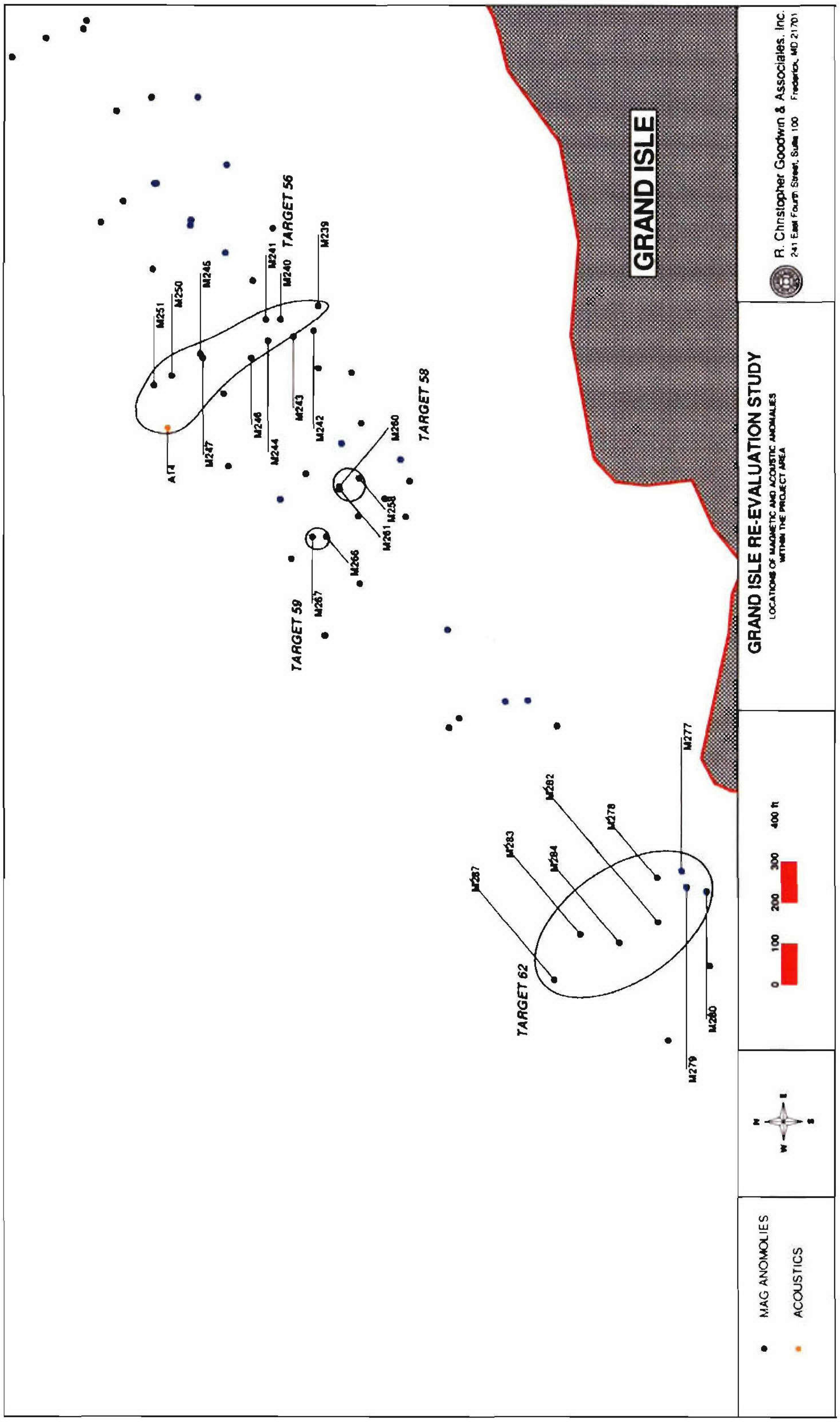

Figure 55. Map showing location of Targets #56, #58, #59, and #62.

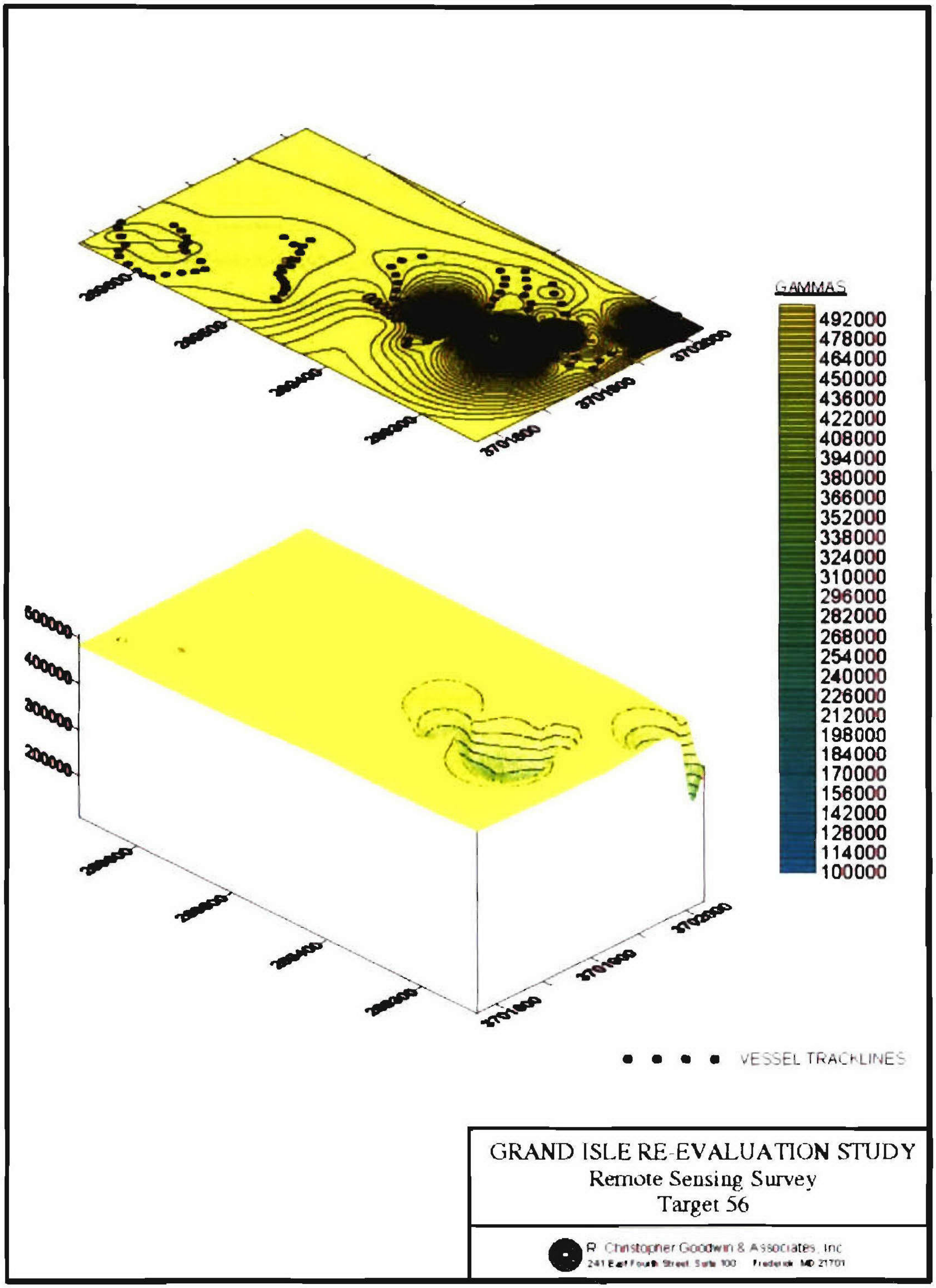

Figure 56. Magnetic contour map of Target #56.

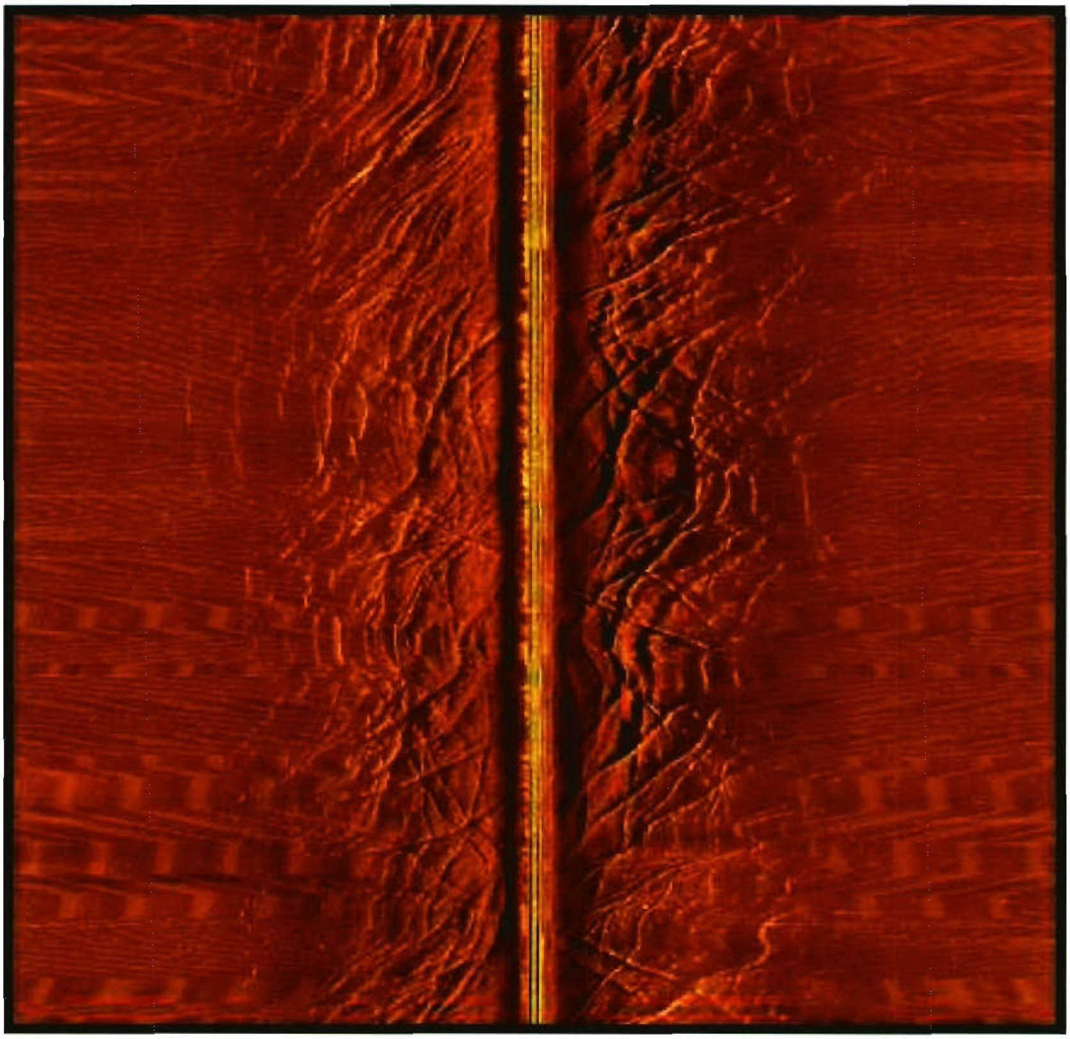

Figure 57. Acoustic image (A14) of Target #56.

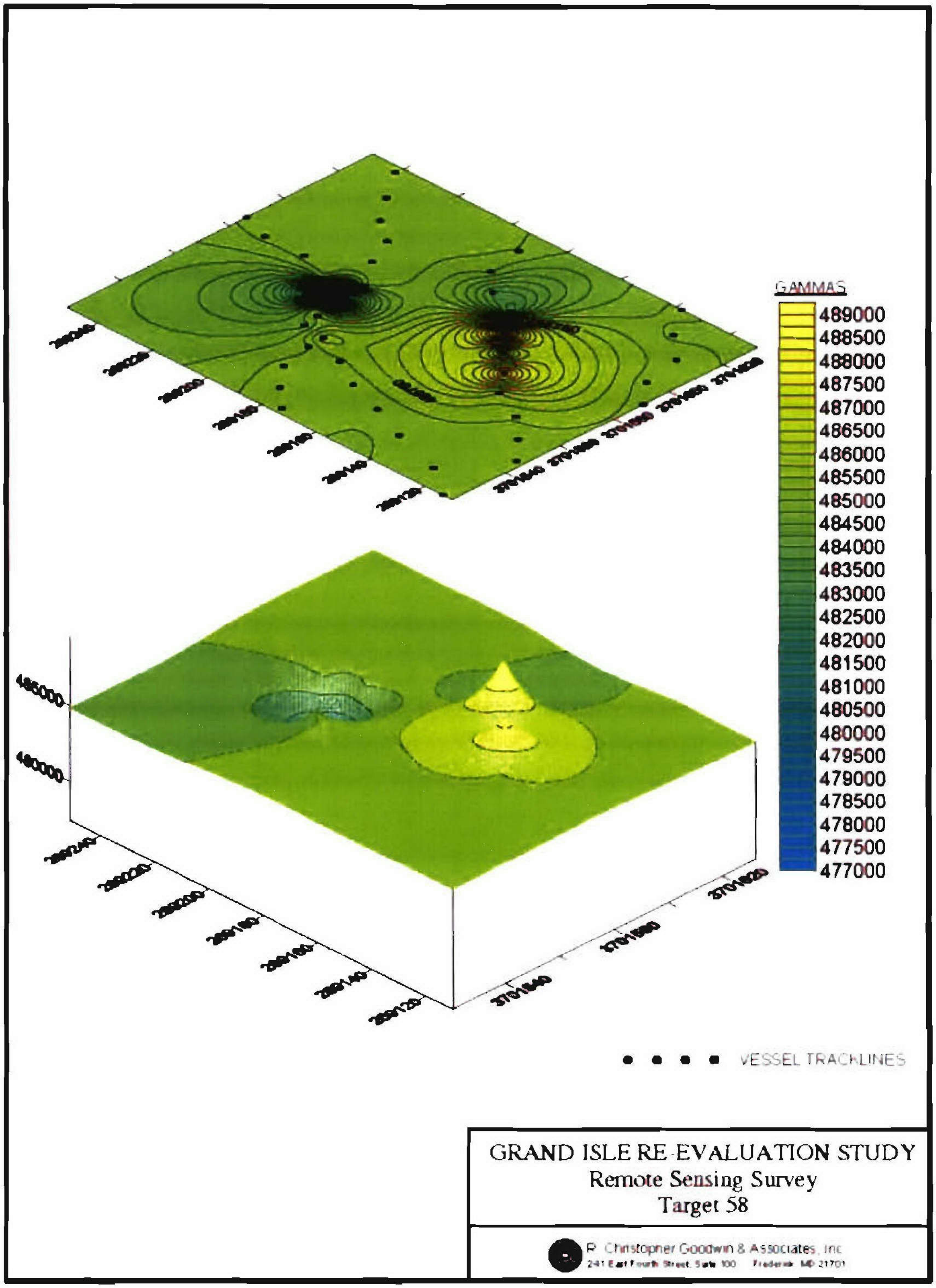

Figure 58. Magnetic contour map of Target #58.

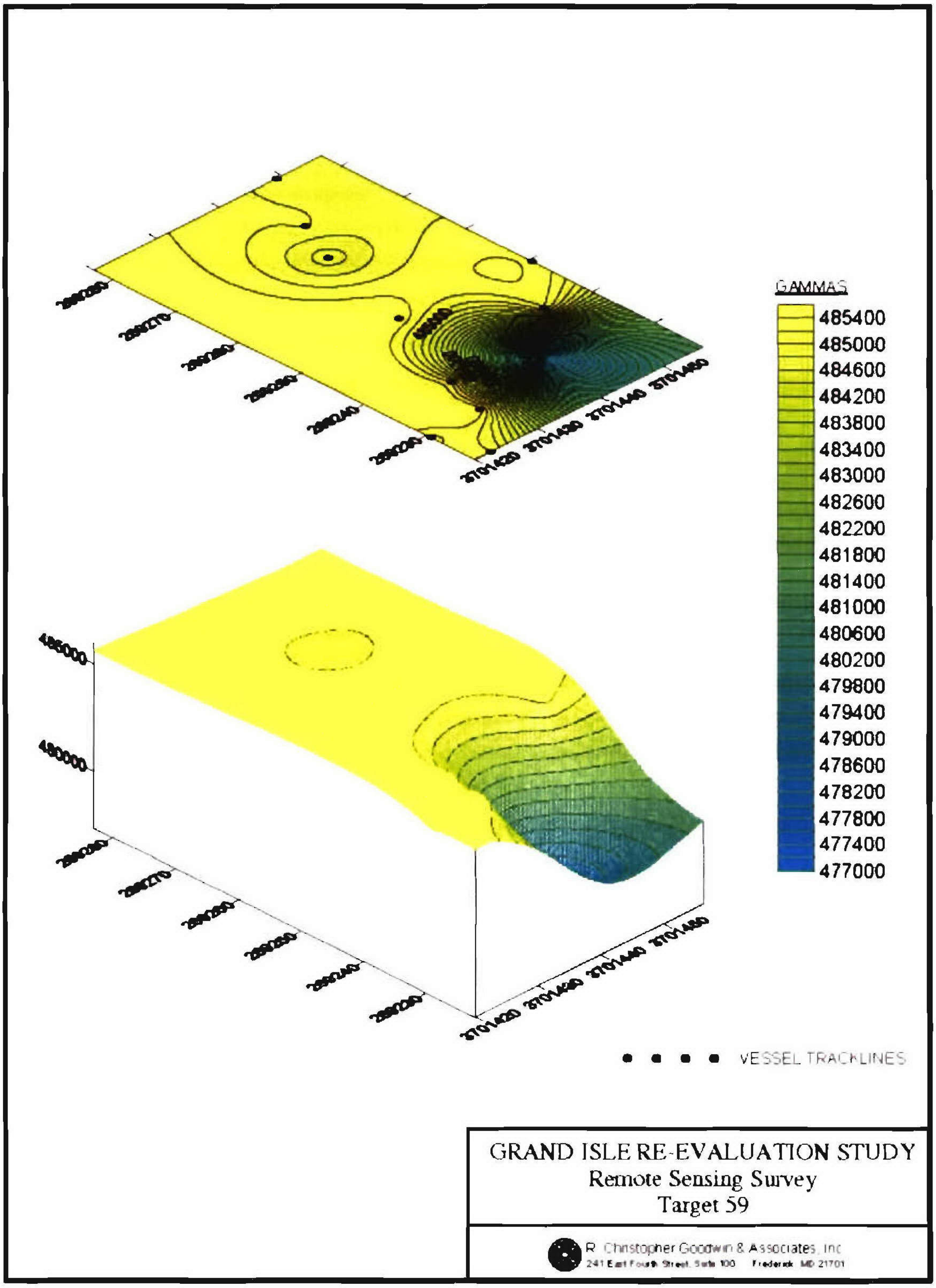

Figure 59. **Magnetic contour map of Target #59.**

Although this feature is seen on six lines, the magnetic contour map shows numerous point source magnetic deflections (Figure 60). This type of feature is not characteristic of a significant cultural resource, but rather is indicative of a field of ferrous debris, most likely resulting from material deposited from passing vessels. No further work is recommended.

<u>Target #63</u>

Target #63 is an isolated magnetic anomaly (M281) with an acoustic correlation (A18) (Figure 61). Although targets that consist of only one magnetic anomaly are not considered to represent a cultural resource, all acoustic and magnetic correlations are examined to ensure that a small cultural resource, not seen on adjacent lines, is not present. M281 is a negative monopole with a short duration of 8 seconds and a high amplitude of 1530 gammas. The image seen in the magnetic contour map shows an isolated point source (Figure 62). The side-scan image shows an area of high resistivity (Figure 63).

This target appears to represent a portion of a dock or sea wall. It does not represent a significant cultural resource and as such, requires no further investigation.

<u>Target #68</u>

Target #68 consists of four magnetic anomalies (M302, M305, M306, and M308) (Figure 61). All have multicomponent signatures with the exception of M302, which is a positive monopole. M302 has a high magnetic deflection of 5,978 gammas and a short duration of 8 seconds. M305 has an amplitude of 658 gammas and a long duration of 46 seconds. Both M306 and M308 have medium durations of 24 and 20 seconds and high amplitudes of 7,746 and 5,790 gammas respectively.

The high magnetic deflections and relatively short durations are consistent with readings taken in shallow water. The magnetic contour map shows three areas of deflection, which more than likely represent isolated ferrous material (Figure 64). This target does not have the characteristics of a significant cultural resource. No further work is recommended.

<u>Target #71</u>

Target #71 is comprised of two magnetic anomalies (M318 and M322) (Figure 61). M318 has a high magnetic perturbation of 366 gammas, a medium duration of 26 seconds, and is dipolar in nature. M322 is a multicomponent with a long duration of 38 seconds and a high magnetic deflection of 423,308 gammas. The magnetic contour map shows an area of gradual magnetic deflection, which means that the magnetometer probably did not pass very close to the object (Figure 65).

Target #71 lacks the characteristics and significance of a cultural resource in that the contour map does not show a complex magnetic perturbation. This target requires no further investigation.

<u>Target #83</u>

This target is comprised of one magnetic anomaly (M378) and one acoustic anomaly (A15) (Figure 66). M378 has a magnetic perturbation of 1,212 gammas, a medium duration of 20 seconds, and is dipolar in nature. The target, when viewed in the magnetic contour map, shows an isolated point source (Figure 67), and the side-scan images show two linear objects lying parallel to one another (Figure 68). The longer one is approximately 15 feet in length. There appears to be scouring on the port side of the object and no shadows are apparent, making the object flush with the seabed.

The acoustic image does not support the presence of a significant submerged cultural resource. Therefore this target warrants no further investigation.

<u>Target #84</u>

Target #84 is made up of one magnetic anomaly (M376) and one acoustic anomaly (A19) (Figure 66). M376 is a negative monopole with a very short duration of 6 seconds and a high amplitude of 423,916 gammas. The magnetic data when viewed in the magnetic contour map shows an elongated, isolated point source (Figure 69). Side scan analysis depicts an object approximately 32 feet in length by 9 feet wide (Figure 70). This object does not project a shadow, making it flush with the sea floor.

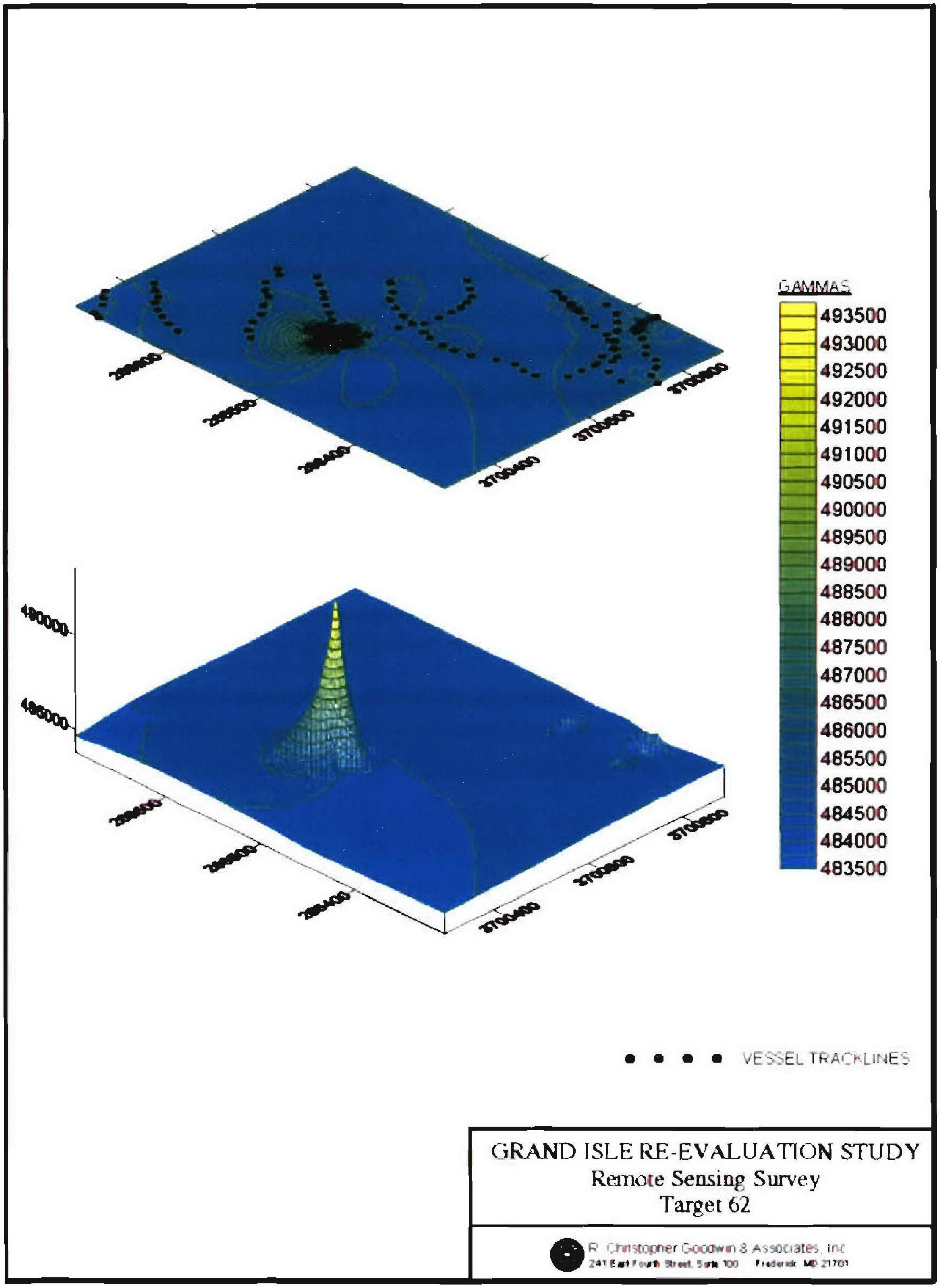

Figure 60. Magnetic contour map of Target #62.

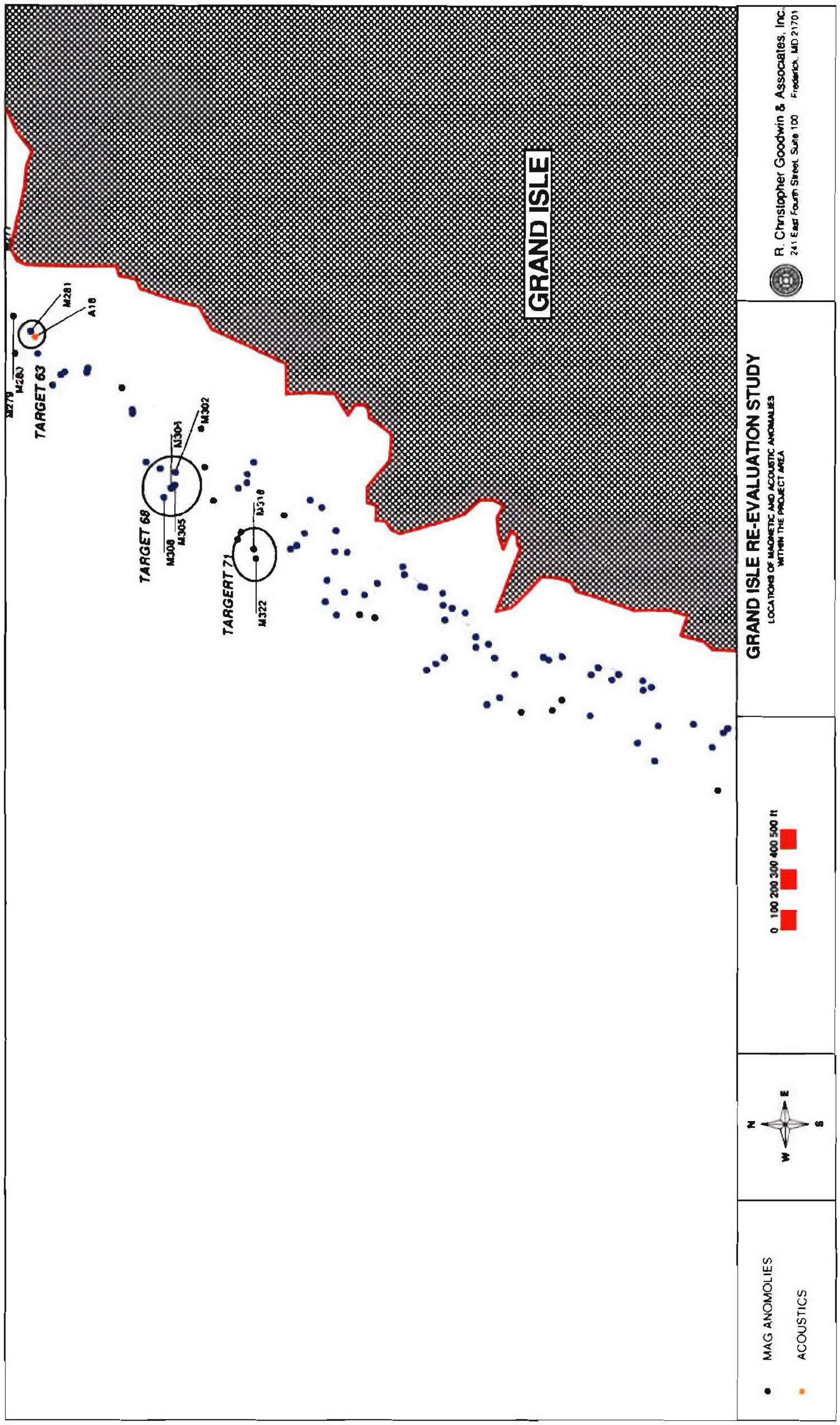

Figure 61. Map showing location of Targets #63, #68, and #71.

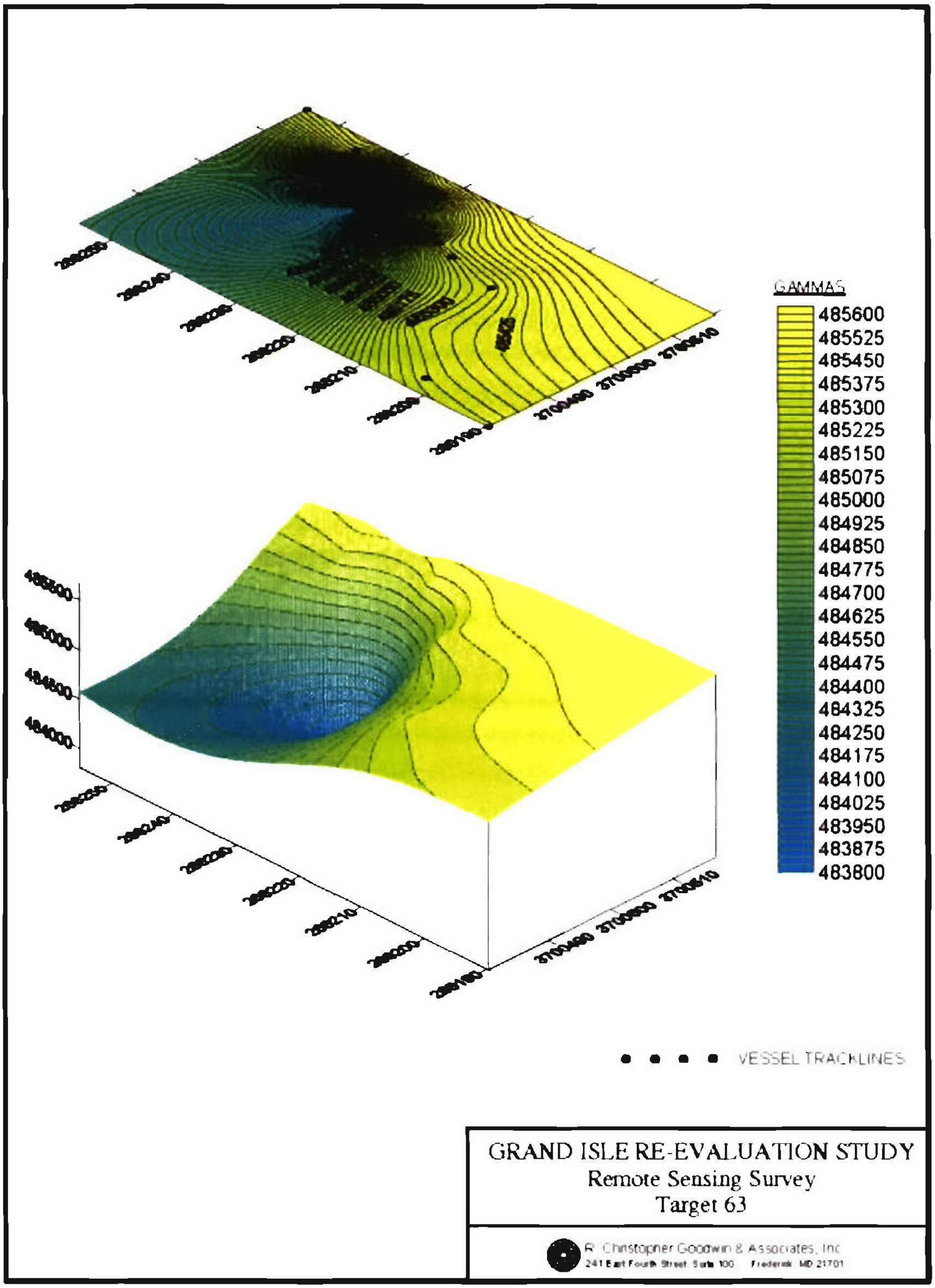

Figure 62. Magnetic contour map of Target #63.

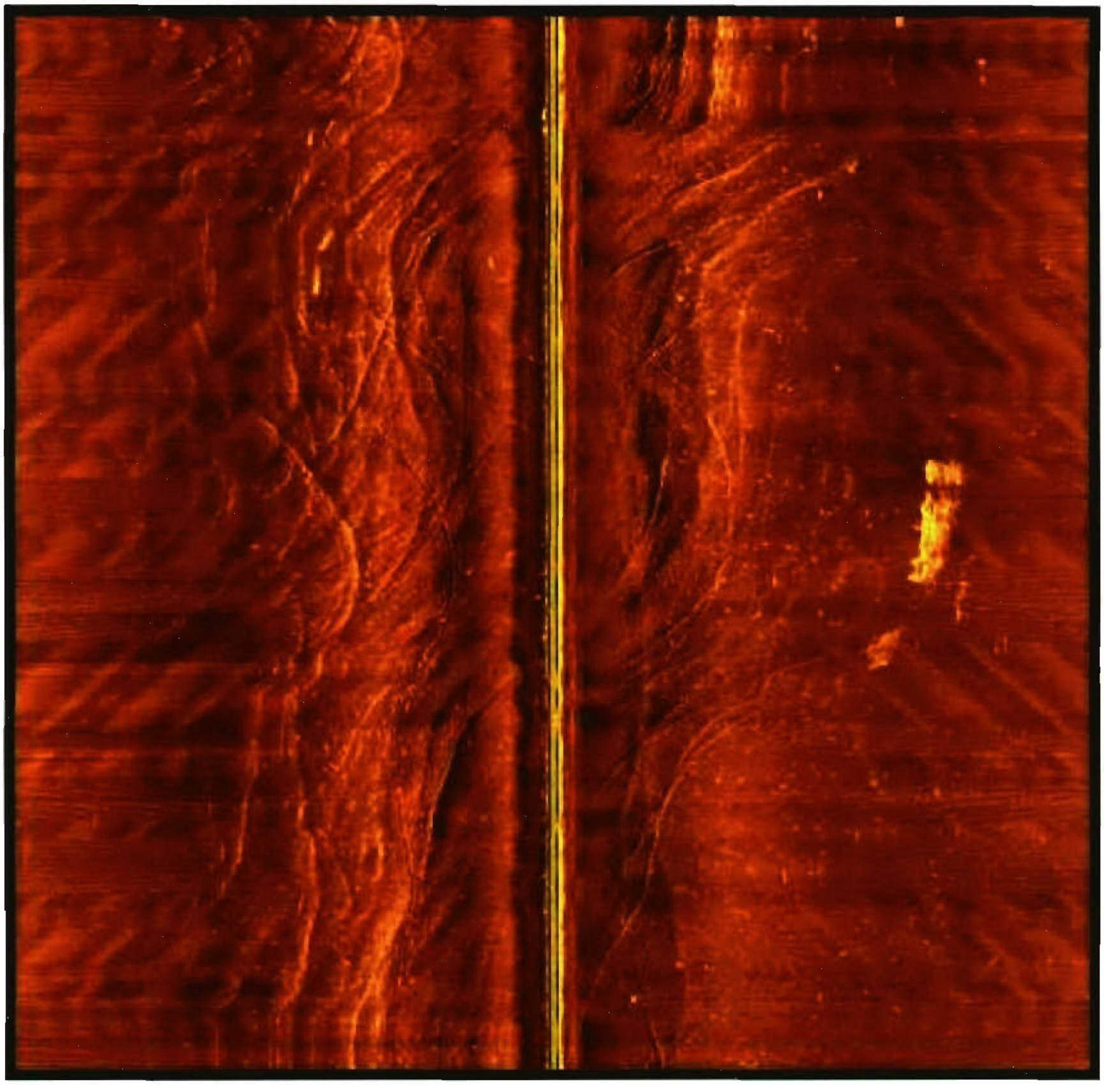

Figure 63. Acoustic image (A18) of Target #63.

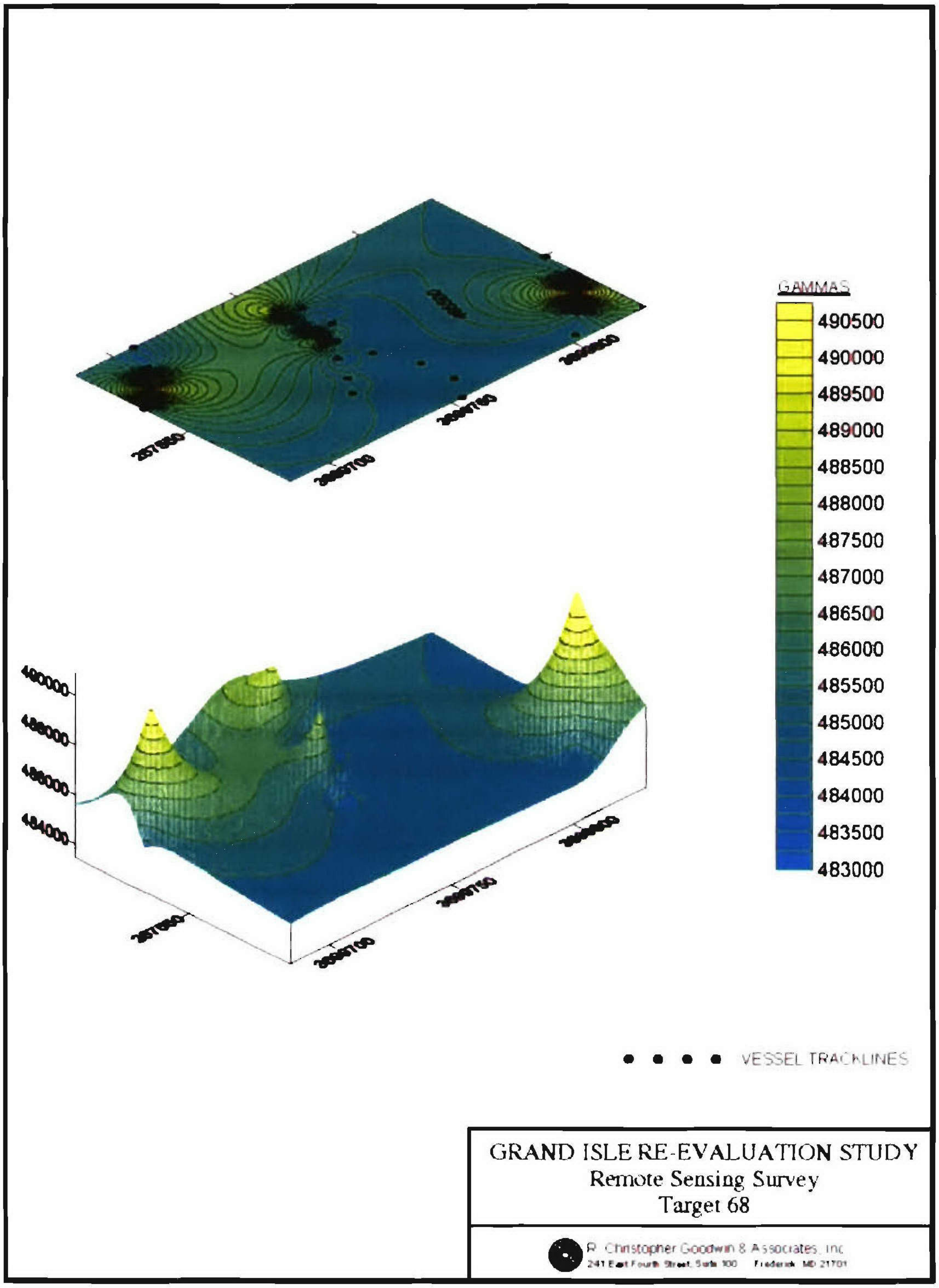

Figure 64. Magnetic contour map of Target #68.

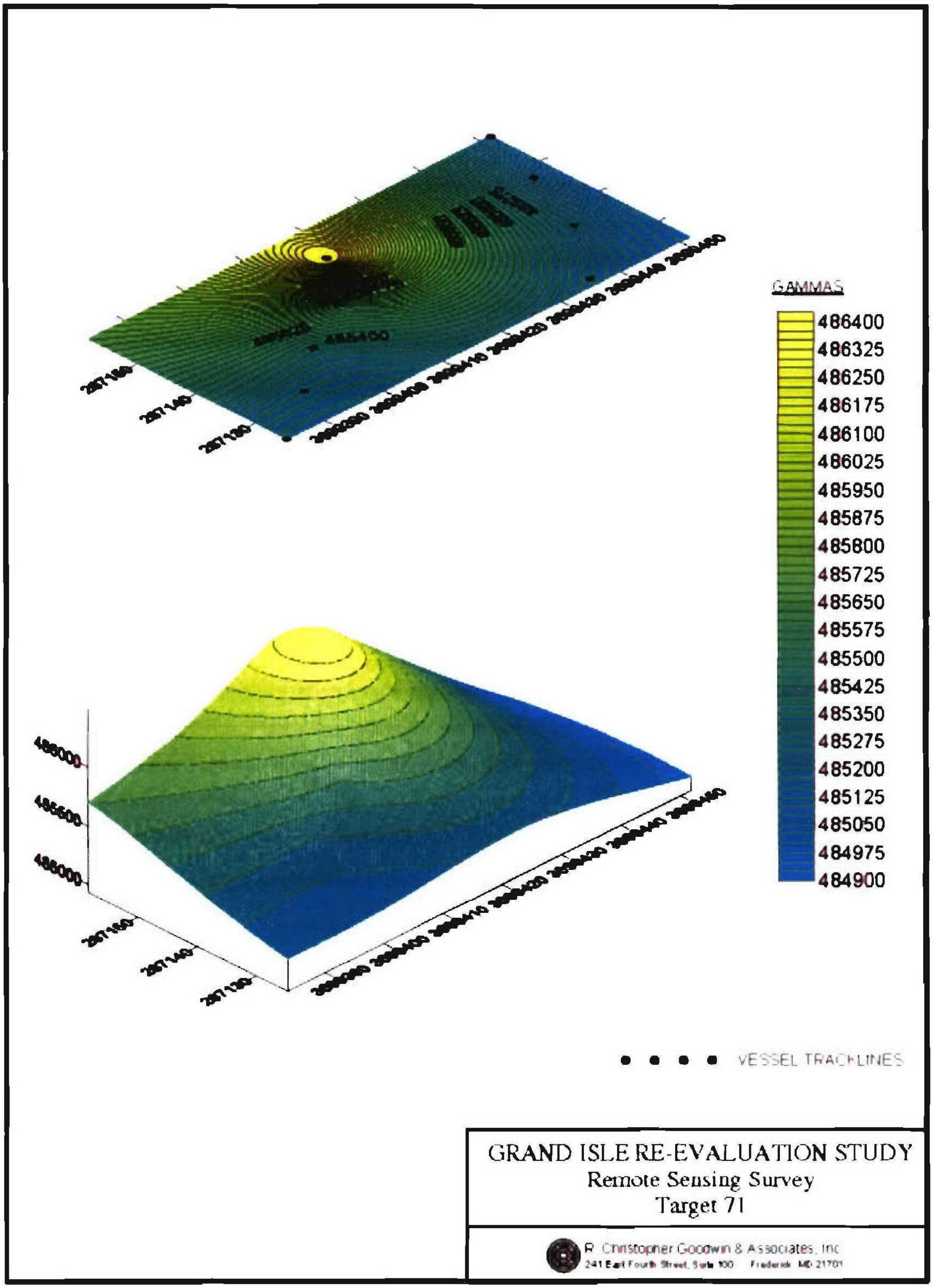

Figure 65. **Magnetic contour map of Target #71.**

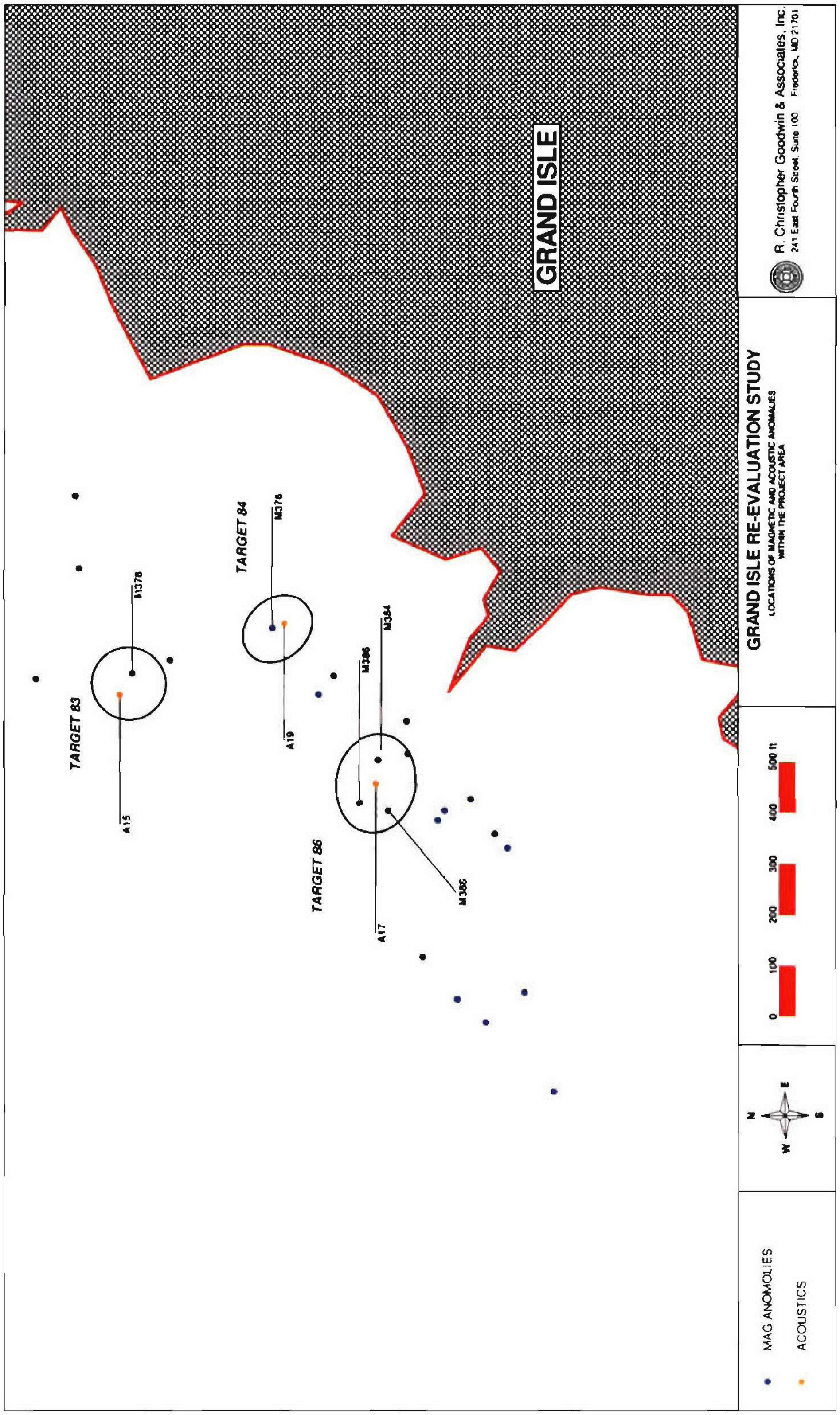

Figure 66. Map showing location of Targets #83, #84, and #86.

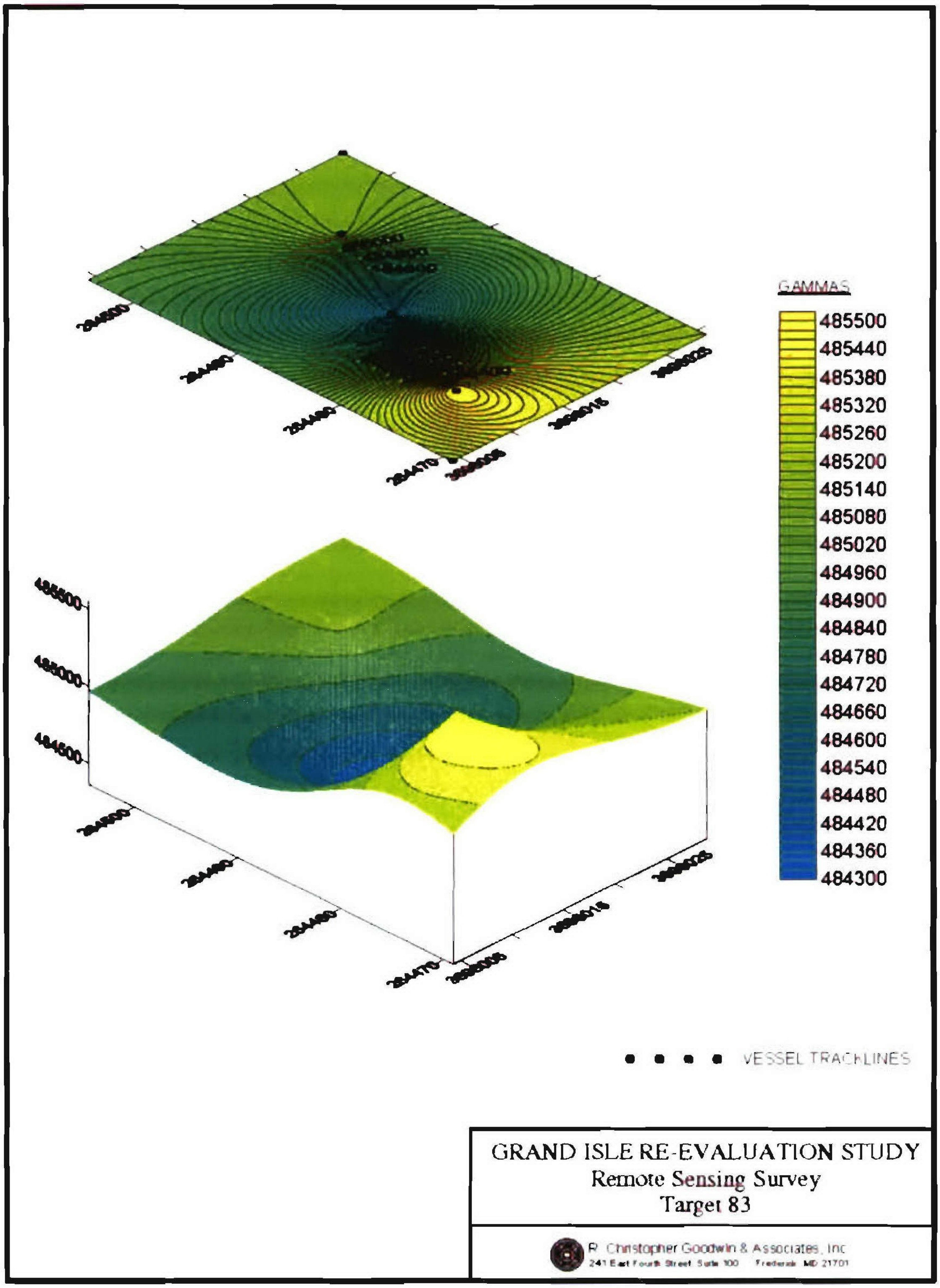

Figure 67. **Magnetic contour map of Target #83.**

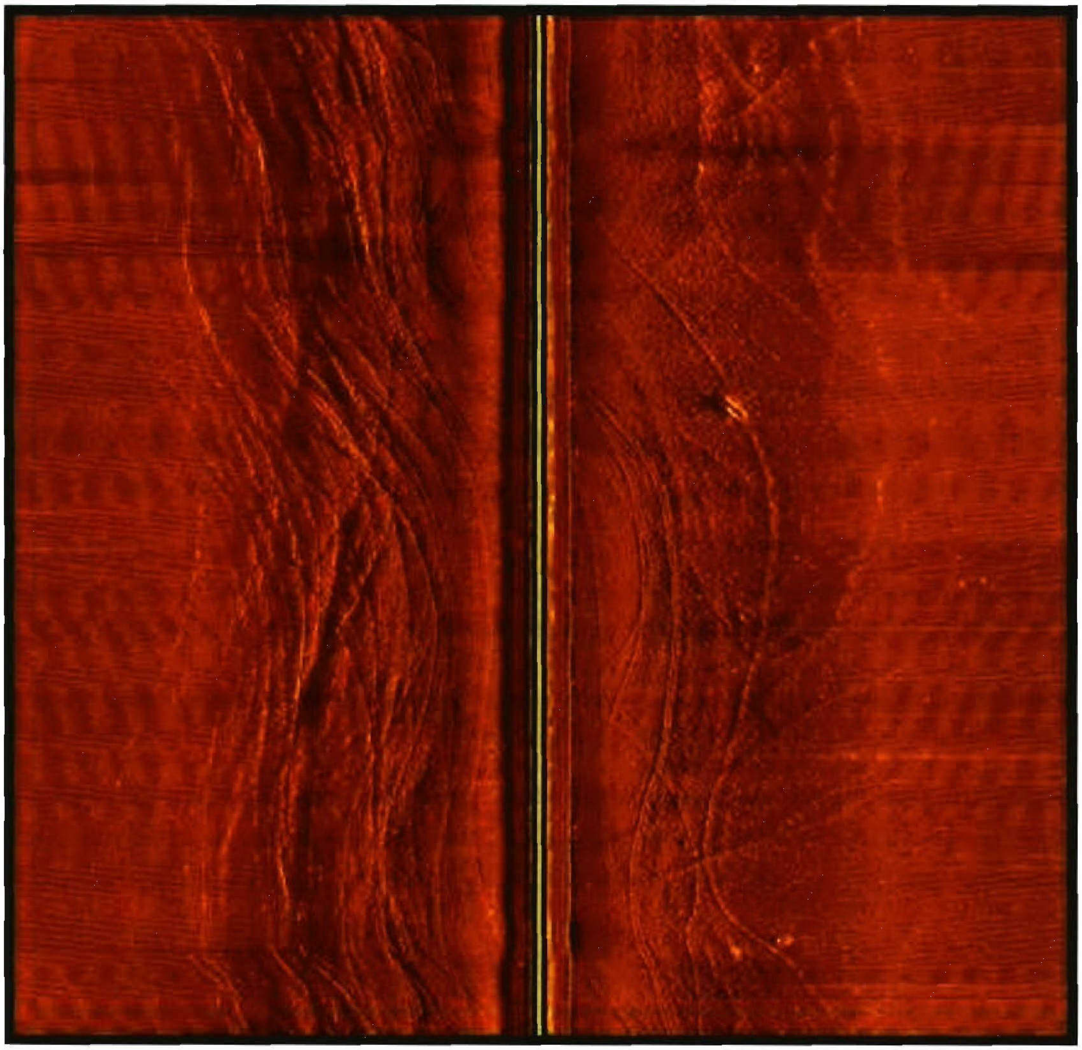

Figure 68. **Acoustic image (A15) of Target #83.**

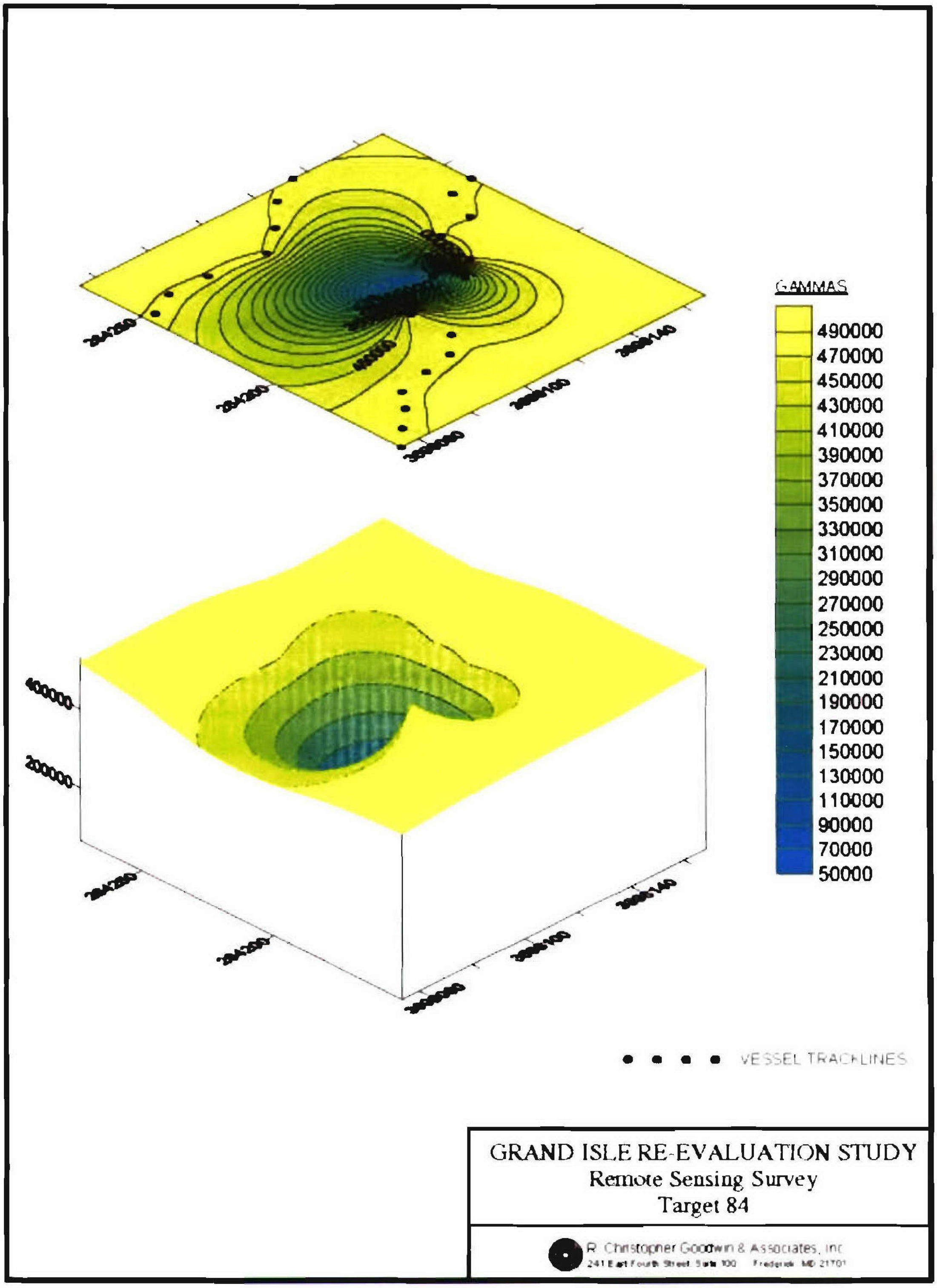

Figure 69. **Magnetic contour map of Target #84.**

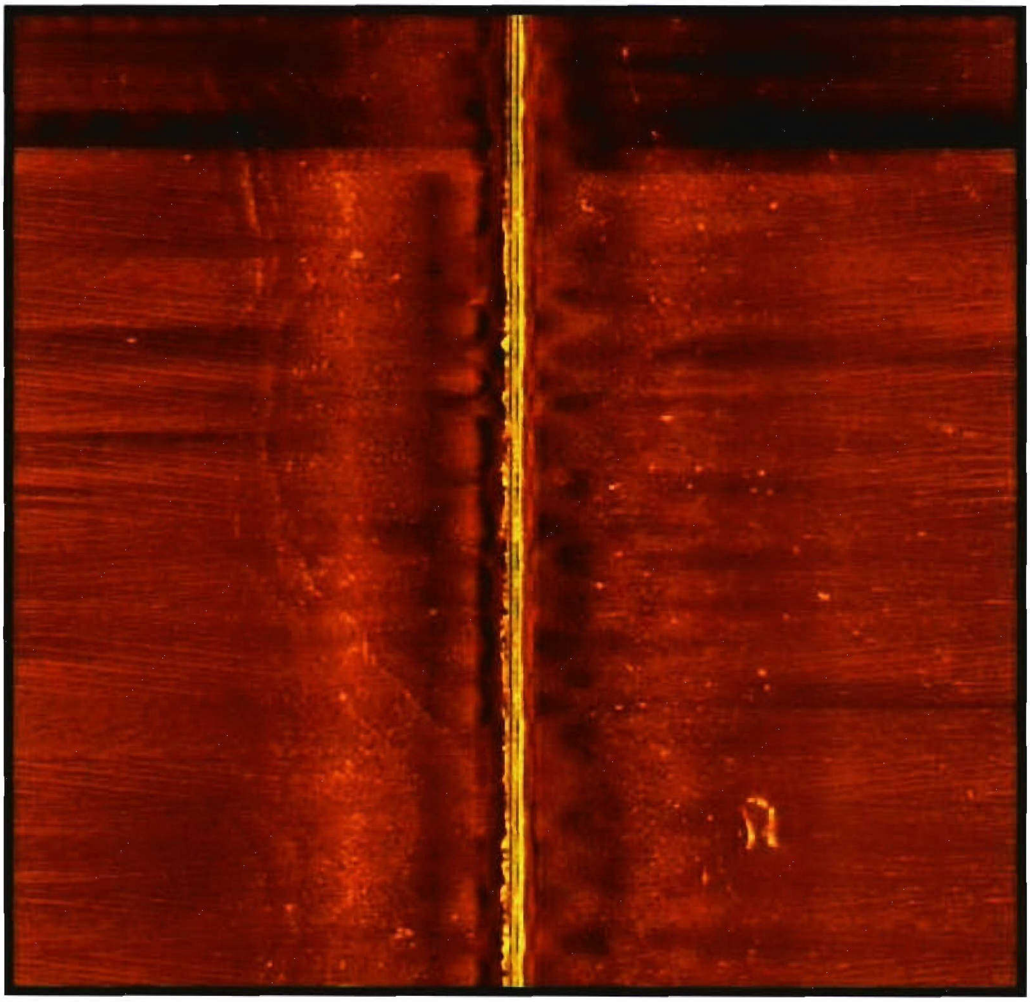

Figure 70. Acoustic image (A19) of Target #84.

The short duration of the magnetic anomaly in relation to its high amplitude indicates that the magnetometer passed over, or very near, the object in question. The object is an isolated point source with no spatial adjacency seen on any other lines. These characteristics do not indicate a submerged cultural resource and no further work on this target is recommended.

Target #86

This target is composed of three magnetic anomalies (M384, M386, and M388) and one acoustic anomaly (A17) (Figure 66). All three magnetic anomalies are dipolar in nature. M384 has a medium duration of 22 seconds and a high amplitude of 1,122 gammas. M386 has a medium duration of 12 seconds and a high amplitude of 882 gammas, and M388 has a perturbation of 802 gammas and a medium duration of 28 seconds. The magnetic contour map shows two point sources on adjacent lines (Figure 71). The side scan image shows an object approximately 12 feet long and at least one foot high in some areas (Figure 72). Although this target lacked a multicomponent signature that would be characteristic of submerged cultural resources, the side-scan image possibly showed a modern watercraft. However, this target does not appear to represent a significant cultural resource as defined by the National Register criteria for evaluation (36 CFR 60.4 [a-d]). No further investigation is warranted.

Target #90

Target #90 is made up of two magnetic anomalies (M399 and M400, Figure 73). M399 is a multicomponent with a medium duration of 16 seconds and a medium amplitude of 68 gammas. M400 is dipolar in nature and has a short duration of 8 seconds and a high magnetic perturbation of 130 gammas. The magnetic contour map clearly shows a point source, which is not typical of a cultural resource (Figure 74).

Although multicomponent signatures can be indicative of the multiple individual ferrous materials comprising the debris patterns typically associated with shipwrecks, the relatively short durations of these two anomalies do not support the hypothesis that this target represents a shipwreck. This target more likely represents isolated debris jettisoned or deposited from the heavy vessel traffic in the area. Moreover, a known pipeline from Enterprise/Promix exists in the immediate vicinity of this target, and it is possible that this target represents a portion of that pipeline. Neither scenario represents a significant culture resource. No further work is recommended for Target #90.

Target #98

This target has one magnetic anomaly (M460) and one acoustic anomaly (A26) associated with it (Figure 73). M460 is a dipole with a short duration of 10 seconds and a medium amplitude of 96 gammas. The magnetic contour map shows a clear, isolated dipole (Figure 75) with no spatial adjacency. The acoustic image shows numerous linear objects, but only one with an acoustic shadow (Figure 76). This object is approximately 25 feet in length. The dipolar signature, the lack of spatial adjacency, and the short duration of the magnetic anomaly make it likely that this target is isolated debris, and therefore is not a significant cultural resource. This target requires no further investigation.

Target #100

Twenty-four (24) anomalies comprise Target #100 (M492, M493, M494, M495, M496, M497, M498, M499, M500, M501, M502, M836, M841, M847, M848, M859, M860, M866, M867, M872, M873, M878, M879, and M884, Figure 77). M494, M848, M872, M879, and M884 have multicomponent signatures. M499, M493, M836, M841, and M873 are dipolar in nature while the rest of the anomalies have monopolar signatures. All of the anomalies have short to medium durations less than 26 seconds and high magnetic perturbations ranging from 920 to 409,682 gammas. The magnetic contour plot shows a linear feature (Figure 78). Anomalies that trend towards a linear orientation, have high magnetic perturbations, and short to medium durations typically are associated with pipelines or flowlines. The surveyors noted a signpost along the waterway warning off anchoring or dredging activities due to a pipeline. The evidence suggests that this target does not reflect a significant cultural resource and no further investigations are necessary.

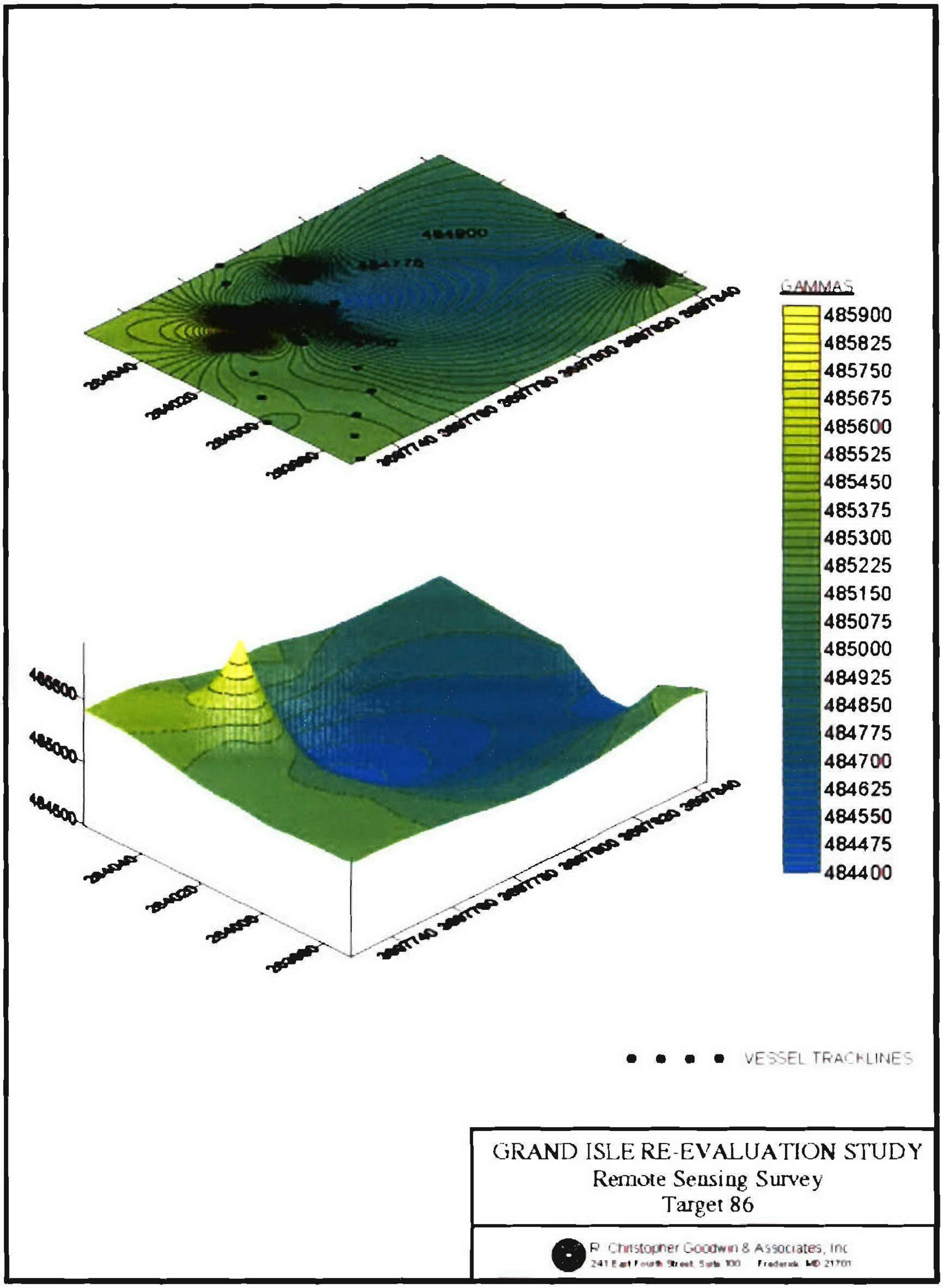

Figure 71. **Magnetic contour map of Target #86.**

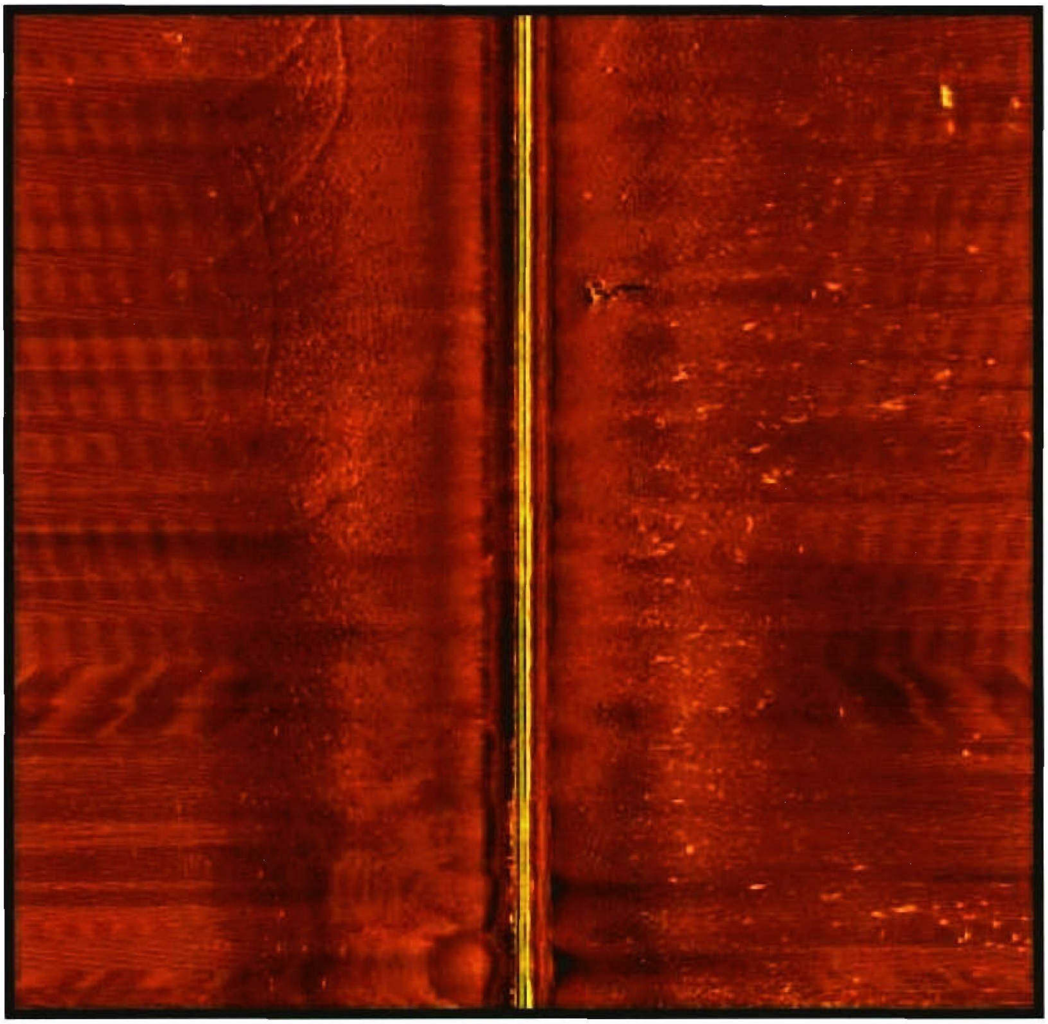

Figure 72. Acoustic image (A17) of Target #86.

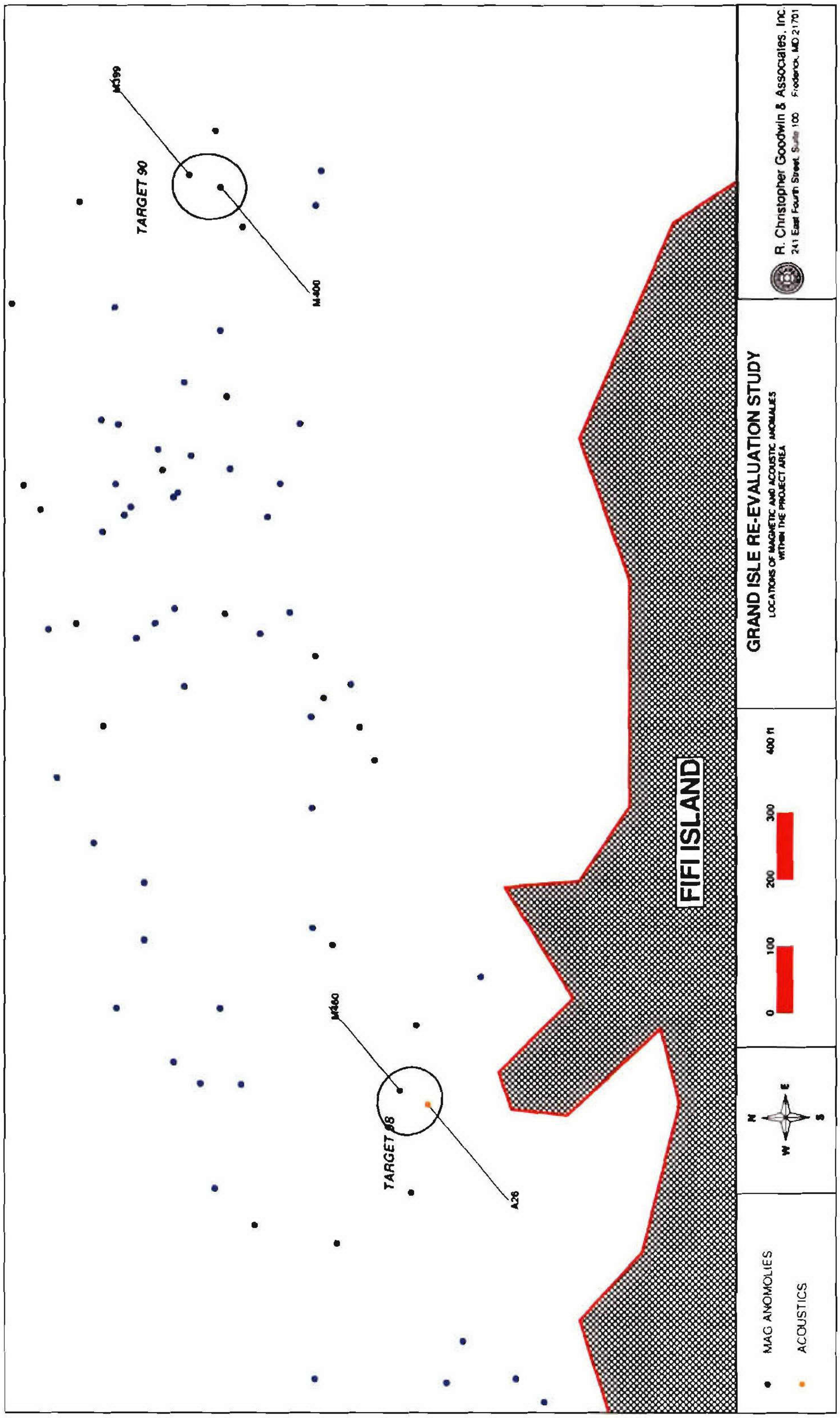

Figure 73. Map showing location of Targets #90 and #98.

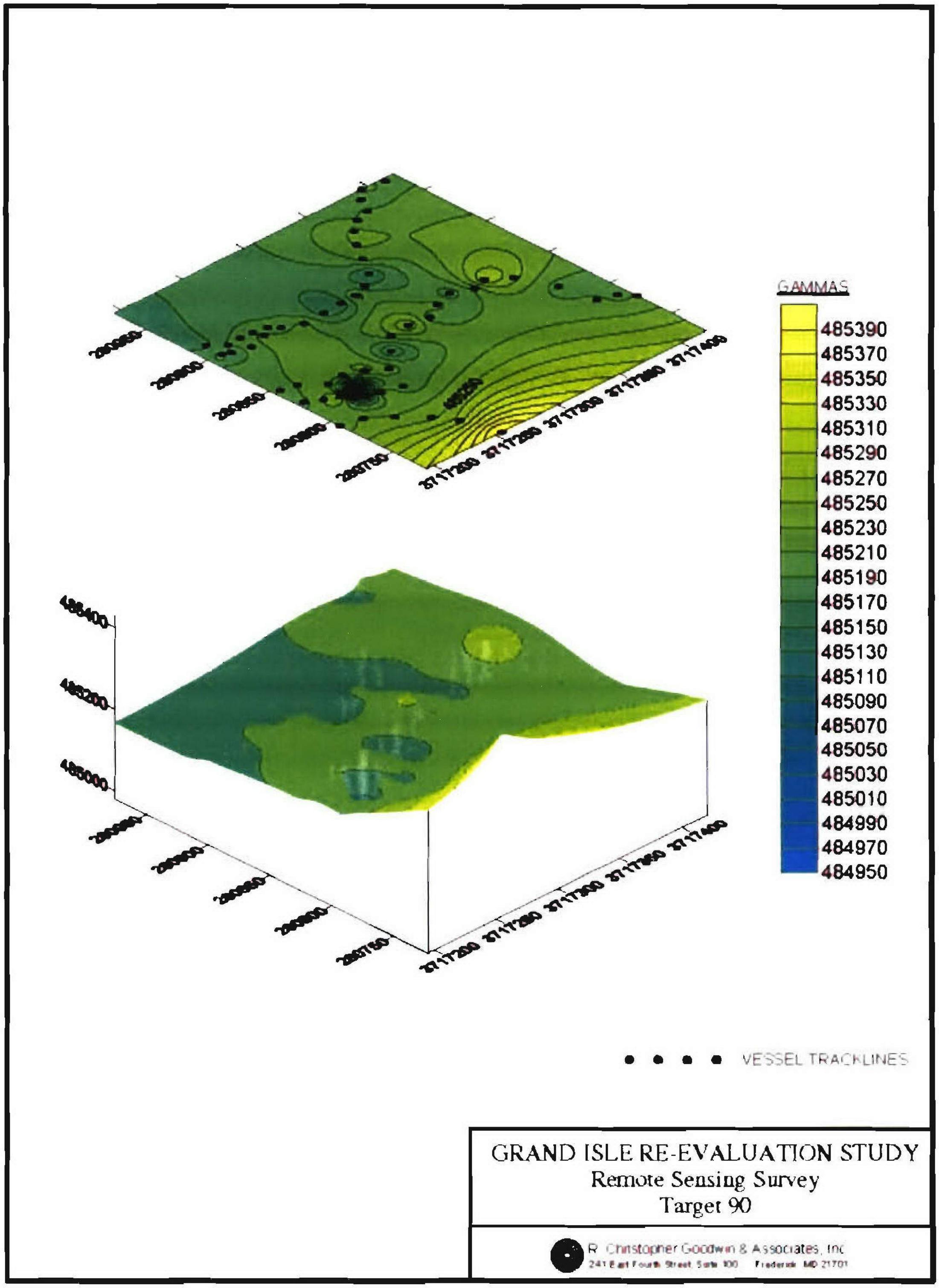

Figure 74. **Magnetic contour map of Target #90.**

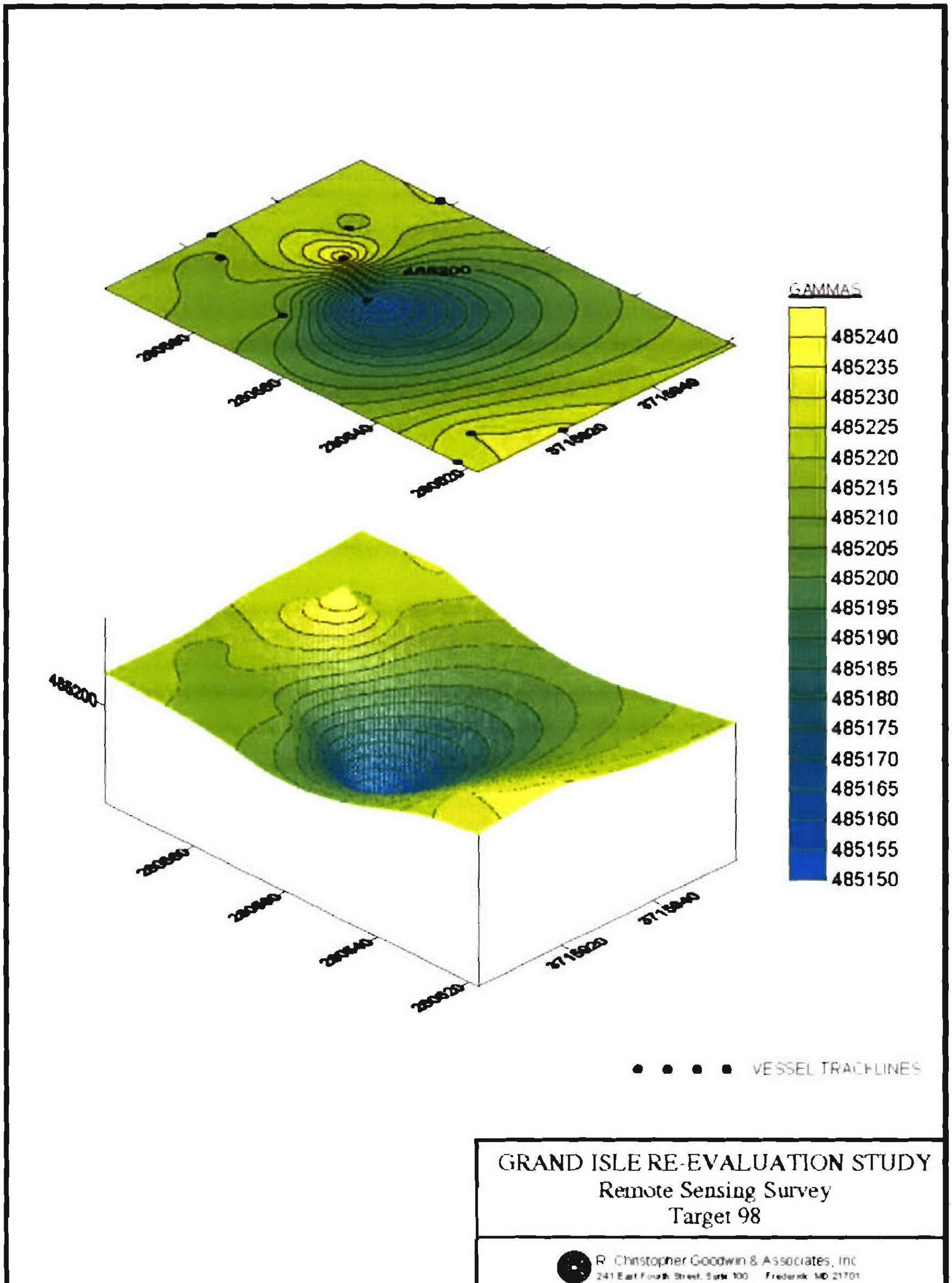

Figure 75. **Magnetic contour map of Target #98.**

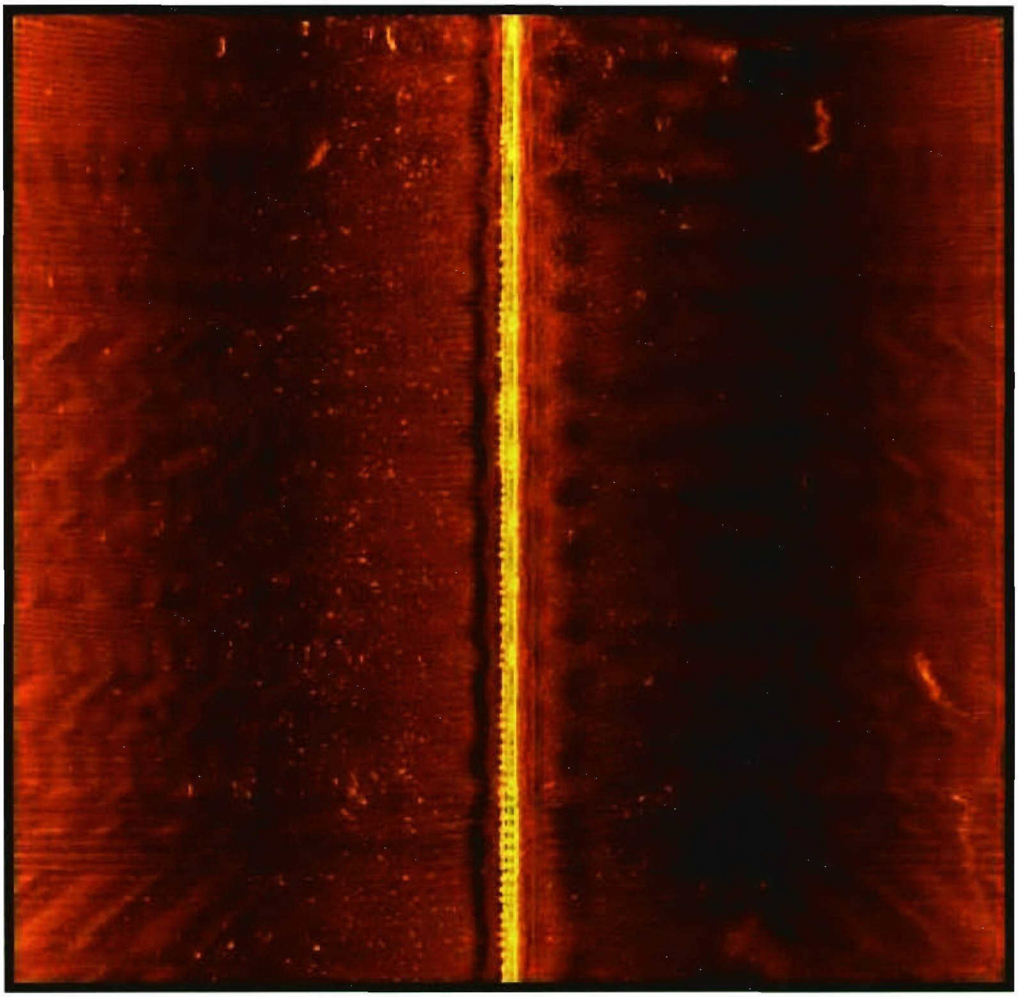

Figure 76. Acoustic image (A26) of Target #98.

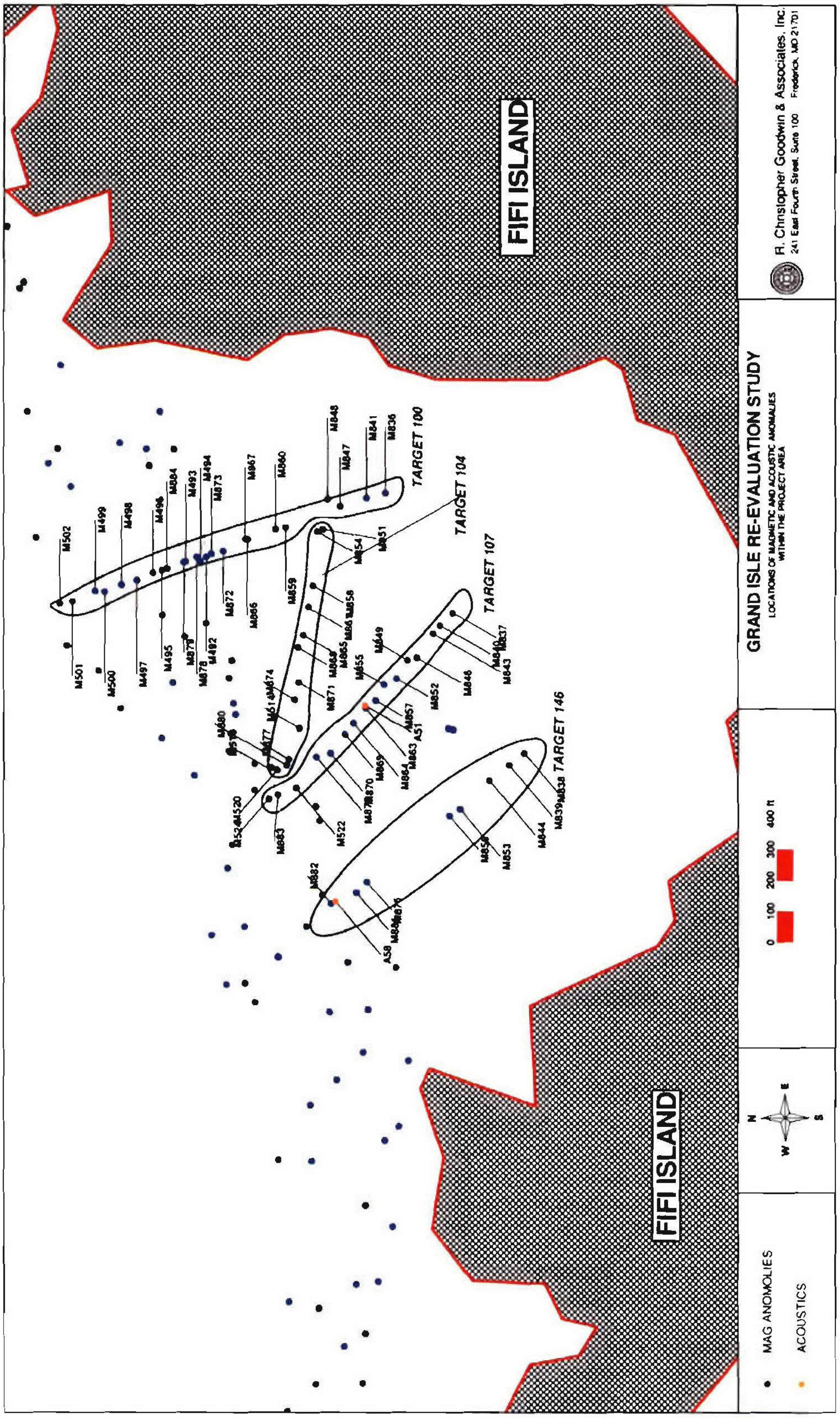

Figure 77. Map showing location of Targets #100, #104, #107, and #146.

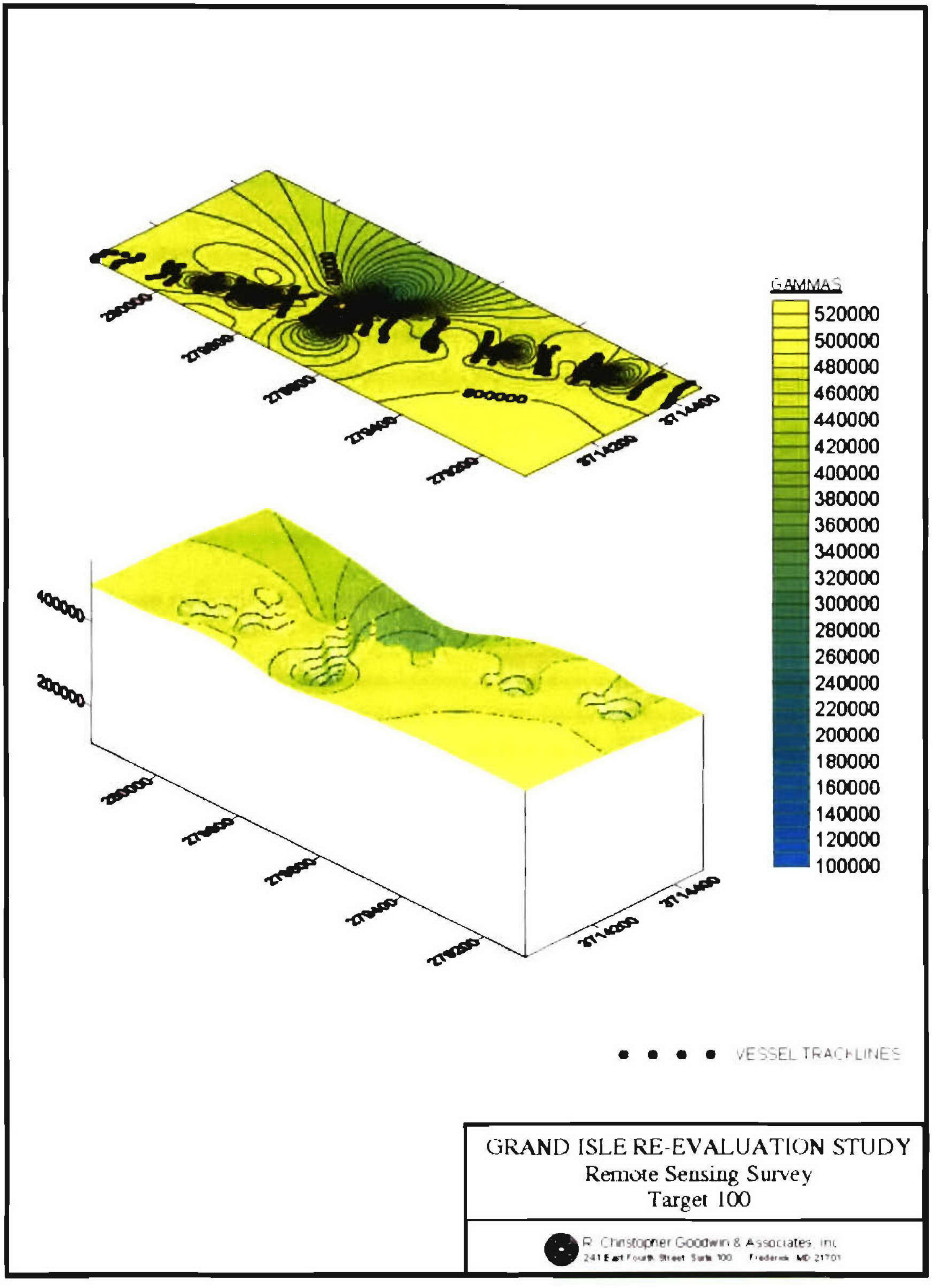

Figure 78. Magnetic contour map of Target #100.

Target #104

This target has 13 magnetic anomalies associated with it (M514, M519, M520, M851, M854, M858, M861, M865, M868, M871, M874, M877, and M880, Figure 77). M520 and M858 are dipolar in nature. M514, M519, M871, and M874 are negative monopoles while the rest of the anomalies are multicomponents. M877, M880, and M854 have long durations of 54, 48.1, and 39.4 seconds respectively; the rest have short to medium durations ranging from 4 to 26.1 seconds. All of the anomalies associated with this target have high magnetic perturbations, which range from 6560 to 420,722 gammas. The magnetic contour plot shows a linear feature when the contour level is low (less than 500 gammas) (Figure 79). However, the contour level had to be at least 5,000 gammas in order to show a clear image, from which three point sources are clearly seen.

This target lies directly over a known pipeline (Conoco) and the linear feature represents this pipeline. The three point sources seen on the northern end of the feature most likely represent ferrous debris, which happened to lie on or near the pipeline. This target therefore does not represent a significant cultural resource and no further investigation is recommended.

Target #107

Target #107 is composed of 16 magnetic anomalies (M522, M524, M837, M840, M843, M846, M849, M852, M855, M857, M863, M864, M869, M870, M875, and M883) and one acoustic anomaly (A51) (Figure 77). M855 and M870 have negative monopolar signatures while M849, M852, M864, and M883 are multicomponents. The rest of the anomalies are dipolar in nature. M524 and M849 have long durations of 40 and 34.8 seconds respectively. The rest of the anomalies have short to medium durations. All of the anomalies that compose this target have high magnetic deflections, which vary from 9,684 to 329,752 gammas.

The magnetic contour plot clearly shows a linear feature (Figure 80). This feature represents a known Exxon/Mobile pipeline, and does not represent a significant cultural resource. The acoustic image shows a number of areas of high reflectivity that likely represent debris and are not cultural in origin (Figure 81). No further investigation of this target is necessary.

Target #124

Target #124 is comprised of three magnetic anomalies (M629, M630, and M631, Figure 82). M629 and M631 are both negative monopoles with short durations of 8 seconds and have high amplitudes of 332 and 186 gammas respectively. M630 is a multicomponent with a medium duration of 18 seconds, and a magnetic deflection of 88 gammas. The magnetic contour map shows two point sources as seen on three different lines (Figure 83).

Short and medium duration anomalies typically represent small scatters of ferrous debris rather than shipwrecks. The isolated nature of these three point sources does not indicate a significant cultural resource and no further investigation is warranted.

Target #146

Target #146 comprises eight magnetic anomalies (M853, M856, M876, M881, M882 M838, M839, and M844) and one acoustic anomaly (A58) (Figure 77). M853 has a multicomponent signature with a high perturbation of 2,600 and a long duration of 47.3 seconds. M856 has a high amplitude of 4,148 gammas, a medium duration of 11 seconds, and is a positive monopole. M876 has a dipolar signature with a medium duration of 28 seconds and a high amplitude of 1,580 gammas. M881 has a high magnetic perturbation of 5,730 gammas, a long duration of 35 seconds, and has a positive monopolar signature. M882, a multicomponent, has a high deflection of 42,050 gammas and a medium duration of 21.6 seconds. These anomalies all have high magnetic amplitudes ranging from 1580 to 42,050 gammas. M838 and M844 are positive monopoles. M839 is dipolar in nature. All have medium to long durations from 11 to 47.3 seconds. The magnetic contour plot shows a linear feature that is more characteristic of a pipeline or flowline than a cultural resource (Figure 84).

There is a documented pipeline from Columbia Gulf located within the area of this target. The acoustic image shows an area with numerous sources of high reflectivity that likely represent debris (Figure 85). This target most

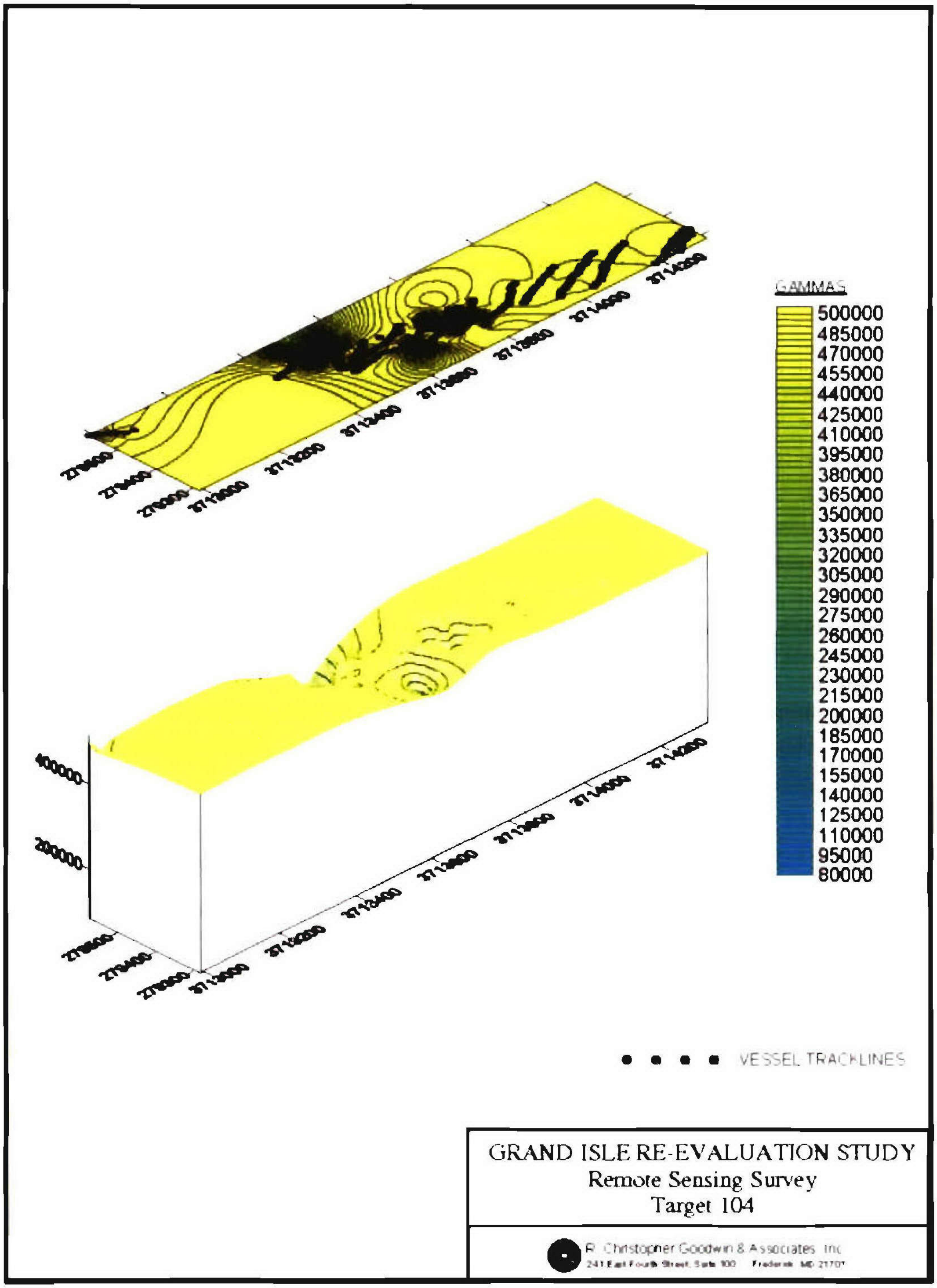

Figure 79. Magnetic contour map of Target #104.

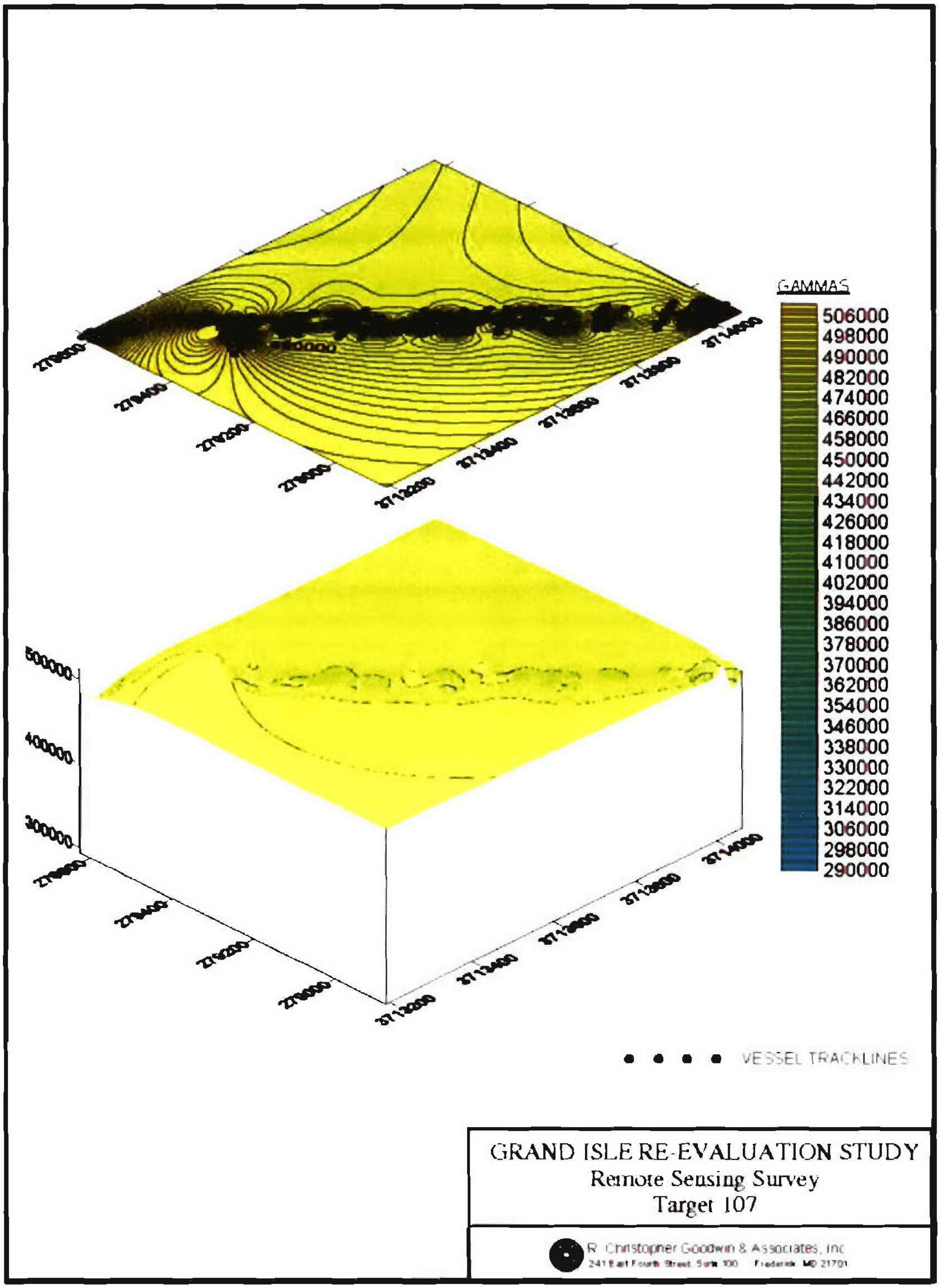

Figure 80. **Magnetic contour map of Target #107.**

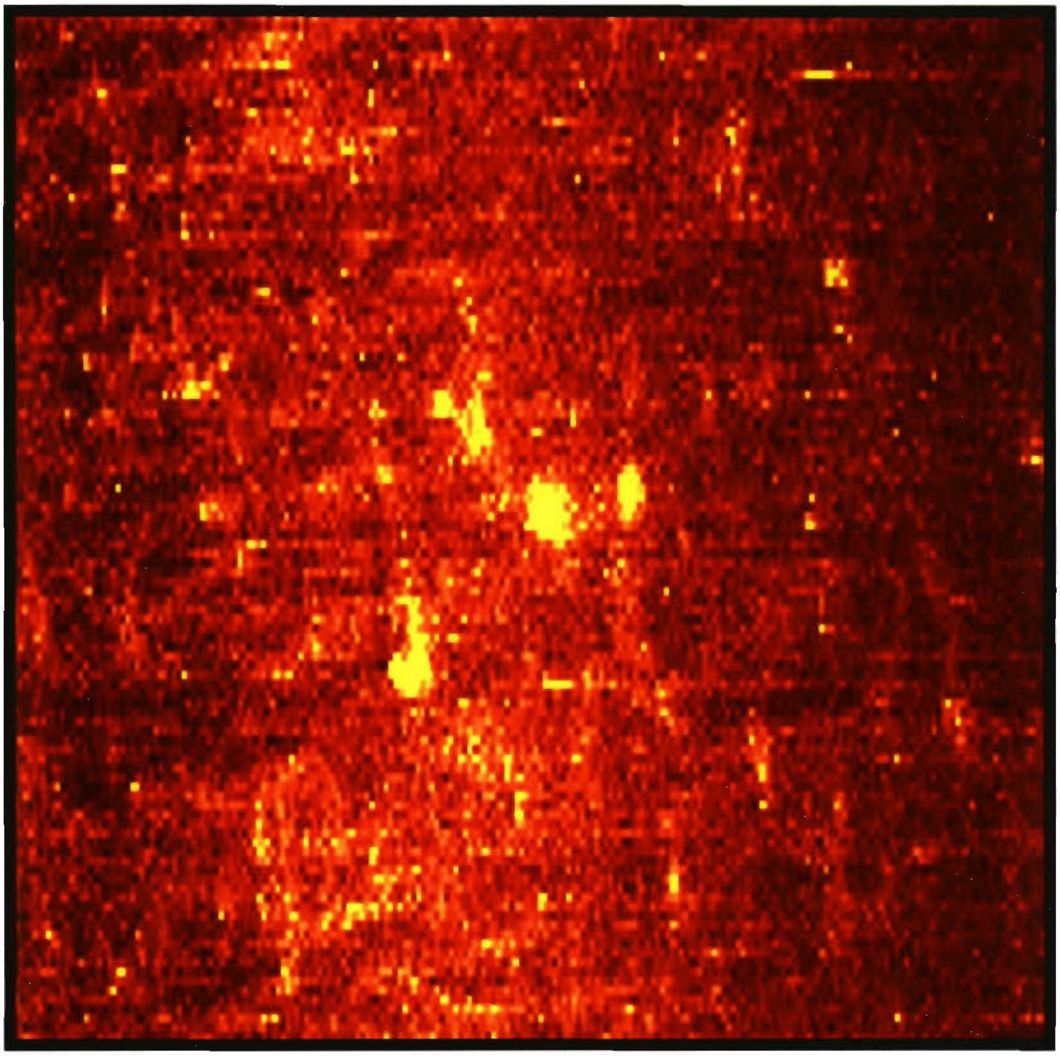

Figure 81. Acoustic image (A51) of Target #107.

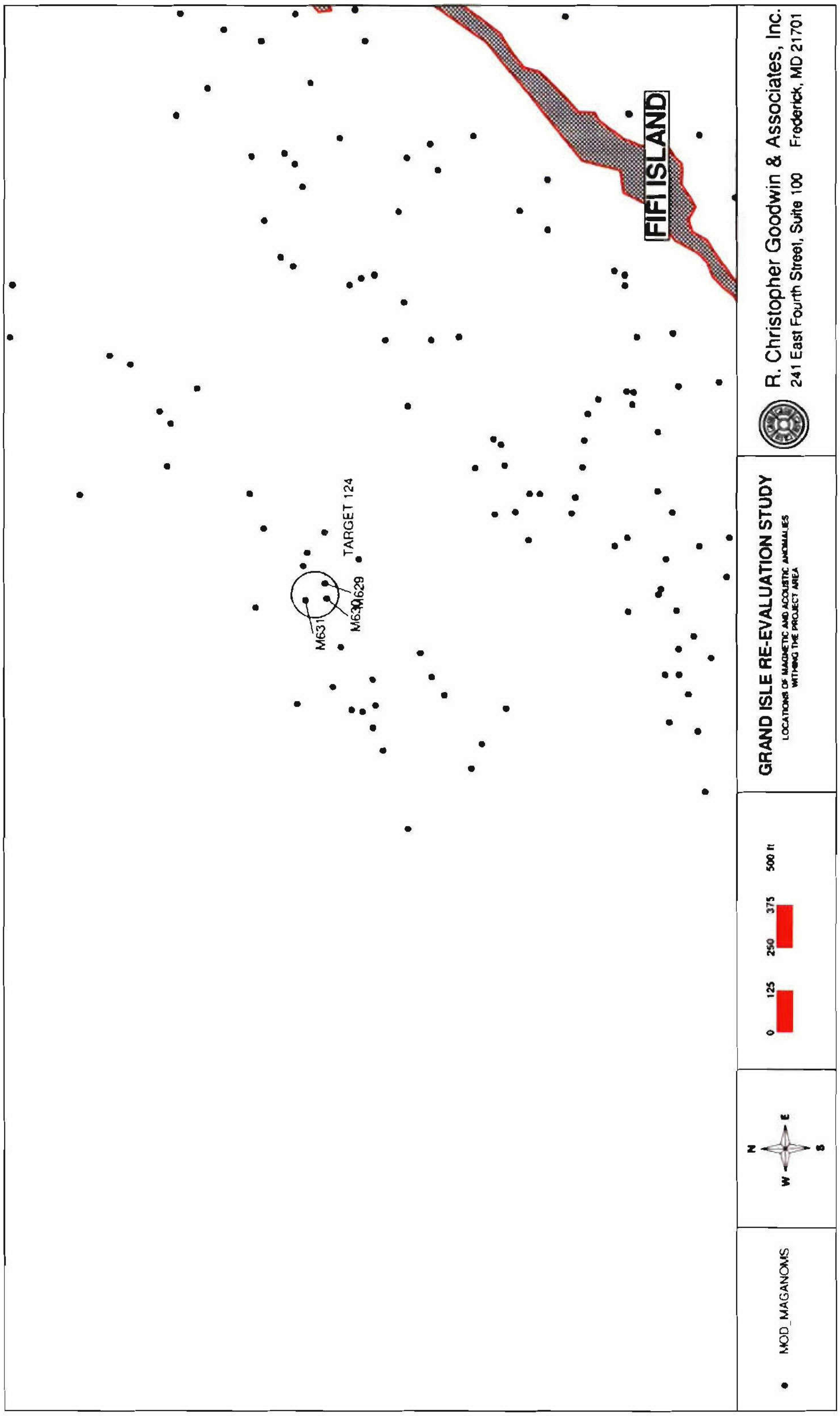

Figure 82. **Map showing location of Target #124.**

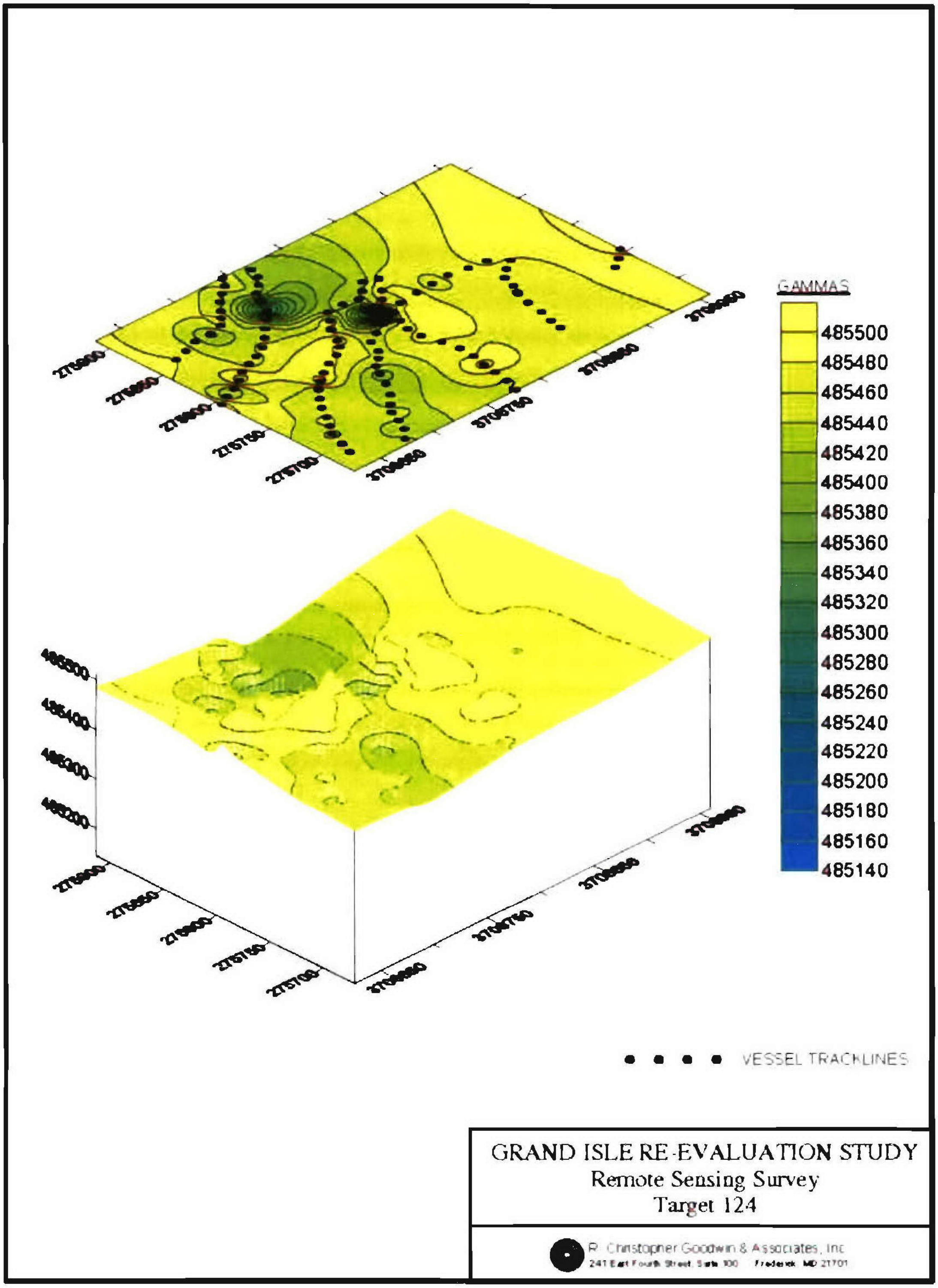

Figure 83. Magnetic contour map of Target #124.

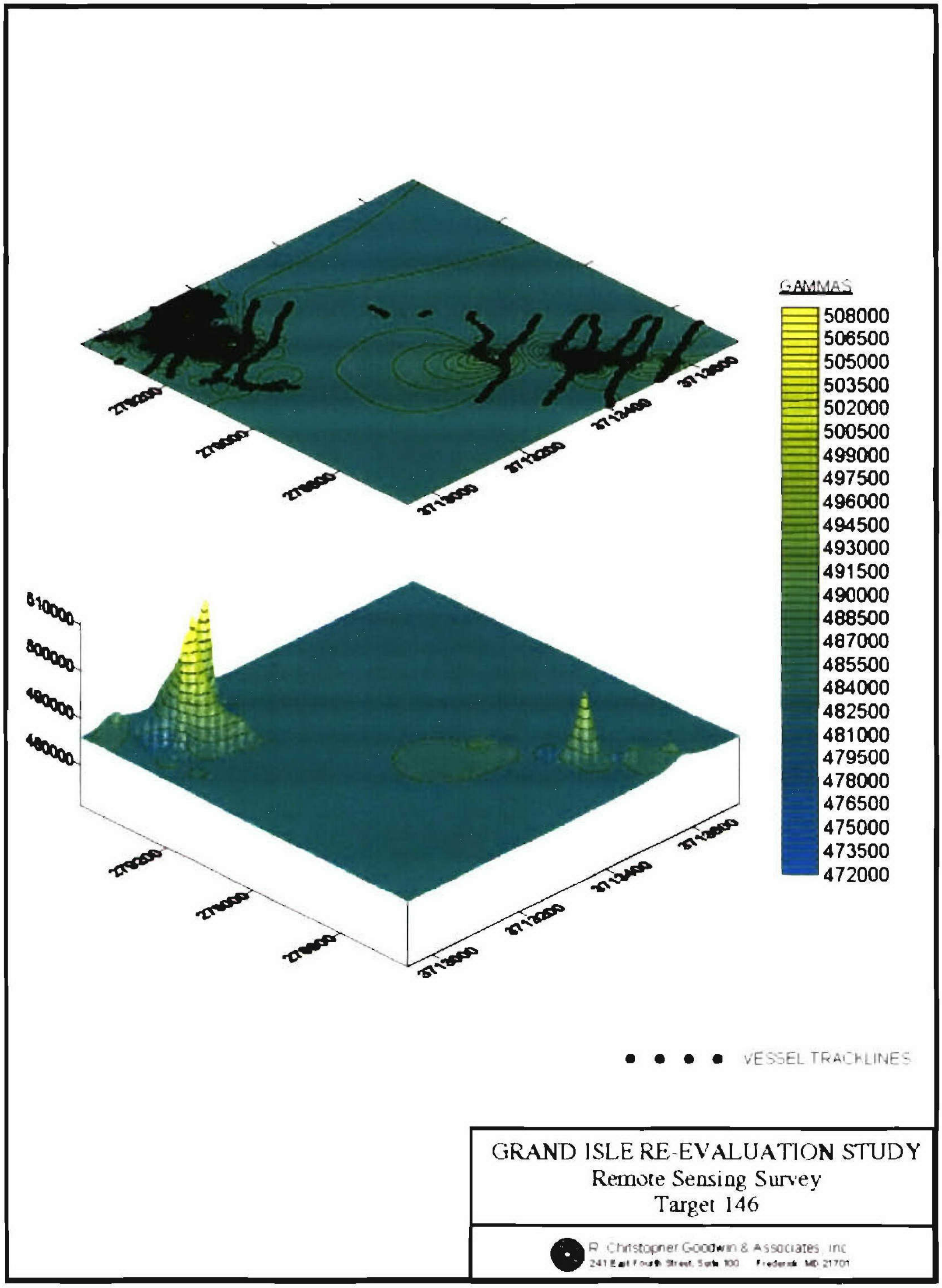

Figure 84. Magnetic contour map of Target #146.

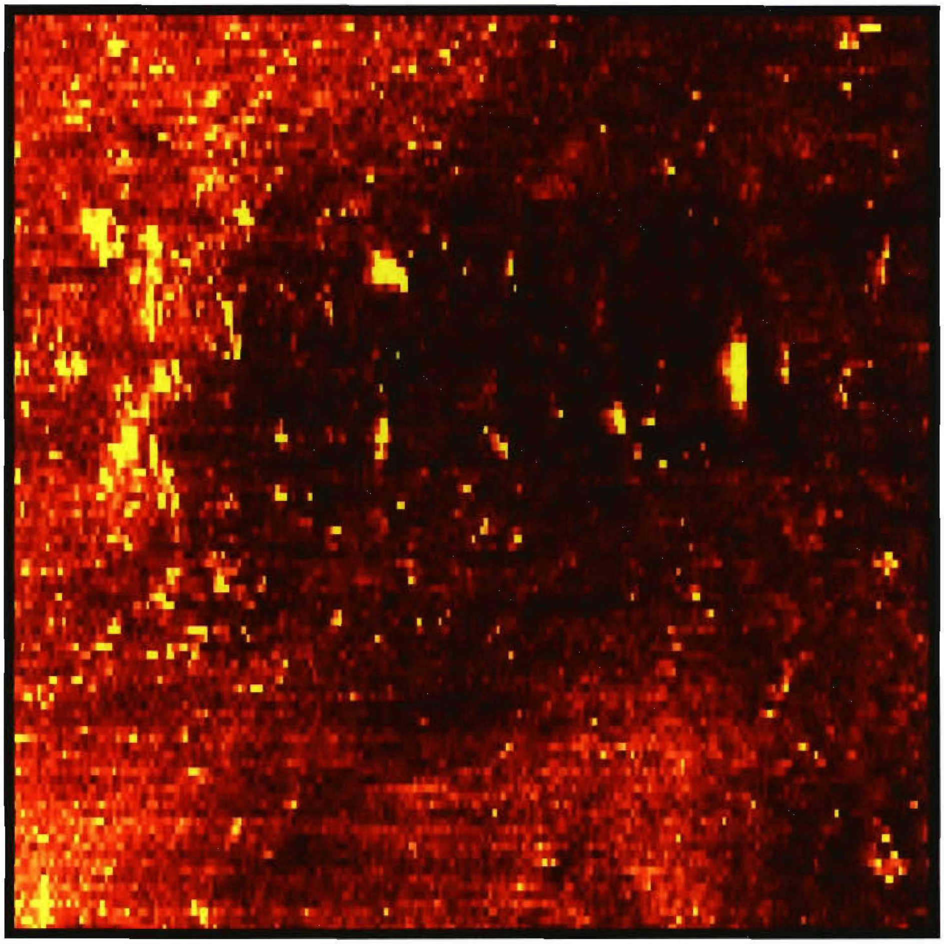

Figure 85. Acoustic image (A58) of Target #146.

likely reflects the presence of the Columbia Gulf pipeline and does not represent a significant cultural resource. No further work is recommended.

Target #147

Target #147 is composed of five magnetic anomalies (M807, M810, M812, M819, and M821) and one acoustic anomaly (A44) (Figure 48). M807, M810, M812, M819, and M821, were multicomponent in nature. All of the magnetic anomalies had high amplitudes ranging from 636 to 15,784 gammas. Anomaly durations ranged from 28 to 164 seconds. The magnetic contour plot shows a linear feature and a scattering of magnetic perturbations to the south (Figure 86).

A Chevron pipeline runs through this area and it is likely that the linear feature represents this line. Although there is a charted wreck in this area, the magnetic perturbations to the south have the characteristics of a scatter of ferrous debris (e.g., a lack of clear spatal adjacency), and it does not appear that these anomalies represent a shipwreck. The acoustic image shows a linear object (Figure 87). The object more than likely represents discarded fishing paraphernalia as witnessed along the adjacent bankline. This target does not require further investigation.

Target #149

Target #149 is made up of three magnetic anomalies (M800, M813, and M827) and two acoustic anomalies (A42 and A46) (Figure 48). M800 has a dipolar signature while M813 and M827 are multicomponents. M800 has a duration of 6 seconds and an amplitude of 224 gammas. M813 has a long duration of 131.7 seconds and a high perturbation of 5,644 gammas. M827 has a long duration of 35.6 seconds and a high deflection of 208 gammas. Analysis in the magnetic contour plot suggests an area of ferrous debris rather than debris associated with a cultural resource (Figure 88). One acoustic image shows a linear shaped feature with a high profile in relation to the sea floor (A42) (Figure 89). The other image shows an area of high reflectivity (A44) (Figure 90).

During fieldwork, the surveyors noticed a modern dredge barge and associated floats located near this target. It is likely that these targets represent material associated with this operation rather than a significant cultural resource. No further work is recommended.

Target #154

This target is made up of two magnetic anomalies (M806 and M808) (Figure 48). Both are multicomponent in nature. M806 has a high amplitude of 15,300 gammas and a medium duration of 22 seconds. M808 has a magnetic deflection of 26,684 gammas and a long duration of 187.9 seconds. The target, when viewed in the magnetic contour map, shows a large overall magnetic deflection with numerous, smaller point source perturbations (Figure 91).

Given the shallow water and debris recorded in the area, side scan, bathymetric, and visual data failed to show any significant cultural resources. Therefore, this target represents a scatter of ferrous material, which may be associated with a known Chevron pipeline that is present in the area. This target has a low probability of representing a significant cultural resource and no further work is recommended.

Target #162

This target is composed of two magnetic anomalies (M770 and M786, Figure 50). Both anomalies have multicomponent signatures. M770 has a long duration of 160 seconds and a high amplitude of 3,894 gammas. M786 has a high amplitude of 1,444 gammas and a long duration of 184 seconds. Two point source perturbations can be seen in the magnetic contour plot (Figure 92). These point sources do not indicate the presence of a cultural resource and can more than likely be attributed to ferrous debris jettisoned from passing vessels. No further work is recommended for this target.

Target #169

Target #169 is composed of three anomalies (M767, M771, and M773, Figure 50). M771 and M773 are both dipoles with medium durations of 13.5 seconds and amplitudes of 2752 gammas. M773 is a multicomponent with a long duration of 35.6 seconds and an amplitude of 604 gammas. Spatial adjacency is seen on two lines.

The signatures of the anomalies, the medium to long durations, and the high gamma values are characteristic of a submerged cultural

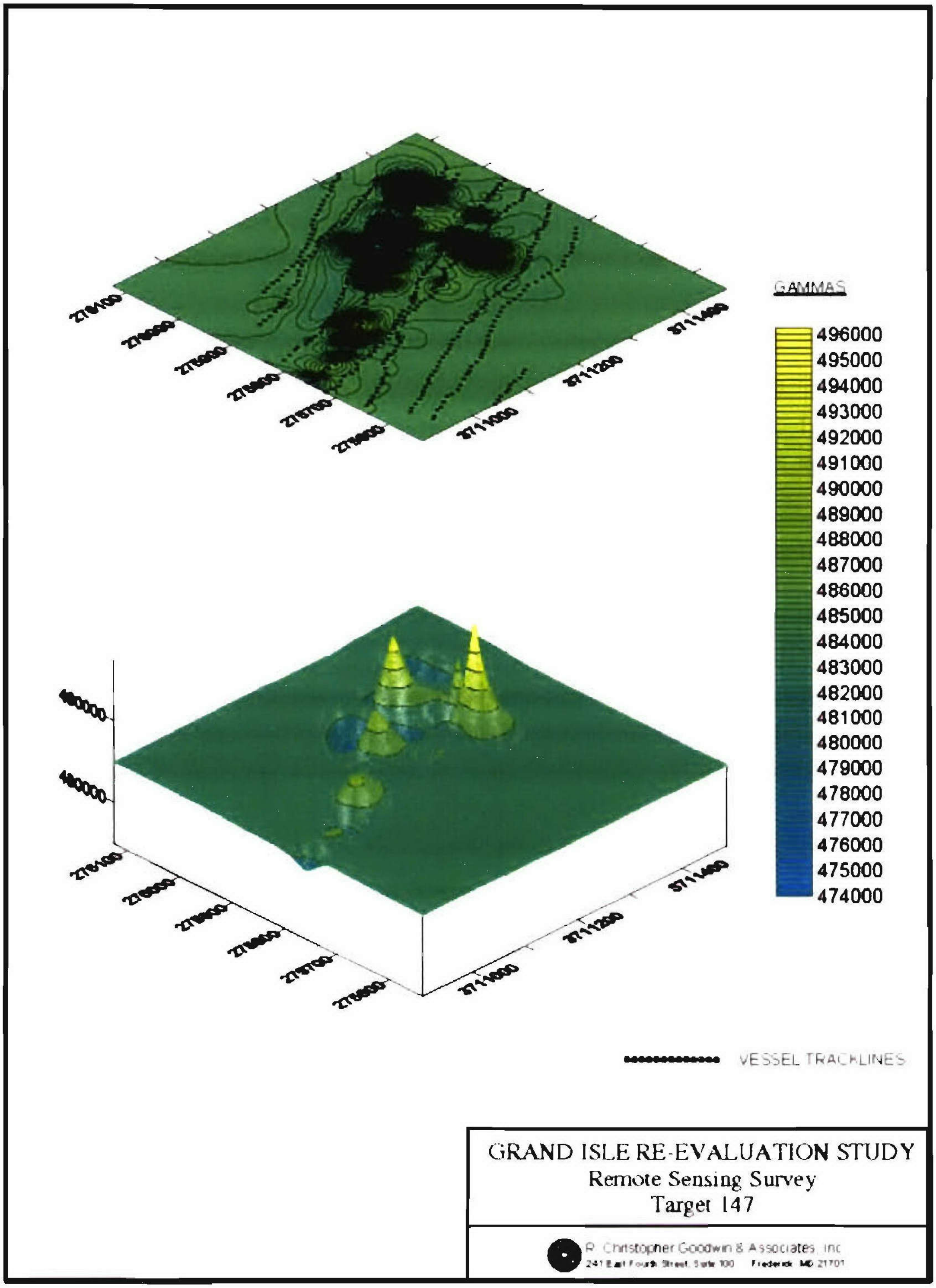

Figure 86. Magnetic contour map of Target #147.

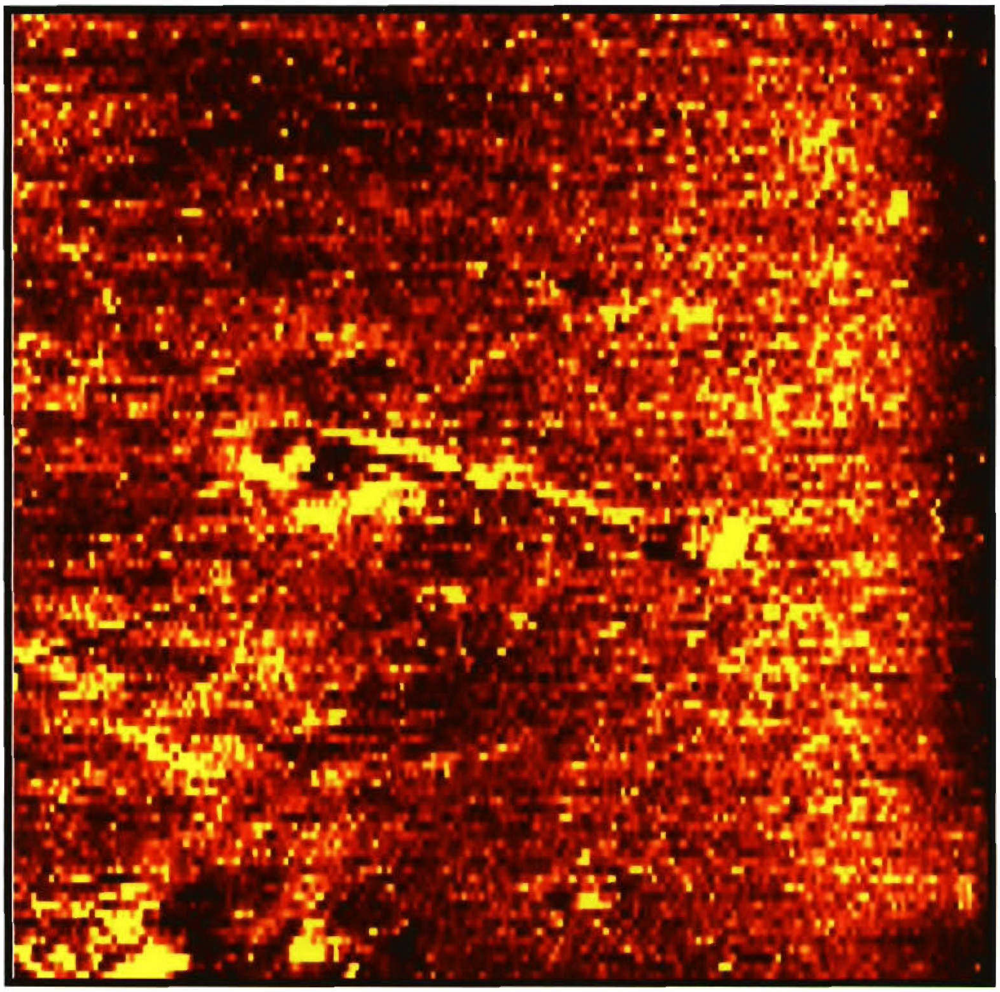

Figure 87. Acoustic image (A44) of Target #147.

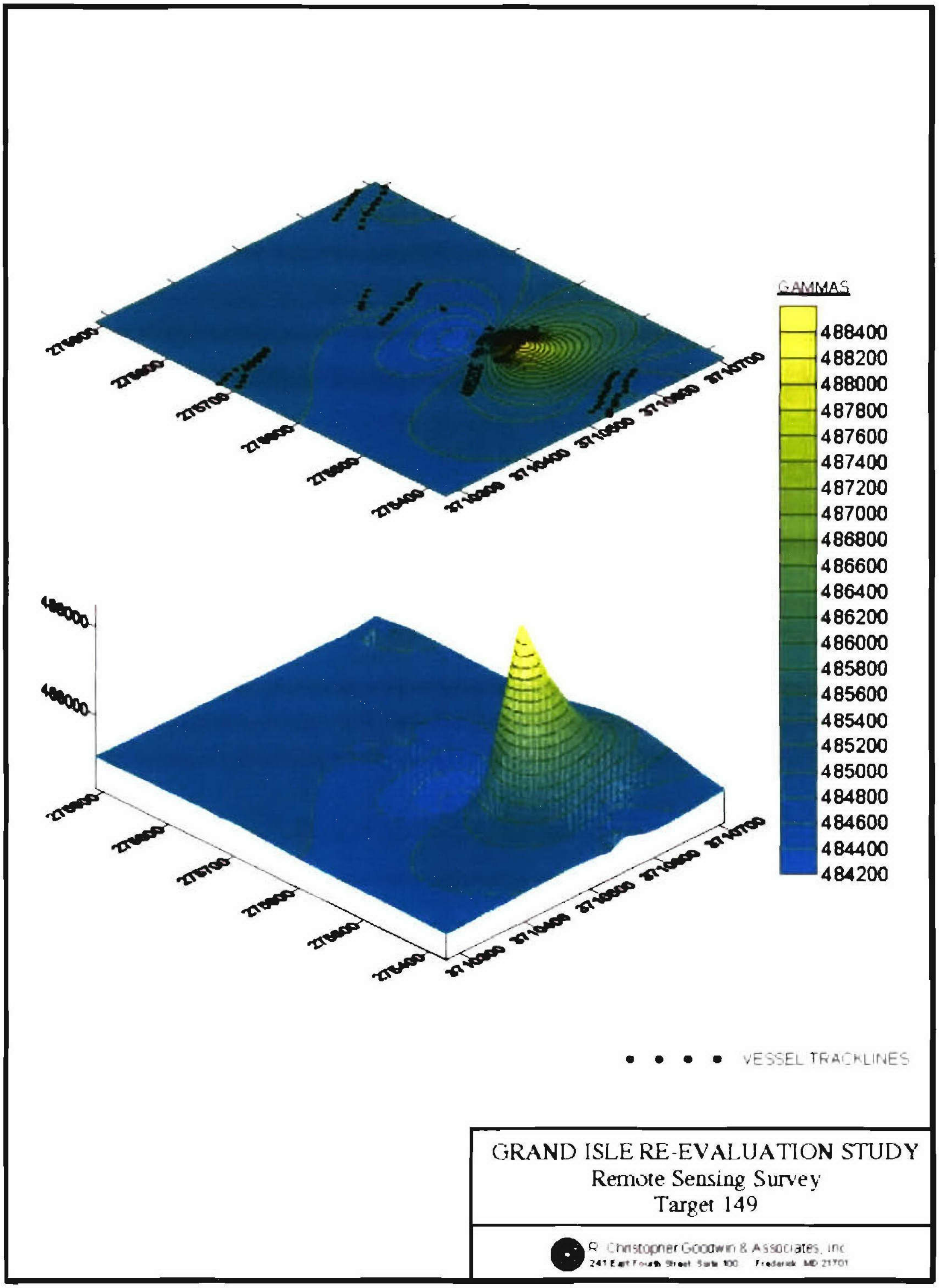

Figure 88. **Magnetic contour map of Target #149.**

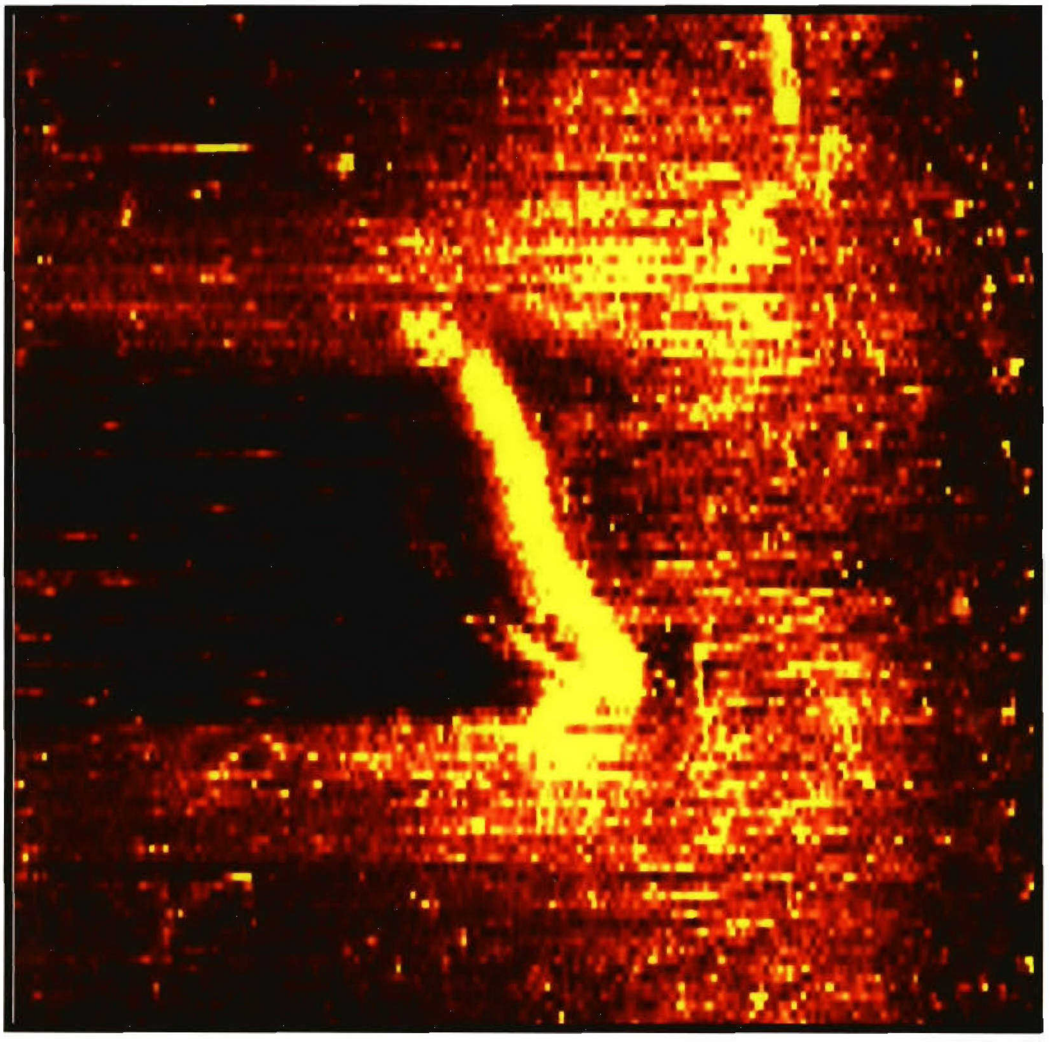

Figure 89. Acoustic image (A42) of Target #149.

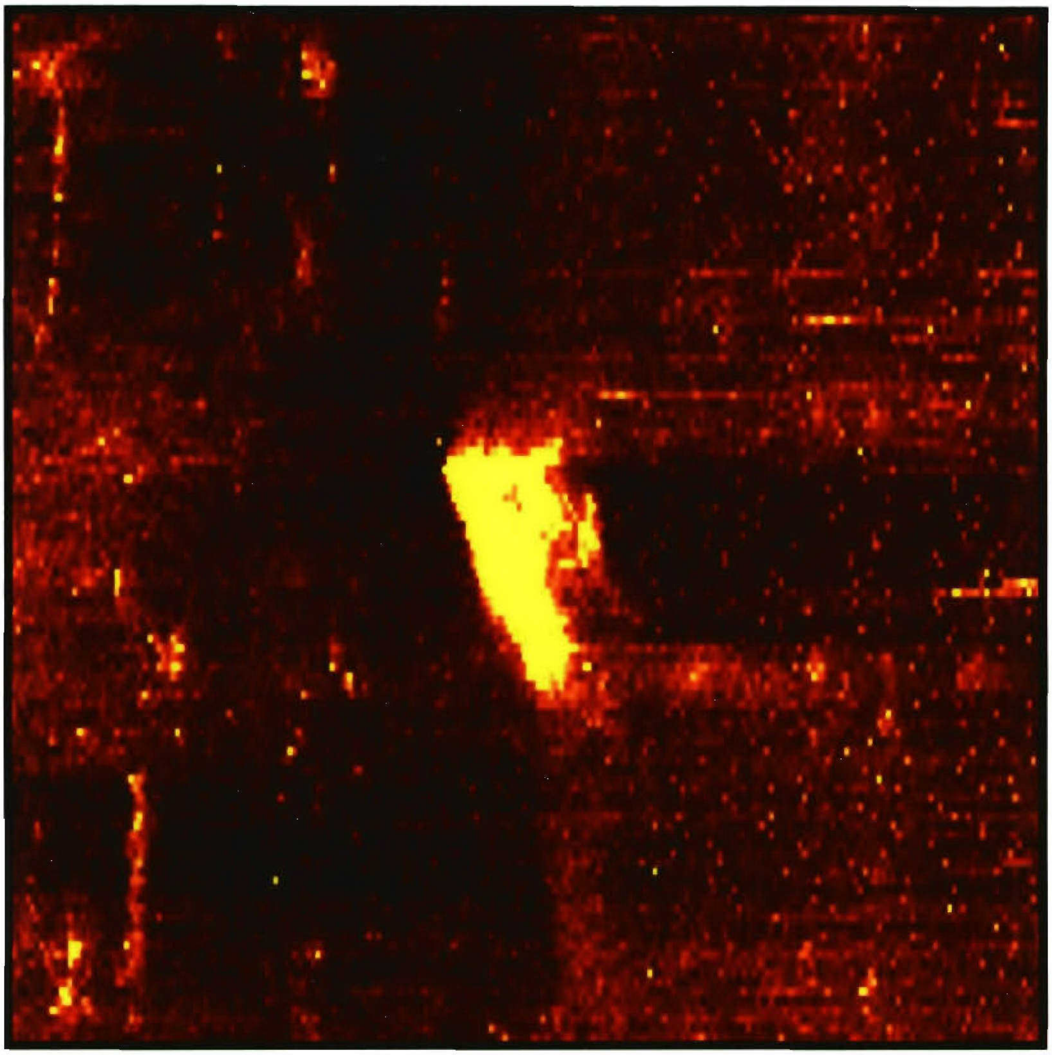

Figure 90. Acoustic image (A46) of Target #149.

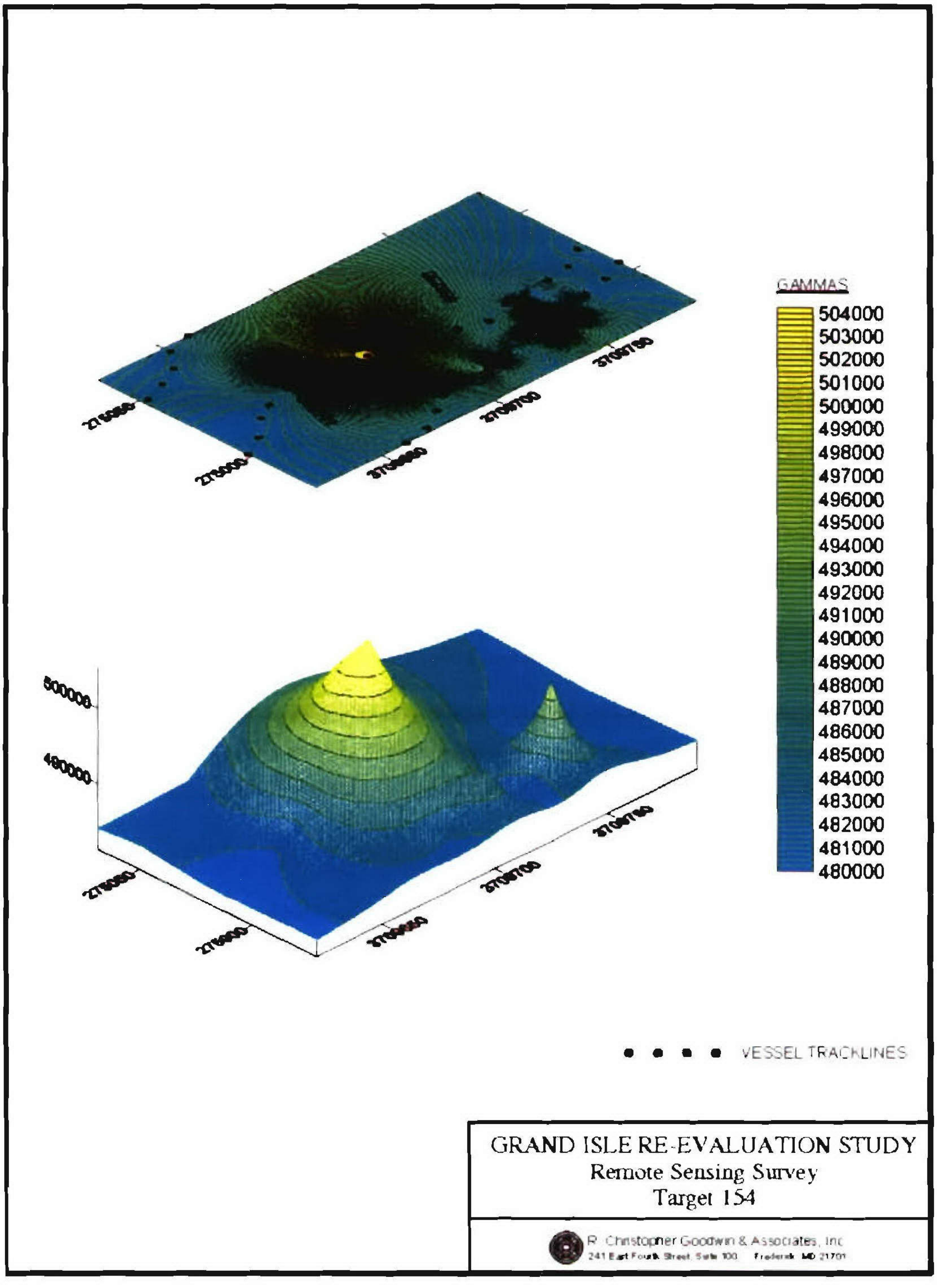

Figure 91. **Magnetic contour map of Target #154.**

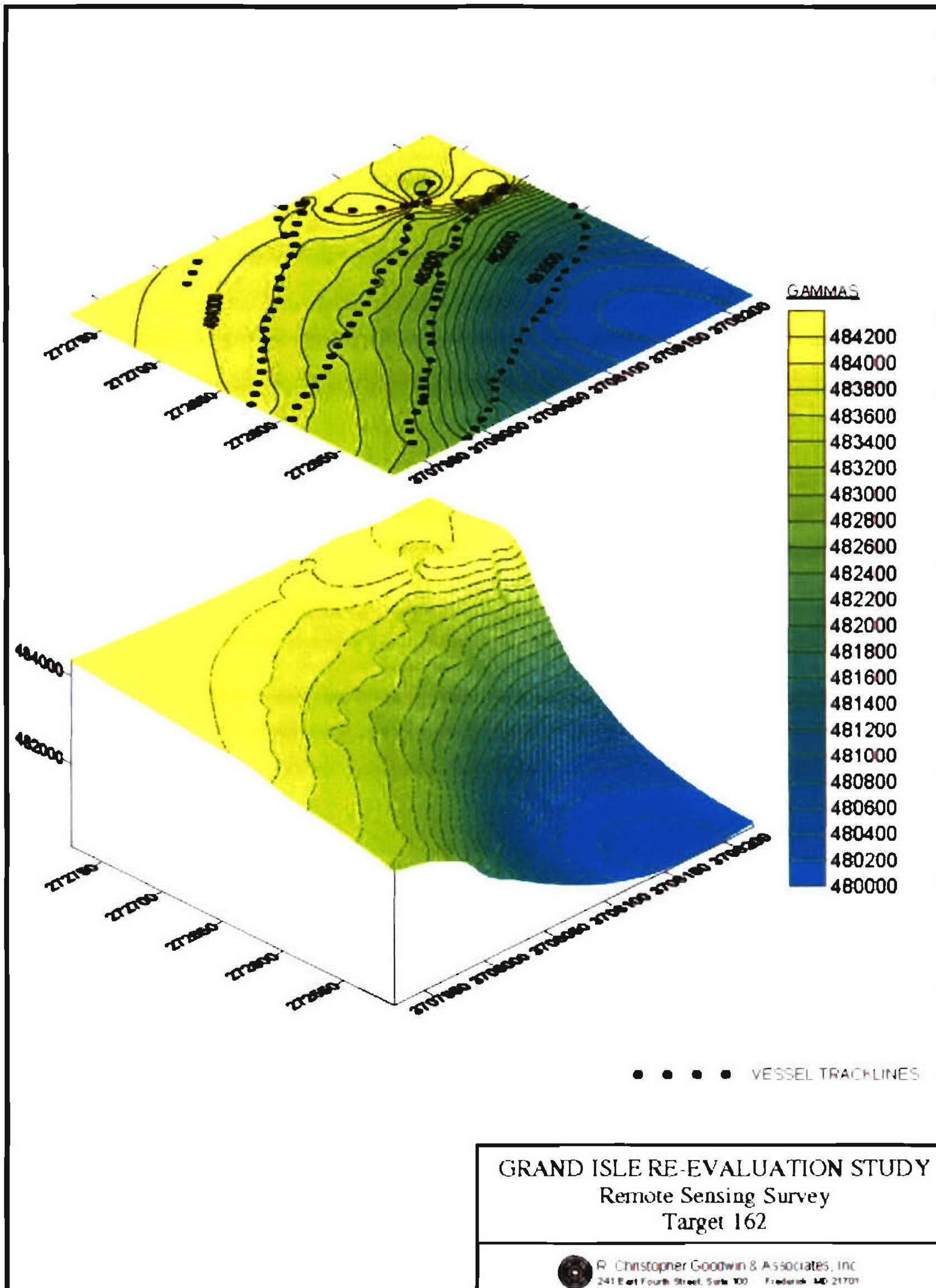

Figure 92. **Magnetic contour map of Target #162.**

resource. However, the target, when viewed in the magnetic contour map, does not appear to indicate a shipwreck (Figure 93). Instead, its pattern is indicative of ferrous debris and does not warrant further investigation.

Target #173

This target has four magnetic anomalies associated with it (M775, M781, M793, and M796, Figure 52). M775, M781, and M796 are dipolar in nature and have high magnetic perturbations of 286, 580, and 306 gammas respectively. M775 has a duration of 24.1 seconds, M781 has a medium duration of 16 seconds, and M796 has a short duration of 10 seconds. M793 is a multicomponent with a high amplitude of 1490 gammas and a long duration of 120 seconds. Spatial adjacency is seen on four lines. The medium to long durations, coupled with the multicomponent signature and spatial adjacency are characteristics typical of cultural resources. However, target #173, when seen in the magnetic contour map, appears to be a field of debris (Figure 94). No further investigation is required.

Target #174

Target #174 consists of two magnetic perturbations (M760 and M776) (Figure 52). M760 is a dipole with a high amplitude of 332 gammas and short duration of 8 seconds. M776 is a multicomponent with a medium duration of 22 seconds and a high gamma value of 4,102. Due to the high amplitudes, magnetic signature of M776, and spatial adjacency seen on two lines, this target was investigated because of its potential to represent a significant cultural resource.

Figure 95 shows the magnetic contours of the anomalies. Two point sources can be seen clearly. This type of resource does not represent a shipwreck. The target does not appear to meet the criteria for evaluation of the National Register of Historic Places (36 CFR 60.4); therefore, no further work is recommended.

Target #177

This target comprises magnetic anomalies M897, M899, M900, M901, M902, M903, M904, M905, M906, M907, M908, M913, M914, M923, M927, and M934 (Figure 96). All of the magnetic anomalies have a multicomponent signature with the exception of M914, which is a dipole. All have high amplitudes ranging from 2,741.3 to 7,337.0 gammas. M914 has a short duration of 10 seconds while the rest have long durations ranging from 35 to 302 seconds. The magnetic contour plot clearly shows a linear feature (Figure 97). When the data were geocoded and plotted into GIS, the linear feature falls directly on a BP pipeline that runs through the area. This target therefore does not represent a significant cultural resource and as such, requires no further investigation.

Target #178

Eleven magnetic anomalies compose Target #179 (M925, M936, M937, M941, M943, M951, M955, M957, M963, M964, and M965, Figure 96). Six of the anomalies have a dipolar signature (M941, M951, M955, M957, M963, and M965). M925, M936, and M937 are multicomponent in nature and M943 and M964 are positive monopoles. Ten of the anomalies have amplitudes of less than 100 gammas (M925, M936, M937, M941, M943, M951, M957, M963, M964, and M965). M955 has a high amplitude of 160 gammas. All of the anomalies have short durations of less than 10 seconds with the exception of M925, M937, and M941, which have durations of 13.1, 11.0 and 46.7 seconds respectively. The magnetic contour map shows an area with scattered debris along a north-south axis (Figure 98). This target follows approximately the route of a 14" plastic waterline in the project area. Random ferrous material resulting from the fishing industry could cause this field of magnetic perturbations. It is also possible that this field is a result of ferrous material left over from trenching or dredging the waterline. This target is not indicative of a significant cultural resource and does not require further investigation.

Target #179

This target has seven magnetic anomalies associated with it (M981, M985, M992, M996, M1003, M1004, and M1005, Figure 96). M981, M985, M992, and M996 are multicomponents; M1003 is a negative monopole; and, M1004, and M1005 are dipoles. All have high gammas values ranging from 351.5 to 6919.9 gammas, with the exception of M996, which has a gamma value of 92.4. M1003, M1004, and M1005 have

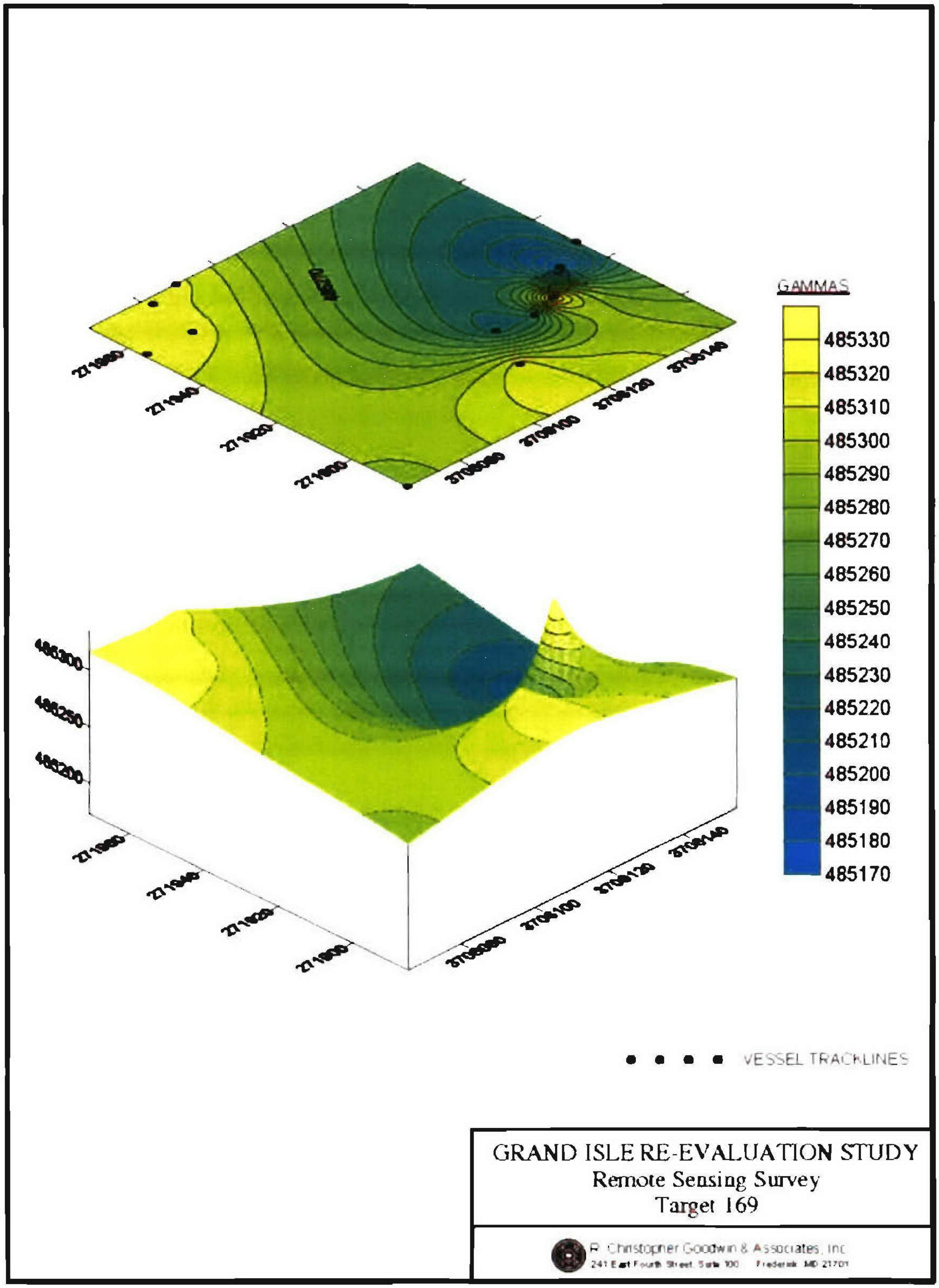

Figure 93. **Magnetic contour map of Target #169.**

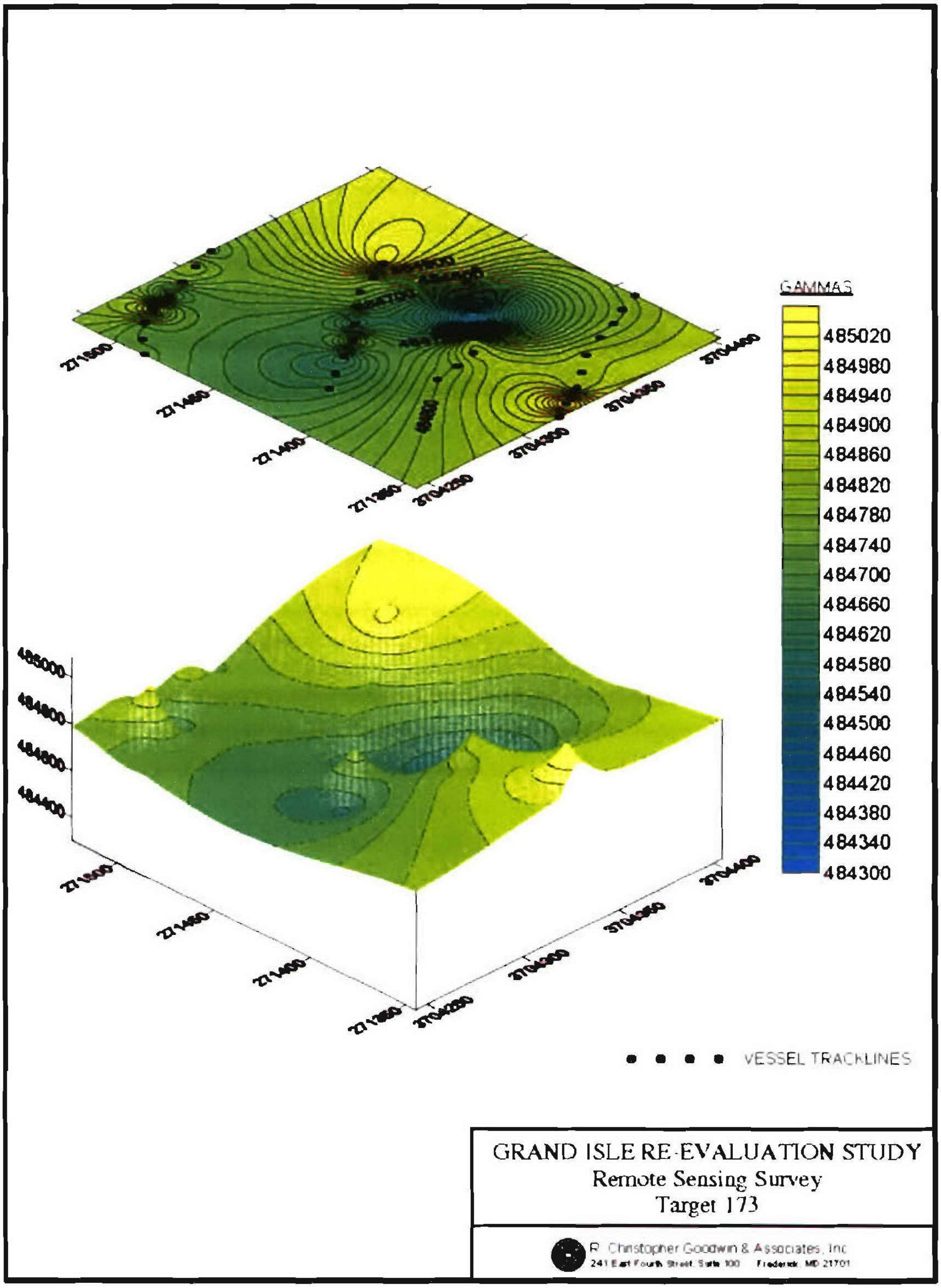

Figure 94. **Magnetic contour map of Target #173.**

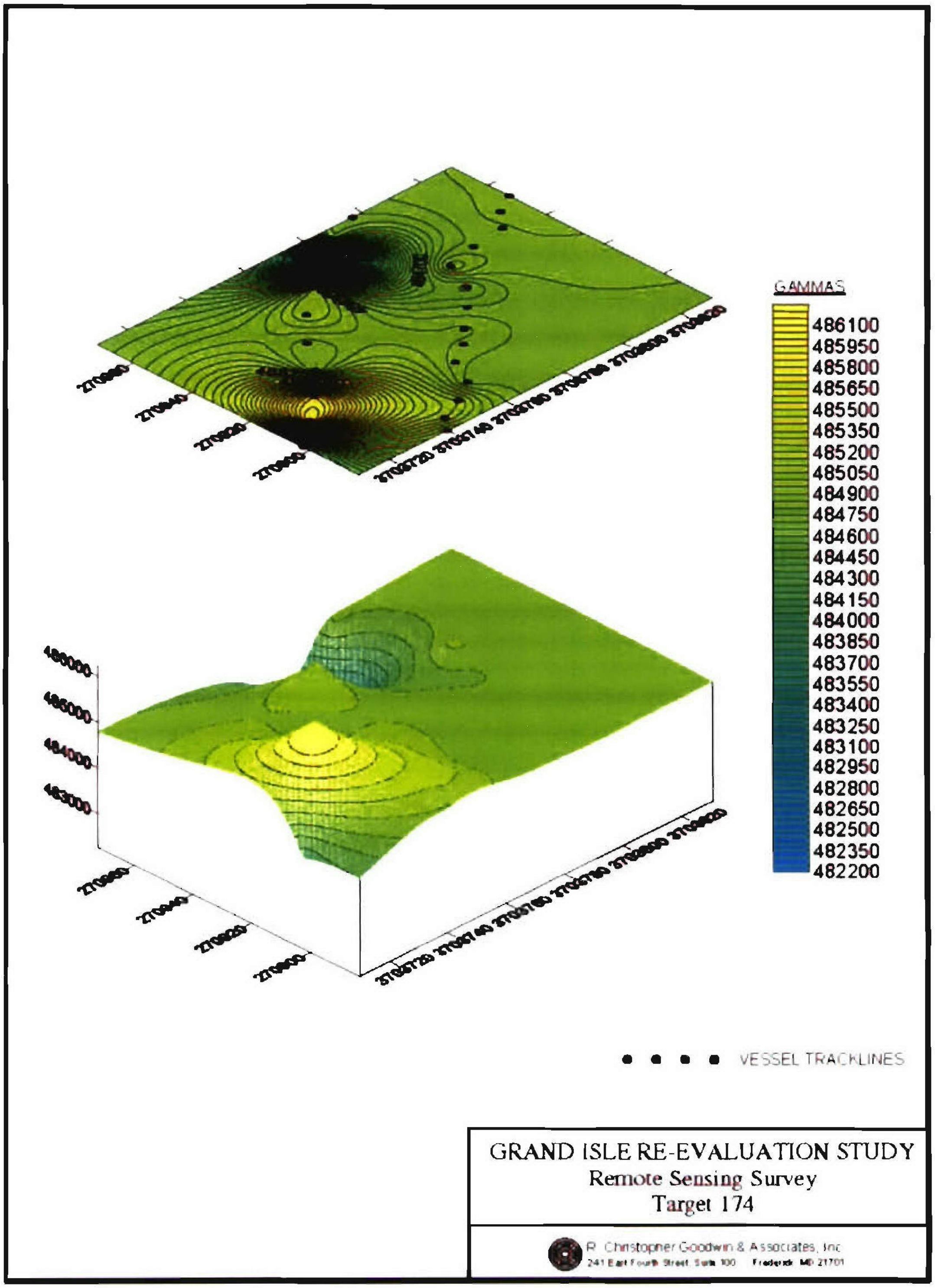

Figure 95. **Magnetic contour map of Target #174.**

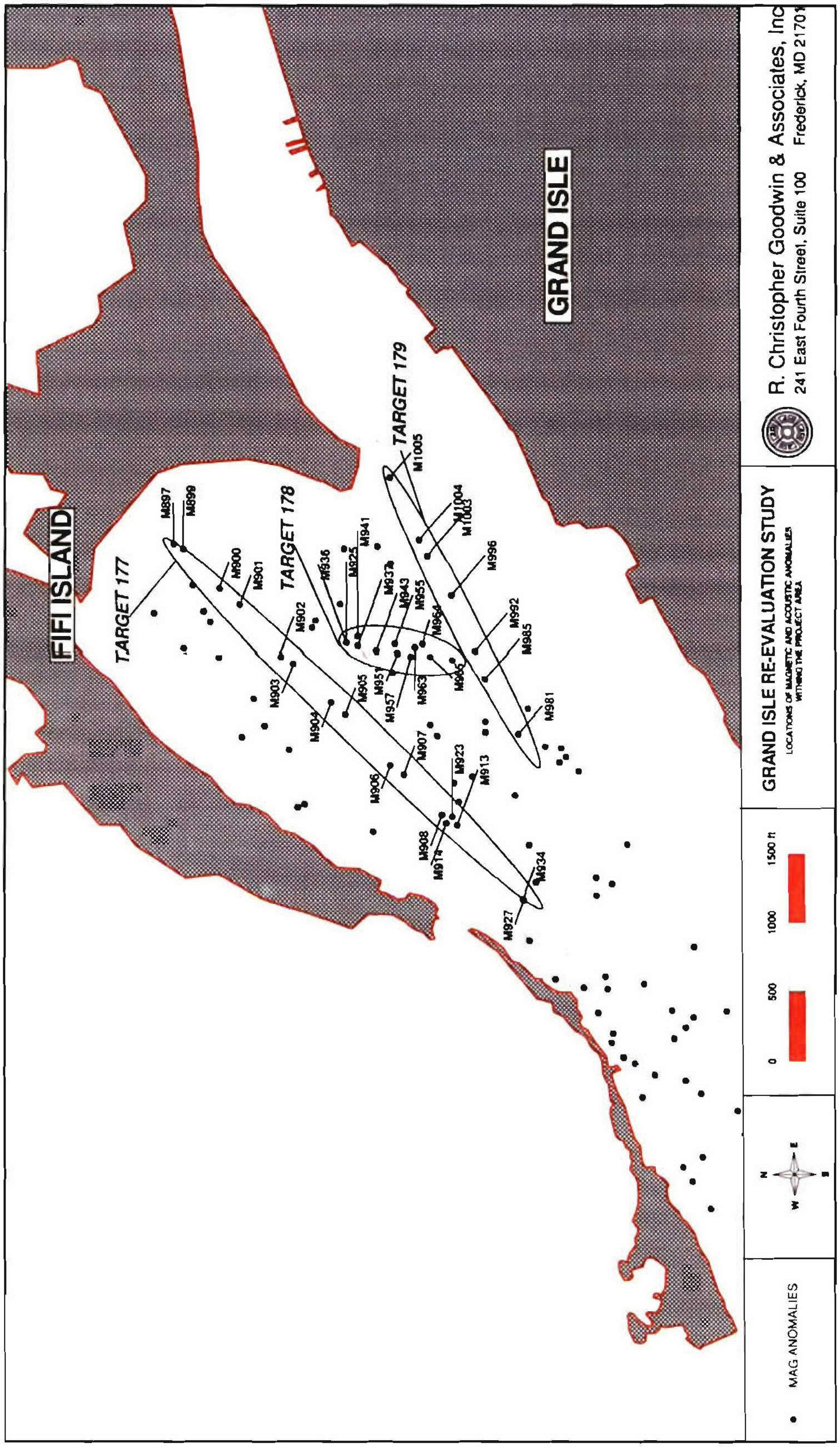

Figure 96. Map showing location of Targets #177, #178, and #179.

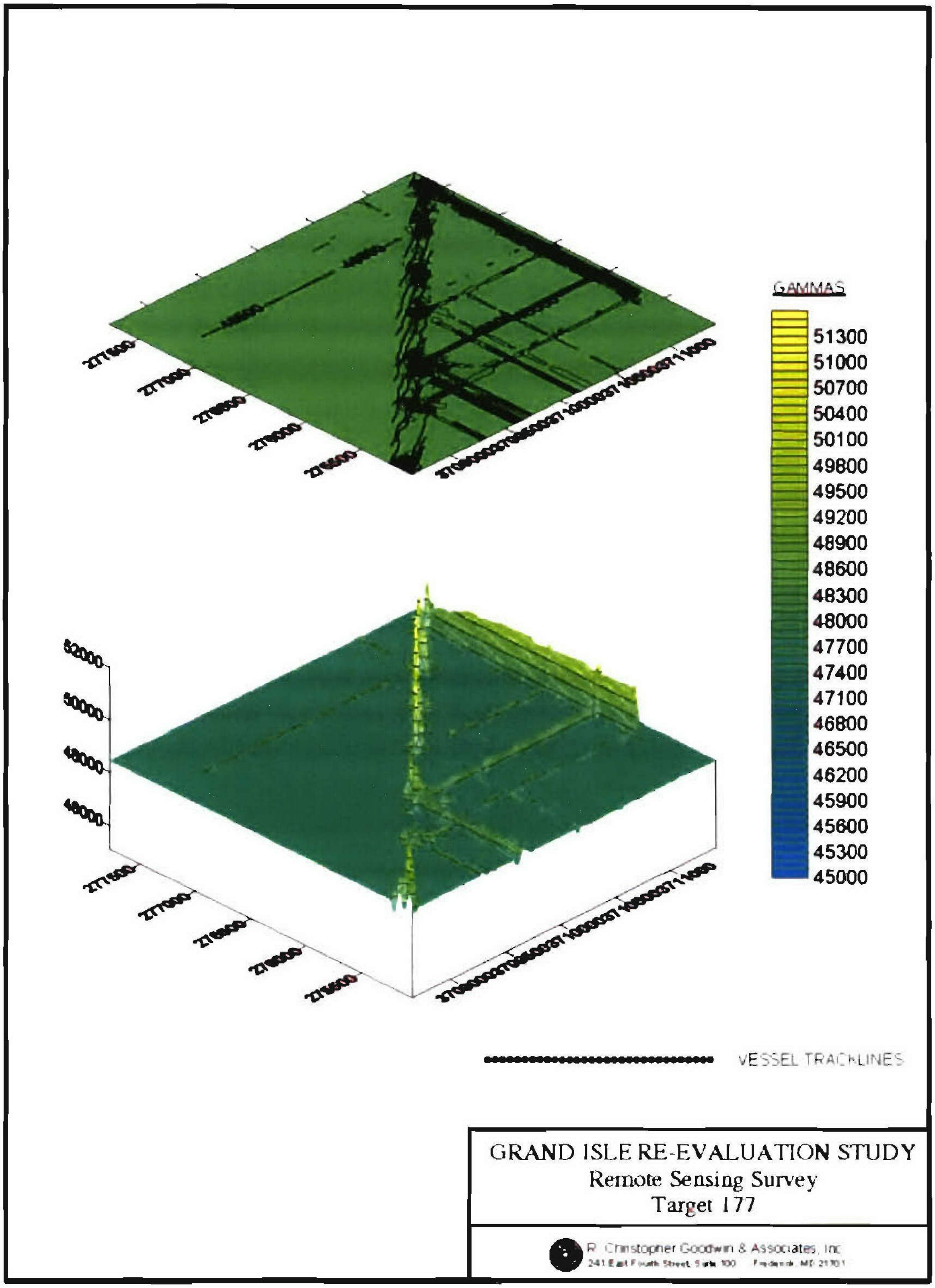

Figure 97. Magnetic contour map of Target #177.

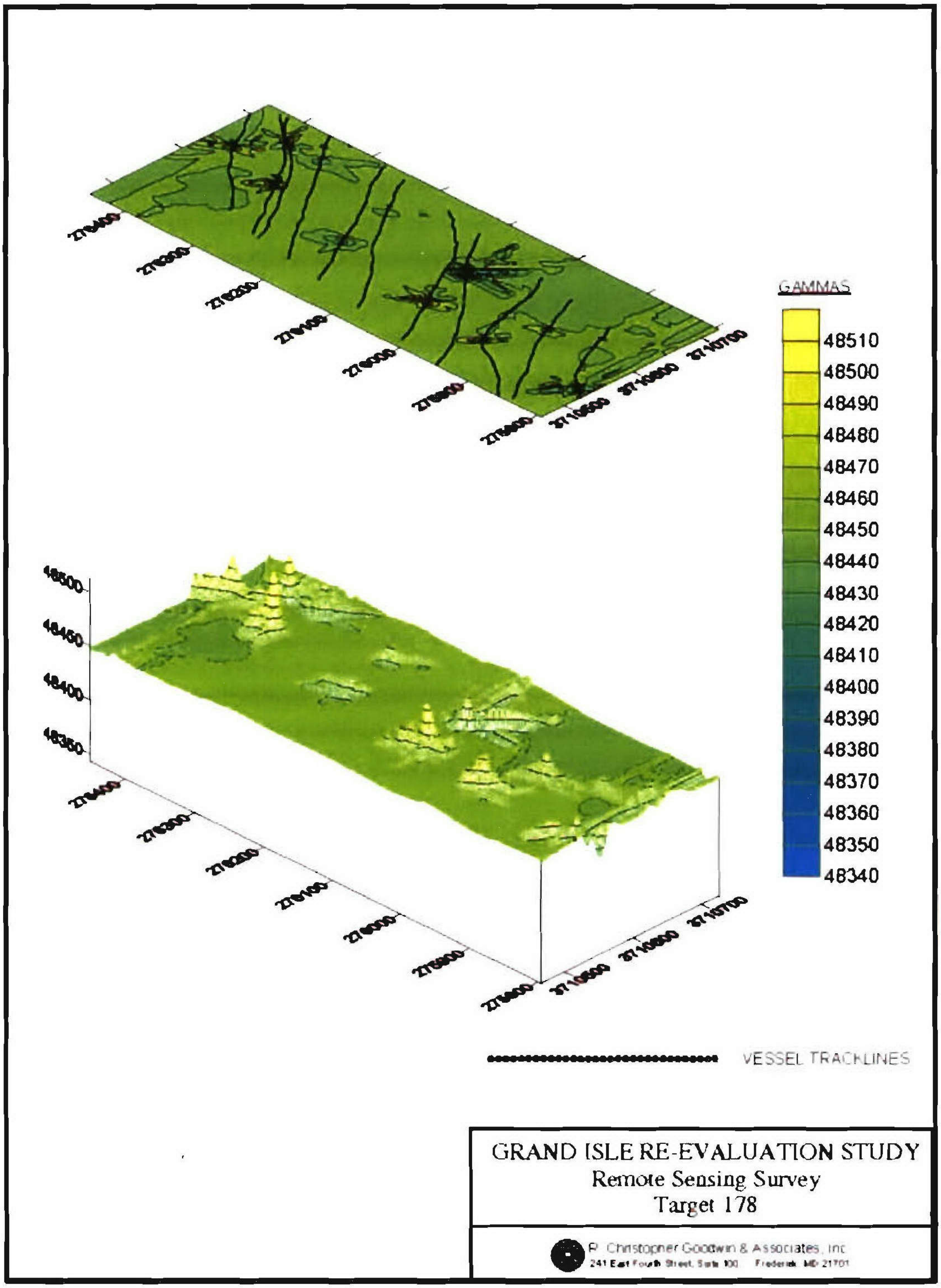

Figure 98. Magnetic contour map of Target #178.

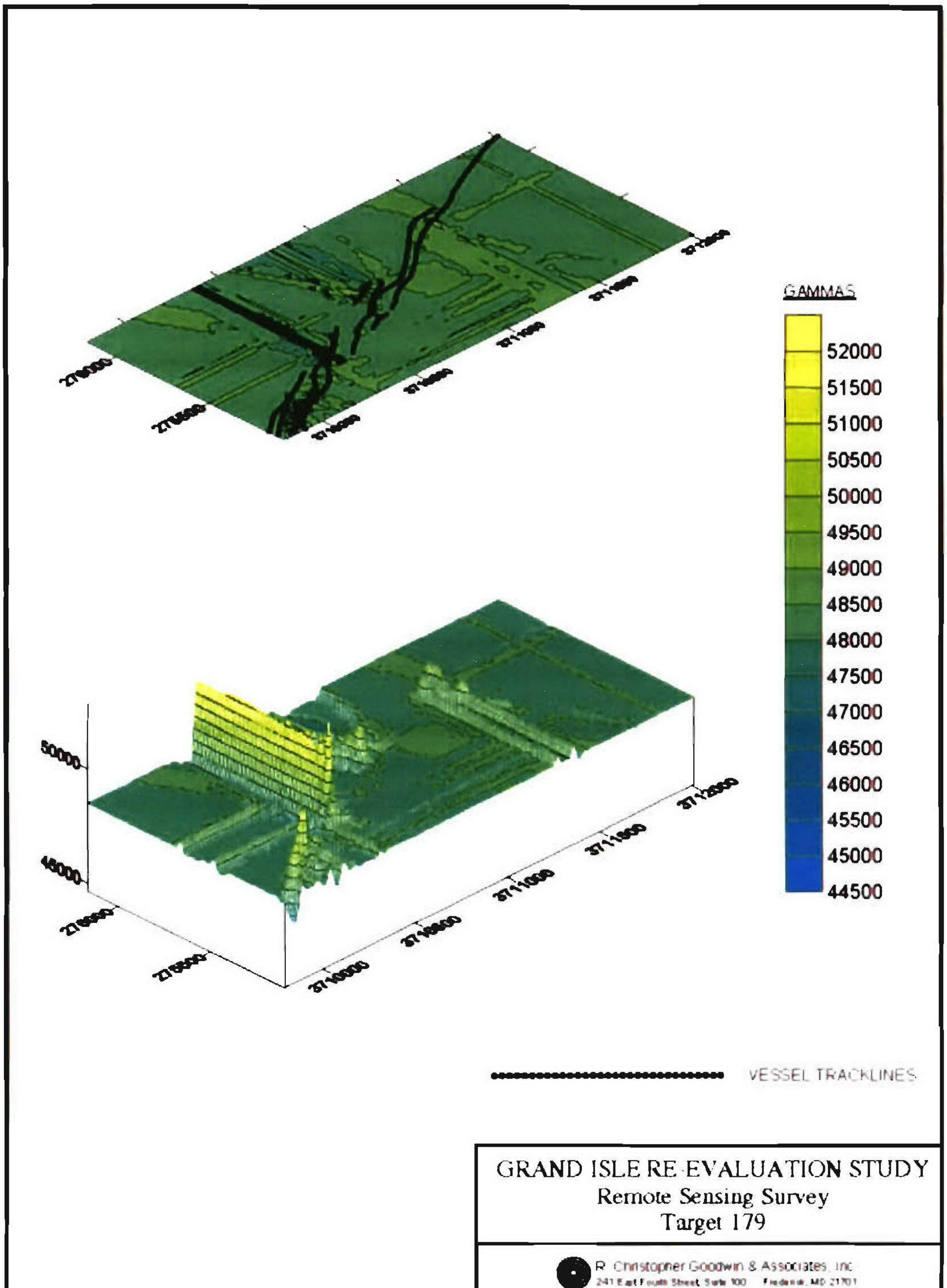

Figure 99. Magnetic contour map of Target #179.

short to medium durations (5 to 22 seconds) and the rest have long durations (139 to 738 seconds). The magnetic contour plot shows a linear feature (Figure 99); this feature parallels the Chevron pipeline present in the project area. The anomalies are not indicative of a significant discrete cultural resource and are more characteristic of a large, linear, ferrous mass such as a pipeline. This target does not warrant further investigation.

Chapter VIII

Summary and Management Recommendations

This report presents the results of the Phase I Marine Remote Sensing Cultural Resources Survey of the Grand Isle Re-evaluation Study, and the dredging of Bayou Rigaud and Marsh Creation Areas in Jefferson Parish, Louisiana. R. Christopher Goodwin & Associates, Inc. conducted these investigations on behalf of the U.S. Army Corps of Engineers, New Orleans District (USACE-NOD) (Contract No. DACW29-02-D-0006; Delivery Order No. 0004) on September 19-22, November 7-8, 2002, and May 12-17, 2003. The study was undertaken to assist the USACE-NOD in satisfying its responsibilities under Section 106 of the National Historic Preservation Act of 1966, as amended. The primary objective of this study was to locate any historic shipwrecks or other potentially significant cultural resources in the project area.

The survey area for this project consisted of six survey blocks. Block One, Bayou Rigaud, is a proposed dredging area measuring 22,176 ft by 200 ft wide (6,760 by 61m, 41.2 ha [101.8 ac]). Block Two, Grand Isle, measures 13,728 ft by 500 ft (4,180 by 152 m, 63.8 ha [157.6 ac]). Block Three comprises Fifi One, Fifi Two, and Fifi Clip; Block Three is located behind Fifi Island and encompasses a proposed breakwater alignment for the Grand Isle and Vicinity Hurricane Protection Project and a proposed disposal area (Fifi Clip). It measures 12,672 by 500 ft (3,860 by 152 m, 58.9 ha[145.5 ac]) and 3,000 by 880 ft (914 by 268m, 24.5 ha [60.6 ac]) for Fifi Clip. Block Four, south of Fifi Island, is approximately 3,917 by 572 ft (1,194 by 174m, 20.8 ha [51.4 ac]). Finally Block Five, also south and adjacent to Fifi Island, is approximately by 2,000 by 663 ft (610 by 202 m, 12.3 ha [30.4 ac]). A sixth area was added as a modification to the original scope of work and is located north of Bayou Rigaud and southwest of Fifi Island. It consisted of a survey block approximately 6,600 by 1,300 ft (1,022 by 396 m, 79.7 ha [197 ac]). In total, approximately 130 linear mi (209 km, 301.2 ha [744.3 ac]) of seabed were surveyed.

The survey produced 1,005 magnetic and 59 acoustic anomalies. These anomalies were clustered together into 179 targets. Of these target clusters, 34 had the potential of being a submerged cultural resource and as such, were assessed, utilizing the National Register criteria for evaluation (36 CFR 60.4 [a-d]), to provide the USACE-NOD with recommendations.

None of the 34 targets investigated exhibited characteristics consistent with shipwrecks or other significant cultural resources. It therefore does not appear that this project will impact any significant submerged cultural resources. No further investigations are warranted or recommended for the Grand Isle Re-evaluation of Bayou Rigaud and Marsh Creation project area.

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APPENDIX I

RESUMES OF KEY PERSONNEL

Jean B. Pelletier, M.A.

Nautical Archeologist/Remote Sensing Specialist

Jean B. Pelletier, M.A., graduated from the University of Maine in 1991 with a Bachelors degree in Geological Sciences, and received a Master of Arts degree in History from the University of Maine in 1998. His research interests include maritime history and nautical archaeology, steamboat technology, industrial technology, remote sensing, geophysics, scientific diving technology, and underwater photography/ videography. Mr. Pelletier has formal training in marine geophysics, marine and terrestrial remote sensing, remotely operated vehicles, underwater video and diving safety, and has conducted archeological, archival, and geophysical investigations in Alabama, Connecticut, Delaware, District of Colombia, Florida, Georgia, Illinois, Louisiana, Maine, Maryland, Massachusetts, Mississippi, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Puerto Rico, Rhode Island, South Carolina, and Virginia. As a graduate student at the University of Maine, Mr. Pelletier worked with Dr. Warren C. Riess as a research assistant on the Penobscot Expedition Phase II, conducting remote sensing and underwater documentation of the ships of the Penobscot Expedition.

Before joining Goodwin & Associates, Inc., in 1997, Mr. Pelletier served as an archeological and scientific diving consultant for several universities and public utility companies along the Atlantic seashore. In this capacity, Mr. Pelletier managed the recovery of nine cannons from the *Nottingham Galley*, an eighteenth century English merchant ship lost on the ledges of Boon Island, Maine.

Since joining Goodwin & Associates, Inc., Mr. Pelletier has been involved in numerous Phase I, II, and III archeological investigations of underwater sites. He has conducted remote sensing surveys in the Gulf of Mexico, the Chesapeake Bay, Puerto Rico, the North Atlantic seaboard, and conducted a Phase III recordation of the steamboat *Kentucky*, a confederate troop-transport lost on the Red River in 1865, near Shreveport, Louisiana. Mr. Pelletier's professional affiliations include: American Academy of Underwater Sciences, Marine Archaeology and Historical Research Institute (MAHRI), and the Society for Historical Archaeology.

KRISTEN HARLEY MEIER, B.A.

NAUTICAL ARCHEOLOGIST / DIVE SAFETY OFFICER

Kristen Harley Meier graduated from Indiana University in 1997 with a Bachelors degree in Anthropology and Spanish. Ms. Meier will be receiving a Masters of Arts degree in Archaeology from Indiana University in 2002. Her experience and education in terrestrial and nautical archeology has led to her interests in scientific diving techniques and safety, remote sensing, and maritime and Pre-Columbian Caribbean history. She has been involved with terrestrial projects in the Mid-West United States, the Dominican Republic, Puerto Rico, and Belize. She has participated in as staff and as Assistant Project Manager in nautical archeology projects in Florida, California, the Cayman Islands, and the Dominican Republic.

Before joining Goodwin & Associates, Inc. in 2001, Ms. Meier worked as a Teaching Assistant and Field School Instructor for the Underwater Science and Educational Resources program at Indiana University. While in this capacity, she helped document numerous shipwrecks in the Florida Keys, some of which were later placed on the National Register of Historic Places and became part of the Florida Keys National Marine Sanctuary Shipwreck Trail. The majority of Ms. Meier's work in Central America has entailed the excavation of Maya sites in Belize. In the Caribbean, she worked as a liaison between Indiana University and the Dominican Republic Government while working at their national museum, Faro a Colon. She also worked doing systematic exploration and excavation of terrestrial and submerged caves in the East National Park.

Since joining Goodwin & Associates, Inc., Ms. Meier has conducted Phase I marine remote sensing surveys in Maryland and Florida and Phase II underwater surveys dealing with prehistoric land surfaces in Florida. She also has participated in deep-water offshore surveys in the North Atlantic. She is acting Diving Safety Officer for the company. Her professional affiliations include the Society of American Archaeology, and the American Academy of Underwater Sciences.

MS. KATY COYLE, M.A., A.B.D.

SENIOR HISTORIAN

Ms. Katy Coyle, M.A. A.B.D., Senior Historian, received her Bachelor of Arts degree in Anthropology from Bryn Mawr College, in Bryn Mawr, Pennsylvania in 1989. She completed her Master's degree in History in 1998 at Tulane University in New Orleans, Louisiana. Her master's thesis examines the development of southern women's colleges. Presently, she is completing her doctoral dissertation in History at Tulane University, studying with Professor Sylvia Frey. Ms. Coyle's field of study is American History, with particular specialization in Southern and Louisiana history. Her dissertation on the Storyville red-light district of turn-of-the-century New Orleans is expected to be completed in the year 2002.

She was a field tech and crew chief for a cultural resource management firm in southeastern Pennsylvania. She is currently a consultant on several documentaries in production, and has received numerous grants for her research on sexual culture. Her primary publication can be found in the edited collection *Carryin' On,* a collection of pieces on the history of southern sexuality. Since joining R. Christopher Goodwin & Associates, Inc., in 2000, Ms. Coyle has taken charge of our history department in the New Orleans Office and has completed historical research projects for a diversity of both private and public sector clients, including, among others, El Paso Energy, Tennessee Gas Pipeline Company, Southern Natural Gas Company and Florida Gas Transmission.

Dr. Gregg Brooks

Consulting Geomorphologist

Dr. Gregg Brooks, Consulting Geomorphologist, is a Professor of Marine Science with Eckerd College in St. Petersburg, Florida. He received his Bachelor's Degree in Geology from Youngstown State University in 1977. He received his Master's and Ph.D. Degrees in Marine Science, specializing in Marine Geology, from the University of South Florida in 1981 and 1986 respectively.

Gregg's current research interests include the study of sediments and sedimentary processes, and the geologic development of open marine and coastal systems. He has worked on a variety of projects ranging from west Florida to south Australia, and is author of over 125 publications. He has acquired over $600,000 in research grants over the past two years and is currently a principal investigator with the USGS-funded Tampa Bay Integrated Science Study.

In recent years Gregg has been involved with numerous projects in and around Florida and throughout the Caribbean. Gregg has served as Principal Investigator on most of these projects which include, a 5-year study of the development of the west Florida coast and inner shelf, a variety of projects dealing with Tampa Bay and Charlotte Harbor, coauthor of a geology field guide to Roatan, Honduras, an ongoing (currently in the 3rd year) study of the sedimentary development and the record of anthropogenic impacts in the US Virgin Islands. Gregg recently served as senior editor of a Special Publication on the west-central Florida coast and inner shelf, which was published in the journal *Marine Geology* during the Fall of 2003.

Over the past five years Gregg has worked closely with R. Christopher Goodwin & Associates, Inc. on a number of projects around Florida and the Gulf of Mexico. These projects involve sediment analyses and/or report writing and have focused on such areas as west Texas, the Mississippi River delta region, Santa Rosa County in the Florida Panhandle, and Tampa Bay, Venice and Jacksonville, all in peninsular Florida.

Appendix II

Inventory of Identified Acoustic Anomalies, Magnetic Anomalies, and Target Clusters

Table 1. Inventory of Magnetic Anomalies in Survey Area.

Inventory of Magnetic Anomalies in Survey Area									
Anom. Number	**Region**	**Block**	**Line**	**Signature**	**Amplitude**	**Duration**	**Easting (in State Plane)**	**Northing (in State Plane)**	**Notes**
M1	BR	1	1	D	132.0	34.0	3720508.0	283659.1	Unknown
M2	BR	1	4	D	322.0	22.0	3720091.4	283520.8	Unknown
M3	BR	1	1	D	222.0	17.5	3719982.4	283244.5	Unknown
M4	BR	1	3	MC	624.0	85.7	3719670.7	283105.8	Probable navigation can
M5	BR	1	1	PM	190.0	18.0	3719611.0	282917.4	Unknown
M6	BR	1	2	D	438.0	14.0	3719313.3	282731.6	Unknown
M7	BR	1	4	PM	410.0	8.0	3719078.7	282696.0	Unknown
M8	BR	1	4	D	738.0	16.0	3718954.1	282571.7	Unknown
M9	BR	1	1	MC	1150.0	95.8	3718750.2	282077.0	Possible buoy ground tackle
M10	BR	1	2	PM	914.0	22.0	3718676.7	282190.8	Unknown
M11	BR	1	5	D	484.0	22.0	3718644.3	282347.8	Debris
M12	BR	1	4	PM	602.0	42.1	3718611.7	282329.5	Debris
M13	BR	1	2	D	3008.0	34.0	3718279.7	281576.8	Possible Day Shape or debris
M14	BR	1	5	D	582.0	18.0	3718158.4	281725.5	Unknown
M15	BR	1	1	D	1368.0	26.0	3718082.8	281038.2	Navigation can G5
M16	BR	1	1	D	2832.0	28.0	3717945.8	280457.5	Unknown
M17	BR	1	3	PM	804.0	46.1	3717919.2	280617.1	Monopole and start of negative trend
M18	BR	1	5	PM	824.0	18.0	3717890.3	280997.7	Unknown
M19	BR	1	5	MC	2812.0	82.1	3717849.5	280553.5	Possibly associated with wreck on shore
M20	BR	1	4	NM	500.0	12.0	3717843.7	280486.7	Unknown
M21	BR	1	1	NM	2298.0	80.1	3717813.7	279951.7	Unknown
M22	BR	1	4	NM	2700.0	16.0	3717757.2	280310.8	Unknown
M23	BR	2	3	PM	536.0	14.0	3717723.4	279921.8	Debris
M24	BR	1	2	D	836.0	18.0	3717713.0	279908.1	Debris
M25	BR	1	4	pos trend	1804.0	62.1	3717648.4	280064.7	Possibly associated with wreck on shore
M26	BR	1	4	D	2002.0	50.1	3717648.4	280064.7	Pipeline
M27	BR	2	1	NM	33250.0	143.7	3717588.9	279474.6	Start of line near docks, bulkheads
M28	BR	1	2	NM	6118.0	44.1	3717560.4	279536.2	Bulkheads
M29	BR	2	2	NM	13760.0	104.1	3717559.0	279461.0	Bulkheads
M30	BR	2	3	PM	3586.0	92.1	3717464.5	279474.8	m+ and neg trend
M31	BR	2	5	neg trend	1716.0	35.5	3717368.7	279432.9	Trend associated with passing vessel
M32	BR	2	5	PM	258.0	6.0	3717234.5	279243.6	Debris
M33	BR	2	4	NM	1324.0	10.0	3717222.9	279201.9	Debris
M34	BR	2	5	D	6130.0	12.0	3717215.1	279257.0	Debris
M35	BR	2	5	D	16426.0	18.0	3717154.2	279146.0	Unknown
M36	BR	2	1	MC	60792.0	206.3	3716835.1	278396.4	Possibly associated with Exxon Station on shore nearby
M37	BR	2	2	MC	10592.0	208.3	3716832.1	278497.1	Possibly associated with Exxon Station on shore nearby
M38	BR	2	5	D	4982.0	36.1	3716601.6	278432.8	Debris
M39	BR	2	4	D	9212.0	42.1	3716597.8	278440.6	Debris
M40	BR	2	4	D	6682.0	25.5	3716422.7	278204.0	Unknown
M41	BR	2	4	D	1488.0	10.0	3716133.7	277894.0	Unknown
M42	BR	2	5	D	12164.0	20.0	3716024.3	277866.6	Unknown
M43	BR	2	5	D	10792.0	14.0	3715938.5	277821.1	Unknown
M44	BR	2	1	D	8928.0	60.1	3715734.2	277330.9	Possible pipeline
M45	BR	2	2	MC	7414.0	98.1	3715674.9	277417.0	Possible pipeline
M46	BR	2	3	D	17962.0	26.0	3715664.2	277405.3	Possible pipeline
M47	BR	2	4	MC	13824.0	52.1	3715611.8	277483.4	Possible pipeline
M48	BR	2	5	D	14068.0	40.0	3715565.8	277477.7	Possible pipeline
M49	BR	2	5	PM	2616.0	16.0	3715248.8	277325.6	Debris
M50	BR	2	2	MC	21876.0	129.8	3714905.6	277139.2	Debris
M51	BR	2	4	NM	11940.0	26.0	3714792.9	277195.9	Unknown
M52	BR	2	1	MC	16448.0	88.1	3714756.7	277021.9	Debris or modern john boat
M53	BR	2	3	D	12422.0	18.0	3714720.2	277114.3	Debris
M54	BR	2	4	NM	8574.0	18.0	3714686.2	277160.4	Debris

Inventory of Magnetic Anomalies in Survey Area									
Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M55	BR	2	4	PM	1386.0	12.0	3714578.5	277124.4	Unknown
M56	BR	2	4	D	2132.0	12.0	3714485.6	277096.4	Unknown
M57	BR	2	3	NM	333352.0	16.0	3714113.0	276882.8	Possibly associated with passing vessel
M58	BR	2	4	PM	5254.0	26.0	3713995.2	276938.5	Debris
M59	BR	2	5	PM	2964.0	30.0	3713971.2	276976.5	Debris
M60	BR	2	1	MC	3294.0	84.1	3713648.5	276486.7	Debris
M61	BR	3	1	PM	2776.0	12.0	3713423.4	276378.4	Debris
M62	BR	2	1	PM	2794.0	24.0	3713418.9	276378.5	Debris
M63	BR	2	4	PM	1500.0	12.0	3713313.5	276570.6	Unknown
M64	BR	3	1	PM	410.0	10.0	3713252.6	276290.4	Debris
M65	BR	3	3	D	968.0	15.5	3713202.1	276350.4	Debris
M66	BR	2	2	MC	10208.0	77.6	3713188.6	276316.6	Debris
M67	BR	2	4	D	8418.0	28.0	3713132.2	276377.0	Debris
M68	BR	3	5	MC	1124.0	36.0	3713094.5	276492.0	Debris
M69	BR	3	4	PM	238.0	12.0	3713073.6	276337.7	Debris
M70	BR	3	5	D	384.0	14.0	3712900.5	276267.0	Unknown
M71	BR	3	4	MC	120.0	10.0	3712890.4	276200.5	Debris
M72	BR	3	4	NM	2144.0	30.0	3712746.3	276135.1	Debris
M73	BR	3	1	neg trend	1644.0	116.2	3712737.2	275870.1	Unknown
M74	BR	3	5	D	1102.0	14.0	3712732.8	276140.6	Debris
M75	BR	3	5	PM	558.0	10.0	3712545.9	276068.6	Unknown
M76	BR	3	4	PM	332.0	14.0	3712469.1	275931.4	Unknown
M77	BR	3	4	PM	1062.0	22.0	3712388.4	275893.1	Associated with red channel marker "12"
M78	BR	3	5	D	5188.0	20.0	3712380.5	275903.7	Associated with red channel marker "12"
M79	BR	3	2	MC	5198.0	40.5	3712379.3	275736.4	Associated with shipyard and dock
M80	BR	3	4	PM	316.0	12.0	3712300.4	275816.4	Unknown
M81	BR	3	1	NM	2818.0	14.0	3712043.6	275420.1	Unknown
M82	BR	3	1	NM	1478.0	10.0	3711988.3	275376.6	Unknown
M83	BR	3	4	D	710.0	30.0	3711934.6	275551.7	Debris
M84	BR	3	5	D	2040.0	18.0	3711889.5	275552.3	Debris
M85	BR	3	1	D	69574.0	42.1	3711858.9	275307.9	Possible pipeline
M86	BR	3	2	D	2896.0	28.0	3711811.4	275327.0	Possible pipeline
M87	BR	3	3	MC	2816.0	37.6	3711803.5	275398.3	Possible pipeline
M88	BR	3	4	MC	2712.0	56.1	3711671.0	275358.5	Debris
M89	BR	3	5	D	4884.0	34.1	3711657.0	275401.7	Debris
M90	BR	3	5	NM	1342.0	10.0	3711408.2	275229.2	Unknown
M91	BR	3	1	NM	6222.0	50.1	3711373.1	274977.5	Associated with construction and bulkhead
M92	BR	3	4	NM	426.0	26.0	3711245.4	275060.5	Debris
M93	BR	3	5	D	4806.0	22.0	3711235.6	275094.9	Debris
M94	BR	3	2	D	8488.0	49.1	3711115.7	274819.9	Unknown
M95	BR	3	5	pos trend	328.0	158.2	3710900.2	274833.7	Positive trend associated with pipeline crossing
M96	BR	3	3	MC	1398.0	176.3	3710834.2	274654.6	Positive trend and m+ associated with pipeline crosing
M97	BR	3	4	pos trend	438.0	193.8	3710825.1	274741.9	Positive trend associated with pipeline crossing
M98	BR	3	2	D	690.0	18.0	3710611.3	274457.9	Unknown
M99	BR	3	1	D	566.0	22.0	3710415.1	274183.5	Unknown
M100	BR	3	4	D	270.0	18.0	3710389.8	274376.0	Unknown
M101	BR	3	4	NM	192.0	12.0	3710158.9	274193.1	Unknown
M102	BR	3	4	PM	184.0	10.0	3710059.2	274105.0	Unknown
M103	BR	3	3	D	3330.0	14.0	3709954.1	273957.1	Unknown
M104	BR	3	5	D	798.0	18.0	3709879.1	274036.5	Unknown
M105	BR	3	1	NM	2162.0	82.1	3709866.9	273723.1	Unknown
M106	BR	3	2	NM	1066.0	20.0	3709847.2	273818.8	Unknown
M107	BR	3	5	PM	564.0	8.0	3709826.0	273967.1	Unknown
M108	BR	3	2	NM	690.0	14.0	3709737.9	273764.9	Unknown

Inventory of Magnetic Anomalies in Survey Area									
Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M109	BR	3	1	D	588.0	11.5	3709655.4	273591.1	Unknown
M110	BR	3	5	MC	180.0	16.0	3709619.1	273812.6	Debris
M111	BR	3	4	D	698.0	14.0	3709559.6	273709.7	Debris
M112	BR	3	5	D	338.0	14.0	3709503.9	273727.0	Debris
M113	BR	3	1	D	488.0	14.0	3709396.8	273409.5	Unknown
M114	BR	3	4	PM	476.0	6.0	3709282.1	273494.0	Unknown
M115	BR	3	4	PM	408.0	8.0	3709153.9	273473.1	Unknown
M116	BR	3	5	PM	296.0	9.5	3708990.7	273409.8	Unknown
M117	BR	3	1	PM	648.0	14.0	3708953.7	273123.9	Unknown
M118	BR	3	3	D	814.0	5.5	3708919.3	273236.2	Debris
M119	BR	3	4	PM	246.0	14.0	3708896.6	273244.0	Debris
M120	BR	3	5	PM	1106.0	10.0	3708851.7	273270.8	Debris
M121	BR	3	4	PM	94.0	8.0	3708805.6	273204.4	Unknown
M122	BR	3	4	D	362.0	20.0	3708708.3	273145.0	Unknown
M123	BR	3	1	D	1360.0	90.1	3708697.7	272923.1	Unknown
M124	BR	3	4	PM	192.0	10.0	3708634.3	273122.6	Debris
M125	BR	3	5	PM	530.0	8.0	3708632.3	273141.2	Debris
M126	BR	3	5	PM	1196.0	12.0	3708538.6	273096.3	Unknown
M127	BR	3	5	D	416.0	14.0	3708273.8	272931.9	Unknown
M128	BR	3	2	PM	958.0	18.0	3708263.4	272738.7	Unknown
M129	GI	4	7	D	196.0	16.0	3707568.5	272277.4	Unknown
M130	GI	4	9	NM	2750.0	14.0	3707435.1	272139.8	Debris
M131	GI	4	6	PM	394.0	4.0	3707413.1	272307.2	Unknown
M132	GI	4	8	D	350.0	16.0	3707411.1	272209.3	Unknown
M133	GI	4	10	D	2422.0	14.0	3707411.0	272101.0	Debris
M134	GI	4	7	D	202.0	16.0	3707372.4	272260.6	Unknown
M135	GI	4	1	D	62.0	14.0	3707344.5	272477.0	Debris
M136	GI	4	2	NM	2126.0	6.0	3707288.2	272505.4	Debris
M137	GI	4	1	NM	1182.0	10.0	3707278.5	272519.0	Debris
M138	GI	4	8	D	200.0	12.0	3707273.8	272158.7	Unknown
M139	GI	4	9	NM	1462.0	4.0	3707245.4	272081.0	Debris
M140	GI	4	10	PM	2436.0	10.0	3707225.4	272050.5	Debris
M141	GI	4	3	NM	10668.0	6.0	3707212.5	272402.1	Debris
M142	GI	4	4	PM	1078.0	16.0	3707210.9	272393.4	Debris
M143	GI	4	1	PM	38.0	10.0	3707152.6	272464.4	Unknown
M144	GI	4	8	D	296.0	14.0	3707141.1	272167.7	Unknown
M145	GI	4	3	PM	258.0	6.0	3707132.5	272347.4	Unknown
M146	GI	4	5	D	80.0	16.0	3707119.6	272270.9	Debris
M147	GI	4	6	D	548.0	22.0	3707090.8	272253.8	Debris
M148	GI	4	7	D	902.0	20.0	3707083.5	272165.6	Unknown
M149	GI	3	7	D	90.0	12.0	3707059.7	272077.4	Unknown
M150	GI	4	7	D	112.0	10.0	3706996.0	272163.7	Unknown
M151	GI	4	10	PM	594.0	6.0	3706980.7	271982.1	Unknown
M152	GI	3	1	PM	30.0	4.0	3706938.7	272336.4	Start of line near red channel marker "16"
M153	GI	4	8	PM	234.0	10.0	3706936.6	272068.4	Unknown
M154	GI	4	5	D	588.0	6.0	3706925.9	272223.5	Debris
M155	GI	3	7	D	74.0	6.0	3706901.6	272021.6	Unknown
M156	GI	4	4	D	1432.0	12.0	3706895.0	272329.2	Start of line near red channel marker "16"
M157	GI	3	3	D	160.0	16.0	3706880.5	272213.5	Debris
M158	GI	4	6	D	266.0	12.0	3706870.0	272187.1	Debris
M159	GI	4	1	D	68.0	10.0	3706853.1	272394.3	Debris
M160	GI	4	10	NM	5372.0	10.0	3706834.2	271955.7	Unknown
M161	GI	3	5	NM	54.0	8.0	3706827.4	272100.5	Unknown
M162	GI	4	2	D	322.0	12.0	3706821.0	272389.6	Debris
M163	GI	3	1	NM	1930.0	20.0	3706813.7	272346.2	Debris
M164	GI	3	7	D	128.0	8.0	3706795.8	272005.3	Unknown
M165	GI	3	3	PM	750.0	8.0	3706757.4	272192.9	Unknown
M166	GI	3	4	D	90.0	14.0	3706713.5	272119.0	Unknown
M167	GI	4	4	PM	182.0	6.0	3706693.6	272290.2	Unknown

Inventory of Magnetic Anomalies in Survey Area									
Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M168	GI	2	3	PM	34.0	4.0	3706666.2	272064.2	Debris
M169	GI	3	1	PM	214.0	4.0	3706632.3	272239.7	Daymarker and associated ferrous debris
M170	GI	2	5	PM	106.0	10.0	3706631.5	271983.6	Unknown
M171	GI	3	5	D	194.0	20.0	3706618.8	272078.8	Debris
M172	GI	3	3	D	72.0	10.0	3706600.2	272124.9	Debris
M173	GI	3	2	D	1226.0	12.0	3706597.2	272211.0	Daymarker and associated ferrous debris
M174	GI	2	3	D	54.0	8.0	3706582.3	272113.8	Debris
M175	GI	3	6	D	1374.0	36.0	3706570.9	272039.5	Unknown
M176	GI	3	2	MC	686.0	18.0	3706557.3	272241.3	Daymarker and associated ferrous debris
M177	GI	2	1	D	1242.0	6.0	3706551.0	272195.0	Daymarker and associated ferrous debris
M178	GI	2	5	D	94.0	22.0	3706517.1	271951.8	Unknown
M179	GI	3	8	D	164.0	20.0	3706511.5	271860.4	Unknown
M180	GI	2	3	D	62.0	10.0	3706488.4	272035.2	Debris
M181	GI	2	4	NM	38.0	4.0	3706466.2	271985.9	Debris
M182	GI	3	6	NM	52.0	3.0	3706453.7	271937.7	Debris
M183	GI	2	1	D	1652.0	10.0	3706451.0	272178.2	Debris
M184	GI	3	2	PM	612.0	12.0	3706447.0	272146.1	Debris
M185	GI	3	8	NM	424220.0	4.0	3706435.9	271858.5	Unknown
M186	GI	3	4	D	442.0	46.0	3706416.0	272018.0	Unknown
M187	GI	2	4	NM	22.0	4.0	3706383.1	271975.7	Unknown
M188	GI	2	5	NM	438.0	12.0	3706347.7	271890.4	Unknown
M189	GI	2	3	D	686.0	18.0	3706337.9	272044.4	Debris
M190	GI	3	2	D	656.0	20.0	3706327.8	272153.8	Debris
M191	GI	2	1	D	23690.0	32.0	3706320.8	272114.5	Debris
M192	GI	2	2	D	556.0	60.0	3706305.9	272059.3	Debris
M193	GI	2	4	D	974.0	12.0	3706260.7	271955.3	Unknown
M194	GI	2	4	D	168.0	8.0	3706136.6	271916.5	Associated with rock constructed breakwater
M195	GI	2	2	D	26.0	6.0	3706029.4	271998.3	Unknown
M196	GI	1	3	PM	722.0	12.0	3703131.4	270190.9	Unknown
M197	GI	1	1	PM	666.0	8.0	3703093.8	270414.4	Unknown
M198	GI	1	5	MC	2090.0	36.0	3703084.6	270028.4	Start of line near rock constructed breakwater
M199	GI	1	8	D	2908.0	8.0	3703049.1	270046.1	Start of line near rock constructed breakwater
M200	GI	1	1	D	68.0	12.0	3703047.1	270325.7	Unknown
M201	GI	1	9	NM	400.0	4.0	3703043.8	269883.3	Debris
M202	GI	1	7	D	378.0	24.0	3703032.3	269879.6	Debris
M203	GI	1	9	D	596.0	14.0	3703028.7	269680.7	Unknown
M204	GI	1	7	D	272.0	10.0	3703027.5	270044.8	Start of line near rock constructed breakwater
M205	GI	1	9	NM	418174.0	4.0	3703008.8	270025.1	Start of line near rock constructed breakwater
M206	GI	1	7	PM	284.0	8.0	3703007.1	270140.3	Unknown
M207	GI	1	9	D	2372.0	10.0	3702999.9	269835.7	Debris
M208	GI	1	3	NM	328.0	10.0	3702985.5	270069.5	Start of line near rock constructed breakwater
M209	GI	1	9	NM	586.0	4.0	3702940.0	269666.6	Possibly caused by survey vessel maneuvering off shallow bottom
M210	GI	1	6	PM	342.0	8.0	3702934.6	269902.9	Debris
M211	GI	1	1	D	352.0	14.0	3702930.3	270204.2	Debris
M212	GI	1	1	MC	2254.0	26.0	3702925.3	270195.1	Debris
M213	GI	1	1	D	2112.0	22.0	3702914.1	270175.7	Debris
M214	GI	1	7	PM	1418.0	10.0	3702907.1	269858.8	Debris
M215	GI	1	8	PM	346.0	6.0	3702891.8	269853.6	Debris
M216	GI	1	2	D	3194.0	10.0	3702887.0	270192.9	Debris
M217	GI	1	2	D	834.0	12.0	3702850.9	270098.0	Unknown

Inventory of Magnetic Anomalies in Survey Area									
Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M218	GI	1	1	D	862.0	24.0	3702776.4	270116.9	Debris
M219	GI	1	1	D	1896.0	16.0	3702771.5	270120.2	Debris
M220	GI	1	1	D	108.0	16.0	3702703.8	270156.5	Unknown
M221	GI	1	6	D	275310.0	26.0	3702687.4	269809.1	Debris
M222	GI	1	5	PM	272.0	8.0	3702668.2	269816.5	Debris
M223	GI	1	4	D	262.0	10.0	3702645.9	269906.5	Unknown
M224	GI	1	2	PM	1484.0	12.0	3702600.5	269988.4	Unknown
M225	GI	1	9	NM	367074.0	4.0	3702505.2	269541.6	Unknown
M226	GI	1	7	PM	438.0	0.0	3702504.5	269653.1	Micro burst
M227	GI	1	5	D	270.0	12.0	3702472.2	269736.8	Unknown
M228	GI	1	9	D	1620.0	10.0	3702343.2	269472.5	Unknown
M229	GI	1	6	D	324.0	30.0	3702298.8	269641.0	Debris
M230	GI	1	5	D	7686.0	24.0	3702298.4	269645.4	Debris
M231	GI	1	4	NM	194.0	24.0	3702255.7	269720.5	Negative trend
M232	GI	1	5	D	1892.0	18.0	3702210.0	269557.6	Debris
M233	GI	1	2	PM	578.0	12.0	3702204.5	269774.0	Unknown
M234	GI	1	6	PM	738.0	16.0	3702197.4	269559.4	Debris
M235	GI	1	9	D	1240.0	10.0	3702191.2	269361.7	Unknown
M236	GI	1	7	D	6024.0	10.0	3702131.3	269475.5	Unknown
M237	GI	1	3	PM	2570.0	8.0	3702091.7	269649.1	Unknown
M238	GI	1	8	NM	320.0	6.0	3702063.9	269409.2	Unknown
M239	GI	1	9	NM	403678.0	4.0	3702003.4	269252.2	Probable pipeline
M240	GI	1	8	D	4340.0	14.0	3701970.3	269342.5	Probable pipeline
M241	GI	1	7	NM	270.0	8.0	3701969.6	269377.8	Probable pipeline
M242	GI	1	9	D	922.0	14.0	3701943.5	269263.4	Probable pipeline
M243	GI	1	7	NM	417476.0	12.0	3701929.3	269312.1	Probable pipeline
M244	GI	1	6	D	400388.0	36.0	3701919.6	269372.3	Probable pipeline
M245	GI	1	3	D	1718.0	20.0	3701886.2	269534.3	Probable pipeline
M246	GI	1	5	NM	2084.0	24.0	3701877.0	269412.4	Probable pipeline
M247	GI	1	4	D	866.0	12.0	3701876.7	269528.6	Probable pipeline
M248	GI	1	8	D	1178.0	14.0	3701851.3	269251.4	Unknown
M249	GI	1	9	PM	122.0	6.0	3701839.9	269172.0	Unknown
M250	GI	1	1	NM	6176.0	12.0	3701831.6	269602.7	Probable pipeline
M251	GI	1	2	NM	6190.0	30.0	3701809.5	269645.5	Probable pipeline
M252	GI	1	3	D	104.0	10.0	3701789.0	269478.5	Unknown
M253	GI	1	9	NM	7534.0	10.0	3701717.2	269148.9	Debris
M254	GI	1	8	D	2444.0	10.0	3701668.5	269197.1	Debris
M255	GI	1	9	D	962.0	16.0	3701629.8	269054.6	Unknown
M256	GI	1	3	PM	200.0	10.0	3701612.2	269468.4	Unknown
M257	GI	1	5	D	774.0	14.0	3701593.9	269282.7	Unknown
M258	GI	1	7	MC	6386.0	16.0	3701583.9	269154.8	Debris
M259	GI	1	9	D	218.0	10.0	3701576.8	269032.7	Unknown
M260	GI	1	5	D	8924.0	22.0	3701563.1	269202.5	Debris
M261	GI	1	6	NM	734.0	12.0	3701557.2	269201.3	Debris
M262	GI	1	7	D	14426.0	20.0	3701534.2	269092.3	Unknown
M263	GI	1	4	D	246.0	20.0	3701532.2	269343.7	Unknown
M264	GI	1	6	D	424.0	22.0	3701491.8	269156.5	Unknown
M265	GI	1	8	NM	313302.0	10.0	3701490.6	269042.1	Possibly caused by jetty running parallel to track line near EOL
M266	GI	1	4	D	8360.0	18.0	3701441.3	269233.2	Debris
M267	GI	1	3	MC	928.0	42.0	3701440.6	269266.4	Debris
M268	GI	1	2	D	2424.0	32.0	3701388.0	269317.1	Unknown
M269	GI	1	4	D	116.0	10.0	3701326.6	269152.3	Unknown
M270	GI	1	6	PM	1160.0	9.0	3701212.7	268940.4	Unknown
M271	GI	1	1	D	724.0	10.0	3701199.2	269235.8	Unknown
M272	GI	1	7	PM	868.0	8.0	3701040.9	268746.8	Debris
M273	GI	1	6	D	110.0	10.0	3701038.1	268801.1	Debris
M274	GI	1	4	D	176.0	18.0	3700996.1	268912.3	Debris
M275	GI	1	7	NM	2558.0	10.0	3700978.9	268676.6	Unknown
M276	GI	1	3	D	150.0	14.0	3700973.9	268936.6	Debris

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M277	GI	1	9	NM	1748.0	8.0	3700628.6	268377.0	Debris
M278	GI	1	7	D	1320.0	10.0	3700611.7	268436.3	Debris
M279	GI	1	7	PM	558.0	4.0	3700588.9	268365.6	Debris
M280	GI	1	9	D	432.0	10.0	3700578.6	268317.9	Debris
M281	GI	1	8	NM	1530.0	8.0	3700505.3	268235.0	Dock or seawall
M282	GI	1	6	MC	236.0	18.0	3700504.7	268434.6	Debris
M283	GI	1	3	D	276.0	24.0	3700473.5	268620.9	Debris
M284	GI	1	4	PM	9000.0	10.0	3700453.8	268527.3	Debris
M285	GI	1	6	D	54.0	10.0	3700398.7	268309.9	Unknown
M286	GI	1	7	D	794.0	8.0	3700397.5	268198.0	Unknown
M287	GI	1	1	NM	776.0	22.0	3700363.6	268683.4	Debris
M288	GI	1	7	NM	1152.0	8.0	3700325.0	267954.3	Debris
M289	GI	1	7	PM	1428.0	10.0	3700308.1	268067.4	Debris
M290	GI	1	8	PM	220.0	6.0	3700304.6	267961.5	Debris
M291	GI	1	6	D	96.0	14.0	3700295.2	268086.8	Debris
M292	GI	1	5	NM	1702.0	16.0	3700246.4	268125.1	Debris
M293	GI	1	8	D	150.0	6.0	3700231.3	267789.1	Unknown
M294	GI	1	1	D	2934.0	14.0	3700216.4	268409.7	Unknown
M295	GI	1	6	PM	766.0	8.0	3700125.1	267738.6	Debris
M296	GI	1	7	PM	508.0	8.0	3700106.7	267738.2	Debris
M297	GI	1	9	NM	1130.0	6.0	3700034.1	267406.1	Unknown
M298	GI	1	9	PM	232.0	10.0	3699872.2	267149.1	Debris
M299	GI	1	3	MC	126.0	14.0	3699871.6	267673.0	Debris
M300	GI	1	6	D	58.0	12.0	3699845.1	267388.1	Unknown
M301	GI	1	4	NM	320.0	8.0	3699839.7	267604.5	Unknown
M302	GI	1	4	PM	5978.0	8.0	3699820.8	267528.3	Debris
M303	GI	1	8	D	536.0	20.0	3699811.5	267180.4	Debris
M304	GI	1	7	D	12056.0	30.0	3699768.8	267181.9	Debris
M305	GI	1	3	MC	658.0	46.0	3699759.7	267530.9	Debris
M306	GI	1	2	MC	7746.0	24.0	3699744.9	267549.7	Debris
M307	GI	1	6	D	192.0	40.0	3699743.5	267224.7	Debris
M308	GI	1	1	MC	5790.0	20.0	3699702.2	267584.8	Debris
M309	GI	1	9	NM	381008.0	8.0	3699687.6	266872.7	Unknown
M310	GI	1	4	NM	888.0	14.0	3699684.4	267344.7	Unknown
M311	GI	1	9	NM	268.0	4.0	3699651.5	266816.8	Unknown
M312	GI	1	6	D	102.0	8.0	3699611.7	266999.1	Unknown
M313	GI	1	8	D	1496.0	12.0	3699538.2	266748.7	Unknown
M314	GI	1	3	D	224.0	20.0	3699530.4	267210.5	Debris
M315	GI	1	6	D	218.0	14.0	3699524.4	266901.1	Unknown
M316	GI	1	2	NM	804.0	8.0	3699494.7	267225.3	Debris
M317	GI	1	5	D	638.0	18.0	3699464.8	266939.3	Debris
M318	GI	1	2	D	336.0	26.0	3699448.4	267147.8	Debris
M319	GI	1	4	D	908.0	24.0	3699447.5	266969.9	Debris
M320	GI	1	6	NM	774.0	14.0	3699437.3	266754.3	Unknown
M321	GI	1	7	PM	1750.0	16.0	3699433.3	266693.3	Unknown
M322	GI	1	1	MC	428308.0	38.0	3699401.2	267137.8	Debris
M323	GI	1	9	D	316.0	8.0	3699362.7	266422.7	Debris
M324	GI	1	8	PM	190.0	10.0	3699323.4	266414.7	Debris
M325	GI	1	3	D	748.0	14.0	3699294.0	266790.9	Unknown
M326	GI	1	6	NM	1130.0	14.0	3699281.8	266545.9	Unknown
M327	GI	1	8	NM	2492.0	10.0	3699264.8	266335.9	Submerged pipe charted in this area
M328	GI	1	9	NM	424362.0	8.0	3699261.4	266316.9	Submerged pipe charted in this area
M329	GI	1	3	NM	3648.0	20.0	3699236.2	266705.1	Unknown
M330	GI	1	8	D	150.0	8.0	3699231.7	266228.7	Debris
M331	GI	1	4	D	136.0	8.0	3699224.0	266607.6	Unknown
M332	GI	1	1	NM	506.0	10.0	3699189.8	266799.3	Unknown
M333	GI	1	7	NM	684.0	6.0	3699173.9	266225.2	Debris
M334	GI	1	7	NM	396.0	8.0	3699160.7	266180.0	Debris
M335	GI	1	8	D	252.0	8.0	3699136.3	266118.2	Unknown

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M336	GI	1	2	PM	1994.0	12.0	3699126.9	266633.1	Unknown
M337	GI	1	1	D	406162.0	20.0	3699125.4	266745.1	Unknown
M338	GI	1	3	D	178.0	16.0	3699112.5	266558.3	Unknown
M339	GI	1	6	D	242.0	18.0	3699102.6	266216.6	Debris
M340	GI	1	8	D	578.0	8.0	3699019.3	266066.1	Submerged pipe charted in this area
M341	GI	1	9	D	600.0	14.0	3698984.4	266006.0	Unknown
M342	GI	1	6	D	410972.0	16.0	3698969.4	266066.6	Submerged pipe charted in this area
M343	GI	1	9	NM	546.0	8.0	3698923.5	265647.1	Unknown
M344	GI	1	7	NM	524.0	10.0	3698920.3	265736.9	Debris
M345	GI	1	3	NM	982.0	12.0	3698919.1	266219.7	Submerged pipe charted in this area
M346	GI	1	6	D	472.0	16.0	3698917.4	265975.8	Unknown
M347	GI	1	8	NM	238.0	8.0	3698907.3	265712.0	Debris
M348	GI	1	2	D	414886.0	10.0	3698888.2	266261.4	Submerged pipe charted in this area
M349	GI	1	7	NM	427210.0	10.0	3698870.6	265472.4	Submerged pipe charted in this area
M350	GI	1	1	D	758.0	14.0	3698856.4	266306.3	Submerged pipe charted in this area
M351	GI	1	8	PM	88.0	8.0	3698836.9	265507.1	Submerged pipe charted in this area
M352	GI	1	4	D	248.0	10.0	3698836.8	265877.4	Unknown
M353	GI	1	9	D	670.0	10.0	3698836.6	265373.6	Debris
M354	GI	1	8	D	130.0	12.0	3698811.3	265405.3	Debris
M355	GI	1	9	D	522.0	12.0	3698807.0	265253.9	Debris
M356	GI	1	8	PM	7528.0	8.0	3698774.2	265211.6	Debris
M357	GI	1	7	D	136.0	12.0	3698760.3	265252.2	Debris
M358	GI	1	7	D	136.0	4.0	3698760.3	265252.2	Debris
M359	GI	1	2	D	9094.0	12.0	3698722.7	265950.4	Unknown
M360	GI	1	4	D	3294.0	18.0	3698711.5	265649.0	Unknown
M361	GI	1	1	D	668.0	16.0	3698692.2	266011.6	Unknown
M362	GI	1	3	D	1170.0	22.0	3698664.9	265696.0	Unknown
M363	GI	1	2	D	2752.0	14.0	3698656.0	265846.5	Unknown
M364	GI	1	4	D	142.0	18.0	3698638.6	265511.2	Unknown
M365	GI	1	8	D	56.0	8.0	3698598.8	265008.3	Unknown
M366	GI	1	5	NM	2526.0	20.0	3698591.1	265179.7	Unknown
M367	GI	1	7	D	92.0	12.0	3698577.5	264840.0	Debris
M368	GI	1	8	D	82.0	14.0	3698554.9	264861.4	Debris
M369	GI	1	3	NM	388.0	10.0	3698503.3	265280.8	Unknown
M370	GI	1	6	D	226.0	18.0	3698484.7	264914.9	Unknown
M371	GI	1	2	NM	478.0	4.0	3698416.8	265196.4	Unknown
M372	GI	1	6	PM	366.0	14.0	3698370.7	264760.8	Unknown
M373	GI	1	7	PM	518.0	6.0	3698366.6	264597.0	Unknown
M374	GI	1	3	D	182.0	18.0	3698271.6	264889.2	Unknown
M375	GI	1	5	PM	1708.0	14.0	3698223.2	264589.6	Unknown
M376	GI	1	9	NM	423916.0	6.0	3698104.9	264214.0	Debris
M377	GI	1	6	D	106.0	34.0	3698042.0	264412.6	Unknown
M378	GI	1	4	D	1212.0	20.0	3698015.7	264486.4	Debris
M379	GI	1	9	D	1948.0	8.0	3698011.4	264093.4	Debris
M380	GI	1	1	NM	1966.0	8.0	3698003.1	264674.4	Unknown
M381	GI	1	8	D	108.0	14.0	3697973.5	264122.8	Debris
M382	GI	1	9	D	6852.0	14.0	3697921.2	263950.0	Unknown
M383	GI	1	8	D	17288.0	10.0	3697855.7	263947.4	Unknown
M384	GI	1	7	D	1122.0	22.0	3697843.5	264005.8	Debris
M385	GI	1	9	NM	2032.0	4.0	3697767.4	263825.5	Unknown
M386	GI	1	5	D	882.0	12.0	3697759.5	264042.8	Possible modern watercraft
M387	GI	1	8	NM	417214.0	6.0	3697744.3	263875.9	Submerged pipe charted in this area
M388	GI	1	6	D	802.0	28.0	3697743.9	263986.5	Debris

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M389	GI	1	7	D	152458.0	22.0	3697725.7	263889.4	Submerged pipe charted in this area
M390	GI	1	9	NM	425328.0	4.0	3697699.1	263777.9	Submerged pipe charted in this area
M391	GI	1	8	D	338.0	6.0	3697671.7	263753.1	Submerged pipe charted in this area
M392	GI	1	2	PM	2510.0	8.0	3697457.1	263919.2	Unknown
M393	GI	1	6	MC	622.0	18.0	3697387.7	263719.9	Debris
M394	GI	1	2	NM	3390.0	6.0	3697374.0	263850.9	Unknown
M395	GI	1	2	NM	786.0	4.0	3697328.4	263795.1	Unknown
M396	GI	1	2	D	280.0	10.0	3697191.6	263662.1	Unknown
M397	FIFI	2		PM	92.0	8.0	3717371.7	280853.4	Unknown
M398	FIFI	2		PM	4192.0	4.0	3717312.7	280696.9	Unknown
M399	FIFI	2		MC	68.0	16.0	3717306.6	280892.4	Debris or Enterprise/Promix Pipeline
M400	FIFI	2		D	130.0	8.0	3717288.7	280846.0	Debris or Enterprise/Promix Pipeline
M401	FIFI	2	5	D	2536.0	10.0	3717267.1	281056.1	Unknown
M402	FIFI	2		D	446.0	6.0	3717261.9	280705.1	Unknown
M403	FIFI	2		NM	306.0	4.0	3717229.5	280813.7	Unknown
M404	FIFI	2	4	D	1004.0	10.0	3717116.2	281155.7	Unknown
M405	FIFI	2	6	PM	284.0	12.0	3717110.3	281003.0	Unknown
M406	FIFI	2		NM	394.0	4.0	3717076.3	280846.7	Unknown
M407	FIFI	2		NM	14.0	6.0	3716997.4	280900.0	Unknown
M408	FIFI	2		D	286.0	12.0	3716976.3	280837.2	Unknown
M409	FIFI	2	5	NM	418.0	4.0	3716940.7	281023.0	Debris
M410	FIFI	2		PM	76.0	4.0	3716935.6	280728.6	Unknown
M411	FIFI	2	6	NM	222.0	4.0	3716934.4	280997.9	Debris
M412	FIFI	2		NM	542.0	8.0	3716896.8	280938.6	Chevron Pipeline
M413	FIFI	2		D	714.0	10.0	3716887.0	280890.0	Chevron Pipeline
M414	FIFI	2	2	NM	3812.0	16.0	3716878.1	281233.7	Chevron Pipeline
M415	FIFI	2	1	D	3104.0	30.0	3716875.4	281238.6	Chevron Pipeline
M416	FIFI	2		PM	186.0	4.0	3716867.0	280831.9	Chevron Pipeline
M417	FIFI	2		PM	154.0	4.0	3716865.8	280932.6	Chevron Pipeline
M418	FIFI	2		NM	86.0	6.0	3716844.8	280757.9	Chevron Pipeline
M419	FIFI	2	6	D	542.0	8.0	3716844.0	281001.9	Chevron Pipeline
M420	FIFI	2	3	D	1258.0	36.0	3716842.4	281138.5	Chevron Pipeline
M421	FIFI	2		PM	174.0	6.0	3716831.5	280909.4	Chevron Pipeline
M422	FIFI	2		PM	204.0	6.0	3716824.1	280916.2	Chevron Pipeline
M423	FIFI	2	6	PM	630.0	4.0	3716809.8	280978.9	Chevron Pipeline
M424	FIFI	2	4	PM	6222.0	18.0	3716805.6	281112.7	Chevron Pipeline
M425	FIFI	2	6	PM	5610.0	20.0	3716798.1	280989.2	Chevron Pipeline
M426	FIFI	2		NM	68.0	4.0	3716794.9	280776.8	Chevron Pipeline
M427	FIFI	2	5	D	5254.0	30.0	3716772.4	281021.2	Chevron Pipeline
M428	FIFI	2		PM	5616.0	40.0	3716657.1	280914.3	Possible pipeline
M429	FIFI	2		D	9850.0	8.0	3716651.3	280743.4	Possible pipeline
M430	FIFI	2		D	18462.0	40.0	3716649.3	280839.6	Possible pipeline
M431	FIFI	2	1	NM	1800.0	22.0	3716644.5	281227.0	Possible pipeline
M432	FIFI	2	2	NM	21786.0	28.0	3716641.3	281199.7	Possible pipeline
M433	FIFI	2	5	D	3374.0	20.0	3716635.4	280943.2	Possible pipeline
M434	FIFI	2	4	D	7488.0	26.0	3716635.0	281060.5	Possible pipeline
M435	FIFI	2	3	NM	28186.0	22.0	3716626.0	281101.1	Possible pipeline
M436	FIFI	2		D	6570.0	22.0	3716619.8	280787.9	Possible pipeline
M437	FIFI	2	6	PM	11236.0	20.0	3716613.3	280971.4	Possible pipeline
M438	FIFI	2		D	11542.0	14.0	3716586.4	280705.9	Debris
M439	FIFI	2		D	29628.0	22.0	3716544.2	280653.4	Debris
M440	FIFI	2	6	PM	1032.0	4.0	3716541.2	280899.8	Unknown
M441	FIFI	2		NM	782.0	12.0	3716523.2	280693.2	Debris
M442	FIFI	2		D	612.0	18.0	3716494.1	280712.2	Debris
M443	FIFI	2	4	D	2240.0	10.0	3716480.9	281019.7	Unknown
M444	FIFI	2		PM	6294.0	4.0	3716479.1	280639.5	Unknown
M445	FIFI	2		PM	1134.0	7.0	3716429.5	280618.1	Unknown

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M446	FIFI	2	1	NM	188.0	6.0	3716402.8	281088.4	Unknown
M447	FIFI	2		D	430.0	18.0	3716357.9	280710.3	Unknown
M448	FIFI	2	1	PM	390.0	12.0	3716305.2	281034.1	Unknown
M449	FIFI	2	3	NM	8828.0	10.0	3716245.4	280959.9	Unknown
M450	FIFI	2	6	PM	144.0	6.0	3716177.8	280709.6	Debris
M451	FIFI	2	2	D	84.0	8.0	3716159.2	280959.8	Unknown
M452	FIFI	2	6	PM	284.0	4.0	3716152.3	280679.8	Debris
M453	FIFI	2		D	610.0	16.0	3716104.3	280461.0	Unknown
M454	FIFI	2	2	MC	82.0	16.0	3716058.0	280846.6	Debris
M455	FIFI	2	1	D	146.0	10.0	3716057.7	281001.0	Unknown
M456	FIFI	2		D	36.0	10.0	3716032.1	280556.1	Unknown
M457	FIFI	2	1	D	156.0	14.0	3715977.1	280915.6	Debris
M458	FIFI	2	2	NM	74.0	12.0	3715944.8	280876.4	Debris
M459	FIFI	2	3	NM	460.0	10.0	3715943.9	280815.6	Unknown
M460	FIFI	2		D	96.0	10.0	3715934.7	280580.2	Debris
M461	FIFI	2	1	PM	40.0	4.0	3715788.5	280854.8	Unknown
M462	FIFI	2	6	D	48.0	6.0	3715783.0	280564.1	Unknown
M463	FIFI	2	1	PM	38.0	4.0	3715733.7	280796.6	Unknown
M464	FIFI	2	3	D	1534.0	10.0	3715707.1	280674.2	Unknown
M465	FIFI	2	5	D	426574.0	14.0	3715562.0	280487.5	Unknown
M466	FIFI	2	6	NM	1838.0	4.0	3715506.5	280408.6	Unknown
M467	FIFI	2	1	NM	120.0	8.0	3715505.7	280707.5	Unknown
M468	FIFI	2	4	PM	592.0	4.0	3715500.3	280511.8	Unknown
M469	FIFI	2		PM	106.0	4.0	3715471.5	280366.1	Unknown
M470	FIFI	2	1	PM	58.0	6.0	3715428.5	280617.6	Unknown
M471	FIFI	2	5	D	1344.0	10.0	3715354.5	280393.7	Unknown
M472	FIFI	2	6	D	44.0	14.0	3715284.4	280327.8	Unknown
M473	FIFI	2	3	D	406.0	8.0	3715225.6	280450.2	Unknown
M474	FIFI	2	6	PM	11146.0	10.0	3715104.6	280274.7	Possible pipeline
M475	FIFI	2	5	NM	5790.0	14.0	3715085.0	280288.4	Possible pipeline
M476	FIFI	2	1	D	90.0	18.0	3715055.5	280479.9	Unknown
M477	FIFI	2	3	PM	12442.0	14.0	3715037.6	280347.2	Possible pipeline
M478	FIFI	2	4	PM	4558.0	24.0	3715026.6	280370.3	Possible pipeline
M479	FIFI	2	2	D	3404.0	22.0	3714955.1	280430.1	Possible pipeline
M480	FIFI	2	1	PM	17150.0	20.0	3714953.4	280462.9	Possible pipeline
M481	FIFI	2		D	120.0	6.0	3714837.4	280156.0	Unknown
M482	FIFI	2	3	NM	5196.0	16.0	3714685.6	280262.2	Unknown
M483	FIFI	2		PM	62.0	6.0	3714685.4	279835.9	Unknown
M484	FIFI	2		NM	636.0	6.0	3714583.6	279965.4	Unknown
M485	FIFI	2	4	D	420.0	18.0	3714565.3	280165.3	Unknown
M486	FIFI	2		PM	110.0	10.0	3714564.9	279880.7	Unknown
M487	FIFI	2		D	78.0	8.0	3714564.1	279792.1	Unknown
M488	FIFI	2	3	D	528.0	20.0	3714516.7	280195.1	Unknown
M489	FIFI	2		D	130.0	14.0	3714509.7	279870.2	Unknown
M490	FIFI	2	4	NM	634.0	20.0	3714442.3	280122.8	Possibly associated with well
M491	FIFI	2	1	NM	1550.0	6.0	3714276.7	280234.7	Unknown
M492	FIFI	2		PM	1400.0	8.0	3714213.2	279687.9	Probable pipeline
M493	FIFI	2		D	2410.0	16.0	3714199.7	279753.5	Probable pipeline
M494	FIFI	2		MC	372526.0	24.0	3714198.5	279705.9	Probable pipeline
M495	FIFI	2		PM	49198.0	16.0	3714170.0	279830.1	Probable pipeline
M496	FIFI	2		NM	409682.0	24.0	3714161.1	279858.8	Probable pipeline
M497	FIFI	2	6	PM	8348.0	12.0	3714136.2	279909.9	Probable pipeline
M498	FIFI	2	5	NM	270550.0	10.0	3714121.4	279959.0	Probable pipeline
M499	FIFI	2	3	D	6354.0	20.0	3714101.7	280043.6	Probable pipeline
M500	FIFI	2	4	NM	2142.0	14.0	3714099.8	280012.9	Probable pipeline
M501	FIFI	2	2	PM	1384.0	8.0	3714068.2	280117.4	Probable pipeline
M502	FIFI	2	1	PM	4578.0	8.0	3714060.5	280157.7	Probable pipeline
M503	FIFI	2		D	626.0	16.0	3714023.7	279828.0	Unknown
M504	FIFI	2		PM	224.0	4.0	3713996.1	279688.5	Unknown
M505	FIFI	2		MC	200.0	22.0	3713952.6	279755.8	Debris
M506	FIFI	2	1	NM	431198.0	22.0	3713923.2	280134.4	BP Pipeline

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M507	FIFI	2		PM	5532.0	4.0	3713874.4	279605.4	Undocumented pipeline
M508	FIFI	2	2	D	28152.0	36.0	3713842.3	280033.1	BP Pipeline
M509	FIFI	2		PM	278.0	4.0	3713816.5	279614.9	Undocumented pipeline
M510	FIFI	2	6	NM	446.0	4.0	3713802.8	279794.9	Unknown
M511	FIFI	2		NM	180.0	4.0	3713735.9	279600.5	Undocumented pipeline
M512	FIFI	2	3	D	435058.0	50.0	3713719.4	279962.9	BP Pipeline
M513	FIFI	2		NM	66.0	4.0	3713700.3	279594.2	Undocumented pipeline
M514	FIFI	2		NM	420722.0	4.0	3713655.7	279389.8	Conoco pipeline
M515	FIFI	2		PM	232.0	4.0	3713639.7	279608.5	Undocumented pipeline
M516	FIFI	2	4	D	79292.0	32.0	3713624.7	279830.4	BP Pipeline
M517	FIFI	2		NM	3780.0	10.0	3713582.9	279614.6	Undocumented pipeline
M518	FIFI	2		PM	1492.0	4.0	3713541.8	279533.6	BP/Vasser pipeline
M519	FIFI	2		NM	414476.0	12.0	3713529.5	279479.4	Conoco pipeline
M520	FIFI	2		D	12010.0	14.0	3713522.6	279461.2	Conoco pipeline
M521	FIFI	2	5	D	447840.0	20.0	3713504.3	279725.2	BP Pipeline
M522	FIFI	2		D	17154.0	14.0	3713461.8	279400.6	Exxon/Mobile pipeline
M523	FIFI	2		neg trend	1576.0	14.0	3713455.6	279533.0	Pipeline
M524	FIFI	2		D	20996.0	40.0	3713427.8	279487.1	Exxon/Mobile pipeline
M525	FIFI	2		PM	744.0	6.0	3713402.5	279337.4	Debris
M526	FIFI	2		PM	336.0	4.0	3713357.8	279325.2	Debris
M527	FIFI	2	6	NM	5888.0	8.0	3713278.5	279604.9	BP Pipeline
M528	FIFI	2	4	D	23936.0	30.0	3713202.4	279618.6	Unknown
M529	FIFI	1	7	D	26640.0	28.0	3713116.1	279316.2	Unknown
M530	FIFI	1	5	D	5280.0	20.0	3713013.0	279367.8	BP Pipeline
M531	FIFI	1	1	NM	47086.0	22.0	3713012.2	279565.4	Unknown
M532	FIFI	1	1	MC	6470.0	18.0	3712986.6	279669.3	BP/Vasser pipeline
M533	FIFI	1	3	PM	12188.0	20.0	3712914.8	279458.7	Debris
M534	FIFI	1	4	PM	1632.0	18.0	3712912.9	279455.9	Debris
M535	FIFI	1		D	420842.0	42.0	3712896.1	279235.3	BP Pipeline
M536	FIFI	1		D	366446.0	30.0	3712880.6	279080.2	Negative trend, dipolar signature with negative spike at negative side of sinusoidal curve
M537	FIFI	1	1	PM	1964.0	8.0	3712829.8	279563.7	Unknown
M538	FIFI	1	1	PM	2354.0	6.0	3712824.7	279623.4	Unknown
M539	FIFI	1	2	NM	3668.0	38.0	3712766.5	279531.6	Unknown
M540	FIFI	1		MC	116.0	24.0	3712744.2	279169.8	Debris
M541	FIFI	1	6	pos trend	272.0	62.0	3712735.5	279294.0	Unknown
M542	FIFI	1		D	72.0	12.0	3712607.4	279186.7	Unknown
M543	FIFI	1		NM	417098.0	14.0	3712579.3	279042.2	Unknown
M544	FIFI	1	6	D	94.0	10.0	3712517.2	279270.2	Unknown
M545	FIFI	1	4	NM	794.0	14.0	3712436.1	279355.4	Unknown
M546	FIFI	1		D	612.0	8.0	3712367.1	279072.2	Unknown
M547	FIFI	1		D	44.0	14.0	3712321.6	279117.2	Unknown
M548	FIFI	1	2	D	90.0	10.0	3712259.2	279457.1	Unknown
M549	FIFI	1	4	D	86.0	14.0	3712254.3	279351.8	Unknown
M550	FIFI	1		D	58.0	12.0	3712111.5	279179.5	Unknown
M551	FIFI	1		D	280.0	14.0	3712044.8	279092.3	Unknown
M552	FIFI	1		D	150.0	18.0	3711868.1	279138.6	Unknown
M553	FIFI	1		D	168.0	12.0	3711858.4	279208.5	Unknown
M554	FIFI	1	4	D	96.0	24.0	3711802.3	279424.0	Unknown
M555	FIFI	1	6	PM	44.0	6.0	3711781.1	279328.7	Unknown
M556	FIFI	1		PM	74.0	4.0	3711699.0	279180.0	Unknown
M557	FIFI	1	7	D	102.0	8.0	3711659.1	279247.8	Unknown
M558	FIFI	1		PM	84.0	6.0	3711540.8	279188.4	Unknown
M559	FIFI	1	7	PM	728.0	12.0	3711538.6	279338.3	Unknown
M560	FIFI	1	6	D	128.0	74.0	3711451.5	279429.0	Unknown
M561	FIFI	1		D	48.0	8.0	3711327.4	279210.7	Unknown
M562	FIFI	1		D	48.0	10.0	3711244.4	279245.0	Unknown
M563	FIFI	1	4	MC	98.0	34.0	3711238.5	279553.4	Debris
M564	FIFI	1	7	D	92.0	10.0	3711227.0	279403.8	Unknown

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M565	FIFI	1		D	198.0	14.0	3711053.1	279378.9	Small track line parallel with bank
M566	FIFI	1	2	M	58.0	28.0	3711007.6	279708.3	Unknown
M567	FIFI	1	6	MC	232.0	34.0	3711002.3	279473.8	Debris
M568	FIFI	1	7	NM	664.0	6.0	3710792.4	279439.8	Unknown
M569	FIFI	1	2	D	746.0	42.0	3710745.3	279629.3	Unknown
M570	FIFI	1	7	D	246.0	18.0	3710693.8	279418.4	Unknown
M571	FIFI	1	6	neg trend	68.0	66.0	3710556.9	279447.8	Unknown
M572	FIFI	1	7	D	182.0	12.0	3710362.2	279303.1	Induced dipole
M573	FIFI	1	4	D	102.0	14.0	3710293.1	279413.1	Unknown
M574	FIFI	1	6	D	126.0	20.0	3710235.8	279320.8	Dipole signature in center of positive trend
M575	FIFI	1	2	D	70.0	14.0	3710164.6	279521.6	Unknown
M576	FIFI	1	2	D	102.0	16.0	3710049.1	279429.7	Unknown
M577	FIFI	1		D	80.0	12.0	3709425.1	278588.9	Unknown
M578	FIFI	1	7	D	56.0	8.0	3709399.7	278639.8	Unknown
M579	FIFI	1	2	MC	110.0	14.0	3709361.0	278965.7	Debris
M580	FIFI	1	7	NM	198.0	4.0	3709305.3	278581.3	Unknown
M581	FIFI	1		D	76.0	8.0	3709262.4	278421.7	Unknown
M582	FIFI	1	4	PM	74.0	4.0	3709034.4	278457.1	Unknown
M583	FIFI	1	4	NM	76.0	4.0	3709024.6	278405.0	Unknown
M584	FIFI	1		D	224.0	28.0	3708953.9	277950.2	Unknown
M585	FIFI	1	4	NM	68.0	4.0	3708859.3	278287.2	Unknown
M586	FIFI	1	7	PM	84.0	6.0	3708859.3	277955.7	Unknown
M587	FIFI	1	7	PM	92.0	4.0	3708824.5	277912.5	Unknown
M588	FIFI	1	4	PM	44.0	6.0	3708823.6	278221.5	Unknown
M589	FIFI	1		D	178.0	12.0	3708775.5	277856.8	Debris
M590	FIFI	1	7	NM	8526.0	8.0	3708742.2	277874.6	Debris
M591	FIFI	1		D	284.0	14.0	3708717.3	277592.0	Unknown
M592	FIFI	1	7	D	84.0	6.0	3708675.6	277778.1	Unknown
M593	FIFI	1	3	PM	1046.0	20.0	3708629.6	277996.6	Debris
M594	FIFI	1	7	D	74.0	10.0	3708626.1	277707.0	Unknown
M595	FIFI	1	4	PM	52.0	8.0	3708625.6	278007.3	Debris
M596	FIFI	1	6	D	120.0	24.0	3708577.2	277767.5	Debris
M597	FIFI	1	7	D	198.0	12.0	3708577.1	277653.4	Unknown
M598	FIFI	1	2	D	32.0	14.0	3708572.0	278075.3	Unknown
M599	FIFI	1	4	NM	56.0	6.0	3708556.4	277908.1	Unknown
M600	FIFI	1	5	NM	508.0	8.0	3708555.0	277770.5	Debris
M601	FIFI	1		D	130.0	16.0	3708498.6	277516.2	Unknown
M602	FIFI	1	7	NM	74.0	8.0	3708330.2	277344.3	Unknown
M603	FIFI	1	2	MC	54.0	40.0	3708295.6	277757.2	Debris
M604	FIFI	1	5	MC	168.0	20.0	3708269.2	277461.7	Debris
M605	FIFI	1	4	D	292.0	6.0	3708061.5	277324.1	Unknown
M606	FIFI	1	7	D	3186.0	6.0	3708026.7	277059.7	Unknown
M607	FIFI	1		MC	176.0	16.0	3707987.4	276884.7	Debris
M608	FIFI	1		NM	134.0	22.0	3707982.8	276745.6	Debris
M609	FIFI	1		D	28.0	16.0	3707942.4	276772.2	Debris
M610	FIFI	1	4	NM	2338.0	4.0	3707866.6	277178.1	Unknown
M611	FIFI	1	7	D	116.0	14.0	3707664.6	276712.1	Unknown
M612	FIFI	1	4	NM	1230.0	4.0	3707605.7	276850.7	Unknown
M613	FIFI	1	5	PM	1584.0	6.0	3707510.9	276720.3	Unknown
M614	FIFI	1		PM	72.0	32.0	3707456.6	276431.6	Unknown
M615	FIFI	1		NM	1038.0	4.0	3707429.7	276371.9	Unknown
M616	FIFI	1		D	146.0	18.0	3707359.9	276178.6	Unknown
M617	FIFI	1		D	94.0	18.0	3707293.0	276286.8	Debris
M618	FIFI	1	7	PM	102.0	12.0	3707254.9	276255.2	Debris
M619	FIFI	1		D	90.0	28.0	3707233.8	275995.2	Unknown
M620	FIFI	1	6	D	168.0	8.0	3707129.9	276264.5	Unknown
M621	FIFI	1		D	112.0	14.0	3707078.4	275830.5	Unknown
M622	FIFI	1		MC	96.0	16.0	3707048.6	276025.6	Debris
M623	FIFI	1	1	NM	1006.0	4.0	3707046.4	276516.7	Unknown

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M624	FIFI	1		NM	936.0	6.0	3706947.2	275984.6	Unknown
M625	FIFI	1		D	82.0	10.0	3706936.2	275807.7	Unknown
M626	FIFI	1		PM	68.0	4.0	3706875.4	275858.2	Debris
M627	FIFI	1		PM	84.0	8.0	3706856.7	275708.4	Unknown
M628	FIFI	1	7	D	106.0	8.0	3706836.3	275869.6	Debris
M629	FIFI	1		NM	332.0	8.0	3706784.3	275806.0	Debris
M630	FIFI	1	7	MC	88.0	18.0	3706740.1	275801.1	Debris
M631	FIFI	1	6	NM	186.0	8.0	3706735.0	275862.5	Debris
M632	FIFI	1	3	NM	382.0	4.0	3706712.8	276009.0	Unknown
M633	FIFI	1	6	D	102.0	10.0	3706596.0	275759.6	Unknown
M634	FIFI	1		MC	54.0	18.0	3706578.1	275528.7	Debris
M635	FIFI	1		D	94.0	18.0	3706508.5	275495.7	Unknown
M636	FIFI	1	6	D	78.0	6.0	3706499.8	275667.8	Unknown
M637	FIFI	1	4	NM	578.0	4.0	3706477.9	275783.8	Unknown
M638	FIFI	1	7	D	82.0	22.0	3706453.2	275459.2	Induced dipole
M639	FIFI	1	2	D	74.0	18.0	3706426.7	275886.6	Unknown
M640	FIFI	1	5	D	6098.0	10.0	3706423.3	275660.1	Debris
M641	FIFI	1		D	196.0	30.0	3706414.9	275280.3	Unknown
M642	FIFI	1	3	NM	322.0	14.0	3706409.7	275729.1	Debris
M643	FIFI	1	4	D	72.0	10.0	3706404.9	275697.7	Debris
M644	FIFI	1	4	PM	78.0	4.0	3706358.7	275667.2	Debris
M645	FIFI	1		D	48.0	14.0	3706310.8	275350.2	Unknown
M646	FIFI	1	4	D	58.0	14.0	3706290.8	275637.7	Unknown
M647	FIFI	1	6	D	1574.0	16.0	3706238.7	275379.4	Unknown
M648	FIFI	1	2	MC	80.0	16.0	3706061.2	275564.6	Debris
M649	FIFI	3	7	NM	96.0	4.0	3708537.3	276138.7	Unknown
M650	FIFI	3	11	D	58.0	6.0	3708529.3	275794.4	Unknown
M651	FIFI	3	7	NM	72.0	16.0	3708508.2	276024.9	Unknown
M652	FIFI	3	5	D	82.0	8.0	3708507.9	276315.2	Unknown
M653	FIFI	3	11	PM	50.0	8.0	3708462.6	275719.5	Unknown
M654	FIFI	3	11	NM	42.0	4.0	3708451.2	275892.2	Unknown
M655	FIFI	3	5	PM	34.0	4.0	3708451.1	276227.5	Possibly associated with crab pot
M656	FIFI	3	3	PM	74.0	22.0	3708449.9	276312.0	Unknown
M657	FIFI	3	5	D	368.0	24.0	3708405.4	276101.3	Unknown
M658	FIFI	3	6	D	98.0	14.0	3708372.8	275993.3	Unknown
M659	FIFI	3	11	NM	60.0	6.0	3708372.2	275690.4	Unknown
M660	FIFI	3	1	PM	54.0	22.0	3708275.0	276454.9	Unknown
M661	FIFI	3	7	PM	30.0	4.0	3708251.4	275848.4	Unknown
M662	FIFI	3	3	MC	22.0	24.0	3708236.4	276147.7	Debris
M663	FIFI	3	13	D	46.0	20.0	3708229.3	275369.4	Unknown
M664	FIFI	3	1	PM	34.0	10.0	3708158.0	276239.2	Possibly associated with crab pot
M665	FIFI	3	13	D	36.0	12.0	3708097.2	275375.2	Unknown
M666	FIFI	3	7	PM	24.0	12.0	3708090.8	275764.0	Unknown
M667	FIFI	3	11	NM	126.0	3.0	3708075.4	275500.1	Possibly associated with crab pot
M668	FIFI	3	4	PM	22.0	6.0	3708047.5	275923.9	Debris
M669	FIFI	3	1	D	86.0	12.0	3708038.1	276019.8	Unknown
M670	FIFI	3	10	D	1560.0	6.0	3708034.9	275567.6	Possibly associated with crab pot
M671	FIFI	3	4	PM	26.0	4.0	3708015.2	275894.0	Debris
M672	FIFI	3	11	PM	550.0	4.0	3707998.5	275477.6	Unknown
M673	FIFI	3	15	PM	726.0	4.0	3707970.9	275158.2	Unknown
M674	FIFI	3	4	NM	18.0	4.0	3707949.7	275871.3	Unknown
M675	FIFI	3	13	PM	3826.0	8.0	3707879.4	275239.8	Unknown
M676	FIFI	3	7	D	28.0	22.0	3707877.0	275592.8	Unknown
M677	FIFI	3	1	PM	30.0	4.0	3707851.1	275983.5	Unknown
M678	FIFI	3	13	NM	32.0	8.0	3707825.4	275159.0	Unknown
M679	FIFI	3	1	D	62.0	4.0	3707745.4	275935.0	Debris
M680	FIFI	3	1	D	1168.0	6.0	3707718.5	275899.4	Debris
M681	FIFI	3	15	MC	190.0	18.0	3707704.9	274965.7	Debris

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M682	FIFI	3	16	PM	106.0	4.0	3707693.7	274935.7	Debris
M683	FIFI	3	4	NM	246.0	4.0	3707693.2	275662.1	Debris
M684	FIFI	3	3	D	38.0	18.0	3707683.5	275701.8	Debris
M685	FIFI	3	2	PM	38.0	12.0	3707664.4	275735.7	Debris
M686	FIFI	3	16	PM	170.0	8.0	3707663.2	274934.8	Debris
M687	FIFI	3	4	D	40.0	10.0	3707614.5	275575.9	Unknown
M688	FIFI	3	15	D	132.0	12.0	3707523.3	274795.1	Unknown
M689	FIFI	3	14	PM	90.0	10.0	3707513.7	274899.9	Possibly associated with crab pot
M690	FIFI	3	6	D	142.0	10.0	3707513.3	275416.2	Unknown
M691	FIFI	3	4	D	636.0	14.0	3707504.0	275497.6	Unknown
M692	FIFI	3	2	PM	606.0	8.0	3707503.3	275631.7	Unknown
M693	FIFI	3	16	D	374.0	26.0	3707467.5	274634.6	Unknown
M694	FIFI	3	15	D	132.0	8.0	3707379.1	274660.8	Unknown
M695	FIFI	3	14	D	114.0	6.0	3707366.9	274778.7	Unknown
M696	FIFI	3	11	PM	26.0	4.0	3707351.6	274929.2	Debris
M697	FIFI	3	12	D	150.0	10.0	3707349.1	274908.3	Debris
M698	FIFI	3	10	D	614.0	14.0	3707328.0	275012.6	Possibly steel cable and tackle
M699	FIFI	3	11	PM	18.0	4.0	3707313.1	274912.8	Debris
M700	FIFI	3	1	MC	64.0	14.0	3707309.2	275565.3	Debris
M701	FIFI	3	9	PM	198.0	10.0	3707285.5	275041.7	Possibly steel cable and tackle
M702	FIFI	3	16	PM	64.0	8.0	3707254.8	274516.6	Unknown
M703	FIFI	3	11	PM	48.0	4.0	3707232.7	274838.5	Unknown
M704	FIFI	3	3	PM	22.0	8.0	3707210.9	275317.1	Debris
M705	FIFI	3	8	PM	1386.0	6.0	3707206.6	275052.1	Possibly steel cable and tackle
M706	FIFI	3	4	D	68.0	12.0	3707195.0	275294.9	Debris
M707	FIFI	3	16	D	110.0	14.0	3707147.7	274546.2	Unknown
M708	FIFI	3	3	D	26.0	6.0	3707134.3	275284.3	Unknown
M709	FIFI	3	7	D	86.0	20.0	3707128.9	275056.9	Possibly steel cable and tackle
M710	FIFI	3	1	NM	264.0	6.0	3707126.4	275369.7	Unknown
M711	FIFI	3	9	PM	60.0	8.0	3707056.8	274839.4	Unknown
M712	FIFI	3	3	NM	42.0	12.0	3707049.0	275211.4	Debris
M713	FIFI	3	4	PM	40.0	8.0	3707048.8	275181.6	Debris
M714	FIFI	3	5	PM	338.0	6.0	3707039.7	275078.9	Possibly steel cable and tackle
M715	FIFI	3	2	D	154.0	22.0	3706996.6	275252.2	Unknown
M716	FIFI	3	9	NM	30.0	4.0	3706996.0	274796.8	Unknown
M717	FIFI	3	4	PM	32.0	8.0	3706994.0	275089.8	Possibly steel cable and tackle
M718	FIFI	3	1	MC	36.0	10.0	3706989.9	275312.4	Debris
M719	FIFI	3	6	NM	190.0	10.0	3706920.7	274927.8	Debris
M720	FIFI	3	11	D	112.0	14.0	3706920.7	274631.0	Unknown
M721	FIFI	3	1	D	46.0	8.0	3706913.6	275213.9	Unknown
M722	FIFI	3	9	PM	26.0	4.0	3706896.7	274717.6	Unknown
M723	FIFI	3	5	D	356.0	16.0	3706896.5	274964.6	Debris
M724	FIFI	3	11	NM	442.0	6.0	3706885.6	274581.4	Unknown
M725	FIFI	3	7	D	64.0	14.0	3706858.3	274814.4	Possibly associated with crab pot
M726	FIFI	3	9	PM	28.0	4.0	3706806.1	274638.6	Unknown
M727	FIFI	3	6	D	180.0	10.0	3706769.9	274830.1	Debris
M728	FIFI	3	5	NM	46.0	6.0	3706753.4	274837.4	Debris
M729	FIFI	3	5	PM	26.0	4.0	3706705.4	274784.9	Unknown
M730	FIFI	3	4	D	70.0	10.0	3706703.2	274925.3	Unknown
M731	FIFI	3	6	NM	68.0	6.0	3706628.9	274734.6	Unknown
M732	FIFI	3	12	NM	164.0	6.0	3706624.3	274351.3	Unknown
M733	FIFI	3	8	NM	564.0	16.0	3706601.7	274572.3	Unknown
M734	FIFI	3	5	NM	26.0	4.0	3706590.2	274777.9	Unknown
M735	FIFI	3	6	D	108.0	12.0	3706565.0	274684.0	Unknown
M736	FIFI	3	12	NM	74.0	6.0	3706523.6	274386.6	Debris
M737	FIFI	3	4	D	56.0	12.0	3706516.0	274776.6	Debris
M738	FIFI	3	3	D	18.0	10.0	3706515.3	274817.3	Debris
M739	FIFI	3	10	NM	144.0	6.0	3706507.3	274373.7	Debris
M740	FIFI	3	3	PM	34.0	8.0	3706457.9	274749.4	Unknown

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M741	FIFI	3	8	D	136.0	6.0	3706454.6	274448.9	Unknown
M742	FIFI	3	6	PM	104.0	4.0	3706397.9	274534.7	Unknown
M743	FIFI	3	1	PM	72.0	12.0	3706375.4	274805.9	Unknown
M744	FIFI	3	1	MC	34.0	12.0	3706347.8	274721.4	Debris
M745	FIFI	3	10	D	1874.0	8.0	3706302.0	274437.3	Unknown
M746	FIFI	3	8	NM	730.0	4.0	3706276.1	274535.7	Unknown
M747	FIFI	3	3	PM	178.0	6.0	3706273.3	274602.0	Unknown
M748	FIFI	3	4	NM	952.0	4.0	3706195.3	274551.2	Unknown
M749	FIFI	3	6	D	172.0	12.0	3706193.2	274417.6	Debris
M750	FIFI	3	4	D	248.0	22.0	3706171.9	274418.7	Debris
M751	FIFI	3	1	D	28.0	18.0	3706170.7	274701.5	Unknown
M752	FIFI	3	2	D	900.0	18.0	3706134.4	274572.1	Unknown
M753	FIFI	3	2	D	186.0	26.0	3705956.0	274503.2	Unknown
M754	BR	4		PM	494	6.0	3703168.0	270430.8	Unknown
M755	BR	4	1	D	304	8	3703254.6	270483.9	Unknown
M756	BR	4	1	NM	390	6	3703368.2	270568.8	Debris
M757	BR	4	1	PM	45806	4	3703479.5	270675.7	Unknown
M758	BR	4	1	MC	41300	8	3703592.5	270675.7	Debris
M759	BR	4	1	D	3954	8	3703703.7	270852.5	Unknown
M760	BR	4	1	D	332	8	3703792.6	270929.2	Debris
M761	BR	4	1	D	116	6	3703919.9	271014.8	Unknown
M762	BR	4	1	PM	30394	4	3704016.5	271071.4	Unknown
M763	BR	4	1	PM	470	2	3704110.3	271167.5	Unknown
M764	BR	4	1	NM	732	17.5	3704789.3	271547.9	Unknown
M765	BR	4	1	PM	1276	13	3705455.7	271849.7	Debris
M766	BR	4	1	D	54	6	3705854.3	271939.4	Unknown
M767	BR	4	1	MC	604	35.6	3706071.4	271924.5	Debris
M768	BR	4	1	D	160	8	3706316.7	271955.4	Unknown
M769	BR	4	1	MC	4350	111.7	3708146.7	272595.6	Barge & Docks
M770	BR	4	2	MC	3894	160	3708081.1	272630.4	Debris
M771	BR	4	2	D	2752	13.5	3706126.0	271942.0	Debris
M772	BR	4	2	D	1406	22.1	3705990.4	271921.7	Unknown
M773	BR	4	2	D	2752	13.5	3706126.0	271942.0	Debris
M774	BR	4	2	MC	2668	26.1	3705338.3	271750.8	Debris
M775	BR	4	2	D	286	24.1	3704358.9	271370.7	Debris
M776	BR	4	2	MC	4102	22	3703738.2	270926.7	Debris
M777	BR	4	2	D	2270	18.1	3703335.8	270604.9	Debris
M778	BR	4	3	NM	646	12.1	3703010.1	270449.6	Unknown
M779	BR	4	3	D	242	8	3703218.9	270599.6	Unknown
M780	BR	4	3	D	1590	12	3703456.5	270762.5	Unknown
M781	BR	4	3	D	580	16	3704345.8	271417.1	Debris
M782	BR	4	3	PM	2427	34.9	3705445.2	271863.6	Debris
M783	BR	4	3	MC	996	12	3706580.2	272050.1	Unknown
M784	BR	4	3	D	816	12	3706934.5	272110.0	Debris
M785	BR	4	3	MC	1006	44.1	3707022.4	272133.7	Dock and boats
M786	BR	4	3	MC	1444	184	3708068.0	272621.9	Debris
M787	BR	4	4	MC	660	170	3708011.9	272695.2	Barge & Docks
M788	BR	4	4	MC	80	32.2	3707433.4	272342.7	Debris
M789	BR	4	4	MC	198	22	3707160.6	272226.3	Debris
M790	BR	4	4	NM	246	32	3706348.1	272065.5	Unknown
M791	BR	4	4	PM	518	36.1	3705441.5	271905.1	Debris
M792	BR	4	4	MC	128	16	3705153.3	271829.7	Debris
M793	BR	4	4	MC	1490	120	3704315.3	271448.1	Debris
M794	BR	4	5	NM	578	12	3703498.8	270933.0	Unknown
M795	BR	4	5	D	566	9.6	3703667.8	271075.9	Unknown
M796	BR	4	5	D	306	10	3704281.2	271510.8	Debris
M797	BR	4	5	D	54142	16	3706312.0	272135.4	Unknown
M798	BR	4	5	MC	880	24	3706516.2	272133.3	Debris
M799	FIFI	3	1	D	260	10.2	3710959.2	275504.4	Unknown
M800	FIFI	3	1	D	224	6	3710565.6	275398.4	Possibly associated with modern dredge barge

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M801	FIFI	3	1	D	6714	8.2	3709774.1	274919.1	Sunken float
M802	FIFI	3	1	D	1032	26.1	3709596.5	274827.1	Sunken float
M803	FIFI	3	1	MC	13654	188.2	3708749.7	274454.6	Debris
M804	FIFI	3	2	D	490	6	3708950.4	274603.5	Debris
M805	FIFI	3	2	MC	14558	100	3709448.9	274857.7	Debris
M806	FIFI	3	2	MC	15300	22	3709747.0	274993.8	Possibly associated with Chevron Pipeline
M807	FIFI	3	3	MC	636	28	3711271.9	275747.7	Possibly associated with charted wreck
M808	FIFI	3	3	MC	26684	187.9	3709659.4	275021.8	Possibly associated with Chevron Pipeline
M809	FIFI	3	3	D	9688	18	3708816.5	274615.4	Debris
M810	FIFI	3	4	MC	15784	40.1	3711327.3	275861.2	Possibly associated with charted wreck
M811	FIFI	3	4	D	458	12	3711071.0	275745.1	Possibly associated with Chevron Pipeline
M812	FIFI	3	5	MC	13610	32	3711340.7	275900.4	Possibly associated with charted wreck
M813	FIFI	3	5	MC	5644	131.7	3710564.6	275551.4	Possibly associated with modern dredge barge
M814	FIFI	3	5	D	502	30	3708938.9	274775.7	Unknown
M815	FIFI	3	5	D	550	8	3709178.0	274880.7	Unknown
M816	FIFI	3	6	MC	316	30	3708963.5	274883.0	Debris
M817	FIFI	3	6	P	374	12	3710473.4	275556.1	Unknown
M818	FIFI	3	6	D	682	28	3710705.6	275679.0	Unknown
M819	FIFI	3	6	MC	15046	164	3711174.4	275897.8	Possibly associated with charted wreck
M820	FIFI	3	7	NM	344854	2	3711759.2	276147.1	Possibly associated with Chevron Pipeline
M821	FIFI	3	7	MC	13134	98	3711295.1	276011.8	Possibly associated with charted wreck
M822	FIFI	3	7	PM	34234	4	3709374.0	275099.0	Unknown
M823	FIFI	3	8	PM	102	5.9	3709131.8	275030.5	Unknown
M824	FIFI	3	8	MC	428	18	3709221.1	275081.1	Debris
M825	FIFI	3	8	MC	354	34	3709522.6	275225.7	Debris
M826	FIFI	3	8	MC	378	36	3710017.0	275458.1	Debris
M827	FIFI	3	8	MC	208	35.6	3710542.4	275707.1	Possibly associated with modern dredge barge
M828	FIFI	3	8	PM	544	7.9	3711034.3	275930.5	Possibly associated with charted wreck or pipeline
M829	FIFI	3	10	MC	156	48.1	3709562.6	275356.5	Debris
M830	FIFI	3	10	MC	550	70.1	3710664.8	275874.1	Possibly associated with Chevron Pipeline
M831	FIFI	3	10	D	1200	12	3710973.1	276002.0	Unknown
M832	FIFI	3	11	D	1214	7.5	3710570.7	275858.6	Possibly associated with flowline
M833	FIFI	3	11	MC	146	22.1	3710325.1	275730.9	Possibly associated with Chevron Pipeline
M834	FIFI	3	12	D	646	8	3710104.7	275715.0	Unknown
M835	FIFI	3	12	D	462	10	3710573.8	275938.2	Possibly associated with flowline
M836	FIFI	4	18	D	2494	24	3714420.9	279115.9	Probable pipeline
M837	FIFI	4	18	D	329752	6	3714029.8	278899.0	Exxon/Mobile pipeline
M838	FIFI	4	18	PM	3974	30	3713576.1	278669.3	Columbia Gulf pipeline
M839	FIFI	4	19	D	3742	44	3713537.8	278718.9	Columbia Gulf pipeline
M840	FIFI	4	19	D	18980	26.1	3713989.3	278938.5	Exxon/Mobile pipeline
M841	FIFI	4	20	D	2286	18.1	3714406.5	279176.0	Probable pipeline
M842	FIFI	4	20	D	196	12	3714225.6	279100.0	Unknown
M843	FIFI	4	20	D	12168	34	3713963.1	278960.6	Exxon/Mobile pipeline
M844	FIFI	4	21	PM	15560	21.5	3713488.5	278782.2	Columbia Gulf pipeline
M845	FIFI	4	21	PM	5252	13.5	3713651.8	278897.0	Unknown
M846	FIFI	4	21	D	9684	20.1	3713885.4	279014.6	Exxon/Mobile pipeline

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M847	FIFI	4	21	NM	364826	10	3714378.8	279259.4	Probable pipeline
M848	FIFI	4	22	MC	5370	26	3714401.4	279299.6	Probable pipeline
M849	FIFI	4	22	MC	15142	34.8	3713876.8	279044.3	Exxon/Mobile pipeline
M850	FIFI	4	22	D	634	19.2	3713655.4	278912.7	Unknown
M851	FIFI	4	23	MC	6966	26.1	3714303.7	279315.0	Conoco pipeline
M852	FIFI	4	23	MC	20246	24	3713816.9	279078.5	Exxon/Mobile pipeline
M853	FIFI	4	23	MC	2600	47.3	3713394.4	278875.7	Columbia Gulf pipeline
M854	FIFI	4	24	MC	4432	39.4	3714296.3	279332.9	Conoco pipeline
M855	FIFI	4	24	NM	24208	14	3713796.9	279120.3	Exxon/Mobile pipeline
M856	FIFI	4	25	PM	4148	11	3713372.9	278908.5	Columbia Gulf pipeline
M857	FIFI	4	25	D	29926	16	3713745.6	279146.7	Exxon/Mobile pipeline
M858	FIFI	4	25	D	17392	16	3714119.6	279347.2	Conoco pipeline
M859	FIFI	4	25	NM	319646	4	3714310.5	279433.9	Probable pipeline
M860	FIFI	4	26	NM	2100	12	3714304.7	279466.3	Probable pipeline
M861	FIFI	4	26	MC	13782	22.1	3714050.3	279360.9	Conoco pipeline
M862	FIFI	4	26	D	130	6	3713862.2	279247.1	Unknown
M863	FIFI	4	26	D	24280	16.1	3713720.8	279177.9	Exxon/Mobile pipeline
M864	FIFI	4	27	MC	61736	8	3713672.2	279216.4	Exxon/Mobile pipeline
M865	FIFI	4	27	MC	7028	22.1	3713956.7	279377.2	Conoco pipeline
M866	FIFI	4	27	PM	18786	8	3714271.1	279556.5	Probable pipeline
M867	FIFI	4	28	NM	18530	8	3714271.8	279563.3	Probable pipeline
M868	FIFI	4	28	MC	6560	20	3713915.8	279394.9	Conoco pipeline
M869	FIFI	4	28	D	42620	18	3713637.3	279244.9	Exxon/Mobile pipeline
M870	FIFI	4	29	NM	19000	18	3713575.4	279290.2	Exxon/Mobile pipeline
M871	FIFI	4	29	NM	366130	4	3713802.6	279391.4	Conoco pipeline
M872	FIFI	4	29	MC	920	16	3714232.0	279633.6	Probable pipeline
M873	FIFI	4	30	D	1860	6	3714223.1	279671.5	Probable pipeline
M874	FIFI	4	30	NM	420580	6	3713747.6	279404.3	Conoco pipeline
M875	FIFI	4	30	D	30130	20	3713562.9	279335.6	Exxon/Mobile pipeline
M876	FIFI	4	31	D	1580	28	3713158.1	279173.2	Columbia Gulf pipeline
M877	FIFI	4	31	MC	19560	54	3713556.3	279422.1	Conoco pipeline
M878	FIFI	4	31	PM	1980	6.4	3714214.4	279718.7	Probable pipeline
M879	FIFI	4	32	MC	4160	20	3714196.9	279759.0	Probable pipeline
M880	FIFI	4	32	MC	20070	48.1	3713536.7	279429.6	Conoco pipeline
M881	FIFI	4	32	PM	5730	35	3713124.3	279208.1	Columbia Gulf pipeline
M882	FIFI	4	33	MC	42050	21.6	3713088.2	279288.6	Columbia Gulf pipeline
M883	FIFI	4	33	MC	40050	28.1	3713442.0	279458.4	Exxon/Mobile pipeline
M884	FIFI	4	33	MC	24600	12	3714175.1	279814.0	Probable pipeline
M885	Mod2	1	27	NM	7.3	11.0	3709416.8	276776.4	unknown
M886	Mod2	1	27	D	32.8	11.0	3709934.7	277182.7	unknown
M887	Mod2	1	27	D	14.9	4.0	3710850.6	277805.6	unknown
M888	Mod2	1	28	D	8.2	8.0	3710596.8	277589.6	unknown
M889	Mod2	1	30	D	8.4	7.0	3709438.0	276727.3	unknown
M890	Mod2	1	31	D	5.7	7.0	3710014.1	277017.4	unknown
M891	Mod2	1	31	D	322.0	11.0	3710539.9	277342.9	unknown
M892	Mod2	1	32	D	17.1	9.0	3709842.1	276839.8	unknown
M893	Mod2	1	32	NM	5.2	6.0	3710218.3	277093.2	unknown
M894	Mod2	1	33	PM	7.4	2.0	3710789.8	277402.7	unknown
M895	Mod2	1	33	D	221.2	6.0	3710865.9	277450.8	unknown
M896	Mod2	1	34	D	208.8	6.0	3711054.4	277527.8	unknown
M897	Mod2	1	35	MC	2741.3	35.0	3711355.4	277661.9	Probable BP Pipeline
M898	Mod2	1	35	D	6.1	6.0	3709235.9	276232.6	Unknown
M899	Mod2	1	36	MC	4802.3	49.0	3711318.2	277593.6	Probable BP Pipeline
M900	Mod2	1	37	MC	4538.2	302.0	3711032.3	277335.0	Probable BP Pipeline
M901	Mod2	1	38	MC	5622.6	120.0	3710912.8	277192.2	Probable BP Pipeline
M902	Mod2	1	39	MC	5525.7	97.0	3710545.2	276896.4	Probable BP Pipeline
M903	Mod2	1	40	MC	4983.6	116.0	3710488.0	276807.4	Probable BP Pipeline
M904	Mod2	1	41	MC	7017.0	63.0	3710189.0	276533.1	Probable BP Pipeline
M905	Mod2	1	42	MC	3374.9	78.0	3710095.3	276431.3	Probable BP Pipeline
M906	Mod2	1	43	MC	4374.7	110.0	3709722.4	276104.6	Probable BP Pipeline
M907	Mod2	1	44	MC	2851.7	91.0	3709650.9	276007.2	Probable BP Pipeline

Inventory of Magnetic Anomalies in Survey Area									
Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M908	Mod2	1	45	MC	4817.6	90.0	3709356.2	275735.2	Probable BP Pipeline
M909	Mod2	1	46	D	28.2	1.0	3707303.9	274299.1	Unknown
M910	Mod2	1	46	D	34.5	1.0	3707702.8	274518.8	Possibly associated with charted wreck
M911	Mod2	1	46	D	45.7	1.0	3708159.9	274921.7	Possibly associated with charted wreck
M912	Mod2	1	46	NM	57.4	4.0	3708442.4	275107.9	Unknown
M913	Mod2	1	46	MC	6247.0	61.0	3709280.2	275627.5	Probable BP Pipeline
M914	Mod2	1	45	D	4786.4	10.0	3709294.6	275704.1	Probable BP Pipeline
M915	Mod2	1	45	MC	37.4	32.8	3710747.1	276665.3	Possible flowline
M916	Mod2	1	46	D	8.8	3.1	3706501.7	273809.6	Debris
M917	Mod2	1	46	M	22.1	9.4	3706697.1	273939.6	Debris
M918	Mod2	1	46	D	20.2	4.7	3706800.7	274005.4	Debris
M919	Mod2	1	46	MC	28.2	7.8	3707303.9	274299.1	Possibly associated with charted wreck
M920	Mod2	1	46	MC	74.3	10.2	3707597.0	274435.7	Possibly associated with charted wreck
M921	Mod2	1	46	D	45.7	4.4	3708160.9	274923.7	Possibly associated with charted wreck
M922	Mod2	1	46	D	56.7	5.3	3708442.4	275107.9	Debris
M923	Mod2	1	46	MC	6166.0	201.0	3709341.1	275663.3	Probable BP Pipeline
M924	Mod2	1	46	MC	9.6	20.0	3710799.3	276641.2	Possible flowline
M925	Mod2	1	47	MC	63.7	13.1	3710639.6	276416.4	Possibly associated with flowline
M926	Mod2	1	47	D	32.3	8.2	3709449.7	275616.4	Debris
M927	Mod2	1	47	MC	7315.0	60.4	3708736.2	275150.3	Probable BP Pipeline
M928	Mod2	1	47	D	113.8	9.5	3708100.3	274718.3	Possibly associated with charted wreck
M929	Mod2	1	47	PM	10.0	2.0	3707917.9	274613.9	Possibly associated with charted wreck
M930	Mod2	1	47	NM	18.9	3.1	3707767.1	274507.4	Possibly associated with charted wreck
M931	Mod2	1	47	D	312.1	6.8	3707554.2	274351.7	Possibly associated with charted wreck
M932	Mod2	1	47	MC	5280.2	191.5	3706185.3	273461.6	Unknown
M933	Mod2	1	48	MC	5258.2	435.0	3706196.5	273464.7	unknown
M934	Mod2	1	48	MC	7337.0	293.8	3708741.1	275154.3	Probable BP Pipeline
M935	Mod2	1	48	D	32.2	5.3	3709449.7	275616.4	Debris
M936	Mod2	1	48	MC	63.8	8.2	3710639.6	276416.4	Possibly associated with flowline
M937	Mod2	1	49	MC	77.5	11.0	3710617.4	276334.2	Possibly associated with flowline
M938	Mod2	1	49	D	30.2	5.5	3709591.1	275649.1	Debris
M939	Mod2	1	49	MC	9879.9	242.0	3706871.8	273865.6	Probable BP Pipeline
M940	Mod2	1	50	MC	9351.1	391.0	3707467.0	274208.0	Possibly associated with charted wreck
M941	Mod2	1	50	D	9.5	46.7	3710687.1	276335.1	Possibly associated with flowline
M942	Mod2	1	50	D	31.0	15.0	3710916.0	276464.0	Debris
M943	Mod2	1	51	PM	43.2	7.0	3710581.7	276199.8	Possibly associated with flowline
M944	Mod2	1	51	NM	23.4	4.4	3710414.9	276086.3	Possible flowline
M945	Mod2	1	51	D	130.0	6.5	3709936.1	275764.5	Debris
M946	Mod2	1	51	PM	46.4	5.0	3708863.3	275059.5	Debris
M947	Mod2	1	51	MC	315.0	303.0	3708086.0	274547.5	Possibly associated with charted wreck
M948	Mod2	1	52	MC	94.5	232.0	3708180.2	274561.1	Possibly associated with charted wreck
M949	Mod2	1	52	D	28.3	3.4	3709637.8	275518.3	Debris
M950	Mod2	1	52	D	167.2	5.1	3710017.5	275813.7	Debris
M951	Mod2	1	53	D	89.0	5.0	3710558.8	276049.7	Possibly associated with flowline
M952	Mod2	1	53	D	57.0	8.6	3709132.8	275108.0	Debris

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Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M953	Mod2	1	53	NM	61.7	11.1	3707425.0	273983.7	Possibly associated with Chevron Pipeline
M954	Mod2	1	54	NM	25.0	5.1	3707330.7	273872.9	Possibly associated with Chevron Pipeline
M955	Mod2	1	54	D	160.0	9.8	3710628.9	276065.6	Possibly associated with flowline
M956	Mod2	1	55	PM	133.9	16.0	3711321.7	276434.9	Debris
M957	Mod2	1	55	D	67.1	9.0	3710538.4	275952.7	Possibly associated with flowline
M958	Mod2	1	55	D	103.2	10.0	3706853.7	273493.8	Possibly associated with Chevron Pipeline
M959	Mod2	1	55	D	223.9	8.8	3707728.0	274067.0	Possibly associated with Chevron Pipeline
M960	Mod2	1	56	D	123.0	12.4	3707033.4	273557.0	Possibly associated with Chevron Pipeline
M961	Mod2	1	56	D	40.0	4.0	3708123.7	274283.3	Possibly associated with Chevron Pipeline
M962	Mod2	1	56	PM	30.0	3.0	3709498.7	275207.5	Debris
M963	Mod2	1	56	D	39.0	9.0	3710603.1	275921.2	Possibly associated with flowline
M964	Mod2	1	57	PM	14.4	5.7	3710627.6	275866.6	Possibly associated with flowline
M965	Mod2	1	57	D	77.4	5.4	3710537.8	275813.8	Possibly associated with flowline
M966	Mod2	1	57	MC	219.3	29.8	3709964.9	275421.3	Unknown
M967	Mod2	1	57	D	22.0	56.0	3708765.4	274624.5	Possibly associated with Chevron Pipeline
M968	Mod2	1	57	D	319.0	4.9	3707936.1	274083.5	Possibly associated with Chevron Pipeline
M969	Mod2	1	57	D	225.3	4.0	3707805.8	273983.0	Possibly associated with Chevron Pipeline
M970	Mod2	1	57	D	907.0	6.4	3707203.9	273608.1	Possibly associated with Chevron Pipeline
M971	Mod2	1	57	MC		146.0	3706569.5	273193.7	Possibly associated with Chevron Pipeline
M972	Mod2	1	58	MC	5228.8	223.0	3706821.4	273272.3	Possibly associated with Chevron Pipeline
M973	Mod2	1	58	D	7537.9	58.3	3708894.5	274627.6	Possibly associated with Chevron Pipeline
M974	Mod2	1	58	PM	157.3	18.0	3710041.3	275421.0	Possibly associated with Chevron Pipeline
M975	Mod2	1	58	MC	5228.8	223.3	3706823.4	273273.5	Possibly associated with Chevron Pipeline
M976	Mod2	1	59	MC	3618.5	196.0	3707881.7	273927.1	Possibly associated with Chevron Pipeline
M977	Mod2	1	59	MP	72.0	13.7	3710512.9	275659.3	Possibly associated with Chevron Pipeline
M978	Mod2	1	59	MP	24.1	5.0	3711212.4	276098.1	Possibly associated with charted wreck or pipeline
M979	Mod2	1	59	D	60.0	7.3	3711337.5	276193.4	Possibly associated with pipeline or wreck
M980	Mod2	1	60	MC	4060.5	213.0	3708848.7	274512.8	Possibly associated with Chevron Pipeline
M981	Mod2	1	61	MC	6919.9	738.0	3709946.4	275182.7	Possibly associated with Chevron Pipeline
M982	Mod2	1	61	D	1371.3	15.7	3707290.0	273448.8	Unknown
M983	Mod2	1	62	MC	33.6	24.2	3706663.5	272935.5	Unknown
M984	Mod2	1	62	NM	12.6	11.5	3707061.9	273217.0	Unknown
M985	Mod2	1	62	MC	5620.0	399.0	3710361.7	275422.6	Possibly associated with Chevron Pipeline
M986	Mod2	1	62	NM	12.6	8.1	3707061.9	273217.0	Unknown
M987	Mod2	1	62	MC	31.9	22.0	3706663.5	272935.5	Unknown

Inventory of Magnetic Anomalies in Survey Area									
Anom. Number	Region	Block	Line	Signature	Amplitude	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes
M988	Mod2	1	63	MC	19.4	11.5	3707014.4	273107.0	Unknown
M989	Mod2	1	63	D	44.2	11.6	3707443.4	273403.8	Unknown
M990	Mod2	1	63	D	333.4	10.0	3709738.3	274888.0	Unknown
M991	Mod2	1	63	D	135.0	18.2	3709855.0	274989.1	Unknown
M992	Mod2	1	63	MC	613.9	139.0	3710577.8	275488.2	Possibly associated with Chevron Pipeline
M993	Mod2	1	64	D	49.8	3.0	3706920.2	272986.9	Unknown
M994	Mod2	1	64	D	28.8	3.6	3707926.1	273683.1	Debris
M995	Mod2	1	64	NM	29.0	6.2	3710133.0	275112.8	Debris
M996	Mod2	1	64	MC	92.4	192.0	3710981.4	275662.3	Possibly associated with Chevron Pipeline
M997	Mod2	1	65	D	421.9	9.0	3706721.3	272811.6	Unknown
M998	Mod2	1	65	D	57.1	7.0	3708392.3	273921.3	Possibly associated with charted wreck
M999	Mod2	1	65	PM	47.7	4.0	3709135.0	274399.5	Unknown
M1000	Mod2	1	65	D	37.1	4.0	3709670.5	274748.9	Unknown
M1001	Mod2	1	65	D	36.9	2.0	3709778.5	274840.7	Unknown
M1002	Mod2	1	65	D	69.5	6.0	3709845.4	274874.7	Unknown
M1003	Mod2	1	65	NM	1131.0	15.0	3711269.7	275833.1	Unknown
M1004	Mod2	1	65	D	2506.8	22.0	3711383.1	275890.0	Unknown
M1005	Mod2	1	65	D	351.5	5.0	3711839.1	276101.9	Possibly associated with Chevron Pipeline

Table 2. Inventory of Acoustic Anomalies in Survey Area.

Anomaly No.	Line No.	Easting (in State Plane)	Northing (in State Plane)	Description	Correlation
A1	BIL1A	3718457.4	281587.8	Bottom Feature	
A2	B1L2	3717534.0	279691.7	Debris	
A3	B1L3	3719338.7	282992.5	Small modern craft some 18 foot long.	
A4	B1L4	3718983.3	282491.2	Debris	
A5	B1L5	3720357.6	283998.8	Old ground tackle, chain, and tires from earlier buoys.	
A6	B1L5	3719637.3	283353.7	Debris	
A7	B1L5	3719385.2	283102.1	Drag marks and dragged debris	
A8	B2L2	3714282.9	276864.8	Possible modern small craft	
A9	B2L2	3716137.0	277838.4	Rectangular object 15 ft. long possibly an upside-down johnny boat.	
A10	B2L2	3717387.9	279017.1	Possible chain or cable debris	
A11	B2L4	3714727.6	277015.5	Possible john boat.	T15
A12	B2L4	3716142.3	277838.5	Possible john boat.	
A13	B3L3	3710457.9	274431.5	Possible modern small craft	
A14	GIL1A	3701705.3	269613.9	Possible modern small craft	T56
A15	GIL2	3697972.9	264510.0	Debris	T83
A16	GIL4	3697982.9	264570.7	Possible small craft.	
A17	GIL6	3697797.8	264011.0	Possible small boat.	T86
A18	GIL6	3700477.3	268211.8	Possible small craft.	T63
A19	GIL8	3698114.8	264190.4	Possible vessel some 30 feet long.	T84
A20	GIL9	3699984.7	267587.9	Possible small craft.	
A21	F2L1	3715780.9	280961.8	Possible small craft	
A22	F2L4	3713095.9	279699.5	Debris	
A23	F2L4	3714887.3	280126.9	Debris	
A24	F2L6	3713221.2	279446.4	Debris field	
A25	F1L7	3709061.7	278354.9	Possible vessel or mud pushup	
A26	FL10A	3715913.5	280539.1	Debris	T98
A27	FC8	3706667.7	274435.6	Debris	
A28	FC9	3708140.3	275786.3	Bottom Feature	
A29	FC14	3706822.2	274413.1	Barge mud pushup	
A30	BR4L1	3704524.4	271325.5	Debris 15.4 x 3.5 x 2	
A31	BR4L1A	3708210.7	272495.8	Debris 52.4 x 6.4	
A32	BR4L2	3708542.9	272730.0	Debris 25.6 x 17.3	
A33	BR4L3A	3705310.9	271801.3	Red buoy marker # 18 (7 x 3.5)	
A34	BR4L4	3706913.9	272013.9	Debris 23.0 x 14.4	Debris
A35	BR4L4	3704903.1	271675.4	Debris 8.6 x 2.2 x 9.5	Debris
A36	BR4L5	3706566.5	272173.6	Debris 9.8 x 3.2	Possible day marker
A37	BR4L5	3706587.8	272173.8	Debris 4.5 x 3.5 x 1.0	Crab pots
A38	BR4L5	3706609.2	272161.9	Debris 5.9 x 4.8	Crab pots
A39	FF3L1	3708846.3	274509.5	Debris 9.4 x 5.1	Shrimp net
A40	FF3L2	3708796.7	274660.5	Debris 11.8 x 6.73	
A41	FF3L2	3709628.9	274864.2	Debris 32.9 x 3.5 x 3.5	Structural debris
A42	FF3L2	3710627.2	275403.3	Debris 4.5 x 4.5 x 4.4	T149
A43	FF3L2	3710705.6	275519.3	Debris 48.7 x 19.5	
A44	FF3L11	3711273.3	276059.4	Debris 66.5 x 20.1	T147
A45	FF3L12	3709242.9	275138.5	Debris 21.4 x 1.77	Pipe segments
A46	FF3L3	3710616.6	275403.1	Debris 5.64 x 3.2 x 1.4	T149
A47	FF3L3	3709575.7	274863.6	Debris 17.8 x 5.3 x .7	Nunken dredge float
A48	FF3L8	3710278.9	275641.6	Debris 5.3 x 3.8	Crab pots
A49	FF3L9	3711574.8	276178.1	Debris 38.4 x 3.4	Sunken tree
A50	FF4L19	3713730.2	278652.4	Debris 24.8 x 21.8	Well, deck debris
A51	FF4L23	3713729.3	279179.7	Debris 18.3 x 1.9	T107
A52	FF4L23	3713819.8	279162.6	Debris 8.4 x 1.6	Dolphin
A53	FF4L29	3713884.0	279575.5	Debris 18.6 x 1.9	Isolated timber
A54	FF4L32	3714588.6	279771.8	Debris 9.2 x 4.6	Keep
A55	FF4L33	3712979.7	279189.0	Debris 3.3 x 3.6	Pipe marker
A56	FF4L33	3712974.5	279182.9	Debris 6.4 x 2.7 x 3.7	Pipe marker
A57	FF4L33	3713075.3	279196.2	Debris 11.8 x 2.2	Isolated timber
A58	FF4L33	3713095.6	279275.2	Columbia Gas Pilings 2.9 x 1.9	T146
A59	MOD2	3707517.6	274487.9	NOAA Charted Wreck	

Table 3. Target Clusters.

Target Clusters											
Target	**Anom**	**Region**	**Block**	**Line**	**Amplitude**	**Signature**	**Duration**	**Easting (in State Plane)**	**Northing (in State Plane)**	**Notes**	**Correlations**
T1	M4	BR	1	3	624	MC	85.7	3719670.7	283105.8	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T2	M12	BR	1	4	602	PM	42.1	3718611.7	282329.5	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M11	BR	1	5	484	D	22	3718644.3	282347.8	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T3	M9	BR	1	2	1150	MC	95.8	3718750.2	282077.0	NC- Possible buoy ground tackle	
T4	M13	BR	1	2	3008	D	34	3718279.7	281576.8	NC- No adjacency. Insufficient duration. Debris	
T5	M19	BR	1	5	2812	MC	82.1	3717849.5	280553.5	NC -poss assoc with wreck on shore	
T6	M24	BR	1	2	836	D	18	3717713.0	279908.1	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M23	BR	2	3	536	PM	14	3717723.4	279921.8	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T7	M28	BR	1	2	6118	NM	44.1	3717560.4	279536.2	NC- Bulkheads	
	M27	BR	2	1	33250	NM	143.7	3717588.9	279474.6	Start of line near docks, bulkheads	
	M29	BR	2	2	13760	NM	104.1	3717559.0	279461.0	NC- Bulkheads	
T8	M33	BR	2	4	1324	NM	10	3717222.9	279201.9	Debris	
	M32	BR	2	5	258	PM	6	3717234.5	279243.6	Debris	
	M34	BR	2	5	6130	D	12	3717215.1	279257.0	Debris	
T9	M37	BR	2	2	10592	MC	208.3	3716832.1	278497.1	NC -Debris assoc with Exxon terminal nearby on shore	
T10	M36	BR	2	1	60792	MC	206.3	3716835.1	278396.4	NC -Debris assoc with Exxon terminal nearby on shore	
T11	M39	BR	2	4	9212	D	42.1	3716597.8	278440.6	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M38	BR	2	5	4982	D	36.1	3716601.6	278432.8	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T12	M44	BR	2	1	8928	D	60.1	3715734.2	277330.9	NC -Possible Pipeline	
	M45	BR	2	2	7414	MC	98.1	3715674.9	277417.0	NC -Possible Pipeline	
	M46	BR	2	3	17962	D	26	3715664.2	277405.3	NC -Possible Pipeline	
	M47	BR	2	4	13824	MC	52.1	3715611.8	277483.4	NC -Possible Pipeline	
	M48	BR	2	5	14068	D	40	3715565.8	277477.7	NC -Possible Pipeline	
T13	M49	BR	2	5	2616	PM	16	3715248.8	277325.6	NC- No adjacency. Insufficient duration. Debris	
T14	M50	BR	2	2	21876	MC	129.8	3714905.6	277139.2	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T15	M52	BR	2	1	16448	MC	88.1	3714756.7	277021.9	Debris and possible modern john boat	A11
	M53	BR	2	3	12422	D	18	3714720.2	277114.3	Debris	
	M54	BR	2	4	8574	NM	18	3714686.2	277160.4	Debris	
T16	M58	BR	2	4	5254	PM	26	3713995.2	276938.5	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M59	BR	2	5	2964	PM	30	3713971.2	276976.5	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T17	M60	BR	2	1	3294	MC	84.1	3713648.5	276486.7	NC -Debris assoc with nearby shore facilities	
T18	M62	BR	2	1	2794	PM	24	3713418.9	276378.5	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M61	BR	3	1	2776	PM	12	3713423.4	276378.4	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T19	M66	BR	2	2	10208	MC	77.6	3713188.6	276316.6	Debris	
	M67	BR	2	4	8418	D	28	3713132.2	276377.0	Debris	
	M64	BR	3	1	410	PM	10	3713252.6	276290.4	Debris	
	M65	BR	3	3	968	D	15.5	3713202.1	276350.4	Debris	
	M69	BR	3	4	238	PM	12	3713073.6	276337.7	Debris	
	M68	BR	3	5	1124	MC	36	3713094.5	276492.0	Debris	
T20	M71	BR	3	4	120	MC	10	3712890.4	276200.5	NC- No adjacency. Insufficient duration. Debris	

Target Clusters											
Target	Anom	Region	Block	Line	Amplitude	Signature	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes	Correlations
T21	M72	BR	3	4	2144	NM	30	3712746.3	276135.1	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M74	BR	3	5	1102	D	14	3712732.8	276140.6	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T22	M77	BR	3	4	1062	PM	22	3712388.4	275893.1	NC - Red channel Marker 12	
	M78	BR	3	5	5188	D	20	3712380.5	275903.7	NC - Red channel Marker 12	
T23	M79	BR	3	2	5198	MC	40.5	3712379.3	275736.4	NC -assoc with shipyard and dock	
T24	M83	BR	3	4	710	D	30	3711934.6	275551.7	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M84	BR	3	5	2040	D	18	3711889.5	275552.3	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T25	M87	BR	3	3	2816	MC	37.6	3711803.5	275398.3	NC -Possible Pipeline	
T26	M85	BR	3	1	69574	D	42.1	3711858.9	275307.9	NC -Possible Pipeline	
	M86	BR	3	2	2896	D	28	3711811.4	275327.0	NC -Possible Pipeline	
T27	M88	BR	3	4	2712	MC	56.1	3711671.0	275358.5	Debris	
	M89	BR	3	5	4884	D	34.1	3711657.0	275401.7	Debris	
T28	M92	BR	3	4	426	NM	26	3711245.4	275060.5	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M93	BR	3	5	4806	D	22	3711235.6	275094.9	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T29	M96	BR	3	3	1398	MC	176.3	3710834.2	274654.6	NC -Possible Pipeline	
T30	M110	BR	3	5	180	MC	16	3709619.1	273812.6	NC- No adjacency. Insufficient duration. Debris	
T31	M111	BR	3	4	698	D	14	3709559.6	273709.7	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M112	BR	3	5	338	D	14	3709503.9	273727.0	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T32	M118	BR	3	3	814	D	5.5	3708919.3	273236.2	NC-These three anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M119	BR	3	4	246	PM	14	3708896.6	273244.0	NC-These three anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M120	BR	3	5	1106	PM	10	3708851.7	273270.8	NC-These three anomalies lie on adjacent track lines but lack a MC signature. Debris	
T33	M124	BR	3	4	192	PM	10	3708634.3	273122.6	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M125	BR	3	5	530	PM	8	3708632.3	273141.2	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T34	M136	GI	4	2	2126	NM	6	3707288.2	272505.4	NC-These two anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
	M135	GI	4	1	62	D	14	3707344.5	272477.0	NC-These two anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
	M137	GI	4	1	1182	NM	10	3707278.5	272519.0	NC-These two anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
T35	M141	GI	4	3	10668	NM	6	3707212.5	272402.1	NC-These two anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
	M142	GI	4	4	1078	PM	16	3707210.9	272393.4	NC-These two anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	

Target Clusters											
Target	Anom	Region	Block	Line	Amplitude	Signature	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes	Correlations
T36	M130	GI	4	9	2750	NM	14	3707435.1	272139.8	NC-These two anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
	M133	GI	4	10	2422	D	14	3707411.0	272101.0	NC-These two anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
T37	M139	GI	4	9	1462	NM	4	3707245.4	272081.0	NC-These two anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
	M140	GI	4	10	2436	PM	10	3707225.4	272050.5	NC-These anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
T38	M146	GI	4	5	80	D	16	3707119.6	272270.9	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M147	GI	4	6	548	D	22	3707090.8	272253.8	NC-These two anomalies lie on adjacent track lines but lack a MC signature. Debris	
T39	M156	GI	4	4	1432	D	12	3706895.0	272329.2	Red Channel Marker 16	
	M152	GI	3	1	30	PM	4	3706938.7	272336.4	Red Channel Marker 16	
T40	M163	GI	3	1	1930	NM	20	3706813.7	272346.2	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M159	GI	4	1	68	D	10	3706853.1	272394.3	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M162	GI	4	2	322	D	12	3706821.0	272389.6	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T41	M154	GI	4	5	588	D	6	3706925.9	272223.5	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M158	GI	4	6	266	D	12	3706870.0	272187.1	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M157	GI	3	3	160	D	16	3706880.5	272213.5	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T42	M168	GI	2	3	34	PM	4	3706666.2	272064.2	NC-These anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
	M174	GI	2	3	54	D	8	3706582.3	272113.8	NC-These anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
	M172	GI	3	3	72	D	10	3706600.2	272124.9	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M171	GI	3	5	194	D	20	3706618.8	272078.8	NC-These anomalies lie on adjacent track lines but have relatively short duration and lack a MC signature. Debris	
T43	M177	GI	2	1	1242	D	6	3706551.0	272195.0	NC- Daymarker and associated ferrous debris	
	M169	GI	3	1	214	PM	4	3706632.3	272239.7	NC- Daymarker and associated ferrous debris	
	M176	GI	3	2	686	MC	18	3706557.3	272241.3	NC- Daymarker and associated ferrous debris	
	M173	GI	3	2	1226	D	12	3706597.2	272211.0	NC- Daymarker and associated ferrous debris	
T44	M180	GI	2	3	62	D	10	3706488.4	272035.2	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M181	GI	2	4	38	NM	4	3706466.2	271985.9	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M182	GI	3	6	52	NM	3	3706453.7	271937.7	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	

Target Clusters											
Target	**Anom**	**Region**	**Block**	**Line**	**Amplitude**	**Signature**	**Duration**	**Easting (in State Plane)**	**Northing (in State Plane)**	**Notes**	**Correlations**
T45	M183	GI	2	1	1652	D	10	3706451.0	272178.2	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M184	GI	3	2	612	PM	12	3706447.0	272146.1	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T46	M191	GI	2	1	23690	D	32	3706320.8	272114.5	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M190	GI	3	2	656	D	20	3706327.8	272153.8	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T47	M192	GI	2	2	556	D	60	3706305.9	272059.3	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M189	GI	2	3	686	D	18	3706337.9	272044.4	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T48	M211	GI	1	1	352	D	14	3702930.3	270204.2	Debris	
	M213	GI	1	1	2112	D	22	3702914.1	270175.7	Debris	
	M212	GI	1	1	2254	MC	26	3702925.3	270195.1	Debris	
	M216	GI	1	2	3194	D	10	3702887.0	270192.9	Debris	
T49	M208	GI	1	3	328	NM	10	3702985.5	270069.5	Breakwater and associated debris	
	M198	GI	1	5	2090	MC	36	3703084.6	270028.4	Breakwater and associated debris	
	M204	GI	1	7	272	D	10	3703027.5	270044.8	Breakwater and associated debris	
	M199	GI	1	8	2908	D	8	3703049.1	270046.1	Breakwater and associated debris	
	M205	GI	1	9	418174	NM	4	3703008.8	270025.1	Breakwater and associated debris	
T50	M219	GI	1	1	1896	D	16	3702771.5	270120.2	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M218	GI	1	1	862	D	24	3702776.4	270116.9	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T51	M202	GI	1	7	378	D	24	3703032.3	269879.6	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M201	GI	1	9	400	NM	4	3703043.8	269883.3	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M207	GI	1	9	2372	D	10	3702999.9	269835.7	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T52	M210	GI	1	6	342	PM	8	3702934.6	269902.9	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M214	GI	1	7	1418	PM	10	3702907.1	269858.8	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M215	GI	1	8	346	PM	6	3702891.8	269853.6	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T53	M222	GI	1	5	272	PM	8	3702668.2	269816.5	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M221	GI	1	6	275310	D	26	3702687.4	269809.1	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T54	M230	GI	1	5	7686	D	24	3702298.4	269645.4	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M229	GI	1	6	324	D	30	3702298.8	269641.0	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T55	M232	GI	1	5	1892	D	18	3702210.0	269557.6	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M234	GI	1	6	738	PM	16	3702197.4	269559.4	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T56	M250	GI	1	1	6176	NM	12	3701831.6	269602.7	NC - Probable Pipeline	A14
	M251	GI	1	2	6190	NM	30	3701809.5	269645.5	NC - Probable Pipeline	
	M245	GI	1	3	1718	D	20	3701886.2	269534.3	NC - Probable Pipeline	
	M247	GI	1	4	866	D	12	3701876.7	269528.6	NC - Probable Pipeline	

Target Clusters											
Target	Anom	Region	Block	Line	Amplitude	Signature	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes	Correlations
	M246	GI	I	5	2084	NM	24	3701877.0	269412.4	NC - Probable Pipeline	
	M244	GI	I	6	400388	D	36	3701919.6	269372.3	NC - Probable Pipeline	
	M241	GI	I	7	270	NM	8	3701969.6	269377.8	NC - Probable Pipeline	
	M243	GI	I	7	417476	NM	12	3701929.3	269312.1	NC - Probable Pipeline	
	M240	GI	I	8	4340	D	14	3701970.3	269342.5	NC - Probable Pipeline	
	M239	GI	I	9	403678	NM	4	3702003.4	269252.2	NC - Probable Pipeline	
	M242	GI	I	9	922	D	14	3701943.5	269263.4	NC - Probable Pipeline	
T57	M254	GI	I	8	2444	D	10	3701668.5	269197.1	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M253	GI	I	9	7534	NM	10	3701717.2	269148.9	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T58	M260	GI	I	5	8924	D	22	3701563.1	269202.5	Debris	
	M261	GI	I	6	734	NM	12	3701557.2	269201.3	Debris	
	M258	GI	I	7	6386	MC	16	3701583.9	269154.8	Debris	
T59	M267	GI	I	3	928	MC	42	3701440.6	269266.4	Debris	
	M266	GI	I	4	8360	D	18	3701441.3	269233.2	Debris	
T60	M276	GI	I	3	150	D	14	3700973.9	268936.6	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M274	GI	I	4	176	D	18	3700996.1	268912.3	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T61	M273	GI	I	6	110	D	10	3701038.1	268801.1	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M272	GI	I	7	868	PM	8	3701040.9	268746.8	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T62	M287	GI	I	1	776	NM	22	3700363.6	268683.4	Debris	
	M283	GI	I	3	276	D	24	3700473.5	268620.9	Debris	
	M284	GI	I	4	9000	PM	10	3700453.8	268527.3	Debris	
	M282	GI	I	6	236	MC	18	3700504.7	268434.6	Debris	
	M278	GI	I	7	1320	D	10	3700611.7	268436.3	Debris	
	M279	GI	I	7	558	PM	4	3700588.9	268365.6	Debris	
	M277	GI	I	9	1748	NM	8	3700628.6	268377.0	Debris	
	M280	GI	I	9	432	D	10	3700578.6	268317.9	Debris	
T63	M281	GI	I	8	1530	NM	8	3700505.3	268235.0	Dock or seawall	A18
T64	M292	GI	I	5	1702	NM	16	3700246.4	268125.1	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M291	GI	I	6	96	D	14	3700295.2	268086.8	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M289	GI	I	7	1428	PM	10	3700308.1	268067.4	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T65	M288	GI	I	7	1152	NM	8	3700325.0	267954.3	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M290	GI	I	8	220	PM	6	3700304.6	267961.5	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T66	M295	GI	I	6	766	PM	8	3700125.1	267738.6	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M296	GI	I	7	508	PM	8	3700106.7	267738.2	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T67	M299	GI	I	3	126	MC	14	3699871.6	267673.0	NC- No adjacency. Insufficient duration. Debris	
T68	M308	GI	I	1	5790	MC	20	3699702.2	267584.8	Debris	
	M306	GI	I	2	7746	MC	24	3699744.9	267549.7	Debris	
	M305	GI	I	3	658	MC	46	3699759.7	267530.9	Debris	
	M302	GI	I	4	5978	PM	8	3699820.8	267528.3	Debris	
T69	M307	GI	I	6	192	D	40	3699743.5	267224.7	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M304	GI	I	7	12056	D	30	3699768.8	267181.9	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	

Target Clusters											
Target	Anom	Region	Block	Line	Amplitude	Signature	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes	Correlations
	M303	GI	1	8	536	D	20	3699811.5	267180.4	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M298	GI	1	9	232	PM	10	3699872.2	267149.1	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T70	M316	GI	1	2	804	NM	8	3699494.7	267225.3	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M314	GI	1	3	224	D	20	3699530.4	267210.5	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T71	M322	GI	1	1	428308	MC	38	3699401.2	267137.8	Debris	
	M318	GI	1	2	336	D	26	3699448.4	267147.8	Debris	
T72	M319	GI	1	4	908	D	24	3699447.5	266969.9	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M317	GI	1	5	638	D	18	3699464.8	266939.3	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T73	M324	GI	1	8	190	PM	10	3699323.4	266414.7	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M323	GI	1	9	316	D	8	3699362.7	266422.7	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T74	M327	GI	1	8	2492	NM	10	3699264.8	266335.9	NC -Submerged Pipe Charted in this area	
	M328	GI	1	9	424362	NM	8	3699261.4	266316.9	NC -Submerged Pipe Charted in this area	
T75	M339	GI	1	6	242	D	18	3699102.6	266216.6	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M333	GI	1	7	684	NM	6	3699173.9	266225.2	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M334	GI	1	7	396	NM	8	3699160.7	266180.0	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M330	GI	1	8	150	D	8	3699231.7	266228.7	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T76	M350	GI	1	1	758	D	14	3698856.4	266306.3	NC -Submerged Pipe Charted in this area	
	M348	GI	1	2	414886	D	10	3698888.2	266261.4	NC -Submerged Pipe Charted in this area	
	M345	GI	1	3	982	NM	12	3698919.1	266219.7	NC -Submerged Pipe Charted in this area	
T77	M342	GI	1	6	410972	D	16	3698969.4	266066.6	NC -Submerged Pipe Charted in this area	
	M340	GI	1	8	578	D	8	3699019.3	266066.1	NC -Submerged Pipe Charted in this area	
T78	M344	GI	1	7	524	NM	10	3698920.3	265736.9	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M347	GI	1	8	238	NM	8	3698907.3	265712.0	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T79	M349	GI	1	7	427210	NM	10	3698870.6	265472.4	NC -Submerged Pipe Charted in this area	
	M351	GI	1	8	88	PM	8	3698836.9	265507.1	NC -Submerged Pipe Charted in this area	
T80	M354	GI	1	8	130	D	12	3698811.3	265405.3	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M353	GI	1	9	670	D	10	3698836.6	265373.6	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T81	M357	GI	1	7	136	D	12	3698760.3	265252.2	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	

Target Clusters											
Target	Anom	Region	Block	Line	Amplitude	Signature	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes	Correlations
	M358	GI	1	7	136	D	4	3698760.3	265252.2	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M356	GI	1	8	7528	PM	8	3698774.2	265211.6	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M355	GI	1	9	522	D	12	3698807.0	265253.9	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T82	M367	GI	1	7	92	D	12	3698577.5	264840.0	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M368	GI	1	8	82	D	14	3698554.9	264861.4	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T83	M378	GI	1	4	1212	D	20	3698015.7	264486.4	Debris	A15
T84	M376	GI	1	9	423916	NM	6	3698104.9	264214.0	Debris	A19
T85	M381	GI	1	8	108	D	14	3697973.5	264122.8	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M379	GI	1	9	1948	D	8	3698011.4	264093.4	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T86	M386	GI	1	5	882	D	12	3697759.5	264042.8	Possible modern watercraft	A17
	M388	GI	1	6	802	D	28	3697743.9	263986.5	Possible modern watercraft	
	M384	GI	1	7	1122	D	22	3697843.5	264005.8	Possible modern watercraft	
T87	M389	GI	1	7	152458	D	22	3697725.7	263889.4	NC -Submerged Pipe Charted in this area	
	M387	GI	1	8	417214	NM	6	3697744.3	263875.9	NC -Submerged Pipe Charted in this area	
T88	M391	GI	1	8	338	D	6	3697671.7	263753.1	NC -Submerged Pipe Charted in this area	
	M390	GI	1	9	425328	NM	4	3697699.1	263777.9	NC -Submerged Pipe Charted in this area	
T89	M393	GI	1	6	622	MC	18	3697387.7	263719.9	NC- No adjacency. Debris	
T90	M399	FIFI	2		68	MC	16	3717306.6	280892.4	Debris or Enterprise/Promix Pipeline	
	M400	FIFI	2		130	D	8	3717288.7	280846.0	Debris or Enterprise/Promix Pipeline	
T91	M409	FIFI	2	5	418	NM	4	3716940.7	281023.0	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M411	FIFI	2	6	222	NM	4	3716934.4	280997.9	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T92	M415	FIFI	2	1	3104	D	30	3716875.4	281238.6	NC - Chevron Pipeline	
	M414	FIFI	2	2	3812	NM	16	3716878.1	281233.7	NC - Chevron Pipeline	
	M420	FIFI	2	3	1258	D	36	3716842.4	281138.5	NC - Chevron Pipeline	
	M424	FIFI	2	4	6222	PM	18	3716805.6	281112.7	NC - Chevron Pipeline	
	M427	FIFI	2	5	5254	D	30	3716772.4	281021.2	NC - Chevron Pipeline	
	M425	FIFI	2	6	5610	PM	20	3716798.1	280989.2	NC - Chevron Pipeline	
	M423	FIFI	2	6	630	PM	4	3716809.8	280978.9	NC - Chevron Pipeline	
	M419	FIFI	2	6	542	D	8	3716844.0	281001.9	NC - Chevron Pipeline	
	M412	FIFI	2		542	NM	8	3716896.8	280938.6	NC - Chevron Pipeline	
	M417	FIFI	2		154	PM	4	3716865.8	280932.6	NC - Chevron Pipeline	
	M421	FIFI	2		174	PM	6	3716831.5	280909.4	NC - Chevron Pipeline	
	M422	FIFI	2		204	PM	6	3716824.1	280916.2	NC - Chevron Pipeline	
	M413	FIFI	2		714	D	10	3716887.0	280890.0	NC - Chevron Pipeline	
	M416	FIFI	2		186	PM	4	3716867.0	280831.9	NC - Chevron Pipeline	
	M426	FIFI	2		68	NM	4	3716794.9	280776.8	NC - Chevron Pipeline	
	M418	FIFI	2		86	NM	6	3716844.8	280757.9	NC - Chevron Pipeline	
T93	M431	FIFI	2	1	1800	NM	22	3716644.5	281227.0	NC -Possible Pipeline	
	M432	FIFI	2	2	21786	NM	28	3716641.3	281199.7	NC -Possible Pipeline	
	M435	FIFI	2	3	28186	NM	22	3716626.0	281101.1	NC -Possible Pipeline	
	M434	FIFI	2	4	7488	D	26	3716635.0	281060.5	NC -Possible Pipeline	
	M433	FIFI	2	5	3374	D	20	3716635.4	280943.2	NC -Possible Pipeline	
	M437	FIFI	2	6	11236	PM	20	3716613.3	280971.4	NC -Possible Pipeline	
	M428	FIFI	2		5616	PM	40	3716657.1	280914.3	NC -Possible Pipeline	
	M430	FIFI	2		18462	D	40	3716649.3	280839.6	NC -Possible Pipeline	
	M436	FIFI	2		6570	D	22	3716619.8	280787.9	NC -Possible Pipeline	
	M429	FIFI	2		9850	D	8	3716651.3	280743.4	NC -Possible Pipeline	
T94	M442	FIFI	2		612	D	18	3716494.1	280712.2	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	

Target Clusters											
Target	Anom	Region	Block	Line	Amplitude	Signature	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes	Correlations
	M441	FIFI	2		782	NM	12	3716523.2	280693.2	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M438	FIFI	2		11542	D	14	3716586.4	280705.9	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M439	FIFI	2		29628	D	22	3716544.2	280653.4	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T95	M452	FIFI	2	6	284	PM	4	3716152.3	280679.8	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M450	FIFI	2	6	144	PM	6	3716177.8	280709.6	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T96	M454	FIFI	2	2	82	MC	16	3716058.0	280846.6	NC- No adjacency. Insufficient duration. Debris	
T97	M457	FIFI	2	1	156	D	14	3715977.1	280915.6	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M458	FIFI	2	2	74	NM	12	3715944.8	280876.4	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T98	M460	FIFI	2		96	D	10	3715934.7	280580.2	Debris	A26
T99	M480	FIFI	2	1	17150	PM	20	3714953.4	280462.9	NC -Possible Pipeline	
	M479	FIFI	2	2	3404	D	22	3714955.1	280430.1	NC -Possible Pipeline	
	M477	FIFI	2	3	12442	PM	14	3715037.6	280347.2	NC -Possible Pipeline	
	M478	FIFI	2	4	4558	PM	24	3715026.6	280370.3	NC -Possible Pipeline	
	M475	FIFI	2	5	5790	NM	14	3715085.0	280288.4	NC -Possible Pipeline	
	M474	FIFI	2	6	11146	PM	10	3715104.6	280274.7	NC -Possible Pipeline	
T100	M502	FIFI	2	1	4578	PM	8	3714060.5	280157.7	NC -Probable Pipeline	
	M501	FIFI	2	2	1384	PM	8	3714068.2	280117.4	NC -Probable Pipeline	
	M499	FIFI	2	3	6354	D	20	3714101.7	280043.6	NC -Probable Pipeline	
	M500	FIFI	2	4	2142	NM	14	3714099.8	280012.9	NC -Probable Pipeline	
	M498	FIFI	2	5	270550	NM	10	3714121.4	279959.0	NC -Probable Pipeline	
	M497	FIFI	2	6	8348	PM	12	3714136.2	279909.9	NC -Probable Pipeline	
	M496	FIFI	2		409682	NM	24	3714161.1	279858.8	NC -Probable Pipeline	
	M495	FIFI	2		49198	PM	16	3714170.0	279830.1	NC -Probable Pipeline	
	M493	FIFI	2		2410	D	16	3714199.7	279753.5	NC -Probable Pipeline	
	M494	FIFI	2		372526	MC	24	3714198.5	279705.9	NC -Probable Pipeline	
	M492	FIFI	2		1400	PM	8	3714213.2	279687.9	NC -Probable Pipeline	
	M836	FIFI	4	18	2494	D	24	3714420.9	279115.9	NC -Probable Pipeline	
	M841	FIFI	4	20	2286	D	18.1	3714406.5	279176.0	NC -Probable Pipeline	
	M847	FIFI	4	21	364826	NM	10	3714378.8	279259.4	NC -Probable Pipeline	
	M848	FIFI	4	22	5370	MC	26	3714401.4	279299.6	NC -Probable Pipeline	
	M859	FIFI	4	25	319646	NM	4	3714310.5	279433.9	NC -Probable Pipeline	
	M860	FIFI	4	26	2100	NM	12	3714304.7	279466.3	NC -Probable Pipeline	
	M866	FIFI	4	27	18786	PM	8	3714271.1	279556.5	NC -Probable Pipeline	
	M867	FIFI	4	28	18530	NM	8	3714271.8	279563.3	NC -Probable Pipeline	
	M872	FIFI	4	29	920	MC	16	3714232.0	279633.6	NC -Probable Pipeline	
	M873	FIFI	4	30	1860	D	6	3714223.1	279671.5	NC -Probable Pipeline	
	M878	FIFI	4	31	1980	PM	6.4	3714214.4	279718.7	NC -Probable Pipeline	
	M879	FIFI	4	32	4160	MC	20	3714196.9	279759.0	NC -Probable Pipeline	
	M884	FIFI	4	33	24600	MC	12	3714175.1	279814.0	NC -Probable Pipeline	
T101	M505	FIFI	2		200	MC	22	3713952.6	279755.8	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T102	M530	FIFI	1	5	5280	D	20	3713013.0	279367.8	NC -BP Pipeline	
	M535	FIFI	1		420842	D	42	3712896.1	279235.3	NC -BP Pipeline	
	M506	FIFI	2	1	431198	NM	22	3713923.2	280134.4	NC -BP Pipeline	
	M508	FIFI	2	2	28152	D	36	3713842.3	280033.1	NC -BP Pipeline	
	M512	FIFI	2	3	435058	D	50	3713719.4	279962.9	NC -BP Pipeline	
	M516	FIFI	2	4	79292	D	32	3713624.7	279830.4	NC -BP Pipeline	
	M521	FIFI	2	5	447840	D	20	3713504.3	279725.2	NC -BP Pipeline	
	M527	FIFI	2	6	5888	NM	8	3713278.5	279604.9	NC -BP Pipeline	
T103	M517	FIFI	2		3780	NM	10	3713582.9	279614.6	NC -Undocumented Pipeline	
	M515	FIFI	2		232	PM	4	3713639.7	279608.5	NC -Undocumented Pipeline	
	M513	FIFI	2		66	NM	4	3713700.3	279594.2	NC -Undocumented Pipeline	
	M509	FIFI	2		278	PM	4	3713816.5	279614.9	NC -Undocumented Pipeline	
	M511	FIFI	2		180	NM	4	3713735.9	279600.5	NC -Undocumented Pipeline	
	M507	FIFI	2		5532	PM	4	3713874.4	279605.4	NC -Undocumented Pipeline	

Target Clusters										
Target	**Anom**	**Region**	**Block**	**Line**	**Amplitude**	**Signature**	**Duration**	**Easting (in State Plane)**	**Northing (in State Plane)**	**Notes**	**Correlations**
T104	M520	FIFI	2		12010	D	14	3713522.6	279461.2	NC -Conoco Pipeline	
	M514	FIFI	2		420722	NM	4	3713655.7	279389.8	NC -Conoco Pipeline	
	M519	FIFI	2		414476	NM	12	3713529.5	279479.4	NC -Conoco Pipeline	
	M851	FIFI	4	23	6966	MC	26.1	3714303.7	279315.0	NC -Conoco Pipeline	
	M858	FIFI	4	25	17392	D	16	3714119.6	279347.2	NC -Conoco Pipeline	
	M861	FIFI	4	26	13782	MC	22.1	3714050.3	279360.9	NC -Conoco Pipeline	
	M865	FIFI	4	27	7028	MC	22.1	3713956.7	279377.2	NC -Conoco Pipeline	
	M868	FIFI	4	28	6560	MC	20	3713915.8	279394.9	NC -Conoco Pipeline	
	M871	FIFI	4	29	366130	NM	4	3713802.6	279391.4	NC -Conoco Pipeline	
	M874	FIFI	4	30	420580	NM	6	3713747.6	279404.3	NC -Conoco Pipeline	
	M877	FIFI	4	31	19560	MC	54	3713556.3	279422.1	NC -Conoco Pipeline	
	M880	FIFI	4	32	20070	MC	48.1	3713536.7	279429.6	NC -Conoco Pipeline	
	M854	FIFI	4	24	4432	MC	39.4	3714296.3	279332.9	NC -Conoco Pipeline	
T105	M518	FIFI	2		1492	PM	4	3713541.8	279533.6	NC -BP/Vasser Pipeline	
T106	M526	FIFI	2		336	PM	4	3713357.8	279325.2	NC -Anomalies on same line with short durations. Debris	
	M525	FIFI	2		744	PM	6	3713402.5	279337.4	NC -Anomalies on same line with short durations. Debris	
T107	M522	FIFI	2		17154	D	14	3713461.8	279400.6	NC -Exxon/Mobil Pipeline	A51
	M524	FIFI	2		20996	D	40	3713427.8	279487.1	NC -Exxon/Mobil Pipeline	
	M837	FIFI	4	18	329752	D	6	3714029.8	278899.0	NC -Exxon/Mobil Pipeline	
	M840	FIFI	4	19	18980	D	26.1	3713989.3	278938.5	NC -Exxon/Mobil Pipeline	
	M843	FIFI	4	20	12168	D	34	3713963.1	278960.6	NC -Exxon/Mobil Pipeline	
	M846	FIFI	4	21	9684	D	20.1	3713885.4	279014.6	NC -Exxon/Mobil Pipeline	
	M849	FIFI	4	22	15142	MC	34.8	3713876.8	279044.3	NC -Exxon/Mobil Pipeline	
	M852	FIFI	4	23	20246	MC	24	3713816.9	279078.5	NC -Exxon/Mobil Pipeline	
	M855	FIFI	4	24	24208	NM	14	3713796.9	279120.3	NC -Exxon/Mobil Pipeline	
	M857	FIFI	4	25	29926	D	16	3713745.6	279146.7	NC -Exxon/Mobil Pipeline	
	M863	FIFI	4	26	24280	D	16.1	3713720.8	279177.9	NC -Exxon/Mobil Pipeline	
	M864	FIFI	4	27	61736	MC	8	3713672.2	279216.4	NC -Exxon/Mobil Pipeline	
	M869	FIFI	4	28	42620	D	18	3713637.3	279244.9	NC -Exxon/Mobil Pipeline	
	M870	FIFI	4	29	19000	NM	18	3713575.4	279290.2	NC -Exxon/Mobil Pipeline	
	M875	FIFI	4	30	30130	D	20	3713562.9	279335.6	NC -Exxon/Mobil Pipeline	
	M883	FIFI	4	33	40050	MC	28.1	3713442.0	279458.4	NC -Exxon/Mobil Pipeline	
T108	M532	FIFI	1	1	6470	MC	18	3712986.6	279669.3	NC -BP/Vasser Pipeline	
T109	M533	FIFI	1	3	12188	PM	20	3712914.8	279458.7	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M534	FIFI	1	4	1632	PM	18	3712912.9	279455.9	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T110	M540	FIFI	1		116	MC	24	3712744.2	279169.8	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T111	M563	FIFI	1	4	98	MC	34	3711238.5	279553.4	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T112	M567	FIFI	1	6	232	MC	34	3711002.3	279473.8	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T113	M579	FIFI	1	2	110	MC	14	3709361.0	278965.7	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T114	M593	FIFI	1	3	1046	PM	20	3708629.6	277996.6	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M595	FIFI	1	4	52	PM	8	3708625.6	278007.3	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T115	M590	FIFI	1	7	8526	NM	8	3708742.2	277874.6	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M589	FIFI	1		178	D	12	3708775.5	277856.8	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T116	M600	FIFI	1	5	508	NM	8	3708555.0	277770.5	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M596	FIFI	1	6	120	D	24	3708577.2	277767.5	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	

Target Clusters											
Target	**Anom**	**Region**	**Block**	**Line**	**Amplitude**	**Signature**	**Duration**	**Easting (in State Plane)**	**Northing (in State Plane)**	**Notes**	**Correlations**
T117	M603	FIFI	1	2	54	MC	40	3708295.6	277757.2	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T118	M604	FIFI	1	5	168	MC	20	3708269.2	277461.7	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T119	M607	FIFI	1		176	MC	16	3707987.4	276884.7	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T120	M609	FIFI	1		28	D	16	3707942.4	276772.2	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M608	FIFI	1		134	NM	22	3707982.8	276745.6	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T121	M618	FIFI	1	7	102	PM	12	3707254.9	276255.2	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M617	FIFI	1		94	D	18	3707293.0	276286.8	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T122	M622	FIFI	1		96	MC	16	3707048.6	276025.6	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T123	M628	FIFI	1	7	106	D	8	3706836.3	275869.6	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M626	FIFI	1		68	PM	4	3706875.4	275858.2	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T124	M631	FIFI	1	6	186	NM	8	3706735.0	275862.5	Debris	
	M630	FIFI	1	7	88	MC	18	3706740.1	275801.1	Debris	
	M629	FIFI	1		332	NM	8	3706784.3	275806.0	Debris	
T125	M642	FIFI	1	3	322	NM	14	3706409.7	275729.1	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M644	FIFI	1	4	78	PM	4	3706358.7	275667.2	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M643	FIFI	1	4	72	D	10	3706404.9	275697.7	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M640	FIFI	1	5	6098	D	10	3706423.3	275660.1	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T126	M634	FIFI	1		54	MC	18	3706578.1	275528.7	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T127	M648	FIFI	1	2	80	MC	16	3706061.2	275564.6	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T128	M662	FIFI	3	3	22	MC	24	3708236.4	276147.7	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T129	M671	FIFI	3	4	26	PM	4	3708015.2	275894.0	NC -Anomalies on same line with short durations. Debris	
	M668	FIFI	3	4	22	PM	6	3708047.5	275923.9	NC -Anomalies on same line with short durations. Debris	
T130	M679	FIFI	3	1	62	D	4	3707745.4	275935.0	NC -Anomalies on same line with short durations. Debris	
	M680	FIFI	3	1	1168	D	6	3707718.5	275899.4	NC -Anomalies on same line with short durations. Debris	
T131	M685	FIFI	3	2	38	PM	12	3707664.4	275735.7	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M684	FIFI	3	3	38	D	18	3707683.5	275701.8	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M683	FIFI	3	4	246	NM	4	3707693.2	275662.1	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	

Target Clusters											
Target	Anom	Region	Block	Line	Amplitude	Signature	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes	Correlations
T132	M700	FIFI	3	1	64	MC	14	3707309.2	275565.3	NC- No adjacency. Durations suggests a debris field in the bottom of the channel	
T133	M704	FIFI	3	3	22	PM	8	3707210.9	275317.1	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M706	FIFI	3	4	68	D	12	3707195.0	275294.9	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T134	M681	FIFI	3	15	190	MC	18	3707704.9	274965.7	Debris	
	M686	FIFI	3	16	170	PM	8	3707663.2	274934.8	Debris	
	M682	FIFI	3	16	106	PM	4	3707693.7	274935.7	Debris	
T135	M718	FIFI	3	1	36	MC	10	3706989.9	275312.4	NC -No adjacency and short duration. Debris	
T136	M712	FIFI	3	3	42	NM	12	3707049.0	275211.4	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M713	FIFI	3	4	40	PM	8	3707048.8	275181.6	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T137	M717	FIFI	3	4	32	PM	8	3706994.0	275089.8	NC -Possible steel cable and tackle	
	M714	FIFI	3	5	338	PM	6	3707039.7	275078.9	NC -Possible steel cable and tackle	
	M709	FIFI	3	7	86	D	20	3707128.9	275056.9	NC -Possible steel cable and tackle	
	M705	FIFI	3	8	1386	PM	6	3707206.6	275052.1	NC -Possible steel cable and tackle	
	M701	FIFI	3	9	198	PM	10	3707285.5	275041.7	NC -Possible steel cable and tackle	
	M698	FIFI	3	10	614	D	14	3707328.0	275012.6	NC -Possible steel cable and tackle	
T138	M696	FIFI	3	11	26	PM	4	3707351.6	274929.2	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M699	FIFI	3	11	18	PM	4	3707313.1	274912.8	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M697	FIFI	3	12	150	D	10	3707349.1	274908.3	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T139	M723	FIFI	3	5	356	D	16	3706896.5	274964.6	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M719	FIFI	3	6	190	NM	10	3706920.7	274927.8	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T140	M728	FIFI	3	5	46	NM	6	3706753.4	274837.4	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M727	FIFI	3	6	180	D	10	3706769.9	274830.1	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T141	M738	FIFI	3	3	18	D	10	3706515.3	274817.3	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M737	FIFI	3	4	56	D	12	3706516.0	274776.6	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T142	M744	FIFI	3	1	34	MC	12	3706347.8	274721.4	NC -No adjacency and short duration. Debris	
T143	M739	FIFI	3	10	144	NM	6	3706507.3	274373.7	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
	M736	FIFI	3	12	74	NM	6	3706523.6	274386.6	NC-These anomalies lie on adjacent track lines but have short duration and lack a MC signature. Debris	
T144	M750	FIFI	3	4	248	D	22	3706171.9	274418.7	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
	M749	FIFI	3	6	172	D	12	3706193.2	274417.6	NC-These anomalies lie on adjacent track lines but lack a MC signature. Debris	
T145	M845	FIFI	4	21	5252	PM	13.5	3713651.8	278897.0		
	M850	FIFI	4	22	634	D	19.2	3713655.4	278912.7	unknown	
T146	M853	FIFI	4	23	2600	MC	47.3	3713394.4	278875.7	Columbia Gulf Pipeline	A58
	M856	FIFI	4	25	4148	PM	11	3713372.9	278908.5	Columbia Gulf Pipeline	
	M876	FIFI	4	31	1580	D	28	3713158.1	279173.2	Columbia Gulf Pipeline	
	M881	FIFI	4	32	5730	PM	35	3713124.3	279208.1	Columbia Gulf Pipeline	

Target Clusters											
Target	Anom	Region	Block	Line	Amplitude	Signature	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes	Correlations
	M882	FIFI	4	33	42050	MC	21.6	3713088.2	279288.6	Columbia Gulf Pipeline	
	M838	FIFI	4	18	3974	PM	30	3713576.1	278669.3	Columbia Gulf Pipeline	
	M839	FIFI	4	19	3742	D	44	3713537.8	278718.9	Columbia Gulf Pipeline	
	M844	FIFI	4	21	15560	PM	21.5	3713488.5	278782.2	Columbia Gulf Pipeline	
T147	M821	FIFI	3	7	13134	MC	98	3711295.1	276011.8	Possibly associated with NOAA charted wreck	A44
	M810	FIFI	3	4	15784	MC	40.1	3711327.3	275861.2	Possibly associated with NOAA charted wreck	
	M812	FIFI	3	5	13610	MC	32	3711340.7	275900.4	Possibly associated with NOAA charted wreck	
	M807	FIFI	3	3	636	MC	28	3711271.9	275747.7	Possibly associated with NOAA charted wreck	
	M819	FIFI	3	6	15046	MC	164	3711174.4	275897.8	Possibly associated with NOAA charted wreck	
T148	M830	FIFI	3	10	550	MC	70.1	3710664.8	275874.1	Possibly associated with Chevron Pipeline	
T149	M827	FIFI	3	8	208	MC	35.6	3710542.4	275707.1	Possibly associated with modern dredge barge	A42, A46
	M813	FIFI	3	5	5644	MC	131.7	3710564.6	275551.4	Possibly associated with modern dredge barge	
	M800	FIFI	3	1	224	D	6	3710565.6	275398.4	Possibly associated with modern dredge barge	
T150	M826	FIFI	3	8	378	MC	36	3710017.0	275458.1	NC -No adjacency. Debris	
T151	M833	FIFI	3	11	146	MC	22.1	3710325.1	275730.9	Possibly associated with Chevron Pipeline	
T152	M811	FIFI	3	4	D	458	12	3711071.0	275745.1	Possibly associated with charted wreck or pipeline	
	M828	FIFI	3	8	PM	544	7.9	3711034.3	275930.5	Possibly associated with charted wreck or pipeline	
	M978	Mod2	1	59	MP	24.1	5.0	3711212.4	276098.1	Possibly associated with charted wreck or pipeline	
	M996	Mod2	1	64	MC	92.4	192.0	3710981.4	275662.3	Possibly associated with charted wreck or pipeline	
T153	M825	FIFI	3	8	354	MC	34	3709522.6	275225.7	NC -No adjacency. Debris	
T154	M806	FIFI	3	2	15300	MC	22	3709747.0	274993.8	Possibly associated with Chevron Pipeline	
	M808	FIFI	3	3	26684	MC	187.9	3709659.4	275021.8	Possibly associated with Chevron Pipeline	
T155	M802	FIFI	3	1	1032	D	26.1	3709596.5	274827.1	Sunken float	
T156	M805	FIFI	3	2	14558	MC	100	3709448.9	274857.7	NC -No adjacency. Debris	
T157	M824	FIFI	3	8	428	MC	18	3709221.1	275081.1	NC -No adjacency. Debris	
T158	M816	FIFI	3		316	MC	30	3708963.5	274883.0	NC -No adjacency. Debris	
T159	M809	FIFI	3	3	9688	D	18	3708816.5	274615.4	NC -No adjacency. Debris	
T160	M803	FIFI	3	1	13654	MC	188.2	3708749.7	274454.6	NC -No adjacency. Debris	
T161	M769	BR	4	1	4350	MC	111.7	3708146.7	272595.6	Barge & Docks	
T162	M770	BR	4	2	3894	MC	160	3708081.1	272630.4	Debris	
	M786	BR	4	3	1444	MC	184	3708068.0	272621.9	Debris	
T163	M787	BR	4	4	660	MC	170	3708011.9	272695.2	Barge & Docks	
T164	M788	BR	4	4	80	MC	32.2	3707433.4	272342.7	NC -No adjacency. Debris	
T165	M789	BR	4	4	198	MC	22	3707160.6	272226.3	NC -No adjacency. Debris	
T166	M785	BR	4	3	1006	MC	44.1	3707022.4	272133.7	Dock & Boats	
T167	M783	BR	4	3	996	MC	12	3706580.2	272050.1	NC -No adjacency. Debris	
T168	M798	BR	4	5	880	MC	24	3706516.2	272133.3	NC -No adjacency. Debris	
T169	M767	BR	4	1	604	MC	35.6	3706071.4	271924.5	Debris	
	M771	BR	4	2	2752	D	13.5	3706126.0	271942.0	Debris	
	M773	BR	4	2	2752	D	13.5	3706126.0	271942.0	Debris	
T170	M765	BR	4	1	1276	PM	13	3705455.7	271849.7	NC- debris	
	M782	BR	4	3	2427	PM	34.9	3705445.2	271863.6	NC- debris	
	M791	BR	4	4	518	PM	36.1	3705441.5	271905.1	NC- debris	
T171	M774	BR	4	2	2668	MC	26.1	3705338.3	271750.8	NC- debris	
T172	M792	BR	4	4	128	MC	16	3705153.3	271829.7	NC- debris	
T173	M775	BR	4	2	286	D	24.1	3704358.9	271370.7	Debris	
	M781	BR	4	3	580	D	16	3704345.8	271417.1	Debris	
	M793	BR	4	4	1490	MC	120	3704315.3	271448.1	Debris	
	M796	BR	4	5	306	D	10	3704281.2	271510.8	Debris	
T174	M760	BR	4	1	332	D	8	3703792.6	270929.2	Debris	
	M776	BR	4	2	4102	MC	22	3703738.2	270926.7	Debris	
T175	M758	BR	4	1	41300	MC	8	3703592.5	270675.7	NC- debris	
T176	M756	BR	4	1	390	NM	6	3703368.2	270568.8	NC- debris	
	M777	BR	4	2	2270	D	18.1	3703335.8	270604.9	NC- debris	
T177	M897	Mod2	1	35	2741.3	MC	35.0	3711355.4	277661.9	Probable BP Pipeline	

Target Clusters											
Target	Anom	Region	Block	Line	Amplitude	Signature	Duration	Easting (in State Plane)	Northing (in State Plane)	Notes	Correlations
	M899	Mod2	I	36	4802.3	MC	49.0	3711318.2	277593.6	Probable BP Pipeline	
	M900	Mod2	I	37	4538.2	MC	302.0	3711032.3	277335.0	Probable BP Pipeline	
	M901	Mod2	I	38	5622.6	MC	120.0	3710912.8	277192.2	Probable BP Pipeline	
	M902	Mod2	I	39	5525.7	MC	97.0	3710545.2	276896.4	Probable BP Pipeline	
	M903	Mod2	I	40	4983.6	MC	116.0	3710488.0	276807.4	Probable BP Pipeline	
	M904	Mod2	I	41	7017.0	MC	63.0	3710189.0	276533.1	Probable BP Pipeline	
	M905	Mod2	I	42	3374.9	MC	78.0	3710095.3	276431.3	Probable BP Pipeline	
	M906	Mod2	I	43	4374.7	MC	110.0	3709722.4	276104.6	Probable BP Pipeline	
	M907	Mod2	I	44	2851.7	MC	91.0	3709650.9	276007.2	Probable BP Pipeline	
	M908	Mod2	I	45	4817.6	MC	90.0	3709356.2	275735.2	Probable BP Pipeline	
	M913	Mod2	I	46	6247.0	MC	61.0	3709280.2	275627.5	Probable BP Pipeline	
	M914	Mod2	I	45	4786.4	D	10.0	3709294.6	275704.1	Probable BP Pipeline	
	M923	Mod2	I	46	6166.0	MC	201.0	3709341.1	275663.3	Probable BP Pipeline	
	M927	Mod2	I	47	7315.0	MC	60.4	3708736.2	275150.3	Probable BP Pipeline	
	M934	Mod2	I	48	7337.0	MC	293.8	3708741.1	275154.3	Probable BP Pipeline	
T178	M925	Mod2	I	47	63.7	MC	13.1	3710639.6	276416.4	Possibly associated with flowline	
	M936	Mod2	I	48	63.8	MC	8.2	3710639.6	276416.4	Possibly associated with flowline	
	M937	Mod2	I	49	77.5	MC	11.0	3710617.4	276334.2	Possibly associated with flowline	
	M941	Mod2	I	50	9.5	D	46.7	3710687.1	276335.1	Possibly associated with flowline	
	M943	Mod2	I	51	43.2	PM	7.0	3710581.7	276199.8	Possibly associated with flowline	
	M951	Mod2	I	53	89.0	D	5.0	3710558.8	276049.7	Possibly associated with flowline	
	M955	Mod2	I	54	160.0	D	9.8	3710628.9	276065.6	Possibly associated with flowline	
	M957	Mod2	I	55	67.1	D	9.0	3710538.4	275952.7	Possibly associated with flowline	
	M963	Mod2	I	56	39.0	D	9.0	3710603.1	275921.2	Possibly associated with flowline	
	M964	Mod2	I	57	14.4	PM	5.7	3710627.6	275866.6	Possibly associated with flowline	
	M965	Mod2	I	57	77.4	D	5.4	3710537.8	275813.8	Possibly associated with flowline	
T179	M981	Mod2	I	61	6919.9	MC	738.0	3709946.4	275182.7	Possibly associated with Chevron Pipeline	
	M985	Mod2	I	62	5620.0	MC	399.0	3710361.7	275422.6	Possibly associated with Chevron Pipeline	
	M992	Mod2	I	63	613.9	MC	139.0	3710577.8	275488.2	Possibly associated with Chevron Pipeline	
	M996	Mod2	I	64	92.4	MC	192.0	3710981.4	275662.3	Possibly associated with Chevron Pipeline	
	M1003	Mod2	I	65	1131.0	NM	15.0	3711269.7	275833.1	Possibly associated with Chevron Pipeline	
	M1004	Mod2	I	65	2506.8	D	22.0	3711383.1	275890.0	Possibly associated with Chevron Pipeline	
	M1005	Mod2	I	65	351.5	D	5.0	3711839.1	276101.9	Possibly associated with Chevron Pipeline	