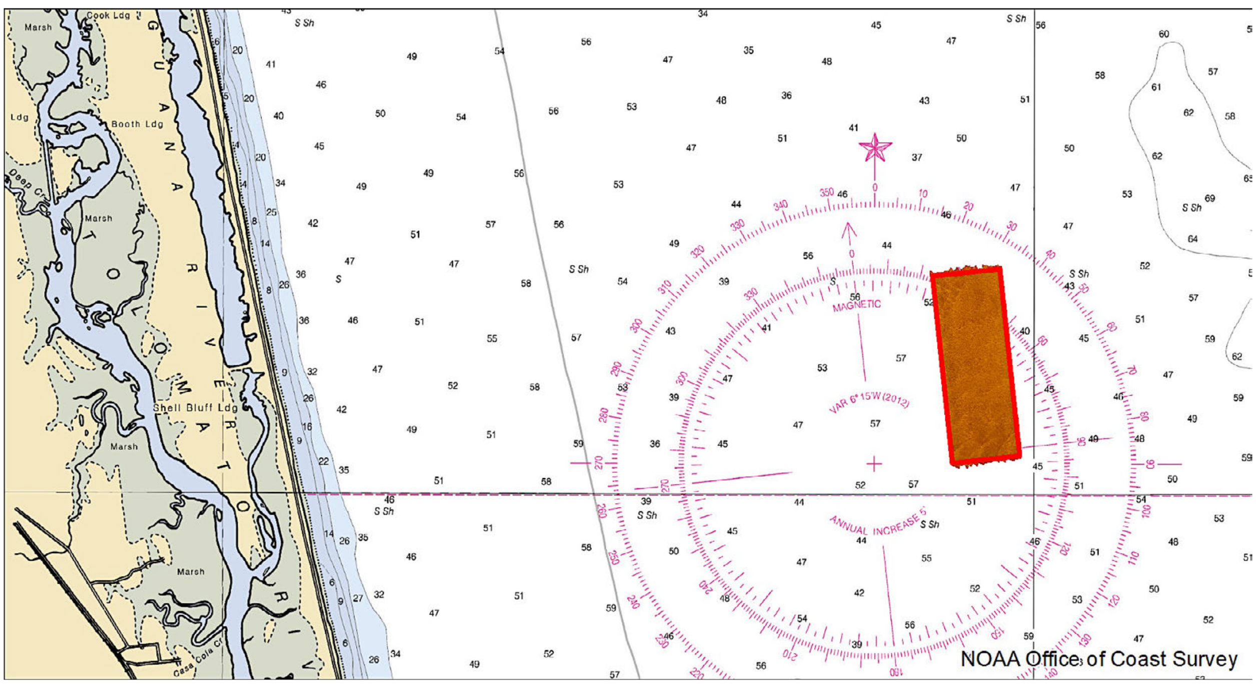
REPORT OF FINDINGS

SUBMERGED CULTURAL RESOURCES SURVEY, OFFSHORE BORROW AREA N-3, ST. JOHNS COUNTY, FLORIDA



PREPARED FOR:
Taylor Engineering, Inc.
Jacksonville, Florida

PREPARED BY:
Panamerican Consultants, Inc.
Memphis, Tennessee

SEPTEMBER 2019

Page intentionally blank

REPORT OF FINDINGS

SUBMERGED CULTURAL RESOURCES SURVEY, OFFSHORE BORROW AREA N-3, ST. JOHNS COUNTY, FLORIDA

CONDUCTED UNDER:

Florida Archaeological Research Permit No. 1920.006

PREPARED FOR:

Taylor Engineering, Inc.
10151 Deerwood Park Boulevard
Building 300, Suite 300
Jacksonville, Florida 32256

PREPARED BY:

Panamerican Consultants, Inc.
91 Tillman Street
Memphis, Tennessee 38111
Panamerican Report No. 39096.MAR

AUTHORED BY:

Andrew M. Derlikowski, M.A., RPA; William J. Wilson, M.A., RPA; Stephen R. James, Jr. M.A., RPA; and Erica Gifford, M.A., RPA

Andrew M. Derlikowski, M.A., RPA
Principle Investigator

PANAMERICAN CONSULTANTS, INC.
30 YEARS OF EXCELLENCE 1989–2019

SEPTEMBER 2019

Page intentionally blank

ABSTRACT

A submerged cultural resources survey of Offshore Borrow Area N-3, located in St. Johns County, was contracted to Taylor Engineering, Inc. of Jacksonville, Florida. In compliance with their responsibilities towards cultural resources, Sonographics, Inc. was then subcontracted to conduct a comprehensive remote sensing survey of the Project N-3 Area. Sonographics, Inc. completed the survey 10 August 2019 under Bureau of Ocean Energy Management G, G Permit No. E18-004, and Florida 1A-32 Permit No. 1920.006. Panamerican Consultants, Inc. then analyzed the data from Sonographics, Inc. for the presence of cultural resources. Comprised of a magnetometer, sidescan sonar, and a subbottom profiler survey, the survey located four magnetic anomalies, two sidescan sonar contacts, and no subbottom acoustic contact nor subbottom impedance contrast feature. After extensive review and analysis of the data, the Magnetic Anomalies M001, M002, M003, and M004, and Sidescan Sonar Contacts C01 and C02, were determined not to meet the National Register of Historic Places criteria of potentially significant submerged cultural resources.

ACKNOWLEDGEMENTS

The successful completion of this project is the direct result of the input and hard work of numerous individuals. The authors would first like to thank Michael Trudnak, Senior Coastal Engineer at Taylor Engineering, as well as Rick Horgan of Sonographics, Inc., for allowing Panamerican Consultants, Inc. to analyze the data for this investigation.

In-house Panamerican Consultants, Inc. personnel, who must be thanked for their assistance with this report production, include: Kate Gilow, Office Manager; Erica Gifford, author of *Chapter II. Cultural Setting*; and Anna Hinnenkamp-Faulk, Editor.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

In July and August of 2019, Sonographics, Inc. (Sonographics) of Ft. Lauderdale, Florida conducted an intensive remote sensing survey of proposed offshore Borrow Area N-3 in St. Johns County, Florida (Figures 1-01 and 1-02). Borrow Area N-3 straddled two Bureau of Ocean Energy Management (BOEM) Lease Blocks, 7067 to the north and 7117 to the south. Borrow Area N-3 is situated approximately 6 miles northwest of St Augustine, Florida. The survey was implemented to locate, record, establish vertical and horizontal site boundaries as appropriate, and evaluate the potential significance and eligibility for listing in the National Register of Historic Places (NRHP) of cultural resources (archaeological sites and other types of historic resources) that may be within the survey area. Work completed for these cultural resources investigations was conducted in compliance with the National Historic Preservation Act of 1966, as amended (PL 89-665), the Archeological and Historic Preservation Act, as amended (PL 93-291), the Abandoned Shipwreck Act of 1987, and the Advisory Council on Historic Preservation revised 36 CFR Part 800 Regulations. This was also conducted in compliance with Chapter 267, *Florida Statues* of the Florida Administrative Code.

Sonographics was contracted to conduct a detail-level remote sensing survey of Borrow Area N-3. The project consisted of magnetometer, sidescan sonar, and subbottom profiler survey. Sonographics conducted the survey in July and August 2019, under BOEM G, G Permit No. E18-004, and Florida 1A-32 Permit No. 1920.006 (*Appendix A: Florida 1A-32 Archaeological Research Permit* and *Appendix D: Bureau of Ocean Energy Management Permit*).

Panamerican Consultants, Inc. (Panamerican) of Memphis, Tennessee was then subcontracted by Taylor Engineering, Inc. (Taylor) to conduct a comprehensive cultural resources analysis of the remote sensing survey data, in order to locate any targets that have the potential to represent significant cultural resources, and produce a report of findings. Panamerican completed the data analysis in September 2019.

Results of the remote sensing survey identified four magnetic anomalies, two sidescan sonar targets, and no subbottom impedance contrast feature within proposed offshore Borrow Area N-3. Magnetic Anomalies M01, M02, M03, and M04 are single-point source (SPS), and M04 is associated with Sonar Contact C01. Based on imagery from the sidescan sonar, Sonar Contacts C01 and C02 appear to be marine debris. Comprehensive analysis of the data revealed no potentially significant cultural resources within the Project Area. Therefore, it is the opinion of the Principal Investigator that no further archaeological work is recommended.

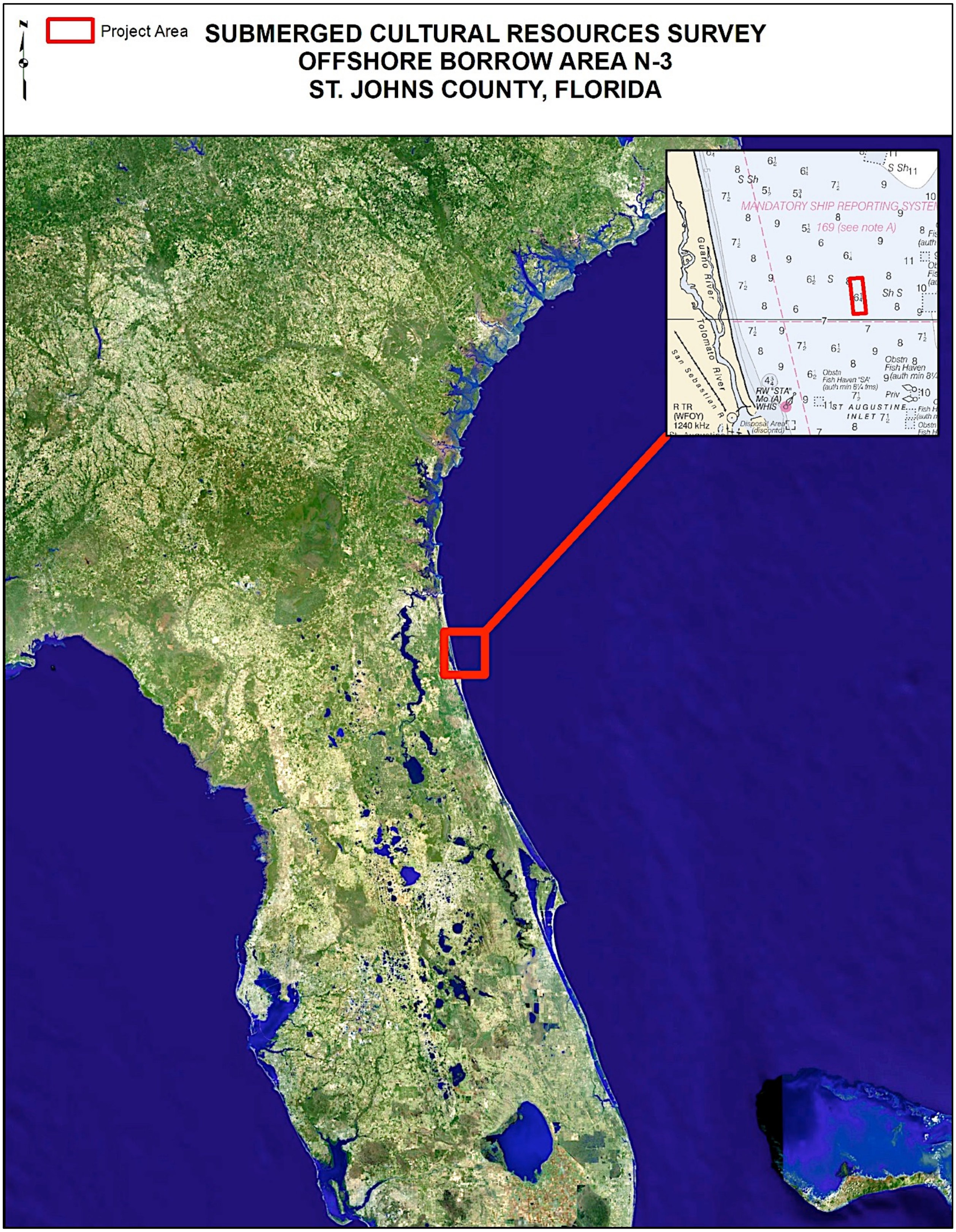


Figure 1-01. Overview of the Project Area.

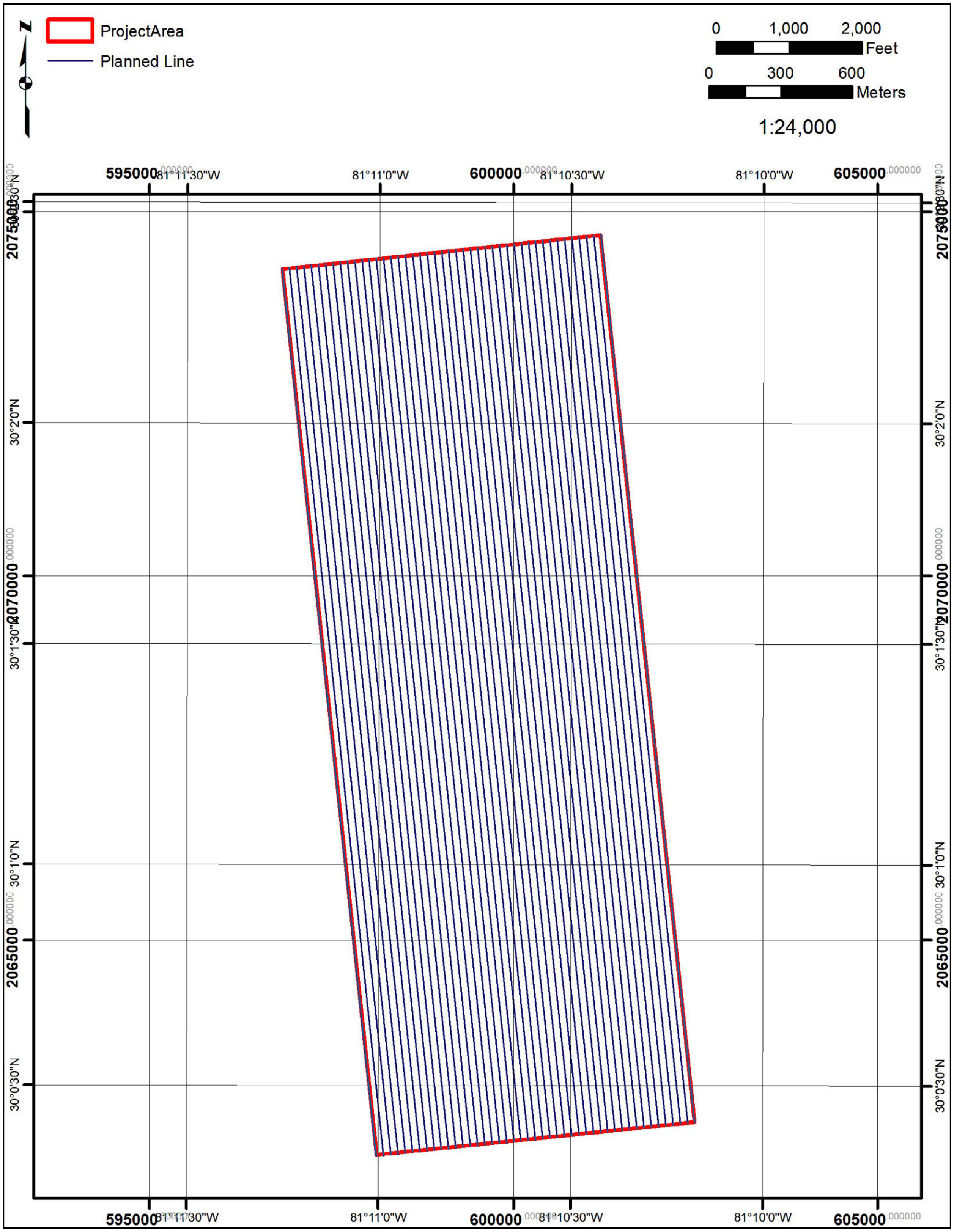


Figure 1-02. Planned lines in the Project Area.

Page intentionally blank

II. HISTORICAL BACKGROUND

ENVIRONMENTAL SETTING

This section on historical context provides information about the local geology and evolution of the environment, prehistoric cultural history relevant to modeling for submerged prehistoric sites, and historic narratives to predict the range of historic resources potential for the Project Area.

The potential for prehistoric sites is based on the local geologic setting and the abundance of evidence for prehistoric presence at times when the Project Area would have been exposed landscape, based on models of local, apparent sea level history. The Project Area is located 8 miles offshore and north of Vilano Beach in the Atlantic Ocean.

GEOLOGY AND PALEOENVIRONMENT

The Florida Atlantic coast is a complex set of sediment ridges that overlie karstified limestone bedrock. The sediment ridges were formed from multiple sea level oscillations over the last 2,000,000 years of the Pleistocene epoch. The cyclical nature of low stands of sea level occurred as the result of glacial accretion, and high stands of sea level occurred as the result of those glaciers melting. These cycles occur roughly every 100,000–125,000 years because of orbital parameters.

The most prominent of these ridges is the Atlantic Coastal Ridge, which was formed with sea levels 30 feet higher than today's, probably during the last high stand of sea level, called the "Sangamon" (White 1970:86). The most well-known and last sea level high stand deposit of the Florida Atlantic coast is the Pleistocene-aged Anastasia Formation (Burdett et al. 2009), a cemented, shelly, beach sedimentary rock often used for construction in historic times. Locally, the Anastasia Formation outcrops along and near shore and it forms the core of the Atlantic Coastal Ridge. At the beach, and immediately offshore, the shoreface and beach sands are active, recent deposits.

Extremely relevant to the Borrow Area N-3, Meisburger and Field (1975) studied for the USACE a large area of the Atlantic continental shelf with seismic remote sensing and vibracoring from Cape Canaveral to Georgia in a search for sand of beach quality to mine for replenishment of east coast beaches. They note the paucity of studies before theirs, which allows for a base for the geology of the offshore area. Remnants of an earlier barrier island complex are preserved locally (intermittently) offshore of central and northern St. Johns County and confirm that there were past configurations of coastline with lowered sea level, but they are altered by the dynamic character of the Atlantic shelf.

Sand resources on the inner continental shelf are arranged in oblique sets of linear sand waves that are massive enough to represent areas of significant relief referred to as "shoals." Genesis of the shoals (massive sand waves) in the near-shore and littoral environs is a combination of tidal inlet migration and sea level rise during the Holocene transgression.

Phelps et al. (2003, 2004, 2005, 2006) was also conducting a study in search of sand resources for beach replenishment in an area that has relevance to the current Project Area. This valuable four-year study is available from the Florida Geologic Survey in the form of Digital Versatile Disc/Geographic Information System (DVD/GIS) products. Phelps et al.'s (2003, 2004, 2005, 2006) products include a bibliography of previous studies, seismic data gathering, beach samples of native sand, seabed grab sampling, and vibracoring collected from offshore of Nassau and Duval counties. The channels remotely sensed and mapped near the Project Area were not in the same configuration as Phelps et al. 2006, which is illustrated in Figure 2-01.

One radiocarbon age gathered by Phelps et al. (2006) that may be useful is 14,140 ±60 (Beta-188958). It is from "organic material of a woody nature" at 16.8 feet in the core (VDU-01-16.8RC) at a water depth of 45 feet, isobaths considered submerged at 8,000 years before present (YBP; 9,000 cal. YBP).

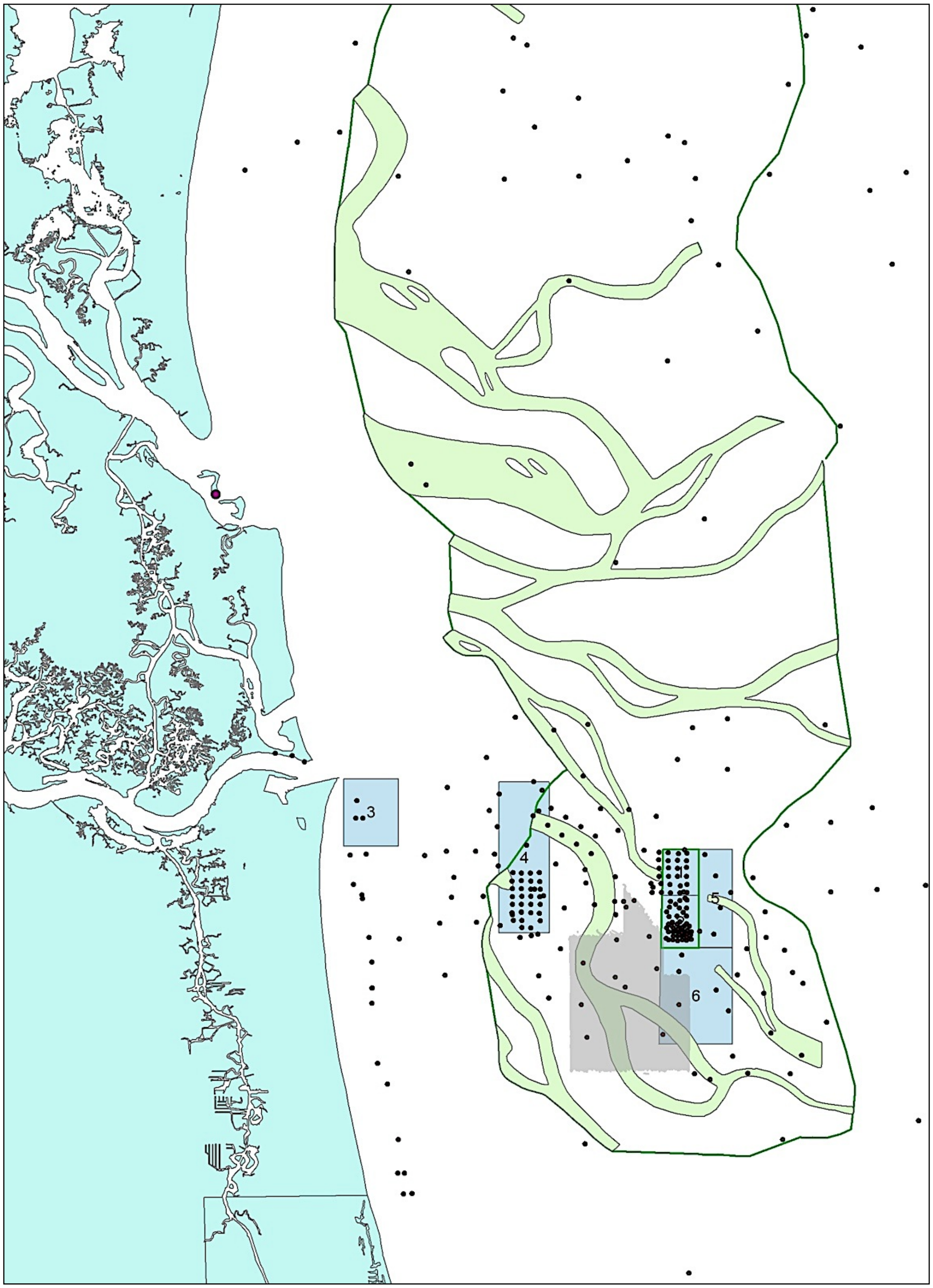


Figure 2-01. Information layers from Phelps et al. (2006) showing the northeastern Florida coastline, drainage systems, inferred paleochannels, and core locations north of the Project Area.

SINKHOLES OFFSHORE

Because people are drawn to reliable potable water sources, sinkholes are prime locales for archaeological sites, and they would be of interest if new sinks are discovered. There are two known sinkholes offshore: Red Snapper Sink located 28 miles offshore of St. Augustine; and Crescent Beach Spring some 2.5 miles offshore Crescent Beach in 60 feet of water (Popenoe et al. 1984). These are considered as potential attractions, or resource foci, for people when the shelf was exposed. The Red Snapper Sink sinkhole is a collapsed doline or cenote. The Crescent Beach Spring sinkhole is actually a freshwater spring vent connected to the Floridan Aquifer 59–115 feet deep (Kindinger et al. 2000). The flow can be seen on the surface of the ocean, and it can be seen from a distance. Note that in 1995, water samples were collected from the spring by the U.S. Geological Survey (USGS) and an age date of 10,500 YBP was obtained based on Carbon-14 techniques (Toth 1999).

CONSIDERATIONS OF SEA LEVEL FLUCTUATION

As described, Florida's eastern coastline has seen repetitive regressing and transgressing seas over several glacial cycles, but it is only the last transgressive sequence that is of concern for submerged prehistoric cultural resources. This transgression occurred over late Pleistocene and Holocene time. In general, the magnitude of melting included rapid glacial melting (sea level rise) in two major pulses, then slowing down after 7,000 YBP (7,800 cal. YBP).

In order to reconstruct past landscape configurations, it is important to know the chronology and rates of sea level rise from latest Pleistocene through Holocene time. Use of the Gulf of Mexico sea level data, such as Balsillie and Donoghue (2004), is not necessarily appropriate. Although theirs is in agreement that 20-meter depths were submerged between 8,000 and 7,000 YBP. Siddall et al.'s (2003) global eustatic model is much more appropriate to refer to, as the eastern Florida continental shelf should be stable. Figure 2-02 shows the portions of the curve where the offshore portion of the Project Area would have been exposed. Data by Toscano and McIntyre (2003) are in agreement mostly because both are using Barbados data from the Caribbean. Colquhoun et al.'s (1995) data show fluctuations later in time that are pertinent when the conditions are shallower.

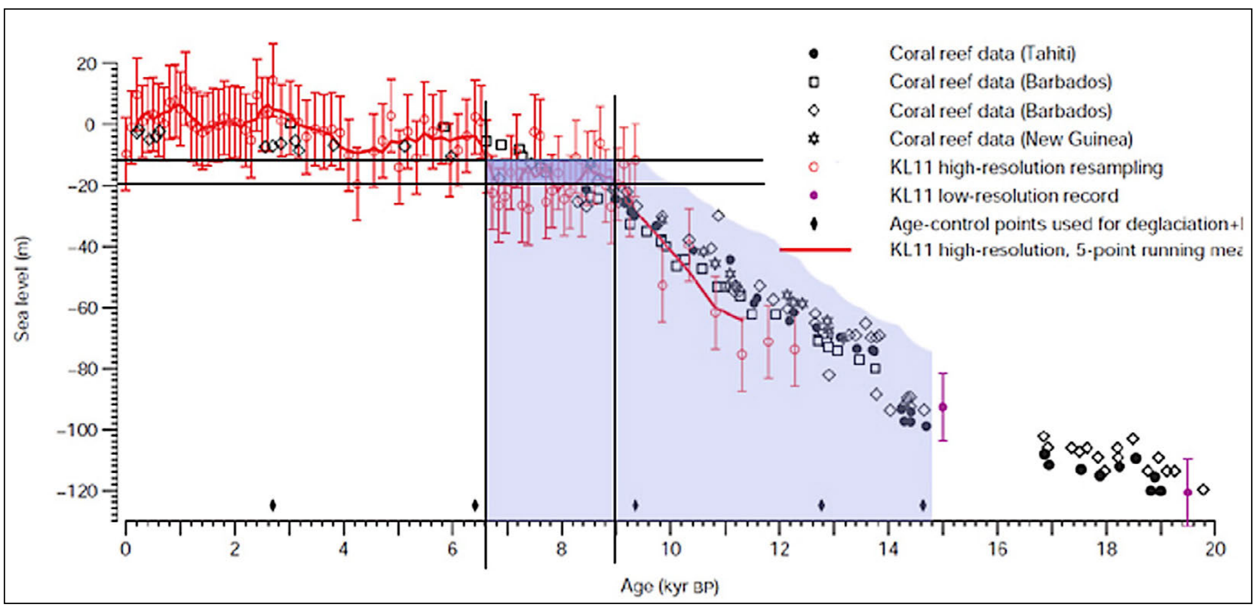


Figure 2-02. Reproduction of the Siddall et al. (2003) global eustatic sea level curve. Showing areas in grey/lilac that would indicate exposure of the Project Area for human occupation and the zone at 20 meters, the depth of the Project Area's deeper central portion.

On average, eustatic sea levels—those sea levels related to glacial melting—globally were about 20 meters below the present sea level around 8,000 YBP, which was during a third pulse of glacial melting and ensuing sea level rise that slowed between 6,000 and 7,000 YBP, resulting in sea levels somewhat lower than today (DePratter and Howard 1981; Faught and Donoghue 1997; Hoyt et al. 1990; Siddall et al. 2003). It is assumed that the base level of rivers and springs will be lower with lower sea levels, including out on the shelf; however, the specifics of affects on the base levels in the offshore portion of the Project Area of the lower sea levels, where bedrock or sediment beds restricted incision, are not known. The rate of transgressing seas slowed around and after 7,000 YBP (7,800 cal. YBP), triggering the formation of most North American barrier islands (Parkinson and White 1994:408), and sea levels reached their present base between 3,000 and 4,000 YBP; therefore, the Project Area was available for Paleoindian through Early Archaic times (12,000–9,000 YBP [14,000–10,200 cal. YBP]), and it was submerged around or just after the time of the Windover Site (BR246), and it was unavailable for most Middle Archaic and later inhabitants. Located south of the Project Area, near the eastern coast in Brevard County, the Windover Site, which dates to 8,000 YBP (9,000 cal. YBP), is a shallow water peat burial site, a custom that is a hallmark of the Middle Archaic in Florida.

PREHISTORIC CONTEXT

The following outlines a brief prehistory of the Project Area relevant to the presence and potential for human occupation sites offshore.

PALEOINDIAN AND EARLY ARCHAIC (12,000– 9000 YBP)

A discussion of nearby Clovis-related Paleoindian and Early Archaic settlement patterns to identify the locations of areas potential for site discovery are not much use here, because no site and few isolated points indicating the presence of these Late Pleistocene/Early Holocene people have been found in northeastern Florida. From a wider perspective, Paleoindian and Early Archaic sites and isolated finds (i.e., fluted and unfluted lanceolates, notched Bolen points, and familiar plethora of formal uniface tools) occur to the north in Georgia and South Carolina, and to the west in a crescentic pattern apparently focused on the Gulf of Mexico side of the peninsula (Miller 1992:102). As illustrated in Figure 2-03, the majority of Paleoindian and Early Archaic sites occur easterly, where the water table is nearer the surface (Thulman 2008).

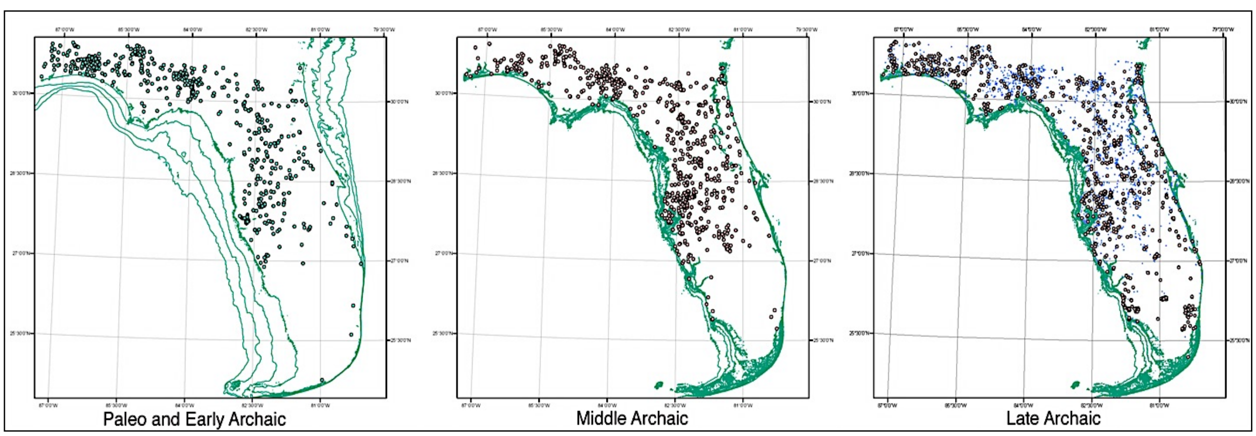


Figure 2-03. Series of GIS-based maps of sites in the Florida Master Site File that show distribution for Paleoindian to Late Archaic sites.

Dunbar reports one fluted point found in Jacksonville Beach in the 1950s (James Dunbar, personal communication, 2009). One conclusion from this lack of data is that Paleoindian and Early Archaic people were not utilizing the area in numbers sufficient for archaeological visibility. That chipped-stone resources, seemingly important to these early people, are also not known as being present in this region (Austin and Eastabrook 2000; Endonino 2007) and that freshwater resources may not have been as abundant are factors that are consistent with a lack of early archaeological sites (Miller 1998; Thulman 2008).

Elsewhere in the state, Paleoindian and Early Archaic sites are found around groundwater connected by freshwater sources in exposed or shallow buried karst, especially where chipping stone resources were available (Dunbar 1991). The geomorphology of the Project Area is not conducive to that pattern. Sand covers most of the area of concern to this project. Chert quarries have not been identified anywhere near the Project Area, but the possibility remains that quarries are present, but covered by rising sea levels or shifting sediments, especially since hard limestone rock is known to have been impacted by dredging operations in the St. Johns River to the west (Buker 1980). Four of the subbottom targets investigated by Faught and James (2011) were bedrock exposures. Nevertheless, the potential for encountering Paleoindian and Early Archaic site remains low for the Project Area. This is in contrast to the likelihood of Middle Archaic site remains, which is higher. With that said, the presence of Red Snapper Sink southeast of St. Augustine Inlet and Crescent Beach Spring just to the northeast of the Inlet suggests the potential for submerged Paleoindian and Early Archaic site types within the Project Area.

MIDDLE ARCHAIC (8,000–5,000 YBP)

The Atlantic coastal lagoons in the St. Johns River valley became more significantly populated during the Middle Archaic, perhaps as a result of increased utilization of river and forest resources or possibly from a migration of peoples from other places (Milanich 1994). The Middle Archaic as used here considers the time from 7,500–5000 YBP. The Windover Site shows that people were nearby by 8,000 YBP (9,000 cal. YBP).

Both freshwater and saltwater shell middens are common site types for Middle and Late Archaic and for the later, ceramic-producing cultures and they could be analogs for site characteristics offshore (Milanich 1994). In terms of cultural materials, the Middle Archaic is distinguished by the occurrence of a variety of artifacts, including well developed bone- and shell-tool industries, mostly expedient chipped-stone tools, and the production of bifacially flaked projectile points; grooved ground stone axes, stone pendants, and bannerstones are known but not as frequent. Middle Archaic projectile point types include stemmed broad-bladed points, of which two types occur most frequently in the area, Newnan and Marion (Bullen 1975).

The custom of shallow water burial in peat is a hallmark of the Middle Archaic in Florida with sites, such as Windover, Bay West, and Little Salt Spring, etc. (Beriault et al. 1981; Clausen et al. 1979; Doran 2002). This appears to be an earlier burial method, with burials in terrestrial middens occurring at later sites, such as Tick Island and Gauthier (Milanich 1994). These kinds of sites could be present in the Project Area. Presented below, one inset terrace-like feature remotely sensed on the offshore that may be an analog for these features is recommended for avoidance, or to be investigated more.

There is no need to review additional archaeological understanding of the culture history of the local area because the Project Area was submerged and not available for occupation after 7,000 YBP (7,800 cal. YBP).

HISTORIC PERIOD

FIRST SPANISH PERIOD (1513–1763)

The first European known to visit and explore Florida was Ponce de Leon. With permission from King Ferdinand to find new lands, de Leon left Puerto Rico in 1513 to search for wealth and "The Fountain of Youth." After traveling through the Bahamas, he landed just above the midpoint of the eastern coast of Florida in early April. Turning south, de Leon coasted along the Atlantic shore of Florida, through the Keys and approximately one-third of the way up the Gulf Coast. After being savagely attacked by the local inhabitants, who had no knowledge of The Fountain of Youth, he left Florida in mid-June after a month and a half of exploration (Morison 1974a:507-511). Later, in 1521, de Leon attempted to settle a colony in Florida, believed to be on Sanibel Island, but died after receiving a fatal wound from the natives (Morison 1974a:515); thus, began the Spanish and other European settlement of the North American mainland.

After the de Leon expedition, several attempts were made by Europeans to capture the natives along the eastern coast of Florida for use as slaves (Hall 2001:7) and to colonize. In 1520, Francisco Gordillo explored the coast of the Carolinas. Another Spanish exploratory expedition visited the area in 1525. A year later Lucas Vazquez de Ayllon coasted up the Carolinas with approximately 500 colonists. Shipwrecks and disease took their toll on the colony, and in 1527, the survivors numbering less than 200, departed (Coker 1987:2); however, by 1530 the existence of Florida and the lower eastern coast of North America were well known to the world. The 1516 Martin Waldseemuller map shows the outline of Florida off Cuba. Thirteen years later a more accurate map of Florida was produced by Diego Ribero (Whitfield 1996:28-31). The information for these maps and charts was gleaned from various exploratory expeditions along the Florida coast.

The Spanish set up several small-scale settlements around Florida to either minister to the natives or to aid shipwrecked mariners. Most of these settlements did not survive long, due either to native resistance or simple abandonment. Later, a concentrated effort to place missions among the natives by the Franciscans was attempted. Approximately 80 sites were set up over the years of Spanish domination of the area, but most were failures. European disease, foreign interlopers, and native resistance were generally the cause for the decline of Spanish power (Hall 2001:8).

St. Augustine was founded in 1565 by Pedro Menendez de Aviles as a base of operations against the French at Fort Caroline to the north. The Spanish, in an attempt to maintain sovereignty over the region, settled at Port Royal in 1566. When Francis Drake captured and burned St. Augustine in 1586 (Figure 2-04), this post was abandoned; however, the raids of other European powers and brigands were only irritants, as Spanish power put a temporary halt to other European nations encroaching down the eastern coast.

In the initial 100 years after the founding of St. Augustine, the settlement was defended by nine successive wooden forts. Following the 1668 attack by English pirate Robert Searle, construction began on a masonry star fort (Figure 2-05). Coquina, quarried on Anastasia Island, was used in the construction, which lasted 23 years. The fort was modified and expanded various times under the various jurisdictions. In 1738, after the fort passed its first test in 1702, during the siege of St. Augustine by the British, the Spanish reconstructed and expanded the fort, adding more guns and increasing the height of the walls. Shortly after, the British declared war on Spain (The War of Jenkins' Ear). The British captured several forts in Spanish Florida, but again failed to take St. Augustine. The British would take possession of the fort, along with the rest of Florida in 1763, at the end of the French and Indian War.

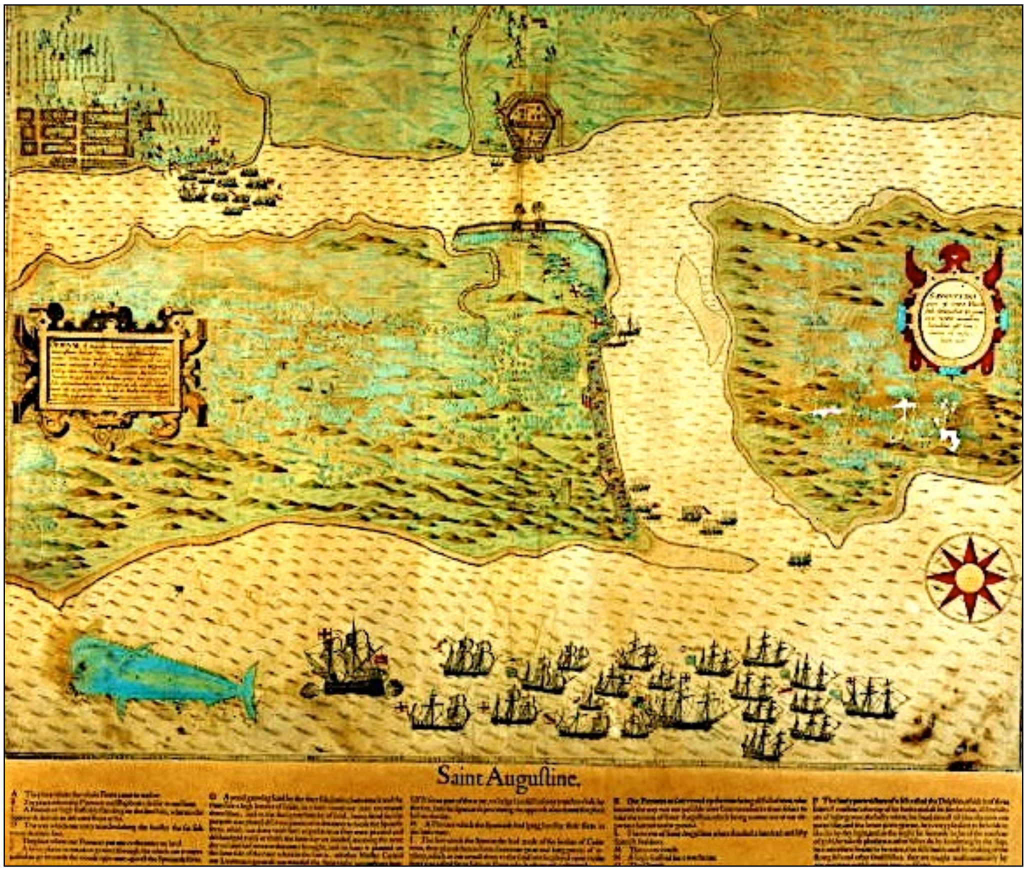


Figure 2-04. Map depicting Sir Francis Drake's attack on St. Augustine on 28 and 29 May 1589. This map is the oldest item in the Florida State Archives and it was drawn by Italian cartographer, Baptista Boazio in 1589 (courtesy of the State Library and Archives of Florida).

Figure 2-05. Immediately southwest of the inshore Project Area lays the *Castillo de San Marcos* National Monument (courtesy of the State Library and Archives of Florida).

FRENCH PERIOD (1524–1586)

In 1524, the French, emboldened by Verrazano's voyage along the eastern coast of the New World, took action to claim some of this terra nova for themselves. During 1562, the French sent two vessels to explore along the present Carolinas coast. Jean Ribault took possession of the area in the name of the King of France, Charles IX. His original settlement of Santa Elena (Port Royal, South Carolina) did not survive long, as there was internal dissention, and the post was abandoned. The French were not to be discouraged, and two years later a second attempt, under Rene de Laudonnière, established a settlement at Fort Caroline, on the St. Johns River in Florida (Coker 1987:3), close to present-day Jacksonville.

The French settlement in Florida was a danger to the homeward fleets carrying New World wealth to Spain. King Philip II of Spain dispatched Menendez de Aviles to eradicate the problem in 1565. At the same time King Charles sent Jean Ribault with a powerful seven-vessel fleet (although the number of ships is in dispute) along with 1,000 colonists and troops to re-supply Fort Caroline. Meeting at the mouth of the St. Johns River, Ribault immediately sailed southward to attack St. Augustine, but his fleet was destroyed by a hurricane sinking his ships from Cape Canaveral to Mantanzas Inlet (Meide et al. 2014), the inlet being just south of the current survey areas. Subsequently, Fort Caroline was taken by a land assault and the defenders were all put to death. The French avenged this treachery three years later when the fort was retaken and all Spanish prisoners were murdered (Morison 1974b:470).

BRITISH PERIOD (1763–1783)

With the ceding of Florida to the British in 1763 as part of the Treaty of Paris, ending the French and Indian War, more settlement and economic activities are recorded in the area (Johnson 2002:35). The British split Florida into eastern and western territories, with St. Augustine designated as the capital of "East Florida." The name of the fort, *Castillo de San Marcos* (see Figure 2-05), was changed to Fort St. Mark.

St. Augustine and the territory of East Florida were of secondary importance among Britain's North American holdings until 1775, when unrest in the British colonies of North America resulted in the Declaration of Independence. East Florida, a colony loyal to King George III, came to be of strategic importance to Britain. Fort St. Marks became the regimental headquarters and served as a prison for captured American soldiers. In 1779, Spain entered the conflict against Britain, hoping to regain its former lands, and distracted the British at St. Augustine enough that they were not able to mobilize efficiently against the rebellion to the north. Fighting east from Louisiana, Spanish forces took Mobile and Pensacola. Lands from there and to the east were ceded back to Spain as part of the Treaty of Paris in 1783.

SECOND SPANISH PERIOD (1783–1821)

Although Spain regained control of Florida after the Revolution, they soon faced increasing pressure on the border with the new Republic. Florida became a destination for runaway slaves, destitute Native Americans, and criminals from north of the border. In spite of this, Spain maintained a military presence in the area, upgrading and improving the defenses at St. Augustine and the fort, which was once again named *Castillo de San Marco*. On 20 July 1821, after heavy pressure from the U.S. government, applied in part because of the increasing use of Florida as a base for pirates, Spain ceded Florida to the U.S. with the signing of the Adams-Onis Treaty.

TERRITORIAL PERIOD (1821–1844)

The American Territorial period began with the arrival of Andrew Jackson, who established the first territorial government. In 1821, Florida was a sparsely inhabited wilderness, with a scattering of Spaniards, Native Americans, and freed slaves. With the American takeover, Florida was opened up to settlement and scores of people from the older southern plantation regions on the Carolinas, Georgia, and Virginia began to immigrate. By 1824, East and West Florida were merged into "Florida Territory," with the new capital city located in Tallahassee, chosen because of its location between the two previous administrative centers of Pensacola and St. Augustine.

As the population of the new territory increased, so did the frequency of conflicts between the newcomers and the native Creek and Miccosukee. Settlers increased pressure on the Federal government to remove the native people, both because they occupied land the settlers wanted, and because native communities provided sanctuary for runaway slaves. Under the Treaty of Moultrie Creek, the Seminoles agreed to give up all claims to land in Florida in exchange for a 4,000,000-acre reservation in the center of the territory. Under the terms of the treaty, the Federal government was obligated to protect the Seminoles as long as they remained peaceful and law-abiding; however, problems and delays in implementing the terms of the treaty led to impatience and unrest among the Seminoles, resulting in scattered violence between the Seminoles and the settlers. By 1830, public pressure to remove the Native Americans entirely from Florida resulted in the Indian Removal Act, which required all Native Americans in Florida Territory to move west of the Mississippi. The Treaty of Paine's Landing, ratified in 1834, formalized this with the Seminoles. While some went quietly, other resisted, leading to the Second Seminole War (1835 to 1842). As a result, the few remaining Seminoles were allowed to stay on an informal reservation in southwestern Florida.

Economic development of the territory continued in rapid pace, with the population reaching 54,000 by 1840. In the mid-1840s, Florida Territory applied for entry into the U.S. as the twenty-seventh state. *Castillo de San Marcos* was changed to "Fort Marion," and was used as part of the American Coastal Defense System as well as a prison during the Second Seminole War.

Statehood Period

Florida became a state on 3 March 1845, with William Moseley elected governor. By 1855, the uneasy peace between settlers and Native Americans again broke down, and the resulting call for Native Americans removal led to the Third Seminole War (1855 to 1858). By the end of the war, only scattered Seminole families remained in the state.

Civil War Period

Florida, joining other southern states, succeeded from the Union on 10 January 1861. After existing as an independent republic for a month, Florida became a founding member of the Confederate States of America (CSA). Although not in the midst of the major land war, Florida was an important supply route for CSA forces. Union forces blockaded the Florida coast and occupied key ports such as Pensacola, Jacksonville, and Key West.

St. Augustine was relatively quiet during the war. In the days before succession, Florida state forces took the fort from the small Union garrison. Four days later, Federal troops with the USS *Wabash* recaptured the fort after the CSA forces abandoned it, and maintained control throughout the war. Florida was readmitted to the Union on 25 July 1868.

Post-Civil War Period

The golden age of St. Augustine began in 1883, when Henry M. Flagler arrived. A wealthy oil tycoon from New York, Flagler vacationed in St. Augustine and came to see the area as America's answer to the French Riviera. Within five years, in 1888, he had built and opened the Ponce de Leon Hotel. It was soon joined by the Cordova, a competing hotel he purchased and then rebuilt, and the Alzacar, a smaller hotel designed for the less affluent traveler. The grand Ponce de Leon would cost $2,500,000 and employ 1,200 skilled workers from all over the world (Figure 2-06). Along with the hotels, Flagler also contributed to improvements in the city infrastructure, including sanitation, street paving, and building hospitals and churches. He also constructed and improved the Florida East Coast (FEC) Railway system down the eastern seaboard of Florida.

TWENTIETH CENTURY

St. Augustine experienced a "decade of progress," fueled at first by tourist traffic from Europe, which would normally be taken by European resorts, closed due to the First World War (WWI). Upgrades to roads, fire protection, electricity, and telephone service attracted automobile travelers for long summer vacations at St. Augustine's beaches.

In 1925, Tampa developer D.P. Davis began to develop Anastasia Island. Although the "Davis Shores" development failed initially, it did result in the building of the Bridge of Lions and set the tone for future development of the area. Tourism slowed considerably during the 1930s, and the area fell back on fishing and Flagler's FEC Railway for employment. Various Works Progress Administration (WPA) projects, including the Government House and the main Visitor Center, helped sustain the population until better economic times came.

Tourism effectively ended for St. Augustine, at least temporarily, as St. Augustine adopted wartime rationing. The loss of nearly 80 percent of the city's income was offset somewhat by the arrival of troops, quartered in the Ponce de Leon and other local hotels, for basic training. Almost immediately after the war ended, St. Augustine experienced another tourism boom. In addition to the renovation of older structures, several new museums, including the Lightner (in the Alzacar Hotel building) and a "Ripley's Believe it or Not" museum in the Warden Castle, opened.

Figure 2-06. Ponce de Leon Hotel, now part of Flagler College (courtesy of the State Library and Archives of Florida).

PREVIOUS SUBMERGED CULTURAL RESOURCES INVESTIGATIONS

One of the best tools for accurately assessing the potential for unknown submerged cultural resources is to compare the Project Area with findings and results of previous investigations, including both remote sensing and cultural resources surveys that have been completed in or near the Project Area. Varying in degree of applicability to the current research, these studies allow for the identification of potentially significant resources, and the studies aid in the recognition of specific problems or aspects inherent in the assessment of the survey data and in the identification of potential resources.

In order to ascertain the presence of submerged archaeological sites and investigations in or adjacent to the Project Area, the Florida Master Site File (FMSF) was reviewed. The review indicates that no submerged cultural resources investigations have been conducted within or near the Borrow Area N-3. The closest investigations have taken place to the south at St. Augustine Inlet.

SHIPWRECKS, AUTOMATED WRECK AND OBSTRUCTION INFORMATION SYSTEM, AND HISTORIC SITES INVENTORY

Both the FMSF and the current online edition of the National Oceanic and Atmospheric Administration's (NOAA's) Automated Wreck and Obstruction Information System (AWOIS) were queried for historic shipwreck sites in or adjacent to the Project Area. In addition, the FMSF was queried for historic sites in St. Johns County within the immediate Project Area. However, according to the FMSF, no nearby archaeological sites or submerged cultural resources have been identified in the Borrow Area N-3.

AUTOMATED WRECK AND OBSTRUCTION INFORMATION SYSTEM

The most comprehensive and up to date list of shipwrecks for the U.S. is NOAA's AWOIS and Electronic Navigation Chart (ENC). These databases were consulted relative to known wreck sites or obstructions within or near the current survey corridor. The AWOIS database contains information on over 10,000 wreck sites and obstructions/hangs in the coastal waters of the United States. Information within the database includes a latitude and longitude of each feature along with any known historic and/or descriptive details. The AWOIS website, which may be accessed at http://historicals.ncd.noaa.gov/awois/awoisdbsearch.asp, allows researchers to search for wrecks based on Latitude/Longitude coordinates for a given area. An Access Database file, it has been projected here into Google Earth to allow the researcher to view what wrecks or obstructions are within a given area.

An examination of survey area via AWOIS and ENC databases did not identify any wrecks or obstructions within 8 miles of the Project Area. All wrecks and obstructions are found south at St. Augustine Inlet. It must be stated that position accuracy of AWOIS/ENC wrecks and/or obstructions is highly variable and usually poor. It also appears the AWOIS program routinely includes wrecks, obstruction, and unknowns located outside the prescribed coordinates or chart.

OTHER SHIPWRECK SOURCES

An early and comprehensive collection of shipwreck information was compiled by Robert Marx (1971). Entitled *Shipwrecks in the Americas,* the book is divided into two basic parts. The first concerns the general history and development of shipping with an emphasis on being able to identify shipwreck sites. The second part of the book focuses on specific shipwrecks and their locations. A section in this part is devoted to Florida, as the author states, "more work has been done on shipwrecks in Florida Waters than throughout the rest of the Western Hemisphere" (Marx 1971:191). The reasons are many, but generally come down to history (Spanish treasure) and geography. Hundreds of wrecks are listed and most are noted as being strewn across the Atlantic Coast or the Keys with none listed in the Project Area.

A more scholarly publication, *Ships and Shipwrecks of the Americas*, edited by Bass (1988) is a survey of numerous shipwrecks that can enlighten us through archaeological study of our past cultural traditions. Vessels from both North and South America are included. Much more selective than the previously noted volume, inclusion in this tome is limited to vessels of historic importance that have offered up information of the past through archaeological investigation. No maritime loss is listed in Bass's work pertaining to the Project Area.

Another collection of shipwreck site locations is presented in *Shipwrecks of Florida* (Singer 1992). Over 2,100 vessels are listed as being lost off the Florida coast. Only one vessel is listed off Vilano Beach, *Dixie Crystal*. The vessel, an oil-fired engine and screw propulsion, is believed to be located inside Matanzas Bay (Hall 2000).

Cartographic Review

Another excellent tool for identifying shipwrecks within or adjacent to the Project Area is a review of historic navigation maps and charts for the area. Often noting shipwrecks, obstructions, and other various hazards for the mariner, many of these maps can be accessed from NOAA's Office of Coast Survey's Historical Map and Chart Collection (www.historicalcharts.noaa.gov/historicals/search), while others are found in various repositories, publications, or websites. The NOAA website allows the researcher to specify the area or region of interest and then review all available maps for that area. Another valuable utility provided by this site is the virtual magnification feature, which allows the researcher to zoom in and out of specific areas. Multiple nautical charts were examined regarding the different survey areas and the charts which best represented the areas or contain valuable information are presented below.

The earliest navigation chart available relative to the Project Area dates to 1882 (Figure 2-07). No cultural feature (i.e., shipwreck or obstruction) is represented at or near the Project Area on the map. The next available map from NOAA dates to 1908 (Figure 2-08). The chart closely resembles the previous map with its hydrographical data for offshore area. No cultural feature (i.e., shipwreck or obstruction) is represented at or near the Project Area on the map.

The next navigation chart from the NOAA website dates to 1933 (Figure 2-09). Again, this chart does not show cultural resources near Borrow Area N-3. This same can be said for the following charts: 1966, 1992, and the most recent 2017 (respectively shown in Figures 2-10, 2-11, and 2-12).

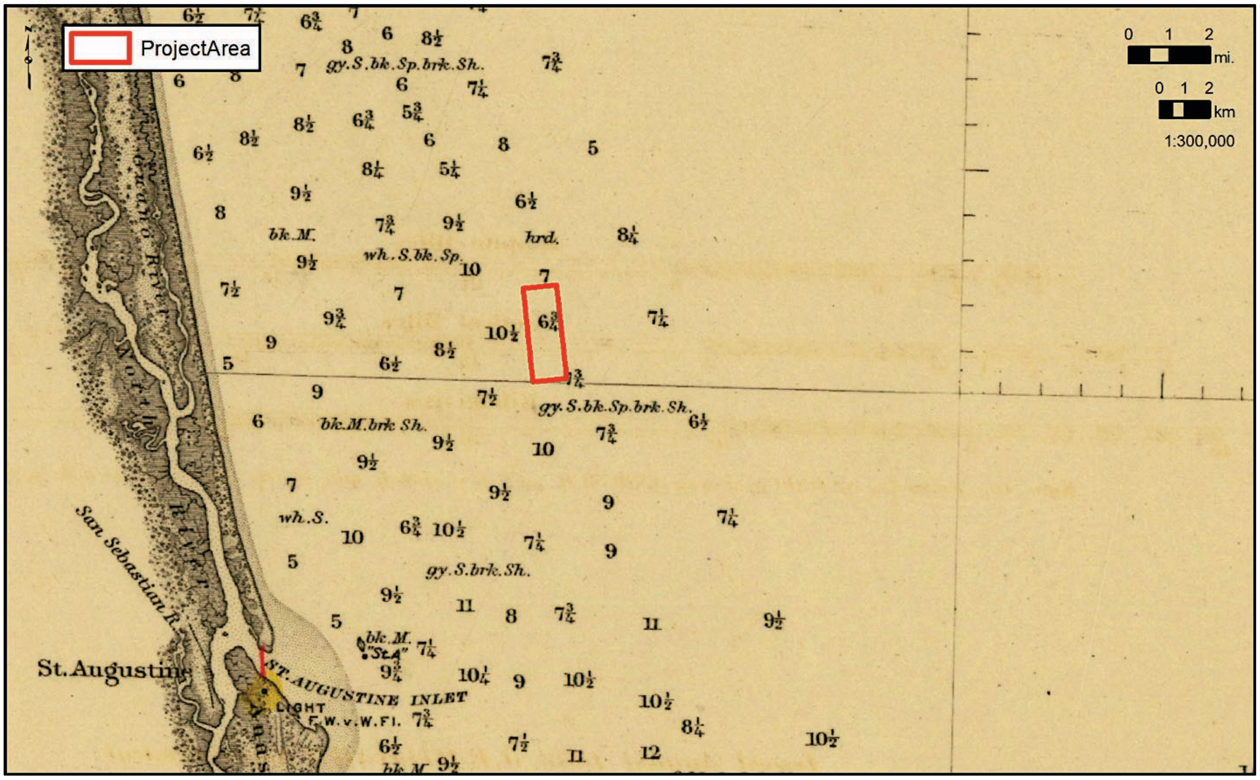


Figure 2-07. 1882 chart excerpt showing the area north of St. Augustine containing the Project Area (Chart No. LC00013 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

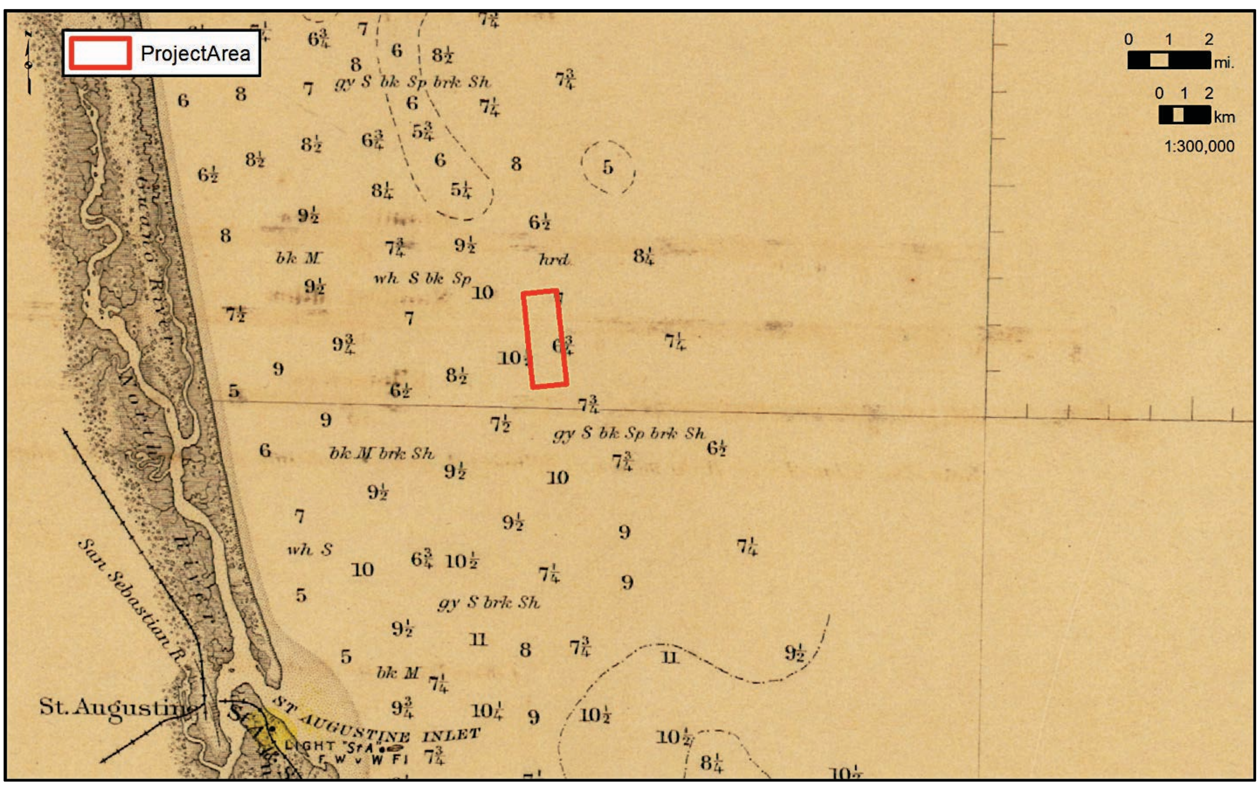


Figure 2-08. 1908 chart excerpt showing the area north of St. Augustine containing the Project Area (Chart No. LC00013 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

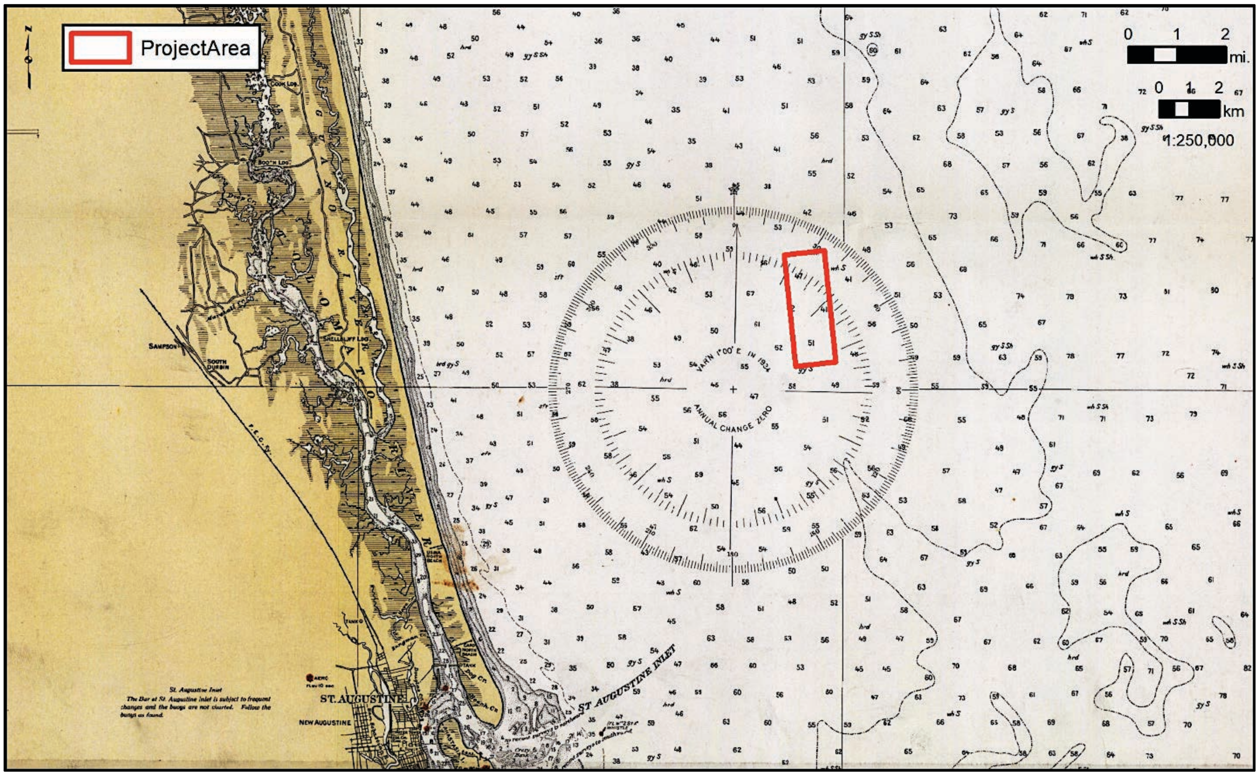


Figure 2-09. 1933 chart excerpt showing the area north of St. Augustine containing the Project Area (Chart No. 1243 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

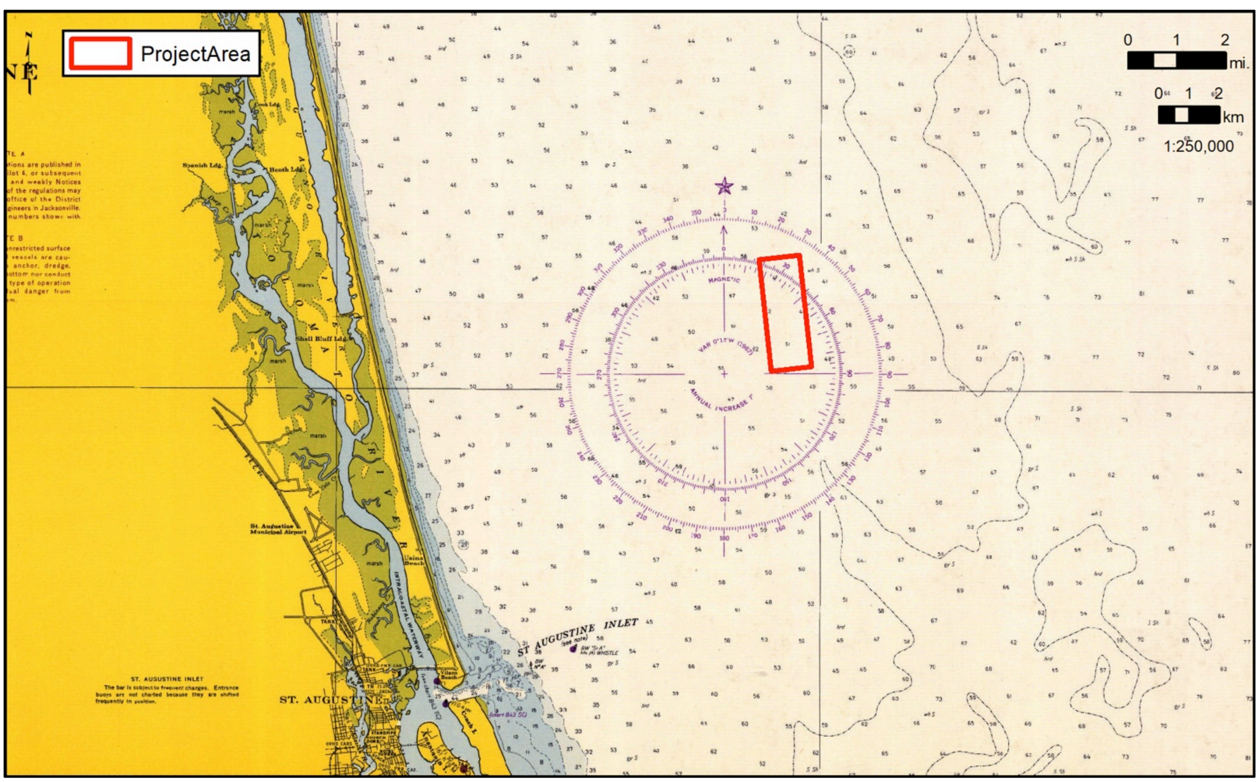


Figure 2-10. 1966 chart excerpt showing the area north of St. Augustine with no shipwreck nearby the Project Area (Chart No. 1243 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

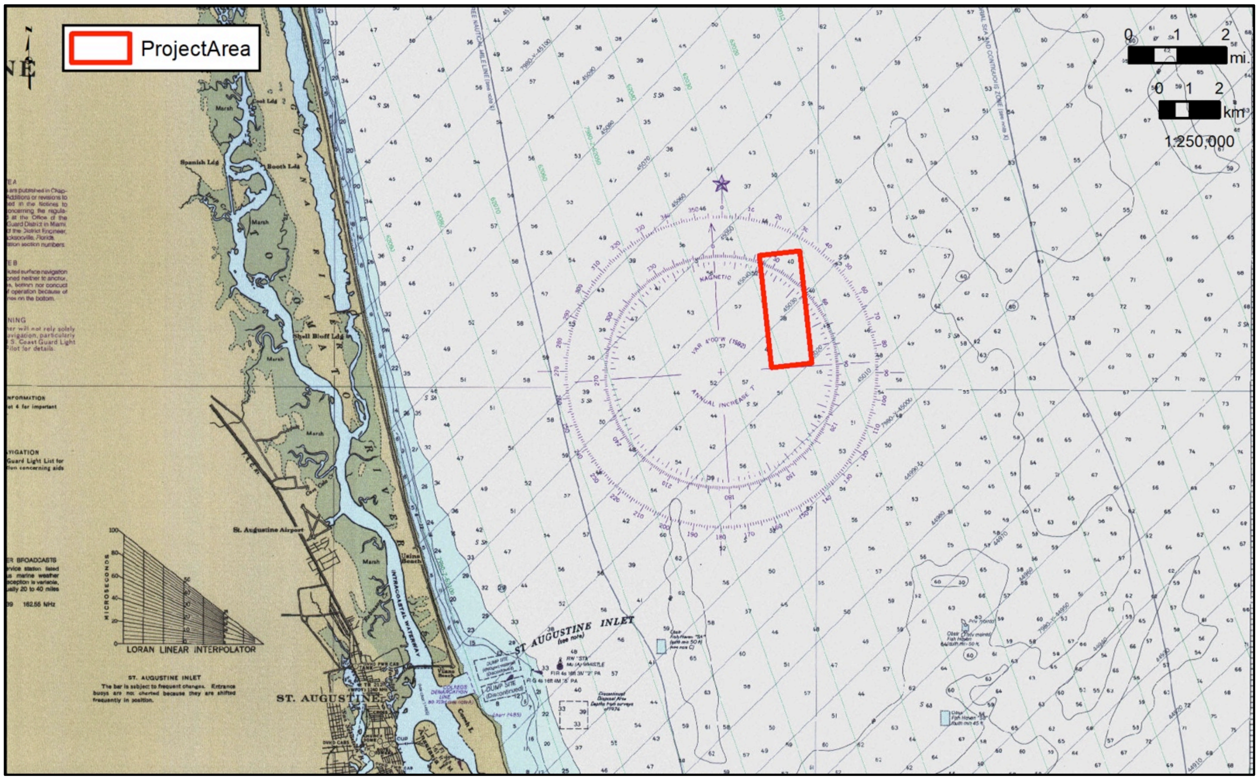


Figure 2-11. 1992 chart excerpt showing the area north of St. Augustine with no shipwreck (Chart No. 11488 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

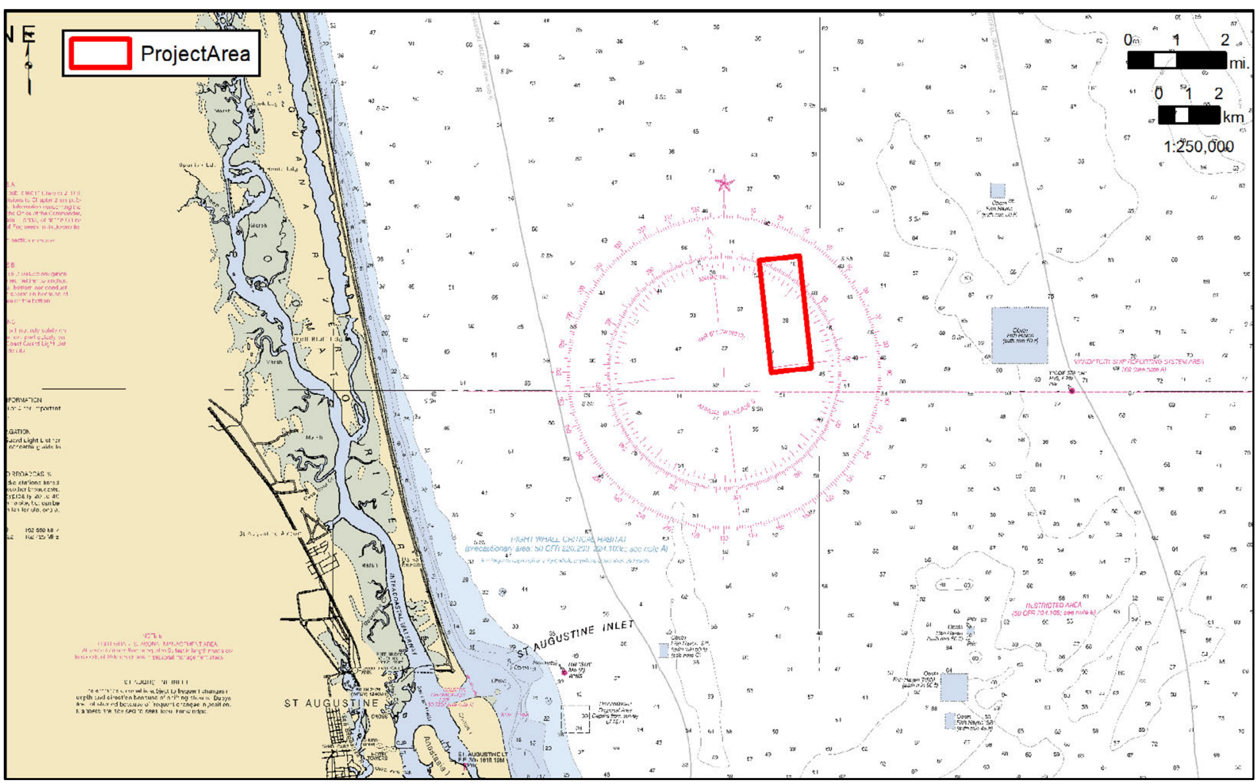


Figure 2-12. 2017 chart excerpt showing the area north of St. Augustine with no shipwreck (Chart No. 11488 from NOAA's Office of Coast Survey's Historical Map and Chart Collection).

Page intentionally blank

III. METHODS

PROJECT AREA ENVIRONMENT

A Submerged Cultural Resources Survey for the Offshore Borrow Area N-3, St. Johns County comprised approximately 1,280 acres in St. Johns County. The Project Area was located eight miles northwest of St. Augustine, Florida. The project area lies within the Northern (or Upper-Peninsular) Zone of the Atlantic Seaboard physiographic province. This area extends along the Northern Coast of Florida from Daytona to Jacksonville. The survey was conducted on July 30-31, August 1 and 10, 2019; weather conditions during the survey were typical for Florida during the summer, with temperatures in 90s, little to no wind, and calm seas.

PERSONNEL

The personnel involved with this investigation had the requisite experience to effectively and safely complete the project as proposed. Rick Horgan of Sonographics, Inc. directed the field survey, and Andrew M. Derlikowski and William J. Wilson completed the data analysis and recommendations. Ms. Erica K. Gifford authored *Chapter II: Cultural Setting*.

REMOTE SENSING SURVEY EQUIPMENT

The remote sensing tools chosen for this investigation were the magnetometer (to detect ferrous materials), sidescan sonar (to create images of the bottom), and the subbottom profiler (to reconstruct the structure of the underlying sediment beds). Locational control was established utilizing Differential Global Positioning System (DGPS) technology. Analyses of these data were conducted using HYPACK 2019 and SonarWiz 7.

DIFFERENTIAL GLOBAL POSITIONING SYSTEM

The primary consideration in the search for any submerged item is positioning. Accurate positioning is essential during the running of survey tracklines, and it is essential in returning to recorded locations for remote sensing refinement or diver investigations. Positioning was accomplished on this project using a Trimble Navigation® DSM12/212 Global Positioning Systems (GPS) and antennae, with National Marine Electronics Association (NMEA) data streams supplied to the navigation, sidescan, and subbottom computers (Figure 3-01).

The DSM12/212 GPS attains sub-meter precision with a dual-channel Minimum-Shift Keying (MSK) differential beacon receiver. This electronic device combines data from satellites and shore-based differential beacon stations, increasing the precision of the satellite data alone. DGPS positions were updated at 1-second intervals, the same rate as the magnetic data were recorded (Trimble Navigation Limited 1998:1-2).

The project was planned in the Florida State Plane East, survey feet, NAD83, using the 2011 adjustment, and all sidescan, subbottom, and magnetometer target data were converted to this Florida East grid. The DGPS data streams are in geographic format, NAD83 (i.e., latitude, longitude). The raw data from the sidescan and subbottom devices are archived in this format, and the magnetic data are in the state plane. Navigation was conducted with a Lenovo Thinkpad E520, using HYPACK Max 2019 for navigation. HYPACK, a Xylem company, was written specifically for marine survey applications. The magnetometer data were acquired with this program as well. All positioning coordinates are based on the position of the DGPS antennae relative to the sensor location. The DGPS antenna was located amidships and 10 feet forward from the transom of the vessel. Offsets from the antenna to tow point locations, in conjunction with cable out, are input into Hypack's towed systems driver to determine layback on the fly

(Figure 3-02). This layback information is critical for accurate positioning of targets in the data analysis phase and to relocate any targets for additional investigations.

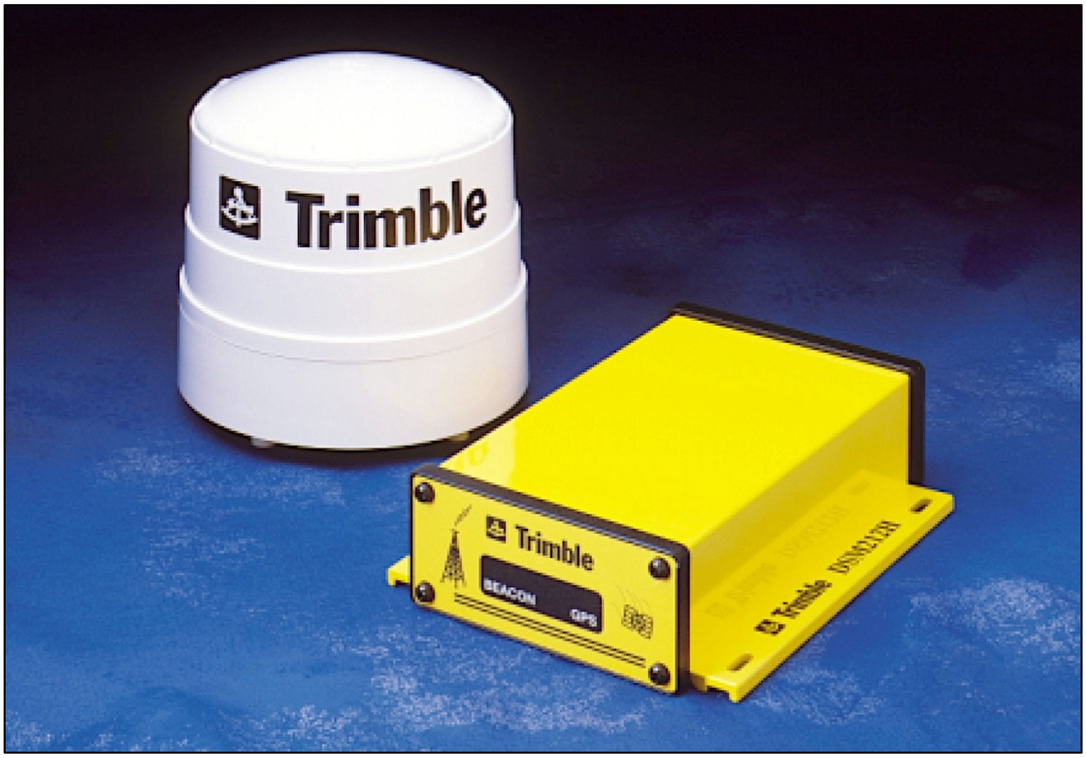


Figure 3-01. Trimble Navigation DSM 12/212 Global Positioning System used during the investigation.

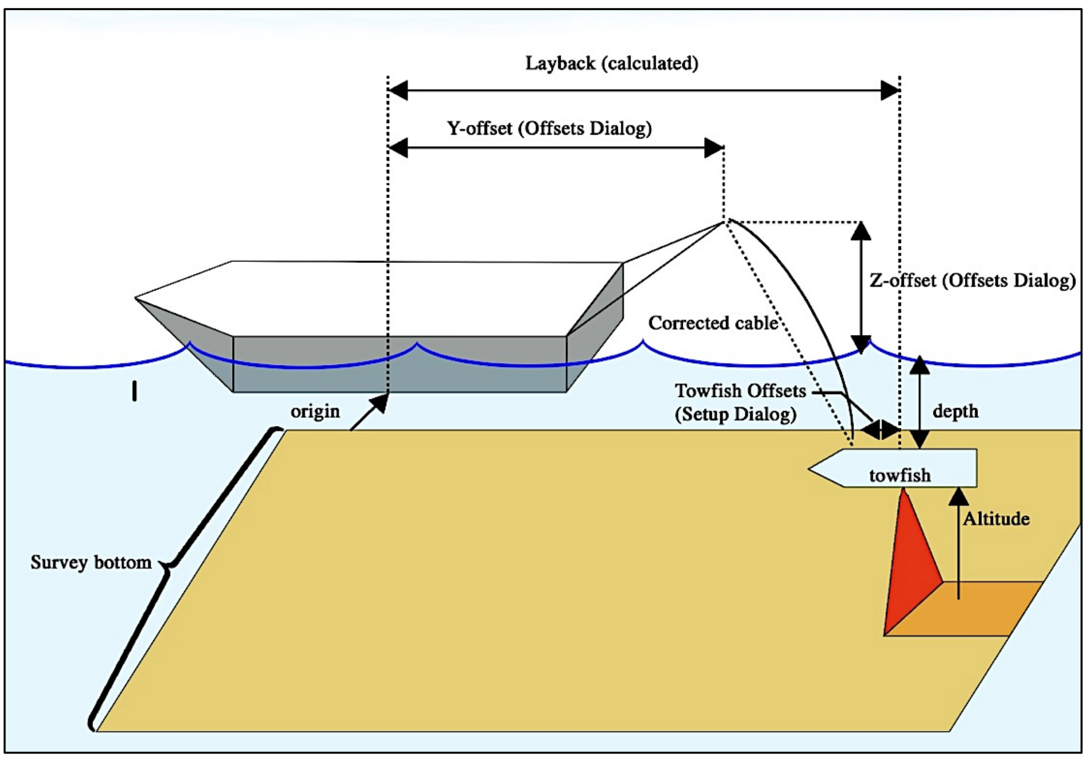


Figure 3-02. Equipment schematic illustrating layback (courtesy of Coastal Oceanographics, Inc.).

MAGNETOMETER

Magnetometers measure the intensity of magnetic forces with a sensor that measures and records the ambient (background) magnetic strength and if present, deviations from the ambient background (anomalies) caused by magnetic fields of ferrous objects and other sources such as high voltage cables (Breiner 1973). These measurements are recorded in nanoteslas, the standard unit of magnetic intensity.

The success of the magnetometer to detect anomalies in local magnetic fields has resulted in the instrument being a principal remote sensing tool of maritime archaeologists because anomalies can represent components of shipwrecks and other historic debris or objects hazardous to dredging or navigation. While it is not possible to identify specific ferrous objects from the magnetic field contours, it is occasionally possible to approximate shape, mass, and alignment characteristics of wrecks or other structures based on complex magnetic field patterns. In addition, other data (historic accounts, use patterns of the area, diver inspection), which overlap data from other remote sensing technologies, such as the sidescan sonar and prior knowledge of similar targets, can lead to an accurate identification of potential targets.

There are three types of commercially available marine magnetometers: proton precession, cesium vapor, and Overhauser. Over the course of the project Sonographics employed a Geometrics 882 cesium vapor magnetometer (Figure 3-03). The G-882 tow-fish was towed from the starboard side of the transom and 52 meters aft. Data were stored in the navigation computer and archived. The Geometrics 882 is capable of sub-second recordation for precise location control, and data were collected at 10 hertz, providing a record of both the ambient field as well as the character and amplitude of the anomalies encountered. A 110-volt gasoline powered generator powered all survey devices.

Figure 3-03. Survey instruments employed during the investigation included (clockwise from top left) the magnetometer, the subbottom profiler, and sidescan sonar.

SIDESCAN SONAR

The remote sensing instrument used to search for physical features on or above the ocean floor was an Edgetech 4200 sidescan sonar system (Figure 3-03). The sidescan sonar is an instrument that, through the transmission of dual fan-shaped pulses of sound and reception of reflected sound pulses, produces an acoustic image of the bottom. Under ideal circumstances, the sidescan sonar is capable of providing a near-photographic representation of the bottom on either side of the trackline of a survey vessel.

This sidescan sonar was utilized with the navigation system to provide manual positioning of fix or target points on the digital printout. Sidescan sonar data are useful in searching for the physical features indicative of submerged cultural resources. Specifically, the record is examined for features showing characteristics such as height above bottom, linearity, and structural form. Additionally, potential acoustic targets are checked for any locational match with the data derived from the magnetometer and the subbottom profiler.

The Edgetech 4200 sidescan sonar was linked to a towfish that employed both 300 and 600 kilohertz frequency settings and a variable side range of 50 meters-per-channel (164 feet) on each of the survey lines. The 50-meters-per-channel setting was chosen to provide detail and over 100% overlapping coverage with the 50-foot line spacing to insure full coverage of the survey area. The 4200 tow-fish was towed from the port side and 13 meters aft of the transom.
The sonar frequency was selected in order to provide maximum possible detail on the record generated; 600 kilohertz was the preferred frequency.

SUBBOTTOM PROFILER

Employed to determine the character of near-surface geologic features over the survey area, subbottom profilers generate low frequency (0.5 to 30 kilohertz) sound pulses capable of penetrating the seabed and reflecting off sediment boundaries or larger objects below the surface. The data are then processed and reproduced as cross sections based on two-way travel time (the time taken for the pulse to travel from the source to the reflector and back to the receiver). This travel time is then interpolated to depth in the sediment column by calculating at 1,500 meters-per-second (the average speed of sound in water).

Subbottom profilers have different ranges of sound wave frequency (sparkers, boomers, pingers, and chirp systems). Sparkers and boomers operate at low frequency (0.005 to 2 kilohertz) and afford deep geologic penetration and low resolution, useful for deep geologic time. Pingers (3.5 and 7 kilohertz) are more useful to penetrate late Pleistocene and Holocene aged deposits or paleolandscape features of interest to prehistoric archaeologists. CHIRP systems sweep multiple frequency ranges and are the most precise and accurate of the subbottom profiler systems, and they operate at ranges of 3–40 kilohertz. The resolution can be on the order of 10 centimeters (6 inches) depending sediment type and the quality of the acoustic return.

The X-Star Full Spectrum Sonar is a versatile wide-band FM sub-bottom profiler that generates cross sectional images of the seabed and collects digital normal incidence reflection data over many frequency ranges. X-Star transmits an FM pulse that is linearly swept over a full spectrum frequency range (also called a ‘chirp pulse’). The tapered wave form spectrum results in images that have virtually constant resolution with depth. Another X-Star advantage is the reduction of side lobes in the effective transducer aperture. The tow-fish utilized in the survey was the Edge Tech model SB 424. (Figure 3-03). The device was operated at a setting of 4 to 24 kilohertz for maximum penetration.

Seismic cross sections reconstruct the shapes and extents of reflectors such as facies in channel sediments, rock/sediment interfaces, marine sand bed cover, and so forth. In addition to subbottom profiling, and depending on the density of data points, the first bottom return data can be used for high-resolution bathymetry. Shipwrecks can be studied with subbottom profilers once their location is known. Finding shipwrecks with subbottom profiler survey is less useful.

High and low amplitude reflectors (light and dark returns) distinguish differences of sediment characteristics such as particle size and consolidation (Stevenson et al. 2002). Facies contacts can be identified by discontinuities in the extent, slope angle, or shape of the reflector returns. This latter fact is important when identifying the sinusoidal shapes of drowned channel systems and other relict and buried fluvial system features (e.g., estuarine, tidal, lowland, upland areas around drainage features). Parabolic-shaped reflectors indicate individual objects of sufficient size and consolidation. The parabolic shape is the result of sound propagating outwardly from the item. There are also five types of signals that may cause misinterpretation in the two dimensional records: direct arrivals from the sound source; water surface reflection; side echoes; reflection multiples; and point source reflections. Judicious analysis is required to identify them.

Peats tend to reflect strongly, as do other fine grain or muddy sediments. Sand and shell deposits like those around and in the Project Area are less reflective, and difficult to penetrate without lower seismic frequencies such as employed by the profiler system employed here.

Survey Vessel

The 25-foot survey vessel *Bar Check* was employed for the survey. The vessel met all U.S. Coast Guard requirements in terms of safety equipment and seaworthiness.

Survey Procedures

Survey lines were spaced at 100-foot intervals, survey lines were programmed into the navigation computer (Figure 3-04). The magnetometer and DGPS were mobilized, tested, found operational, and the trackline running began. The helmsman viewed a video monitor, linked to the DGPS and navigational computer, to aid in directing the course of the vessel down the survey tracklines. The monitor displayed the pre-plotted trackline, the real time position of the survey vessel, and the path of the survey vessel. The speed of the survey vessel was maintained at approximately 3 to 4 knots for the uniform acquisition of data. As the survey vessel maneuvered down each trackline, the navigation system monitored the position of the survey vessel relative to the tracklines every second, each of which was recorded by the computer. Event marks delineated the start and end of each trackline. The positioning points along the traveled line were recorded on the computer hard drive and the magnetic data were also stored digitally.

Data Analysis

Data Processing

Once collected, survey data are processed and analyzed using an array of software packages designed to display, edit, manipulate, map, and compare proximities of raster, vector, and tabular data. These packages include SonarWiz 7 for mosaicing sidescan sonar and subbottom profiler data, mapping target extents and generating target reports, figure details, and GIS layers; HYPACK Magnetometer Editor, Surfer 9, and HYPACK Export for tabulating anomaly characteristics and contouring magnetic data, and generating Geographic Information System (GIS) data layers. ESRI ArcMap is used to display the data on background charts, to conduct a "proximity analysis" for each of the three types of targets (e.g., see which magnetometer, sidescan, and subbottom profiler anomalies are near each other and may explain each other) and to create maps and figures for this report.

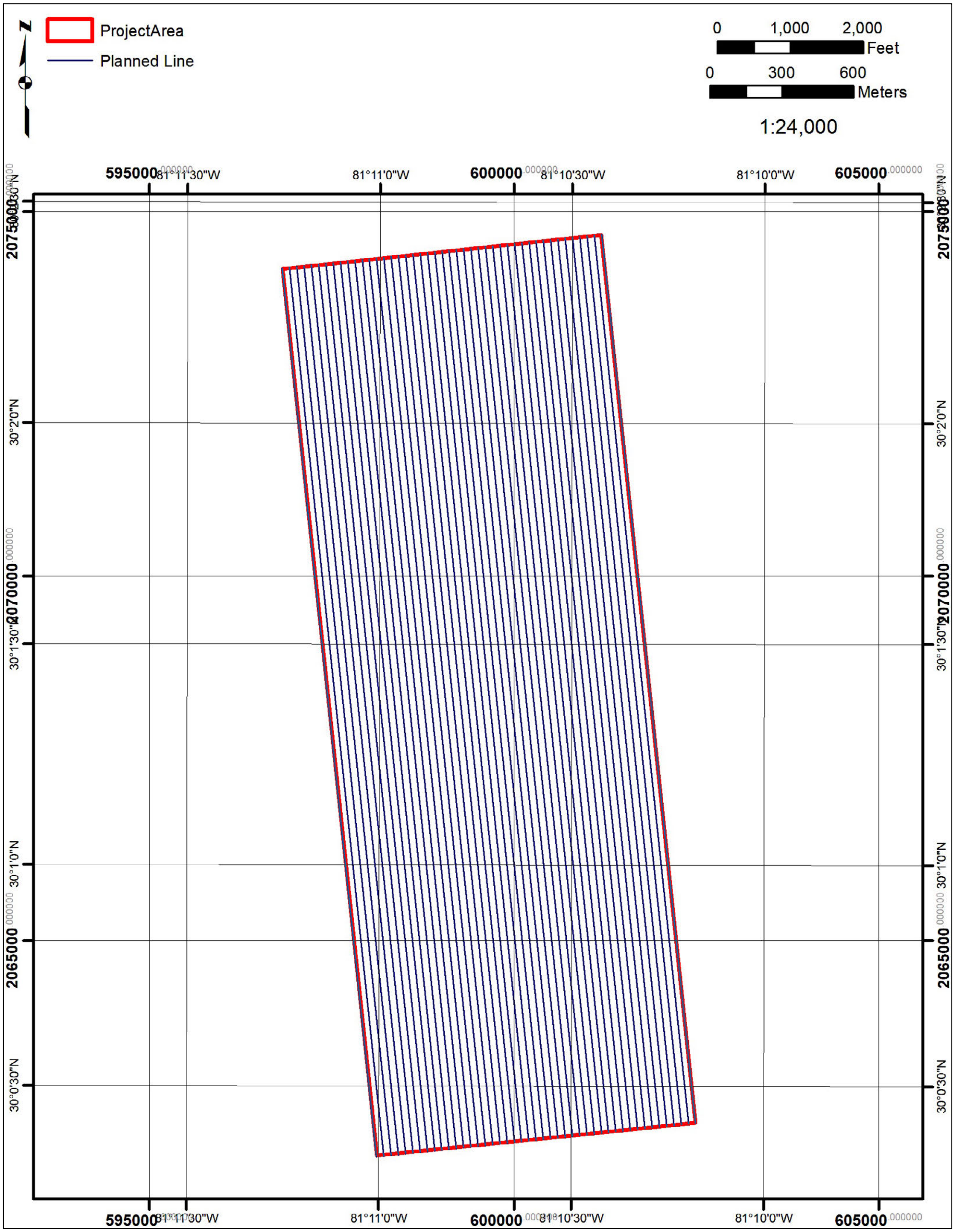


Figure 3-04. Planned lines generated for the Project Area.

MAGNETIC DATA COLLECTION AND PROCESSING

Data from the magnetometer are collected using HYPACK Max. The data are stored as *.RAW files by line, time, and day. *.RAW data files are opened and layback parameters are set. Contour maps are produced of the magnetic data with Surfer 9 using a Minimum Curvature gridding algorithm. The *.DXF file is saved and exported into the combined GIS database. The contour maps allow a graphic illustration of anomaly locations, spatial extent, and association with other anomalies. Magnetic data are reviewed by HYPACK Magnetometer Editor (Figure 3-05), and the location, strength, duration, and type of anomaly are transcribed to a spreadsheet along with comments.

SIDESCAN SONAR DATA COLLECTION AND PROCESSING

Post-processing of sidescan sonar is accomplished using HYPACK's Targeting and Mosaicking software, a product that enables the user to view the sidescan data in digitizer waterfall format, pick targets, and enter target parameters including length, width, height, material, and other characterizations into a database of contacts. In addition, HYPACK's Targeting and Mosaicking software "mosaics" the sidescan data by associating each pixel (equivalent to about 10 centimeters) of the sidescan image with its geographic location determined from the real-time Hypack corrected position. SonarWiz 7 was used to generate the final mosaic found in Chapter Four. SonarWiz 7 is the industry standard for mosaicking capability, the results are exported as geo-referenced *.TIFFs for importing to the GIS database of the project (Figures 3-06 and 3-07). SonarWiz 7 can generate target reports in *.PDF, Word, or Excel format. Panamerican utilizes the Word format for reports.

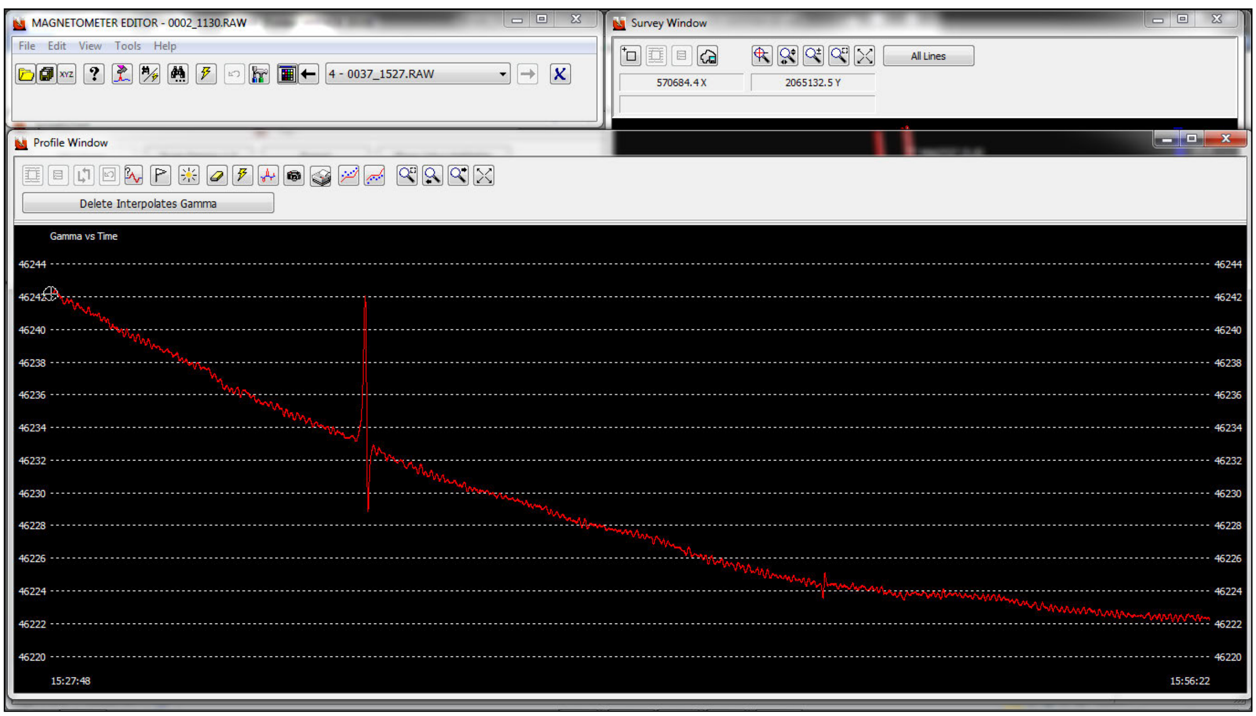


Figure 3-05. HYPACK Magnetometer Editor magnetic data display of a survey line. Using these windows one can analyze anomaly position, strength, duration, and type. Target locations are selected based on their type (e.g. monopoles are selected at peak amplitude deviation), and their width is the duration. Example, Line 0037 of Borrow Area N-3.

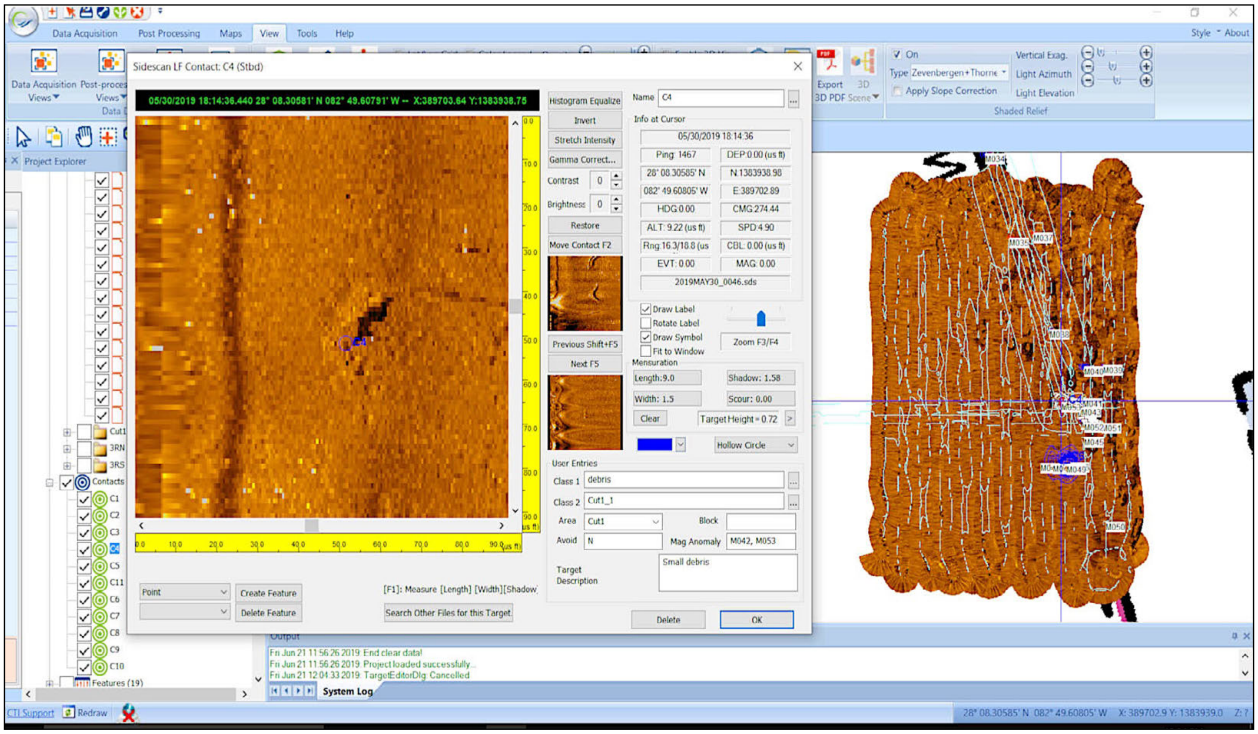


Figure 3-06. SonarWiz 7 software with mosaic example in the background, and a target selection zoom image to the left. Magnetic contours, anomaly locations, and annotations are overlaid.

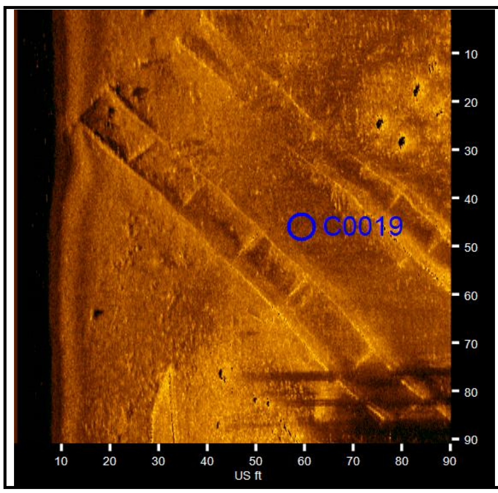
	**C0019** ● Sonar Time at Target: 10/6/2017 4:06:39 PM ● Click Position 28.1561024730 -82.7643968570 (WGS84) 28.1558113939 -82.7645730139 (NAD27LL) 28.1561024730 -82.7643968570 (LocalLL) (X) 409855.80 (Y) 1390232.39 (Projected Coordinates) ● Map Projection: FL83-WF ● Acoustic Source File: C:\Users\Tardis\Desktop\Anclote River 2017\Raw Data\SS\2017OCT06_0003.sds ● Ping Number: 17167 ● Range to target: 58.37 US ft ● Fish Height: 8.90 US ft ● Heading: 0.000 Degrees	**Dimensions and attributes** ● Target Width: 34.92 US ft ● Target Height: 0.48 US ft ● Target Length: 102.11 US ft ● Target Shadow: 3.34 US ft ● Classification1: marine rail ● Description: MARINE RAILWAY

Figure 3-07. SonarWiz 7 sonar contact tabular format, automatically generated.

Subbottom Profiler Data Processing and Analysis

Post-processing of subbottom profiler data, like the sidescan data, is done with SonarWiz 7, which in this case enables the user to view the subbottom data in a planar, trackline format. The user may view the data in a digitizer window as a waterfall format, allowing the digitizing of subbottom features of interest, linear extent, depth, and type (Figure 3-08). SonarWiz 7 batch processes waterfall images to *.JPG formats in order to generate figures (Figure 3-09). Digitized reflectors and the contact databases are exported to the GIS database as *.SHP files. SonarWiz 7 also allows the user to calculate the amount of sonar coverage and illuminate gaps to ensure full coverage of the Project Area.

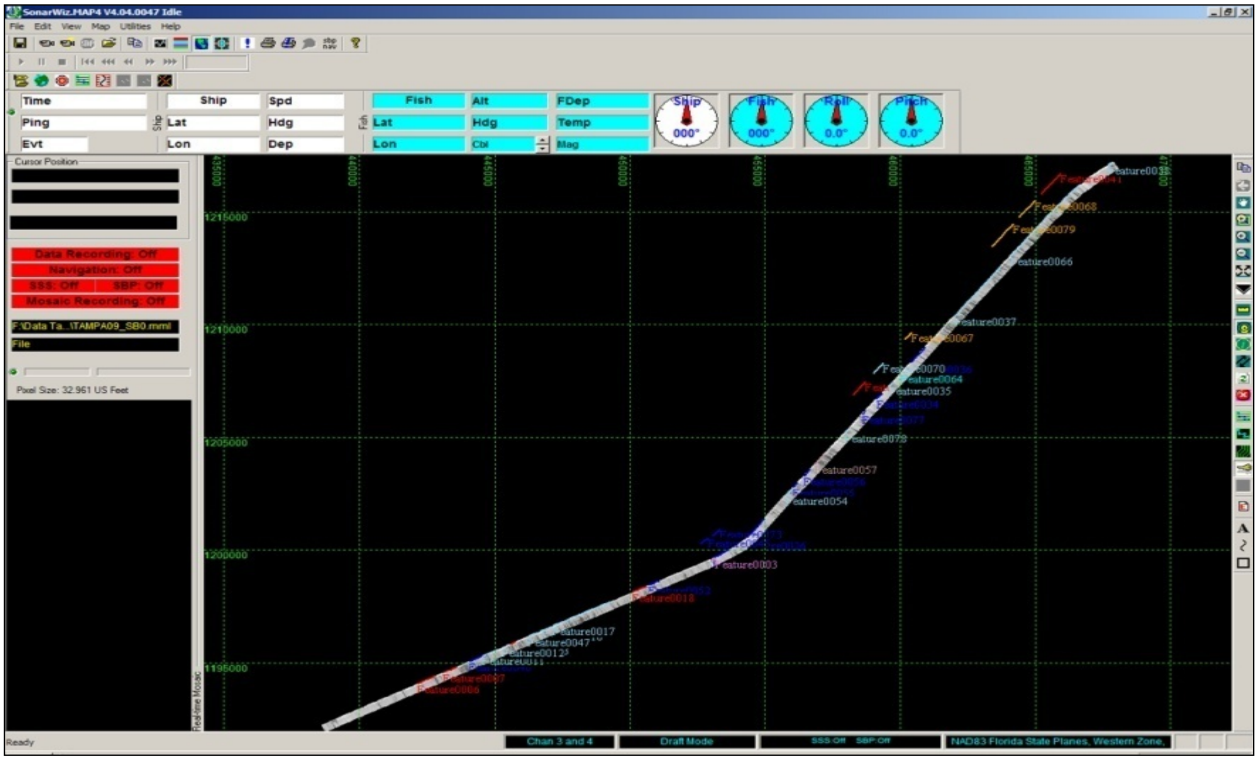


Figure 3-08. Trackline configuration and various "reflector" features digitized. This image is from a past survey conducted in Tampa Bay (see Faught and James 2009).

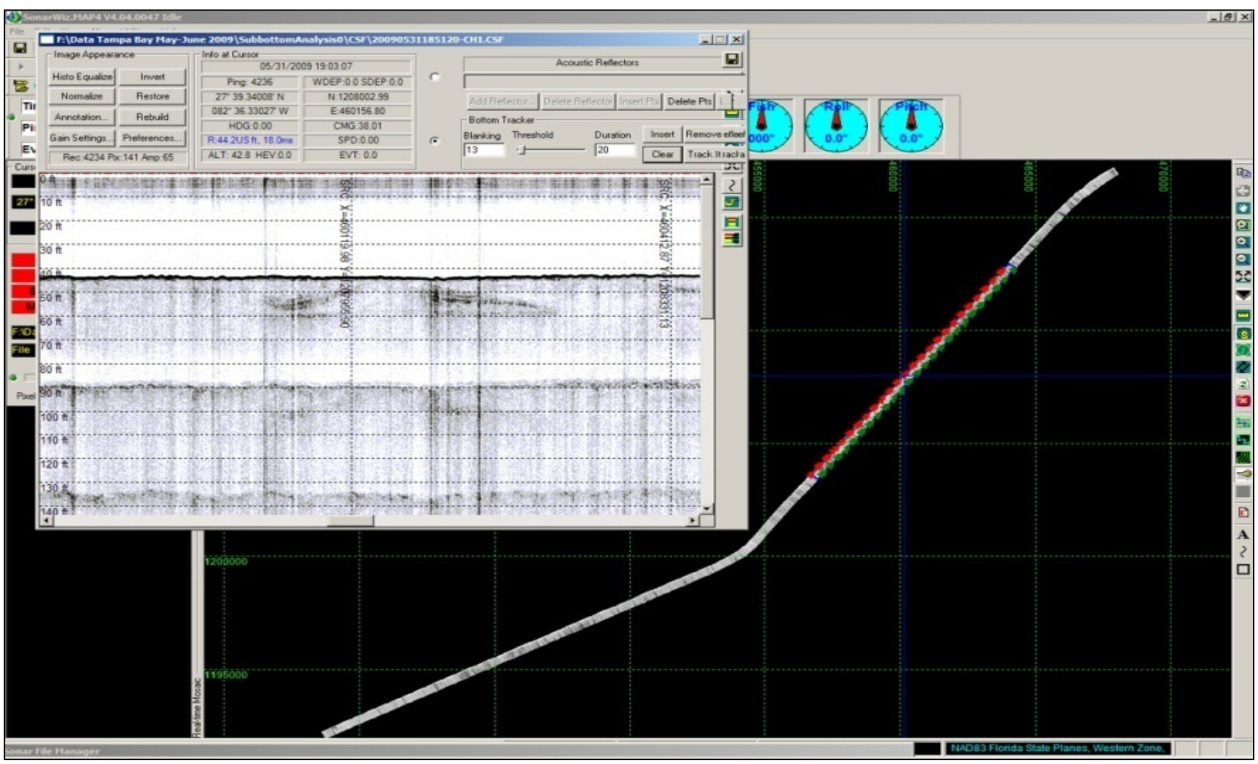


Figure 3-09. SonarWiz subbottom waterfall image showing the seismic profile-digitizing window. The blue cross hairs in the background chart show the location of the cursor, which at the time of the image was directly over the peak of the positive relief feature shown. This image is from a past survey conducted in Tampa Bay (see Faught and James 2009).

Geographic Information Systems Analysis

A project GIS database is constructed using geo-referenced images and layers generated during the magnetometer, sidescan, and subbottom data analyses. Other layers can be added, such as orthographic aerial imagery or navigation charts (Figure 3-10). Several important things are accomplished by GIS compilation. First, the collected data are compared to one another and evaluated for accuracy and consistency of the positioning information. Second, magnetic, sidescan, and other remote sensing targets are compared for relationship (proximity analysis).

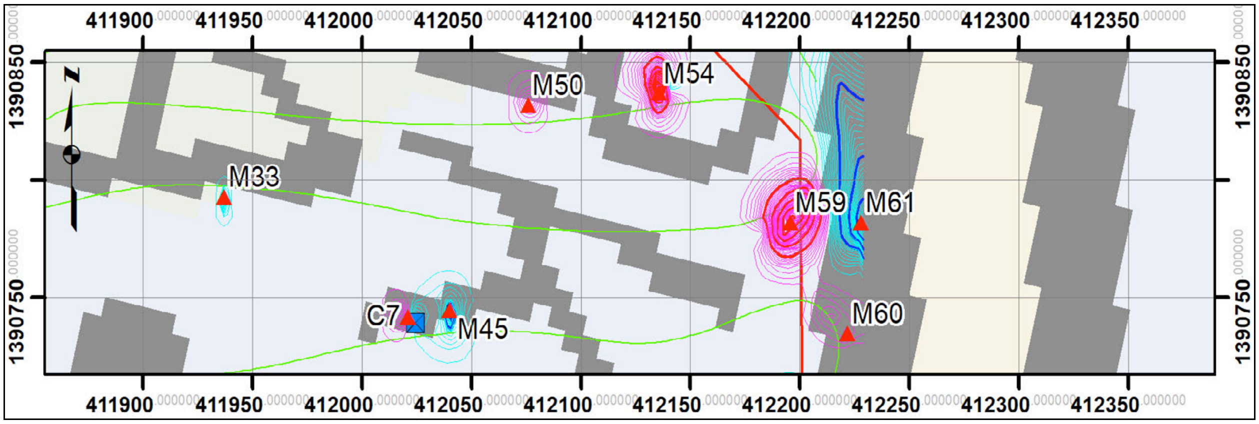


Figure 3-10. Geographic Information System database example showing magnetic anomalies, sidescan sonar contact locations, magnetic contour map, and raster chart data showing environmental context.

Data Analysis Criteria, Theory, and Commentary

The remote sensing survey of the Project Area intended to locate and identify the presence or absence of potentially significant submerged cultural resources that if present might be adversely affected by proposed navigation improvement activities. However, the interpretation of remote sensing data obtained from both the magnetometer and sidescan sonar, as stated by Pearson et al. (1991) "relies on a combination of sound scientific knowledge and practical experience." The evaluation of remote sensing anomalies, with regard to a determination that the anomaly does or does not represent shipwreck remains, depends on a variety of factors. These include the detected characteristics of the individual anomalies (e.g., magnetic anomaly strength and duration, sidescan image configuration) associated with other sidescan or magnetic targets on the same or adjacent lines and relationships to observable target sources, such as channel buoys or pipeline crossings, etc.

Magnetometer

Interpretation of data collected by the magnetometer, the tool of choice by the underwater archaeologist for locating shipwrecks, is perhaps the most problematic. Magnetic anomalies are evaluated and prioritized based on magnetic amplitude or deflection of nanotesla intensity from the ambient background in concert with duration or spatial extent (distance in feet along a trackline of an anomaly influences the ambient background); they are also correlated with sidescan targets. Because the sonar record gives a visible indication of the target, identification or evaluation of potential significance is based on visible target shape, size, and presence of structure, as well as association with magnetic anomalies. Targets, such as isolated sections of pipe, can normally be immediately discarded as non-significant, while large areas of above-sediment wreckage are generally easy to identify.

The problems of differentiating between modern debris and shipwrecks, based on remote sensing data, have been discussed by several authors. This difficulty is particularly true in the case of magnetic data; therefore, it has received the most attention in the current body of literature dealing with the subject. Pearson and Saltus (1990:32) state "even though a considerable body of magnetic signature data for shipwrecks is now available, it is impossible to positively associate any specific signature with a shipwreck or any other feature." There is no doubt that the only positive way to verify a magnetic source object is through physical examination. With that said, however, the size and complexity of a magnetic signature does provide a usable key for distinguishing between modern debris and shipwreck remains (see also Garrison et al. 1989; Irion and Bond 1984; Pearson et al. 1993). Specifically, the magnetic signatures of most shipwrecks tend to be large in area and tend to display multiple magnetic peaks of differing amplitude.

In a study conducted for BOEM for magnetic anomalies in the northern Gulf of Mexico, Garrison et al. (1989) indicate that a shipwreck signature will cover an area between 10,000 and 50,000 square meters. Using the Garrison et al. (1989) study, as well as years of "practical experience," in an effort to assess potential significance of remote sensing targets, the Pearson et al. (1991) study developed general characteristics of magnetometer signatures most likely to represent shipwrecks. The report states that "the amplitude of magnetic anomalies associated with shipwrecks varies considerably, but, in general, the signature of large watercraft or portions of watercraft, range from moderate to high intensity (> 50 nanoteslas) when the sensor is at distances of 20 feet or so" (Pearson et al. 1991:70). Employing a table of magnetic data from various sources as baseline data, the report goes on to state that "data suggests that at a distance of 20 feet or less, watercraft of moderate size are likely to produce a magnetic anomaly (this would be a complex signature [i.e., a cluster of dipoles and/or monopoles]) greater than 80 or 90 feet across the smallest dimension..." (Pearson et al. 1991:70).

While establishing baseline amounts of amplitude and duration reflective of the magnetic characteristics for a shipwreck site, the report "recognizes that a considerable amount of variability does occur" (Pearson et al. 1991:70). Generated in an effort to test the 50-nanotesla/80-foot criteria and to determine the amount of variability, Table 3-01 lists numerous shipwrecks as well as single and multiple-source objects located by magnetic survey and verified by divers. All shipwrecks met and surpassed the 50-nanotesla/80-foot criteria, with one exception. *Emanuel Point II*'s magnetic deviation falls below the cut off, although duration is above. Subsequent archaeological examinations have determined that *Emanuel Point II* contains very little iron (Greg Cook personal communication, 2011). The majority of single-object readings fell below the criteria (with the exception of the pipeline, the two sections of pipe, and one of the seven rocket motors). However, the signature of the pipeline should appear as a linear feature on a magnetic contour map and should not be confused with a single source object. The strengths of the two sections of pipe represent refinement readings that sought to produce the highest reading possible and should perhaps be discounted from the sample. Further, because of their association with the space program, rocket motors, which are single source objects, must be considered potentially significant. While the shipwrecks and most single source objects adhere to the 50-nanotesla/80-foot criteria, the multiple-source objects do not. If all targets listed on the table required prioritization of potential significance based on the 50-nanotesla/80-foot criteria, the two multiple-source object targets would be classified as potentially significant.

Table 3-01. Compilation of Magnetic Data from Various Sources.

Vessel (Object)	Type and Size	Magnetic Deviation	Duration (ft.)	Reference
Shipwrecks				
J.D. Hinde	129-ft. wooden sternwheeler	573	110	Gearhart and Hoyt 1990
Mary	234-ft. iron-hulled sidewheeler	1180	200	Hoyt 1990

Vessel (Object)	Type and Size	Magnetic Deviation	Duration (ft.)	Reference
Confederate Obstructions	numerous vessels with machinery removed and filled with construction rubble	110	long duration	Irion and Bond 1984
Utina	267-ft. wooden freighter	690	150	James and Pearson 1991; Pearson and Simmons 1995
Gen C.B. Comstock	177-ft. wooden hopper dredge	200	200	James et al. 1991
Egmont Shoal wreck	19th century Wooden-hulled copper clad sailing vessel	67	160	Krivor 2005
USS Narcissus	Civil War wooden tug	582	176	Krivor 2005
El Nuevo Constante	126-ft. wooden collier	65	250	Pearson et al. 1991
James Stockton	55-ft. wooden schooner	80	130	Pearson et al. 1991
modern shrimp boat	segment 27-x-5 ft.	350	90	Pearson et al. 1991
Mary Somers	iron-hulled sidewheeler	5000	400	Pearson et al. 1993
Homer	148-ft. wooden side-wheeler	810	200	Pearson and Saltus 1990
Shrimp Boat	modern	162	110	Watts 2000
Pappy's Lane Shipwreck	165-ft. steel-hulled World War II landing craft	685	350	James et al. 2016
Single Objects				
pipeline	18-in. diameter	1570	200	Duff 1996
Pipe	3 in. by 10 ft.	55	352	Krivor 2005
Pipe/mast/davit	18 in. by 26 ft.	475	104	Lydecker 2007
anchor	6-ft. shaft	30	270	Pearson et al. 1991
iron anvil	150 lbs.	598	26	Pearson et al. 1991
engine block	modern gasoline	357	60	Rogers et al. 1990
steel drum	55 gallon	191	35	Rogers et al. 1990
pipe	8-ft. long by 3 in. diameter	121	40	Rogers et al. 1990
railroad rail segment	4-ft. section	216	40	Rogers et al. 1990
7 Rocket Motors	8 ft. to 34 ft. in length	61 to 422	75 to 180	Watts 2000
Multiple Objects				
cable and chain	5 ft.	30	50	Pearson et al. 1991
scattered ferrous metal	14-x-3 ft.	100	110	Pearson et al. 1991
anchor/wire rope	8-ft. modern stockless/large coil	910	140	Rogers et al. 1990

While the 50-nanotesla/80-foot criteria is a good general guide for most conditions, several recent studies have suggested that a 50-nanotesla/80-foot duration applied to remote sensing data as a baseline for all wreck sites is much too low. Allowing for a larger and more focused database on which to assess signature characteristics of specific vessel classes, the findings from these investigations argue for higher nanotesla and duration criteria for specific types of sites. Table 3-02 indicates the sizable magnetic deviation and duration of previously recorded and located steamboat wreck sites. However, there is one exception, each of the known steamboat wrecks investigated has a magnetic deviation of at least 500 nanoteslas and a duration of no fewer than 110 feet, usually in the 200-plus feet range. As opposed to single objects, steamboat wrecks documented during previous investigations are generally much larger in magnetic strength (although not always), tend to have a longer duration, and typically have multi-component signatures. It should be noted, however, that each steamboat wreck signature differs markedly due to environmental conditions, amount of hull/machinery remaining, and the depth of water/overburden over the wreck site.

Furthermore, it should be inferred that one of the biggest influences on a wreck site's magnetic signature is directly related to the distance from the magnetometer sensor to the wreck site. As stated in Pearson and Birchett:

"For a typical iron object, the intensity of its magnetic signature [i.e., anomaly] is inversely proportional to the cube of the distance. One pound of iron, for example, would produce an anomaly of 100 nanoteslas at a distance of 2 feet. At a distance of 10 feet the same pound of iron would produce an anomaly of only 1 nanotesla. A 1,000-ton ship could produce a 700-nanotesla anomaly at 100 feet and a barely discernible 0.7-nanotesla anomaly at 1,000 feet" [Pearson and Birchett 1999:4-13].

An example of a steamboat wreck that produces a magnetic signature of less than 500 nanoteslas involves the purported *Undine* site investigated by Panamerican in 1999 and 2000. During 1999, remote sensing operations located a magnetic anomaly with a magnetic deflection of 193 nanoteslas with a duration of 300 feet. During the 2000 field investigations, the anomaly was identified as the remnant of a charred steamboat ≈ 38–40 feet below the river's surface, and buried 8 feet below riverbed sediments. Historic records indicate the *Undine* was extensively salvaged after the scuttling incident whereupon everything of value including all iron plating, machinery, and cannon were removed from the wreck, but the hull remained in place (James and Krivor 2000:16-17). While only a small portion of the wreck site was uncovered (due to the extensive amount of overburden) it was evident that little of the hull is extant, only just to the turn of the bilge.

It should also be stated that two of the wreck sites with either small areas of deviation or low nanotesla deflections, the *J.D. Hinde* and the purported *Undine*, represent either partial hull remains (*J.D. Hinde*) or were heavily burned and salvaged (*Undine*). Historic records indicate the *J.D. Hinde* was also salvaged after the wrecking process. Retaining none of her steam machinery or wheels, half of the vessel was no longer present, most likely as a result of dredging; both salvage and dredging the obvious reason for its small magnetic duration (James and Pearson 1993:22). Salvage efforts often sought to remove any cargo as well as any machinery, cannon, anchors, or other goods of value. During the Civil War, the salvage of iron for reuse was often paramount. As stated by John B. Jones on 11 August 1863, "the iron was wanted more than anything else but men" (Black 1958:200). Therefore, it may be speculated that any wreck site that (1) has been salvaged in the past; (2) has been exposed to excessive environmental processes (i.e., current); or (3) has been impacted by channelization efforts (i.e., dredging) will produce a lower nanotesla deflection (due to less ferrous metal on site) than a wreck not exposed to similar processes.

Table 3-02. Magnetic Data from Steamboat Wreck Sites.

Vessel (object)	Type & Size	Magnetic Deviation	Duration (feet)	Reference
Shipwrecks				
3MO69 (unidentified)	wooden sidewheeler	2,961	299	Buchner and Krivor 2001
New Mattie	130-ft. wooden sternwheeler	1,491	200	Buchner and Krivor 2001
J.D. Hinde	129-ft. wooden sternwheeler	573	110	Gearhart and Hoyt 1990
Caney Creek Wreck	sidewheeler	2,790	unknown	Hedrick 1998
Undine	sternwheeler	200	300	James and Krivor 2000
John Walsh	275-ft. sidewheeler	1,602	280	James et al. 2002
Scotland	sidewheeler	1,322	200	Kane et al. 1998
Hartford City	150-ton sidewheeler	856	400	Krivor et al. 2002

Vessel (object)	Type & Size	Magnetic Deviation	Duration (feet)	Reference
Choctaw	223-ton sternwheel towboat	797	250	Krivor et al. 2002
Star of the West	172-ton ocean-going sidewheel	8,300	400	Krivor et al. 2002
E.F. Dix/Eastport	sidewheeler/ironclad	800	360	Pearson and Birchett 1995
Mary Somers	iron-hulled sidewheeler	5000	325	Pearson et al. 1993
Homer	148-ft. wooden sidewheeler	810	200	Pearson and Saltus 1993
Mary E. Keene	236-ft. sidewheeler	1,700	220	Robinson 1998
35th Parallel	sidewheeler	1,414	320	Saltus 1993
"Boiler" wreck (unidentified steamboat)	sidewheeler/sternwheeler (?)	1,164	500	Saltus 1993
Oklahoma Wreck	sidewheeler	497	300	M.C. Krivor, personal communication, 2005

If the signatures of the entire steamboat wrecks listed in Table 3-02 are averaged, an average magnetic deviation of 1,576 nanoteslas with an average duration of 234 feet is obtained. While the sensor distance, environmental factors, and the amount of ferrous metal remaining on any given steamboat site must be taken into account, previously identified wreck sites have tended to produce sizable +200-nanotesla magnetic deviations with a minimum duration of 110 feet. While the 110-foot duration represents the lowest duration of any of the known steamboat wreck sites, it must be stated that in such cases a portion of the wreck is no longer extant due to previous salvage and dredging/channelization efforts. However, until further surveys show that this short duration is an "anomaly" so to speak, it must be employed as the baseline duration. Similarly, with the exception of the *Undine* site, which as stated previously was heavily salvaged, all other surveyed steamboats have nanotesla deviations approaching 500 nanoteslas or above, but its 200-nanotesla reading must be employed as the baseline amplitude.

While the data indicates the validity of employing specific nanotesla strength and duration criteria when assessing magnetic anomalies, other factors must be taken into account. Pearson and Hudson (1990) have argued that the past and recent use of a water body must be an important consideration in the interpretation of remote sensing data; in many cases, this should supposedly be the most important criterion. Unless the remote sensing data, the historical record, or the specific environment (i.e., harbor entrance channel) provides compelling and overriding evidence, it is otherwise believed that the history of use should be a primary consideration in the interpretation. The constitution of "compelling evidence" is, to some extent, left to the discretion of the researcher; however, in settings where modern commercial traffic and historic use have been intensive, such as the current Project Area, the presence of a large quantity of modern debris must be anticipated. In harbor, bay, or riverine situations where traffic is heavy, this debris will be scattered along the channel right-of-way, although it may be concentrated in areas where traffic would slow or halt, and it will appear on remote sensing survey records as discrete, small objects. This is in fact the case for many of the anomalies recorded during the current investigation.

In addition to anomaly strength and duration considerations, all anomalies were assessed for type (monopole [negative or positive influence], dipole [negative and positive influence], or complex) and association with other magnetic anomalies (i.e., clustering) and sidescan sonar targets. With regard to analysis of these anomalies, relative to potential significance, many will be found to represent a small, single source object (a localized deviation), and are generally identified and labeled as non-significant, especially in an area of high use (however, this is not generally the case with the current environment). As seen on contour maps, the contour lines for this type of anomaly can be seen to approach, or go to but not beyond, the adjacent survey trackline on which it is located. This visual interpretation is corroborated during the analysis of the electronic magnetometer strip-chart data of each survey trackline. An examination of the strip-chart will show that the target was recorded only on a single transect, and that it was not recorded (i.e., did not influence the ambient magnetic background) on adjacent lines. This is especially true when an anomaly's readings are large deviations but are recorded on only one line. This indicates the source for this target must be a small, discrete object, and the magnetometer sensor must have passed closely by or directly over the object in order to generate the large readings on this survey line, yet not be recorded or have had an influence on adjacent lines. Because these anomalies represent single source objects, they are not considered representative of a potentially significant submerged cultural resource and are not recommended for avoidance.

It cannot be understated that the majority of anomalies recorded during any survey are generated by debris and not shipwrecks. As stated by Gearhart (2011:91-92), "archaeologists have repeatedly struggled to characterize reliable differences between magnetic signatures of shipwrecks and debris," employing amplitude, duration (i.e., spatial extent), and complexity of the signature as vague defining criteria, along with judgmental experience, and further states that "present methods for marine magnetic data interpretation are uncertain at best and scientifically unfounded at worst." However, and as will be discussed, the employment of induced magnetism identified over twenty years ago as a potential defining characteristic of an anomaly, can eliminate many anomalies from consideration as shipwrecks.

In Garrison et al.'s (1989) study to establish an interpretive framework that would help identify the nature of magnetic anomalies, it was predicted correctly that anomalies caused by debris might be differentiated from shipwreck anomalies based on the contrast between permanent and induced magnetism. The study states:

"While it may not be analytically possible to contrast iron and steel by remnant magnetization one may be able to characterize anomalies as to their inductive magnetization…The argument here would rely on the structural complexity of a shipwreck having a large or detectable inductive magnetization. Anomalies without this component could be classified as exclusively ferromagnetic features and by local extension debris" [Garrison et al. 1989:2:224].

In his article entitled *Archaeological Interpretation of Marine Magnetic Data*, Gearhart (2011) expands on Garrison et al.'s 1998 premise and convincingly shows that while "one cannot distinguish between the anomaly produced by a shipwreck and one produced by a similarly complex concentration of magnetic debris…shipwreck anomalies can be characterized by their induced magnetic fields and are distinguishable from a significant proportion of simple-source anomalies." He goes on to state, "the most important parameter to consider when interpreting anomalies based on magnetic induction is the direction of magnetic moment" (Gearhart 2011:106) and "deviation from the northerly magnetic moment direction, common to all induced anomalies, has proven to be the single most powerful discriminator between simple-source anomalies and complex-source anomalies, including shipwrecks" (Gearhart 2011:102).

In simplistic terms, the contour map of the magnetic moment of an induced anomaly will have its negative value to the north and its positive value to the south. Gearhart presents contours of numerous known wreck and debris anomalies and illustrates that magnetic moments of shipwrecks (in the earth's northern hemisphere) are oriented to the north (no more than a 26-degree deviation), as are those of complex debris sites (i.e., large areas of wire rope), while those of simple-source debris anomalies are not. He concludes by suggesting ±20 degrees from magnetic north as an orientation that will allow the successful differentiation of simple-source debris anomalies from most complex-source anomalies and virtually all shipwrecks (Gearhart 2011). In testing this predicted characteristic, we reviewed data from several past surveys and anomaly and wreck investigations (Krivor 2005; Lydecker 2007, James et al. 2002). While not an exhaustive review, we found these same principles apply with no deviation from Gearhart's findings and leads us to also conclude that identifying and categorizing the magnetic moment of an induced anomaly does allow the researcher the ability to differentiate a large percentage of debris source anomalies from potentially significant resources during analysis. A case in point is the recent diver investigation of 13 magnetic anomalies in the Skyway Gulf Intracoastal Waterway (James et al. 2011). Employing the above criteria of inclination of magnetic moment, of the 13 magnetic anomalies investigated, seven anomalies had magnetic moments that did not meet the characteristics of complex-source anomalies including shipwrecks, but rather had signatures representative of simple-source debris. Subsequent diver investigation clearly showed that these anomalies did indeed represent debris and were not significant. Representing over half the total number of anomalies, if this inclination of magnetic moment method had been employed they would not have been recommended for avoidance or subsequent investigation. The remaining six anomalies that had magnetic moment characteristics indicative of shipwrecks or complex debris sites were also found to represent debris (James et al. 2011). This, however, is not unexpected given that this method does not rule out complex source debris anomalies or all simple-source debris anomalies, just a much larger percentage than would have been ruled out if the method had not been employed. While there may be hesitation to adopt the inclination of magnetic moment characteristic, it is recommended that it at least be applied to any interpretive analysis and assessed overtime as to its veracity. It will, we believe, be proven and accepted. The end result could well be the reduction of a significant number of anomalies currently recommended for avoidance or subsequent investigation.

SIDESCAN SONAR

In contrast to magnetic data, sidescan interpretation is less problematic, as objects are reconstructed as they look to the eye. Targets, such as isolated sections of pipe, can normally be immediately discarded as non-significant, while large areas of above-sediment wreckage as well as some exposed potential paleofeatures (i.e., rock outcrops) are generally apparent. The chief factors considered in analyzing sidescan data, with regard to wreckage, include: linearity, height off bottom, size, associated magnetics, and environmental context. Since historic resources in the form of shipwrecks usually contain large amounts of ferrous compounds, complex sidescan targets with complex magnetic anomalies are of the greatest importance. The usual outcome of targets with no associated magnetics are items, such as rocks, trees, and other non-historic debris of limited interest to the archaeologist.

CLUSTERING

Since an archaeological remote sensing survey involves the collection of several different types of data, each of which has the potential to locate significant cultural resources, attention must be given to groups of targets. These groups, referred to as clusters, occur when a target exists that produces both a sidescan sonar return and a magnetic signature. Also, a magnetic source that extends across several survey lines will produce an anomaly on each line, and since these anomalies are related, they will form a cluster. Previously discovered archaeological sites will also be considered as part of a cluster. Although criteria used to determine a cluster is somewhat subjective, anomalies, sidescan targets, and previously identified archaeological sites will generally be included in a cluster if they lie within 65 feet of one another.

SUBBOTTOM PROFILER ANALYSIS

Subbottom profilers generate low-frequency acoustic waves that penetrate the seabed and reflect off boundaries or objects located in the subsurface. The data are then processed and reproduced as a cross section using two-way travel time to determine depth (the time taken for the pulse to travel from the source to the reflector and back to the receiver by a constant). The shapes and extent of reflectors are used to identify bottom and subbottom profile characteristics.

In general, high and low amplitude linear reflectors (light and dark lines) distinguish between sediment beds; parabolic reflectors indicate point-source objects with sound propagating out from them; and erosional or non-depositional contacts can be identified by discontinuities in extent, slope angle, and the shape of the reflector morphology. This latter fact is important when identifying drowned channel systems, other relicts, and buried fluvial system features (e.g., estuarine, tidal, lowland, and upland areas around drainage features).

As a cautionary tale, there are five types of spurious signals that may cause confusion in the two-dimensional records that specialists recognize: direct arrival from the sound source; reflection multiples; water surface reflection; side echoes; and point-source reflections. Judicious analysis is required to identify these acoustic imagery phenomena. In all cases, precise inference of a sediment bed or other anomaly from the subbottom profiler data would necessitate coring.

In analysis, seismic impedance contrast returns indicating positive relief features such as possible mounds and negative relief features as a probable paleochannel or other fluvial feature with margins and sediment beds indicate high potential for prehistoric remains. Other features of interest are buried surface continuations.

Positive relief features on subbottom records are predictable phenomena, given that piles of erosion resistant material of differential character than the surrounding sediments should be perceivable with sound underwater imagery (e.g., subbottom profiler), and therefore, they have long drawn submerged prehistoric archaeologists as potentially identifiable features to find in places that have otherwise impossibly similar images to search (Stright 1990).

Page intentionally blank

IV. INVESTIGATIVE FINDINGS

As illustrated in Figures 4-01 to 4-07, along with Tables 4-01 to 4-04, four magnetic anomalies, two sidescan sonar contacts, and no subbottom impedance contrast feature were identified. Data examples for each system are presented in Figures 4-05, 4-06, and 4-07. With respect to the subbottom profiler results, the Project Area revealed a bottom composed solely of unconsolidated marine sediments to the depth of the instrument capability, which was typically between 3 and 5 meters. The surface facies was dominated by coarse sediment (sand). No paleofeature, including relict channel, positive relief feature, buried surface, or other feature, was located in the data. No further work regarding potential submerged prehistoric archaeological sites is recommended.

Analysis of the magnetic data indicated four magnetic anomalies: M01, M02, M03, and M04 are classified as SPS. A 5-nanotesla contour map was generated to illustrate anomalous changes in the magnetic field (see Figures 4-01 and 4-02). With regard to analysis of these anomalies, relative to potential significance, SPS anomalies (localized deviations) are generally associated with debris, and are labeled as nonsignificant. A geomagnetic forecast (Kp Index) from NOAA was also referenced during analysis, and no Kp value higher than 3 was present during data collection, indicating minimal geomagnetic interference affected the data quality or results (see Chapter III). In conclusion, none of the four magnetic anomalies are considered potentially significant for the NRHP.

Two sidescan contacts, C01 and C02, were identified as marine debris during analysis (see Tables 4-03 and 4-04). Sidescan Contact C01 is associated with Magnetic Anomaly M04. Neither contact is considered potentially significant; therefore, no avoidance is necessary.

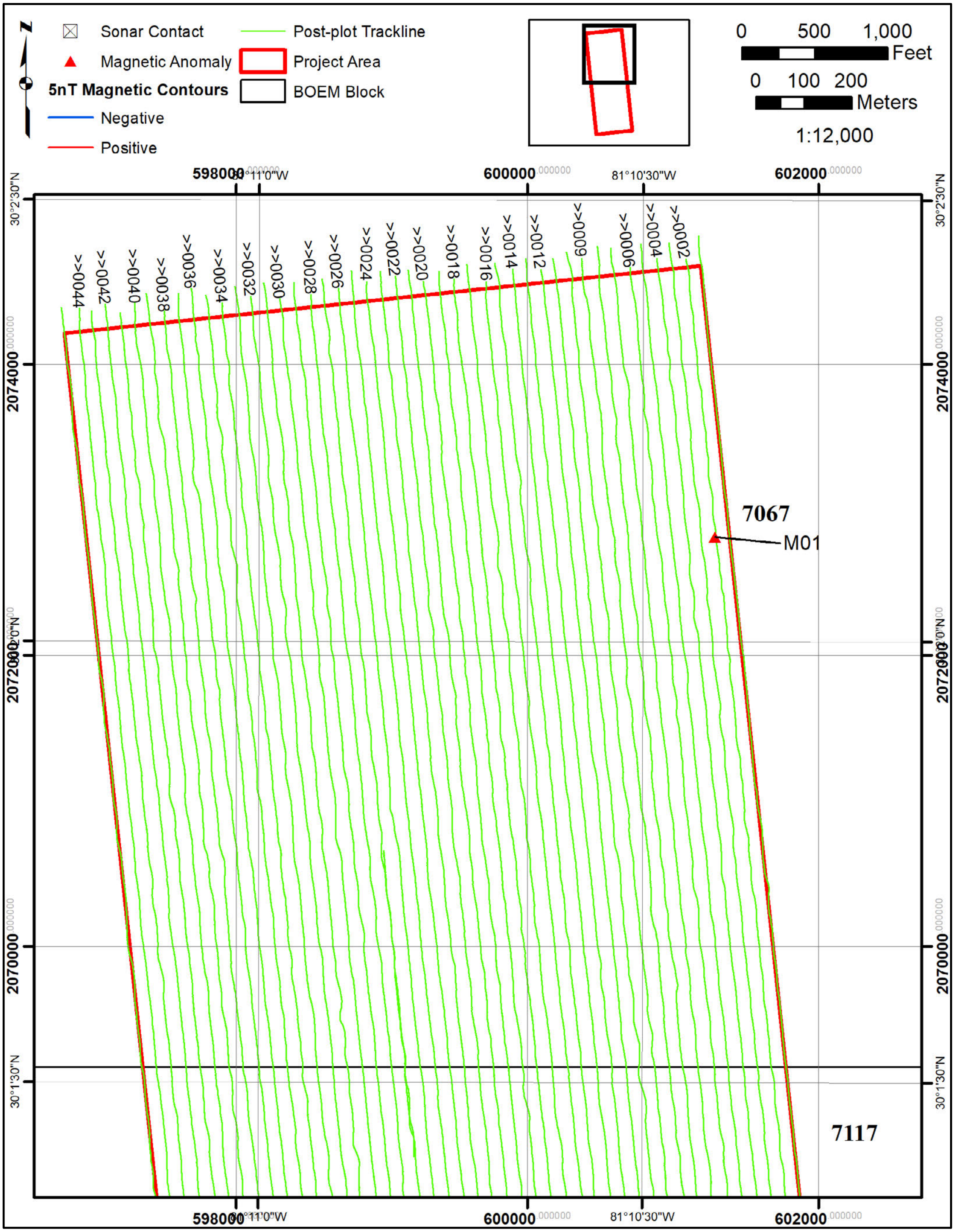


Figure 4-01. Magnetic Contour Map 1 of the Project area. Note that due to the small extents of the anomalies, they are virtually invisible in plan view.

Figure 4-02. Magnetic Contour Map 2 of the Project area. Note that due to the small extents of the anomalies, they are virtually invisible in plan view.

Table 4-01. Magnetic Anomaly Data for the Project Area.

Name	Lease Block	Line Number	Intensity (nTs)	Duration (m)	Type	Latitude	Longitude	Towfish Altitude (m)	Depth of Burial	Associations	Notes
M01	7067	2	5.82	14	D	30.0353138 N	-081.1734240W	17.4	n/a		SPS
M02	7117	7	14.08	15	D	30.0192365N	-081.1730168W	13.5	n/a		SPS
M03	7117	33	5.41	9	M	30.0154946N	-081.1808305W	20	n/a		SPS
M04	7117	37	13.12	11	D	30.0144371N	-081.1819661W	18.9	n/a	C01	SPS

Key: nTs=nanoteslas; M= Monopole; D= Dipole; SPS= Single-Point Source; Coordinates provided in NAD 1983.

Table 4-02. NOAA Geomagnetic forecast Kp index values during survey.

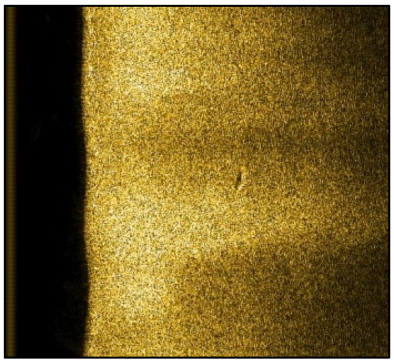
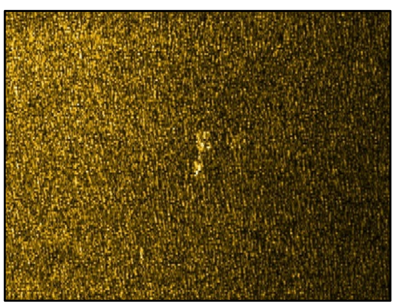
Time	30-July	31-July	1-August	10-August
00-03UT	1	2	3	1
03-06UT	1	2	3	1
06-09UT	2	1	3	1
09-12UT	2	1	3	1
12-15UT	1	2	3	1
15-18UT	1	2	3	2
18-21UT	2	2	2	3
21-00UT	1	3	3	3

Table 4-03. Sonar Contact Data.

Name	Lease Block	Line	Length (m)	Width (m)	Height (m)	Shadow (m)	Description	Associations	Lat.	Long.	File	Avoidance
C01	7117	36S.001	1.6	1.13	0.0	N/A	Debris	M04	30.014404	-81.181944	N-3_01	N/A
C02	7117	41N	.82	.98	0.0	N/A	Debris	N/A	30.015454	-81.183043	N-3_02	N/A

Coordinates provided in NAD 1983.

Table 4-04. Sonar Contact Images.

Name	**Latitude**	30.014404 N
C01	**Longitude**	-81.181944 W
Survey File	**Lease Block**	7117
36S.001	**Height Above Bottom (m)**	0.0
Capture File	**Length (m)**	1.6
N-3_01.JPG	**Width (m)**	1.13
	**Shadow (m)**	0.0
	Notes	Length: 5.2 Width: 3.7 ID: Debris near M04 (13.12 nT).
	Associations	M04
Name	**Latitude**	30.015454 N
C02	**Longitude**	-81.183043 W
Survey File	**Lease Block**	7117
41N	**Height Above Bottom (m)**	0.0
Capture File	**Length (m)**	.82
N-3_02.JPG	**Width (m)**	.98
	**Shadow (m)**	0.0
	Notes	Height: 0.0 Length: 2.7 Width: 3.2 ID: Debris.
	Associations	None

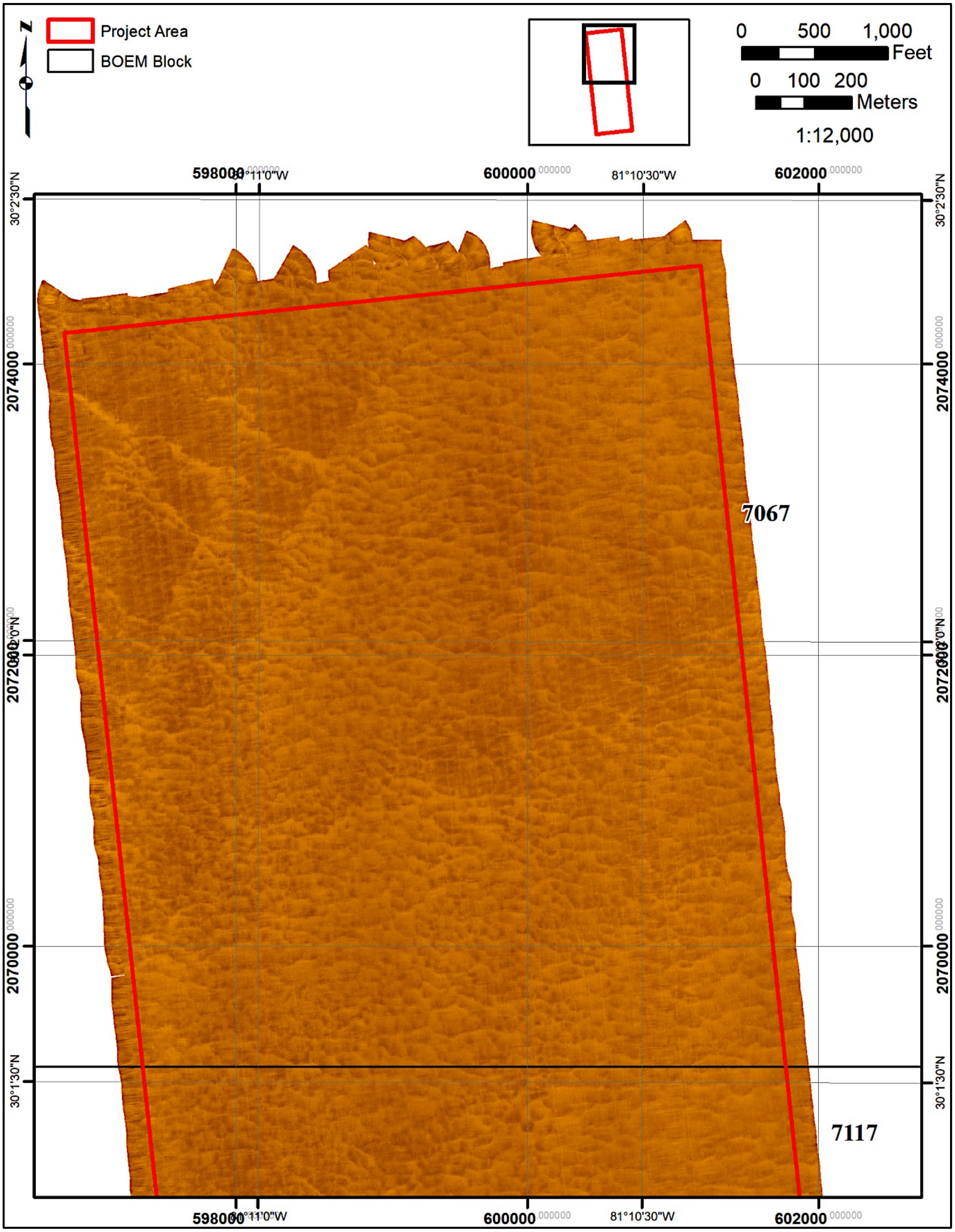


Figure 4-03. Sidescan Sonar Mosaic Map 1 for Project Area.

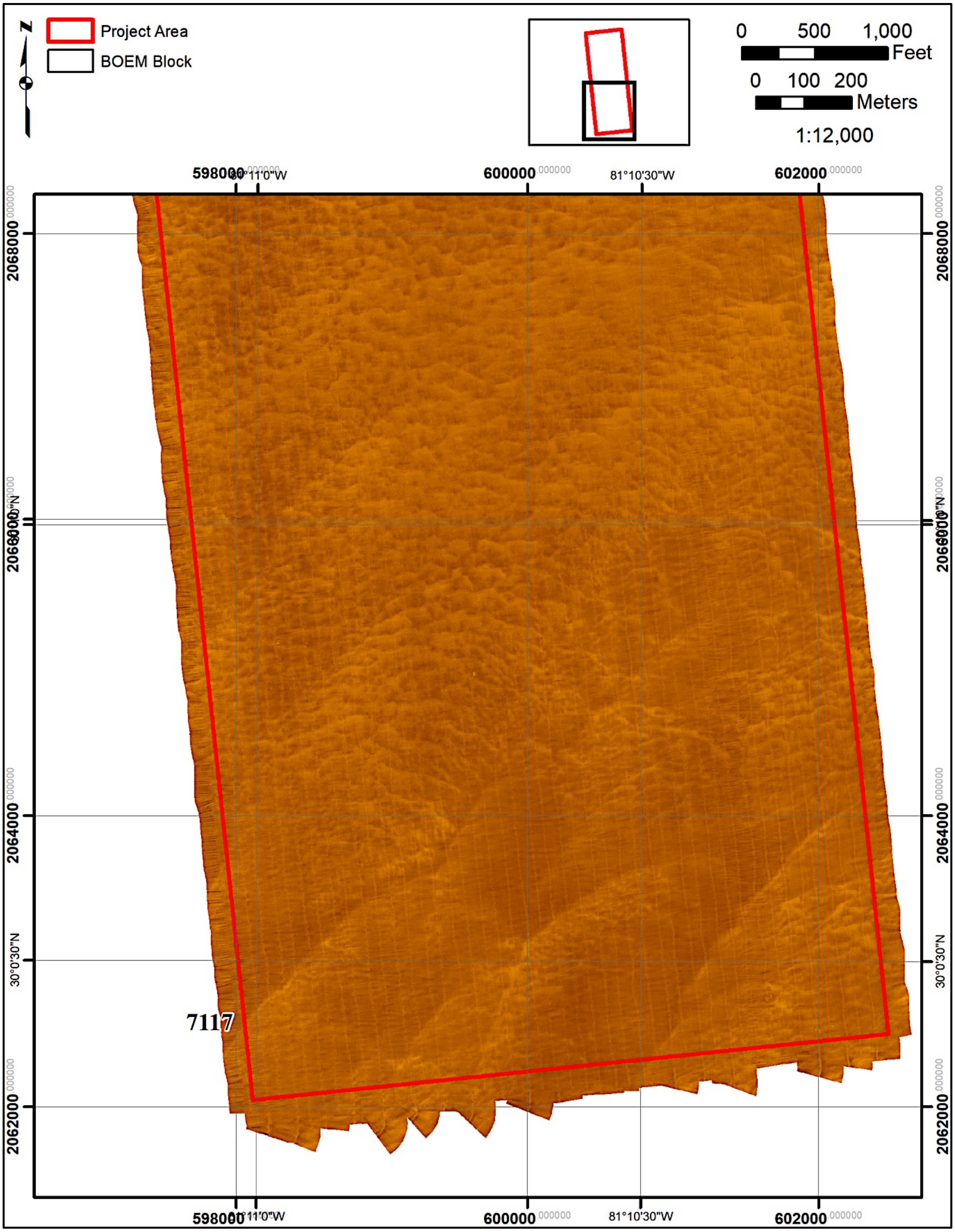


Figure 4-04. Sidescan Sonar Mosaic Map 2 for the Project Area.

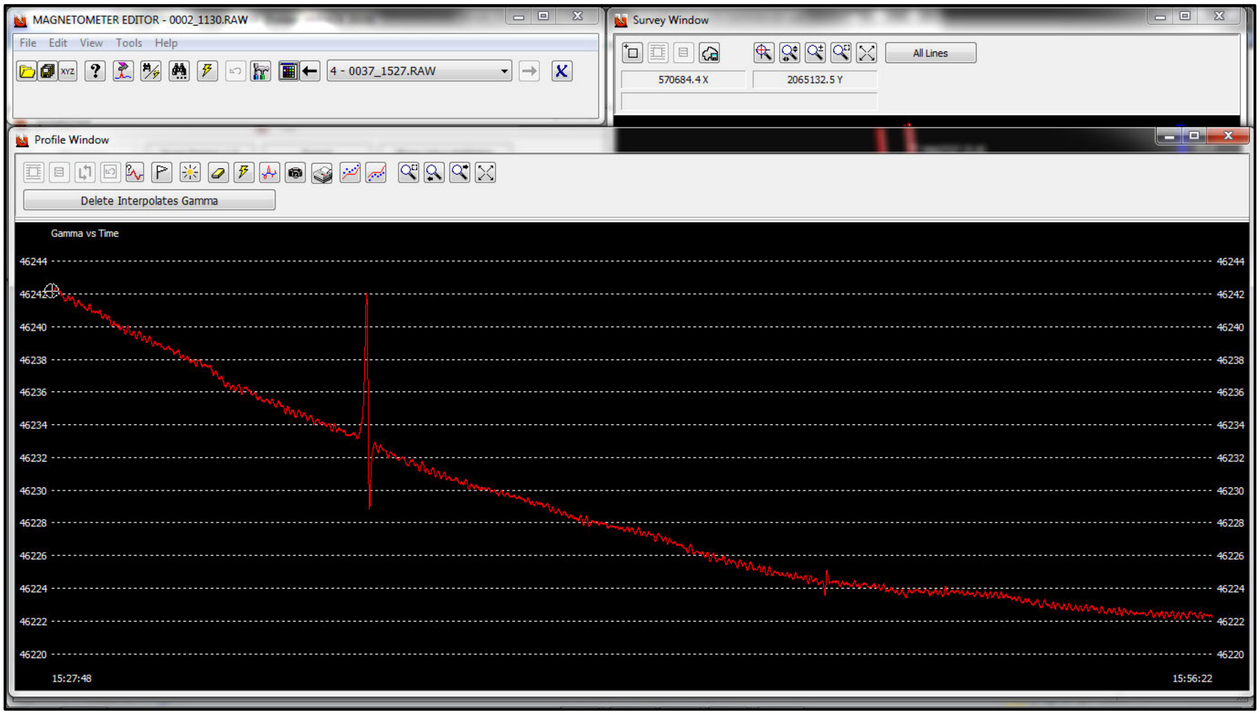


Figure 4-05. Magnetometer data example showing the ambient field and Magnetic Anomaly M04 (Line 37).

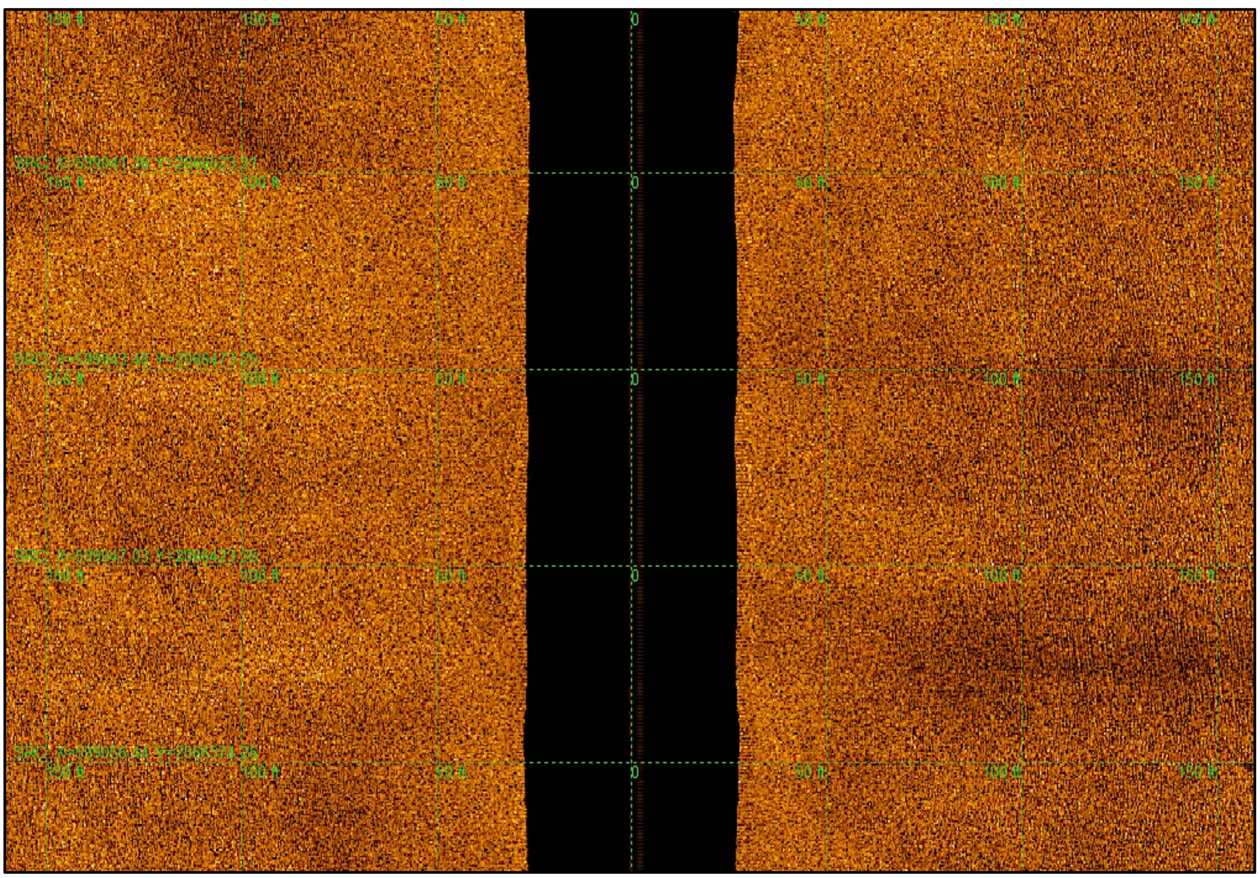


Figure 4-06. Example sidescan sonar waterfall exhibiting typical data found in the Project Area (Line 31).

SUBBOTTOM PROFILER RESULTS

With respect to the subbottom profiler record, analysis indicated the Project Area consists solely of unconsolidated marine sediments (coarse sand) to the depth of the instrument capability—typically between 3 and 5 meters. The shallow seismic records were dominated by a surface facies composed of coarse sands and occasional sand waves, an example of which is presented in Figure 4-07. No buried surface, paleochannel, positive relief feature, or other buried geomorphological feature is present in the data. No further work regarding potential submerged prehistoric archaeological sites is recommended.

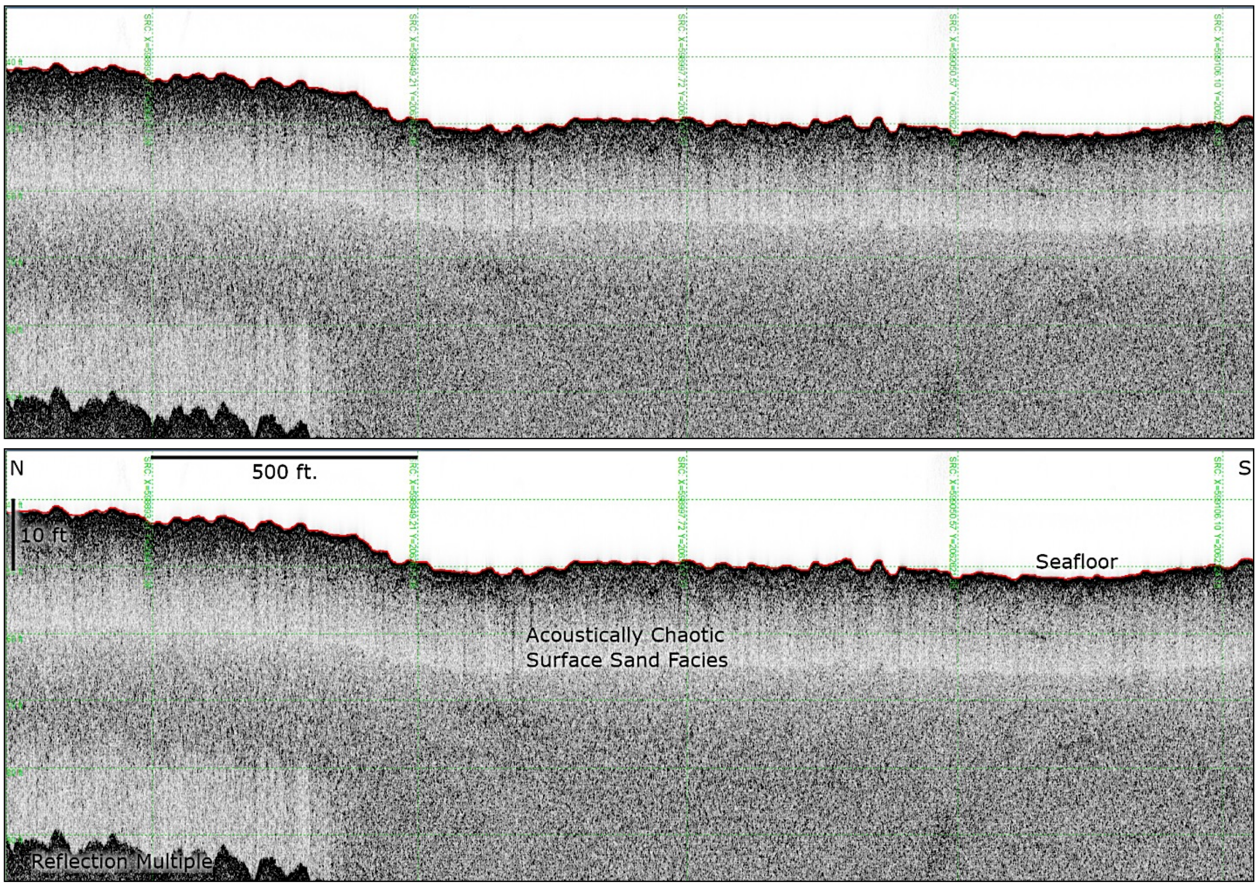


Figure 4-07. Example subbottom profiler record. This profile is from Line 37N, running from north (left) to south (right). Note the lack of subsurface features and the homogenous surface facies composed of transgressive marine sand. This profile is provided in both unannotated (above) and annotated (below).

Page intentionally blank

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

In compliance with their responsibilities towards cultural resources, Taylor contracted Sonographics to conduct a comprehensive remote sensing survey of the proposed offshore Borrow Area N-3. Subsequently, Panamerican provided data analysis of the survey and this cultural resources report of findings. Sonographics completed the survey 10 August 2019 under Florida 1A-32 Permit No. 1920.006 and BOEM G and G Permit No. E18-004. Results of the remote sensing survey identified four magnetic anomalies (M01, M02, M03, and M04), two sidescan sonar contacts (C01 and C02), and no subbottom impedance contrast feature within the Project Area. Sidescan Sonar Contact C01 is associated with Magnetic Anomaly M04. Based on imagery from the sidescan sonar, this target appears to be marine debris. All magnetic anomalies represent SPS objects of modern origin, none is considered potentially significant for the purposes of this investigation, and there are no further recommendations for investigation.

PROCEDURES TO DEAL WITH UNEXPECTED DISCOVERIES

As indicated by the methodology and results described in the preceding chapters, every reasonable effort was made during this investigation to identify and evaluate possible locations of historic archaeological sites and potential prehistoric site locations; however, the possibility exists that evidence of Prehistoric and Historic resources may yet be encountered within the project limits not previously identified. Should any evidence of historic resources be discovered during project activities, all work should stop. Evidence of historic resources includes aboriginal pottery, prehistoric stone tools, bone or shell tools, as well as historic shipwreck remains. Should questionable materials be uncovered during project activities, procedures contained in the Advisory Council on Historic Preservation Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800B) will take effect.

In the unlikely event that human remains are encountered within the Project Area during proposed project activities, procedures to deal with the unanticipated discovery must adhere to Chapter 872.07 of the Florida Statutes (Offenses Concerning Dead Bodies and Graves). As stipulated, work shall cease at the location of remains and the County Medical Examiner immediately notified, a qualified archaeologist retained to investigate the remains, and proper agency personnel notified (i.e., State Historic Preservation Office, State Archaeologist) to determine and implement correct procedural treatment of the remains.

Page intentionally blank

VI. REFERENCES CITED

Arnold, J.B. III

1996 Magnetometer survey of La Salle's ship the *Belle*. The International Journal of Nautical Archaeology. 25.3 & 4:243-249.

Austin, R.J., and R.W. Estabrook

2000 Chert Distribution and Exploitation in Peninsular Florida. *Florida Anthropologist* 53(1-2):116-131.

Balsillie, J., and J.F. Donoghue

2004 *High Resolution Sea Level History for the Gulf of Mexico Since the Last Glacial Maximum.* Florida Geological Survey, Report of Investigations #103 www.dep.state.fl.us/geology/publications/ri/ri103.pdf.

Bass, G.F. (editor)

1988 *Ships and Shipwrecks of the Americas: A History Based on Underwater Archaeology*. Thames and Hudson, New York.

Beriault, J., R. Carr, J. Stipp, R. Johnson, and J. Meeder

1981 The Archaeological Salvage of the Bay West Site, Collier County, Florida. *Florida Anthropologist* 34:39-58.

Black, R.C., III

1958 *A History of Fort Wadsworth, New York Harbor. Cultural Resources Management Study #7.* Submitted to the Division of Cultural Resources, North Atlantic Regional Office, National Park Service, U.S. Department of the Interior.

Blanton, D.B., and S.G. Margolin

1994 *An Assessment of Virginia's Underwater Cultural Resources*. Virginia Department of Historic Resources Survey and Planning Report Series No. 3. Prepared by William and Mary Center for Archaeological Research, Department of Anthropology, The College of William and Mary, Williamsburg, Virginia.

Brazosport Chamber of Commerce

n.d. *The Saga of the Mystery*. Brazosport Chamber of Commerce, Brazosport, Texas.

Breiner, S.

1973 *Applications Manual to Portable Magnetometers*. Geometrics, Inc. (available at geometrics.com).

Buchner, C.A., and M. Krivor

2001 *Cultural Resources Reconnaissance Study of the White River Navigation Project*. Prepared for the USACE, Memphis District by Panamerican Consultants, Inc.

Buker, G.E.

1980 Sun, Sand, and Water: A History of the Jacksonville District, U.S. Army Corps of Engineers 1821-1975. U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, Florida.

Bullen, R.P.
1975 *A Guide to the Identification of Florida Projectile Points*. Kendall Books, Gainesville.

Burdette, D.E., W.J. Rink, G.H. Means, and R.W. Portell
2009 Optical Dating of the Anastasia Formation, Northeastern Florida, USA. *Southeastern Geology* 48(4):173-185.

Burger, Brad W.
2005 *Looking for Angola: Preliminary Phase I CRA*. State of Florida, Division of Historical Resources, Grant No. S0556, Survey No. 12072.

Clausen, C.J., A.D. Cohen, C. Emiliani, J.A. Holman, and J.J. Stipp
1979 Little Salt Spring, Florida: A Unique Underwater Site. *Science* 203(4,381):609-614.

Coker, P.C., III
1987 *Charleston's Maritime Heritage 1670-1865*. Coker Craft, Charleston, South Carolina.

Colquhoun, D.J., M.J. Brooks, and P.A. Stone
1995 Sea-Level Fluctuation: Emphasis on Temporal Correlations with Records from Areas with Strong Hydrologic Influences in the Southeastern United States. *Journal of Coastal Research*.

Cox, J.L.
2009 *Magnetic Remote Sensing Survey Investigations Offshore of Wiggins Pass and Offshore of Cape Romano Gulf of Mexico Lee and Collier Counties, Florida*. Miscellaneous Reports of Investigations, Number 0801. Dolan Research, Inc. Newton Square, PA. Historical Maritime Surveying, L.L.C., Decatur, TX. Ms. number 15988 on file, Florida Division of Historical Resources, Tallahassee.

Cronin, T., T. Edgar, G. Brooks, D. Hastings, R. Larson, A. C. Hine, S. Locker, Suthard, B., B. Flower, D. Hollander, J. Whemiller, D. Willard, and S. Smith
2007 Sea Level Rise in Tampa Bay. *EOS* 88(10):117-118.

Curtis, J.
1984 *Venice: Including Osprey, Nokomis, Englewood & Port, Yesterday and Today & Tomorrow.* Lindsay Curtis Publishing Company, Sarasota, Florida.

Custer, J.
1994 Gas Boats. *The Egregious Steamboat Journal* 19:17-27.

Daniel, I.R., and M. Wisenbaker
1987 *Harney Flats: A Florida Paleo-Indian Site*. Baywood Publishing Company, Farmingdale.

DePratter, C.B., and J.D. Howard
1981 Evidence for a sea level low stand between 4500 and 2400 B.P. on the southeast coast of the United States. *J. Sed. Petrol.*, 51:1287-1295.

Doran, G.H., (editor)
2002 *Windover: Multidisciplinary Investigations of an Early Archaic Florida Cemetery*. University Press of Florida, Gainesville

Driscoll, K.
2008 *An Archaeological and Historical Survey of the Anclote Key Preserve State Park Project Area in Pasco and Pinellas Counties, Florida*. Prepared for Florida Department of Environmental Protection, Dunedin, Florida. Florida History, LLC, Tampa, Florida.

Duff, J.A.
1996 *Underwater Archaeological Investigation and Documentation of Three Anomaly Clusters Within Three Segments of Proposed Preferred Corridor for Replacement of Bonner Bridge, Oregon Inlet, North Carolina*. Panamerican Consultants, Inc., Memphis, Tennessee, under subcontract to Parsons, Brinckerhoff, Quade & Douglas, Inc., Morrisville, North Carolina. Submitted to the Federal Highway Administration and the North Carolina Department of Transportation.

Dunbar, J.S.
1991 Resource Orientation of Clovis and Suwannee Age Paleoindian Sites in Florida. In *Clovis: Origins and Adaptations*, edited by R. Bonnichsen and K. Turnmire, pp. 185-214. Center for the Study of the First Americans, Oregon State University, Corvallis.

Dunbar, J.S.
2006 Paleoindian Archaeology. In *First Floridians and Last Mastodons: The Page-Ladson Site in the Aucilla River*, edited by D. S. Webb, pp. 403-435. Springer, Dordrecht.

Endonino, J.C.
2007 A Reevaluation of the Gainesville, Ocala, and Lake Panasoffkee Quarry Clusters. *Florida Anthropologist* 60(2-3):77-96.

Faught, M.K.
1988 Inundated Sites in the Apalachee Bay Area of the Eastern Gulf of Mexico. *Florida Anthropologist* 41(1):185-190.

2001 *Continental Shelf Prehistoric Archaeology: A Northwest Florida Perspective*. Department of Anthropology, Florida State University. Webpage article at www.adp.fsu.edu/cont_shelf_principles/cont_shelf_principles.html.

2004 The Underwater Archaeology of Paleolandscapes, Apalachee Bay, Florida. *American Antiquity* 69(2):235-249.

Faught, M.K., and J. Ambrosino
2007 *Archaeological Monitoring For Berth 218 Dredging Port Sutton, Hillsborough County, Florida*. Panamerican Consultants, Inc. Prepared for Tampa Port Authority and Subaqueous, Inc.

Faught, M.K.
1996 *Clovis Origins and Underwater Prehistoric Archaeology in Northwestern Florida,* Ph.D. Dissertation University of Arizona, Tucson.

2002–04 Submerged Paleoindian and Archaic sites of the Big Bend, Florida. *Journal of Field Archaeology* 29(3-4):273-290.

Faught, M.K., and B. Carter
1998 Early Human Occupation and Environmental Change in Northwestern Florida. *Quaternary International* 50:167-176.

Faught, M.K., and S.R. James, Jr.
2009 *Addendum to the Remote Sensing Survey of the Tampa Bay harbor Survey along Cuts A & B Hillsborough & Pinellas Counties, Florida*. Prepared for U.S. Army Corps of Engineers, Jacksonville District, by Panamerican Consultants, Inc., Memphis, Tennessee.

2011 *Diver Identification and Archaeological Testing: Addendum to Cultural Resources Remote Sensing Survey of Jacksonville Harbor Project GRR2, Duval County, Florida*. Submitted to the U.S. Army Corps of Engineers, Jacksonville District, by Panamerican Consultants, Inc., Memphis, Tennessee.

Firestone, George
1977 *Historical, Architectural, and Archaeological Survey of Sarasota, Florida.* Miscellaneous Project Report Series No. 51 Bureau of Historic Sites and Properties, Division of Archives and History, and Records Management, Florida Department of State, Tallahassee, Florida.

Fischer, Anders
1995 *Man & Sea in the Mesolithic: Coastal Settlement Above and Below Present Sea Level* 53. Oxbow Monograph.

Fleetwood, R.
1995 *Tidecraft: The Boats of Lower South Carolina, Georgia, and Northeastern Florida, 1550–1950*. Coastal Heritage Society, Savannah.

Garrison, E., C.P. Giammona, F.J. Kelly, A.R. Trip, and G.A. Wolff
1989 *Historic Shipwrecks and Magnetic Anomalies of the Northern Gulf of Mexico: Reevaluation of Archaeological Resource Management Zone 1. Volume II: Technical Narrative.* OCS Study/MMS 89-0024. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Regional Office, New Orleans.

Gearhart, R.L.
2011 "Archaeological Interpretation of Marine Magnetic Data," in *The Oxford Handbook of Maritime Archaeology*. Edited by Alexis Catsambis, Ben Ford and Donny L. Hamilton, Oxford University Press.

Gearhart, R.L., and S.A. Hoyt
1990 *Channel to Liberty: Underwater Archaeological Investigations, Liberty County, Texas*. Espey, Huston & Associates, Austin, Texas. Submitted to the U.S. Army Corps of Engineers, Galveston District.

George, T., P. Monier, S. Fournet, R. Church, and D. Warren
2000 *Archaeological, Engineering and Hazard Report "Buccaneer" Pipeline Project Proposed 36-inch Pipeline Route, Mobile Bay, Alabama to Tarpon Springs, Florida*. Prepared by C & C Technologies Survey Services, Lafayette, LA. Ms. 5799, on file, Florida Division of Historical Resources, Tallahassee.

Griffin, J.W.
1988 *The Archaeology of Everglades National Park: A Synthesis*. National Park Service Southeastern Archaeological Center, Tallahassee, Florida.

Guevin, B.
1991 *Cultural Resources Survey for Permit 19395, Surfside, Brazoria County, Texas*. U.S. Army Corps of Engineers, Galveston District.

Hall, W.

2000 *Archaeological Diver Identification and Evaluation of Twelve Potentially Significant Submerged Targets in St. Augustine Inlet, St. Johns County, Florida.* Mid-Atlantic Technology and Environmental Research, Inc., Castle Hayne, North Carolina. Submitted to the U.S. Army Corps of Engineers, Jacksonville District.

2001 *Submerged Cultural Resources Remote Sensing Survey of Blind Pass and Pass-a-Grille Borrow Areas, Pinellas County, Florida.* Mid-Atlantic Technology and Environmental Research, Inc. Submitted to the U.S. Army Corps of Engineers, Jacksonville District.

Hammond, E. A.

1973 The Spanish Fisheries of Charlotte Harbor. *Florida Historical Quarterly* 51:355-380.

Handley, B., M. Gordon, and C. Campbell

2008 *Phase II of the Survey of Historic Resource, Charlotte County, Florida.* Environmental Services, Inc. Jacksonville, FL. Prepared for the Charlotte County Administration Center, Port Charlotte.

Hedrick, D.L.

1998 "The Investigation Of The Caney Creek Shipwreck Archaeological Site 41MG32." Unpublished Master's Thesis, Department of Anthropology, Texas A&M University. On file at Panamerican Maritime, L.L.C., Memphis, Tennessee.

Hemmings, Christopher Andrew

2004 The Organic Clovis: A Single Continent-Wide Cultural Adaptation. Ph.D. dissertation, University of Florida Press, Gainesville.

Hemmings, E.T., and T.A. Kohler

1974 *The Lake Kanapaha Site in North Central Florida*. Florida Bureau of Historic Sites and Properties Bulletin. Copies available from Bulletin No. 4.

Hinder, K.

2018 *Pinellas County Bridges Historic Resources Survey*. Prepared by Cardno ENTRIX for Pinellas County Planning Department. Ms. Number 25403 on file Florida Division of Historical Resources, Tallahassee.

Horvath, E.A.

2000 Archaeological Investigations at the Colorado Site (8He241) – A Lithic Workshop in Hernando County, Florida. *The Florida Anthropologist* 53:82-97.

Hoyt, S.D.

1990 *National Register Assessment of the* SS *Mary, Port Aransas, Nueces County, Texas*. Espey, Huston & Associates, Austin, Texas. Submitted to the U.S. Army Corps of Engineers, Galveston District.

Hoyt, W.H., J.C. Kraft, and M.J. Chrzastowski

1990 Prospecting for submerged Archaeological Sites on the Continental Shelf; Southern Mid-Atlantic Bight of North America. In *Archaeological Geology of North America*, edited by N. P. Lasca and J. Donahue. Geological Society of America, Boulder.

Huskey, J.
2001 "Home Built in 1896 Hits Auction Block." June 23, 2001, Sarasota Herald-Tribune, Venice Edition.

Irion, J.B., and C.L. Bond
1984 *Identification and Evaluation of Submerged Anomalies, Mobile Harbor, Alabama*. Espey, Huston & Associates, Austin, Texas. Submitted to the U.S. Army Corps of Engineers, Mobile District.

James, S.R., Jr., M.K. Faught, and A.D.W. Lydecker
2011 *Diver Identification of Fourteen Target in the Gulf Intracoastal Waterway, Manatee, Pinellas, and Hillsborough Counties, Florida*. Prepared for the U.S. Army Corps of Engineers, Jacksonville District. Prepared by Panamerican Consultants, Inc., Memphis, Tennessee.

James, S.R., Jr., and M.C. Krivor
2000 *Submerged Cultural Resources Associated with the Battle of Johnsonville: The 2000 Season*. Prepared for the Tennessee Historical Commission by Panamerican Consultants, Inc., Memphis, Tennessee.

James, S.R., Jr., J.C. Hudson, and K.G. Hudson
1991 *The 303 Hang: Archaeological Investigations of a Two Masted Schooner Wrecked Offshore Freeport, Brazoria County, Texas.* Prepared for the U.S. Army Corps of Engineers, Galveston District, by Panamerican Consultants, Inc., Tuscaloosa, Alabama.

James, S.R., Jr., and C.E. Pearson
1991 *Magnetometer Survey and Ground Truthing Anomalies, Corpus Christi Ship Channel, Aransas and Nueces Counties, Texas.* Coastal Environments, Inc., Baton Rouge, Louisiana. Submitted to the U.S. Army Corps of Engineers, Galveston District.

1993 *Submerged Cultural Resources Investigations of the Steamboat J.D. Hinde (41LB85) Channel to Liberty, Liberty County Texas*. Prepared for the U. S. Army Corps of Engineers, Galveston District by Panamerican Consultants, Inc., Tuscaloosa, Alabama and Coastal Environments, Inc.

James, S.R., Jr., M.C. Krivor, A.Whitehead, K. Zoelmer, and M.C. Tuttle
2002 *National Register of Historic Places Eligibility Evaluations of Targets 3B-2-2 and 3B-2-6 Located Within Item 3B-2 of the Upper Yazoo Projects and Limited Survey and National Register of Historic Places Eligibility Evaluations of All Bridges, Structures, and Targets 4-6, 4-7, 4-11, 4-12, 4-15, and 4-16 Located Within Item 4B of the Upper Yazoo Projects, Leflore County, Mississippi*. Submitted to the USACE, Vicksburg District by Panamerican Consultants, Inc., Memphis, Tennessee.

James, S.R., Jr., W. J. Wilson, J. Wallace, and E.K. Gifford
2018 *Gulf Inland Waterway Federal Navigation Project, Submerged and Terrestrial Cultural Resources Survey, Sarasota County, Florida.* Panamerican Consultants, Inc., Memphis, TN. Submitted to United States Army Corps of Engineers Jacksonville District.

Johnson, R.E.
2002 *An Intensive Archeological Survey of the U.S. Army Corps of Engineers Ponce de Leon Inlet Study Areas 1 and 2, Volusia County, Florida.* Florida Archaeological Services, Inc., Jacksonville. Prepared for Taylor Engineering, Inc., Jacksonville.

Kane, A.I., J.B. Pelletier, M. Williams, D.S. Robinson, and R. Saucier
1998 *A Cultural Resources Survey of Items 3B and 4 of the Upper Yazoo River Projects, Leflore County, Mississippi*. Prepared for the U.S. Army Corps of Engineers, Vicksburg District, by R. Christopher Goodwin & Associates, Inc., Frederick, Maryland.

Kozuch, L.
1995 Shellfish Gatherers of Florida's East Coast. In *Final Report on the Archeological Investigations at the Seminole Rest Site (8VO124)*, edited by E.A. Horvath, pp. 59–91. Southeast Archeological Center, National Park Service, Tallahassee.

Krivor, M.C.
2005 *Bonner Bridge Cultural Resources Survey and Diver Assessment of Submerged Targets, Dare County, North Carolina*. Conducted for the North Carolina Department of Transportation under contract to Parson, Brinkerhoff, Quade & Douglas, Inc., by Panamerican Consultants, Inc, Memphis, Tennessee.

Krivor, M., and A. Hemmings
2011 *Cultural Remote Sensing of the Gulf Intracoastal Waterway, Manatee Pinellas, and Hillsborough Counties, Florida*. SEARCH, Newberry.

Krivor, M.C., S.R. James Jr., and A. Whitehead
2002 National Register of Historic Places Eligibility Evaluations of 13 Potential Watercraft Targets within the Upper Yazoo Projects Items 5 through 9 Quitman, Tallahatchie and Leflore Counties, Mississippi. Prepared for the U.S. Army Corps of Engineers, Vicksburg District.

Locker, Stanley D., Albert C. Hine and Gregg R. Brooks
2003 Regional stratigraphic framework linking continental shelf and coastal sedimentary deposits of west-central Florida. *Marine Geology* 200(1-4):351-378.

Luer, George M., and Marion M. Almy
1982 A Definition of the Manasota Culture. *Florida Anthropologist* 35(1): 34-58.

Lydecker, A.D.W.
2007 *Historic Assessment and Diver Evaluations of Two Magnetic Anomalies Near Sand Key, Pinellas County, Florida.* Prepared for the U.S. Army Corps of Engineers, Jacksonville District, under subcontract to the U.S. Army Corps of Engineers, Memphis District. Panamerican Consultants, Inc., Memphis, TN.

Lydecker, A.D.W., E.K. Gifford, M.K. Faught, and S.R. James, Jr.
2014 *Submerged Cultural Resources Remote Sensing Survey of the Offshore Borrow Areas, Charlotte County, Florida.* Panamerican Consultants, Inc., Memphis, TN. Submitted to Charlotte County Board of County Commissioners.

Lydecker, A.D.W.
2007 *Historic Assessment and Diver Evaluations of Two Magnetic Anomalies Near Sand Key, Pinellas County, Florida.* Prepared for the U.S. Army Corps of Engineers, Jacksonville District, under subcontract to the U.S. Army Corps of Engineers, Memphis District. Panamerican Consultants, Inc., Memphis, TN.

Mahon, John K.
1967 *History of the Second Seminole War.* University of Florida Press, Gainesville.

Mandeville, D.
2016 "Local History: Tarpon Springs." Tarpon Springs Area Historical Society. Online: www.tarponspringsareahistoricalsociety.org/?page_id=106. Accessed on October 2, 2017.

Marquardt, William H.
1992 *Culture and Environment in the Domain of the Calusa*. Florida Museum of Natural History, Gainesville.

Marx, R.
1971 *Shipwrecks of the Western Hemisphere, 1492-1825*. David McKay Co., New York.

Matthews, Janet Snyder
1989 *Venice—Journey from Horse and Chaise*. Pine Level Press, Inc., Sarasota, Florida.

McKay, D.B. (editor)
1924 South Florida: Its Builders, Its Resources, Its Industries and Climatic Advantages. *Tampa Daily Times*.

McMichael, Alan E.
1982 A Cultural Resource Assessment of Horrs Island, Collier County, Florida. Unpublished Master's thesis, Department of Anthropology, University of Florida Press, Gainesville.

Meide, C., B. Burke, O. McDaniel, S.P. Turner, E. Andes, H. Brendel, S. Cox, and B. McNamara
2014 *First Coast Maritime Archaeology Project 2011–2012: Report on Archaeological Investigations*. Lighthouse Archaeological Maritime Program, St. Augustine Lighthouse & Museum, First Light Maritime Society, St. Augustine, Florida.

Meisburger, E.P., and M.E. Field
1975 *Geomorphology, shallow structure and sediments of the Florida Inner Continental Shelf, Cape Canaveral to Georgia: Technical Memorandum 54*, Department of the Army, Coastal Engineering Research Center (CEREN-GE), Fort Belvoir, Virginia.

Milanich, J.T.
1994 *Archaeology of Precolumbian Florida*. University Presses of Florida, Gainesville.

1998 *An Environmental History of Northeast Florida.* University Press of Florida, Gainesville.

Miller, J.J.
1998 *An Environmental History of Northeast Florida*. The Ripley P. Bullen series. University Press of Florida, Gainesville.

Morison, S.E.
1974a *The European Discovery of America: The Southern Voyages 1492-1616*. Oxford University Press, New York.

1974b *The European Discovery of America: The Northern Voyages 500-1600*. Oxford University Press, New York.

Parkinson, R.W., and J.R. White
1994 Late Holocene Erosional Shoreface Retreat Within a Silicilastic-to-Carbonate Transition Zone, East Central Florida, USA. *Journal of Sedimentary Research* 64(3b):408-415.Phelps, D.C., R.W. Hoenstine, J.H. Balsilli, A. Dabous, M. Lachance, and C. Fischler

2003 A geological investigation of the offshore area along Florida's northeast coast, Year One annual report to the United States Department of Interior, Minerals Management Service: 2002-2003: Florida Geological Survey unpublished report. (on CD).

Pearson, C.E., and T. Birchette
1995 *Historical Assessment and Magnetometer and Terrestrial Surveys of the Gunboat USS Eastport and Steamboat Edward F. Dix, Red River Waterway, Grant Parish, Louisiana.* Coastal Environments, Inc., Baton Rouge, Louisiana. Submitted to the USACE, Vicksburg District.

1999 *The History And Archaeology Of Two Civil War Steamboats: The Ironclad Gunboat USS Eastport and The Steamer Ed. F. Dix*. Coastal Environments, Inc., Baton Rouge, Louisiana. Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

Pearson, C.E., B.L. Guevin, and A.R. Saltus, Jr.
1991 *Remote-Sensing Survey of the Lower Pearl and West Pearl Rivers, Louisiana and Mississippi*. Coastal Environments, Inc., Baton Rouge, Louisiana. Prepared for the U.S. Army Corps of Engineers, Vicksburg District.

Pearson, C.E., and K.G. Hudson
1990 *Magnetometer Survey of the Matagorda Ship Channel: Matagorda Peninsula to Point Comfort, Calhoun and Matagorda Counties, Texas.* Submitted to the U.S. Army Corps of Engineers, Galveston District by Coastal Environments, Inc., Baton Rouge, Louisiana.

Pearson, C.E., S.R. James, Jr., K.G. Hudson, and J. Duff
1993 *Underwater Archaeology Along the Lower Navidad and Lavaca Rivers, Jackson County, Texas*. Coastal Environments, Inc., Baton Rouge, Louisiana. Submitted to the U.S. Army Corps of Engineers, Galveston District.

Pearson, C.E., and A.R. Saltus, Jr.
1990 *Cultural Resources Investigation at Island 86, Mississippi River, Arkansas-Mississippi.* Coastal Environments, Inc., Baton Rouge, Louisiana. Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1993 *Underwater Archaeology on the Ouachita River, Arkansas: The Search for the Chieftain, Haydee, and Homer*. Coastal Environments, Inc., Baton Rouge, Louisiana. Prepared for the U.S. Army Corps of Engineers, Vicksburg District.

Pearson, C.E., and J.J. Simmons III
1995 *Underwater Archaeology of the Wreck of the Steamship Mary (41NU252) and Assessment of Seven Anomalies, Corpus Christi Entrance Channel, Nueces County, Texas*. Submitted to U.S. Army Corps of Engineers, Galveston District by Coastal Environments, Inc., Baton Rouge, Louisiana.

Pelletier, Jean, Martha B. Williams, Greg Brooks, Harley Meier
2003 Historic Assessment and Phase I Remote Sensing Survey of Four Borrow Areas for Venice Beach, Sarasota County, Florida. Christopher Goodwin & Associates, Inc., Frederick, MD, Submitted to United States Army Corps of Engineers Jacksonville District.

Phelps, D.C., R.W. Hoenstine, J.H. Balsilli, L.J. Ladner, A. Dabous, M. Lachance, K. Bailey, and C. Fischler
2004 A geological investigation of the offshore area along Florida's northeast coast, Year Two annual report to the United States Department of Interior, Minerals Management Service: 2003-2004: Florida Geological Survey unpublished report (on DVD).

Phelps, D.C., R.W. Hoenstine, M. Lachance, J. Sparr, and A. Dabous
2006 A geological investigation of the offshore area along Florida's northeast coast, Year Four annual report to the United States Department of Interior, Minerals Management Service: 2005-2006: Florida Geological Survey unpublished report (on DVD).

Phelps, D.C., R.W. Hoenstine, L.J. Ladner, J.H. Balsilli, A. Dabous, J. Sparr, and M. Lachance
2005 A geological investigation of the offshore area along Florida's northeast coast, Year Three annual report to the United States Department of Interior, Minerals Management Service: 2004-2005: Florida Geological Survey unpublished report (on DVD).

Robinson, D.S.
1998 *Management Summary: Cultural Resources Survey of Items 3B-2 and 4 of the Upper Yazoo River Projects, Mississippi*. *Contract DACW29-97-D-0018*. R. Christopher Goodwin & Associates, Inc., Frederick, Maryland. Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

Rogers, R., S.D. Hoyt, C.L. Bond, L. Voellinger, and S.R. James, Jr.
1990 *Cultural Resources Investigations, Virginia Point, Galveston County, Texas.* Espey, Huston and Associates, Inc., Austin, Texas. Submitted to the U.S. Army Corps of Engineers, Galveston District.

Robinson, D.S., and J.L. Seidel
1995 *Documentation of Several Historic Vernacular Watercraft on Bayou Dularge, Terrebonne Parish, Louisiana*. R. Christopher Goodwin & Associates, Inc., New Orleans. Prepared for the U.S. Army Corps of Engineers, New Orleans District.

Saltus, A.R., Jr.
1993 *Magnetometer Assessment of the Coldwater and Tallahatchie Rivers from Darling to Greenwood, Mississippi.* Prepared for the U.S. Army Corps of Engineers, Vicksburg District.

Scott, T.M.
2001 Open-file report 80. *Text to Accompany the Geologic Map of Florida*. Florida Geological Survey, Tallahassee, Florida.

Siddall, M., E.J. Rohling, A. Almogi-Labin, C. Hemleben, D. Meischner, I. Schmetzer, and D.A. Smeed
2003 Sea-level fluctuations during the last glacial cycle. *Nature* 423:853-858.

Singer, S.D.
1992 *Shipwrecks of Florida: A Comprehensive Listing*. Pineapple Press, Sarasota, Florida.

Stapor, Frank W., Thomas D. Mathews and Fonda E. Lindfors-Kearns
1991 Barrier-Island Progradation and Holocene Sea-Level History in Southwest Florida. *Journal of Coastal Research* 7(3):815-838.

Stevenson, I.R., C. McCann, and P.B. Runciman
2002 An attenuation-based sediment classification technique using Chirp sub-bottom profiler data and laboratory acoustic analysis. *Marine Geophysical Research* 23(4):277-298.

Stright, M.J.
1990 "Archaeological Sites on the North American Continental Shelf." In *Geological Society of America Centennial Special Volume 4*, pp. 439-465.

Tebeau, Charlton W.
1966 *Florida's Last Frontier: The History of Collier County*. University of Miami Press, Miami.

Tesar, L.D., and B.C. Jones
2004 "Wakulla Springs Lodge Site (8WA329)" in *Edward Ball Wakulla Springs State Park Wakulla County, Florida: A Summary of Eleven Projects and Management Recommendations*. Bureau of Archaeological Research.

Tidd, J.F., Jr.
1989 *The Works Progress Administration in Hillsborough and Pinellas Counties, Florida, 1935 to 1943*. Unpublished Master's thesis, Department of History, University of South Florida, Tampa.

Thulman, D.
1990 *Archaeological Sites on the North American Continental Shelf*. In Geological Society of America Centennial Special Volume 4, pp. 439-465.

2008 "A typology of fluted points from Florida," *Florida Anthropologist* 60: 63-75.

2009 Freshwater Availability as the Constraining Factor in the Middle Paleoindian Occupation of North-Central Florida. *Geoarchaeology* 24(3):243-276.

Toscano, M.A., and I.G. Macintyre
2003 Corrected Western Atlantic Sea-level Curve for the Last 11,000 Years Based on Calibrated 14C Dates from *Acropora palmata* Framework and Intertidal Mangrove Peat. *Coral Reefs* 22:257-270.

Trimble Navigation Limited
1998 *DSM12/212 Operation Manual*. Trimble Navigation Limited, Sunnyvale, California.

Turner, G.M.
2000 *Images of America, Venice in the 1920s*. Arcadia Publishing, Charleston, South Carolina.

Twichell, D. G. R. Brooks, G. Gelfenbaum, V. Paskevich, and B. Donahue
2003 Sand Ridges off Sarasota, Florida: A complex facies boundary on a low-energy inner shelf environment. *Marine Geology* 200:243-62.

van Soelen, E.E, G.R. Brooks, R.A. Larson, J.S. Sinninghe Damsté, G.J. Reichart
2012 "Mid- to late-Holocene coastal environmental changes in southwest Florida, USA". The Holocene 22:929-938.

Walker, K.J., F.W. Stapor, and W.H. Marquardt
1995 Archaeological evidence for a 1750-1450 B.P. higher-than-present sea level along Florida's Gulf Coast. In *Holocene Cycles: Climate, Sea Levels, and Sedimentation: Journal of Coastal Research Special Issue 17, pp 205-218*, edited by C. W. Finkl

Warren, D.
2000 *Archaeological Seabed Investigations Report: Proposed "Buccaneer" 36" Pipeline Route, Mobile Bay, Alabama to Tarpon Springs, Florida*. Ms. 5989, on file, Florida Division of Historical Resources, Tallahassee. Prepared by C & C Technologies Survey Services, Lafayette, LA.

Watts, G.P., Jr.
1971 Postglacial and Interglacial Vegetation History of Southern Georgia and Central Florida. *Ecology* 52:676–690.

2000 *Phase I Archaeological Remote Survey of the Virginia Beach and Fort Story Hurricane Protection Borrow Areas, Virginia*. Prepared for the U.S. Army Corps of Engineers, Wilmington District by Tidewater Atlantic Research, Washington, North Carolina.

Watts, G.P., Jr.
1971 Postglacial and Interglacial Vegetation History of Southern Georgia and Central Florida. *Ecology* 52:676–690.

2000 *Phase I Archaeological Remote Survey of the Virginia Beach and Fort Story Hurricane Protection Borrow Areas, Virginia*. Prepared for the U.S. Army Corps of Engineers, Wilmington District by Tidewater Atlantic Research, Washington, North Carolina.

Watts, W.A., and B.C.S. Hansen
1988 Environments of Florida in the late Wisconsin and Holocene. In *Wet Site Archaeology*, edited by B.A. Purdy, p. 307-323. Telford Press, Caldwell, New Jersey.

Weddle, Robert S., editor
1987 La Salle, the Mississippi, and the Gulf: Three Primary Documents, 1987, College Station: Texas A & M University Press.

White, William A.
1970 *The Geomorphology of the Florida Peninsula*. Florida Geological Survey Bulletin No. 51, Tallahassee, Florida.

Whitfield, P.
1996 *The Charting of the Oceans: Ten Centuries of Maritime Maps.* Pomegranate Artbooks, Rohnert Park, California.

Widmer, R.J.
1988 *The Evolution of the Calusa: A Nonagricultural Chiefdom on the Southwest Coast of Florida*. University of Alabama Press, Tuscaloosa.

Wilson, E.M.
1983 *A Typology of Vessels Known to have Been Used in the Mobile Bay Region From the 16th Through the Twentieth Century*, edited by T.S. Mistovich and V.J. Knight, Jr. Cultural Resources Survey of Mobile Harbor, Alabama. OSM Archaeological Consultants, Inc., Moundville, Alabama. Prepared for the U.S. Army Corps of Engineers, Mobile District.

Wilson, W.J., S.R. James, Jr., and E. Gifford
2018 *Submerged Cultural Resources Survey, Anclote River Federal Navigation Project, Pasco County, Florida.* Prepared for U.S. Army Corps of Engineers, Jacksonville District, by Panamerican Consultants, Inc., Memphis, Tennessee.

Page intentionally blank

APPENDIX A:
FLORIDA 1A-32 ARCHAEOLOGICAL RESEARCH PERMIT

Page intentionally blank

FLORIDA DEPARTMENT OF STATE
Laurel M. Lee
Secretary of State
DIVISION OF HISTORICAL RESOURCES

ARCHAEOLOGICAL RESEARCH PERMIT

Permit No. 1920.006 Field Begin Date: 7/17/2019 Field End Date: 7/30/2019

PERMITTEE/AUTHORIZED ENTITY:
Panamerican Consultants, Inc. Memphis Office
c/o Stephen James
91 Tillman Street
Memphis, Tennessee 38111

Report/Artifact Due Date: 7/30/2020
Project: Submerged Cultural Resources Survey, Offshore Borrow Area N-3, St. Johns County Feasibility Study

This permit is issued under the authority of Chapters 267.031 (1) and 267.12, Florida Statutes (F.S.) and Rule 1A-32, Florida Administrative Code (F.A.C.), and is administered by the Florida Bureau of Archaeological Research (BAR), Florida Division of Historical Resources (DHR).

ACTIVITY DESCRIPTION:
Remote sensing

LOCATION DESCRIPTION:
St. Johns County
DEP, Sovereignty Submerged Lands

GENERAL CONDITIONS:

1. The Principal Investigator listed above or another qualified archaeologist designated by the applicant shall be responsible for all archaeological investigations, production of a final report, and be on site during all fieldwork.

2. A copy of this permit shall be provided to the land managing agency (when applicable) and field personnel shall carry a copy during fieldwork.

3. The permittee shall (initial each item as indicated):
   a. prepare a final report that meets standards and guidelines required by Rule 1A-46, F.A.C., including the necessary Florida Master Site File forms; ______
   b. inform the BAR permit administrator that a report has been completed and submitted to the Division of Historical Resources; or submit a copy of the final report to the BAR permit administrator; ______
   c. provide proper curation and conservation of recovered artifacts and other recovered site materials until such time as those artifacts and other site materials are conveyed to the BAR for curation; ______
   d. convey all artifacts and related materials obtained from state-owned or controlled land to the BAR permit administrator for permanent curation or processing for loan; ______

500 S. Bronough Street • Tallahassee, FL 32399-0250 • http://www.flheritage.com

☐ Director's Office (850) 245-6300 • FAX: 245-6436	✓ Archaeological Research (850) 245-6444 • FAX: 245-6452	☐ Historic Preservation (850) 245-6333 • FAX: 245-6437

e. convey copies of all notes, maps, photographs, videotapes, and other field records pertaining to research conducted under this permit to the BAR permit administrator following completion of the project ______;

f. and not remove from a stable environment artifacts and materials which the permit recipient is unable to properly curate and conserve before conveying to BAR. ______

4. The effective field investigation dates are subject to receipt of permission from the land management agency and, in some instances, State/Federal dredge-and-fill permitting programs. Those agencies may also require work performance conditions relevant to their natural resource management and permitting responsibilities. A representative of the land managing agency (if one exists) will need to sign this permit document prior to BAR executing this permit (see page 3).

5. Unless approved in writing by BAR, no work beyond that described in the "ACTIVITY DESCRIPTION" and attached to your application shall be performed.

6. This permit is valid for up to one year following the requested report due date. Requests for approval for amendments to fieldwork, fieldwork end date and report/artifact due date are required during this time. Such requests may be made and approved by phone, email, or in writing during this time and do not require amendments to this document.

7. In any release of information, including public presentations, media contacts, and the final written report, there shall be acknowledgement that the portion of the project involving state-owned and controlled land was conducted under the terms of an archaeological research permit issued by the Florida Department of State, Division of Historical Resources, Bureau of Archaeological Research.

8. If Unmarked Human Burials are discovered, permit recipient shall comply with the provisions of 872.05, F.S., and when appropriate, Rule 1A-44, F.A.C. Specifically, upon discovery of unmarked human remains, all activities that might further affect those remains shall be halted and the remains protected from further disturbance until an appropriate course of action has been determined by the local medical examiner or by the State Archaeologist, as appropriate.

9. In issuing this permit, the State assumes no liability for the acts, omissions to act or negligence of the permittee, its agents, servants or employees; nor shall this permittee exclude liability for its own acts, omissions to act or negligence to the State.

10. The permittee, unless the permittee is an agency of the State, agrees to assume all responsibility for, indemnify, defend and hold harmless the Division of Historical Resources from and against any and all claims, demands, or liabilities, or suits of any nature whatsoever arising out of, because of, or due to any act or occurrence of omission or commission arising out of the permittee's operations pursuant to this permit and shall investigate all claims at its own expense. In addition, the permittee hereby agrees to be responsible for any injury or property damage resulting from any activities conducted by the permittee.

11. The parties hereto agree that the permittee, its officers, agents and employees, in performance of this permit, shall act in the capacity of an independent contractor and not as an officer, employee, or agent of the State.

The undersigned, as representative of the Permittee/Authorized Entity, understands and accepts the terms of this 1A-32 Archaeological Research Permit.

Signature ____________________ Date: 7/17/19

This permit will not become effective until it has been executed by the Chief of BAR. Before BAR can execute this permit, the Permittee must have a land management representative (if applicable) sign in the space provided above. Please send the signed permit to the Permit Administrator at the address above.

A copy of the executed permit will be sent to you prior to commencing fieldwork.

Executed in Tallahassee, Florida

STATE OF FLORIDA
DEPARTMENT OF STATE

Mary Glowacki, Ph.D.
Chief, Bureau of Archaeological Research

7/18/19
Date of Issue

Enclosures:

- DHR Curation Guidelines
- DHR Conservation Field Guide
- DHR Destructive Analysis Protocol
- DHR Florida Master Site File Requirements
- DHR Report Compliance Requirements

Copies furnished to:
MG

Page intentionally blank

APPENDIX C: SONOGRAPHICS, INC.'S SURVEY REPORT

Page intentionally blank

Page 1

Clear Form Values

Ent D (FMSF only) ____________

Survey Log Sheet

Florida Master Site File
Version 5.0 3/19

Survey # (FMSF only) ____________

Consult *Guide to the Survey Log Sheet* for detailed instructions.

Manuscript Information

Survey Project (name and project phase)
Phase I, Submerged Cultural Resources Survey, Offshore Borrow Area N-3, St. Johns County Feasibility Study

Report Title (exactly as on title page)
Submerged Cultural Resources Survey, Offshore Borrow Area N-3, St. Johns County Feasibility Study

Report Authors (as on title page)
1. Andrew M Derlikowski
2. Stephen R James
3. William J Wilson
4. Erica K Gifford

Publication Year 2019 **Number of Pages in Report** (do not include site forms) ____________

Publication Information (Give series, number in series, publisher and city. For article or chapter, cite page numbers. Use the style of *American Antiquity*.)
Derlikowski et al., 2019 Submerged Cultural Resources Survey, Offshore Borrow Area N-3, St. Johns County Feasibility Study. Prepared by Panamerican Consultants, Inc., 91 Tillman St., Memphis, TN 38111

Supervisors of Fieldwork (even if same as author) Names Rick, Horigan

Affiliation of Fieldworkers: Organization Sonographics, Inc. City Ft. Lauderdale

Key Words/Phrases (Don't use county name, or common words like *archaeology, structure, survey, architecture, etc.*)
1. Marine Survey
2. Offshore Borrow Area
3. Remote Sensing
4. Renourishment
5. ____________
6. ____________
7. ____________
8. ____________

Survey Sponsors (corporation, government unit, organization, or person funding fieldwork) Clear Sponsor Values
Name Michael Trudnak, Taylor Engineering Inc Organization ____________
Address/Phone/E-mail 10151 Deerwood Park Blvd., Bldg. 300, Suite 300 Jacksonville, FL 32256

Recorder of Log Sheet Andrew Derlikowski **Date Log Sheet Completed** 9-9-2019

Is this survey or project a continuation of a previous project? ☒No ☐Yes: Previous survey #s (FMSF only) ____________

Project Area Mapping

Clear Mapping Values

Counties (select every county in which field survey was done; attach additional sheet if necessary)
1. St. Johns
2. ____________
3. ____________
4. ____________
5. ____________
6. ____________

USGS 1:24,000 Map Names/Year of Latest Revision (attach additional sheet if necessary)
1. Name ST. AUGUSTINE Year 2018
2. Name ____________ Year ______
3. Name ____________ Year ______
4. Name ____________ Year ______
5. Name ____________ Year ______
6. Name ____________ Year ______

Field Dates and Project Area Description

Fieldwork Dates: Start 7-17-2019 End 8-10-2019 **Total Area Surveyed** (fill in one) ________ hectares ________ acres
Number of Distinct Tracts or Areas Surveyed 1
If Corridor (fill in one for each) **Width:** 1341 meters ________ feet **Length:** ________ kilometers 107.57 miles

HR6E066R0319, effective 05/2016
Rule 1A-46.001, F.A.C.

Florida Master Site File / Div. of Historical Resources / R.A. Gray Bldg / 500 S Bronough St., Tallahassee, Florida 32399-0250
Phone 850.245.6440, Fax 850.245.6439, Email: SiteFile@dos.myflorida.com

Page 2 **Survey Log Sheet** Survey #___________

Research and Field Methods

Types of Survey (select all that apply): ☒archaeological ☐architectural ☐historical/archival ☒underwater ☐damage assessment ☐monitoring report ☐other(describe): ______

Scope/Intensity/Procedures

Remote sensing survey conducted using 30-meter line spacing. Data collected using magnetometer, side-scan sonar, and sub-bottom profiler, and DGPS.

Preliminary Methods (select as many as apply to the project as a whole)

☐Florida Archives (Gray Building) ☐library research- *local public* ☐local property or tax records ☐other historic maps ☐LIDAR
☐Florida Photo Archives (Gray Building) ☐library-special collection ☐newspaper files ☐soils maps or data ☐other remote sensing
☐Site File property search ☐Public Lands Survey (maps at DEP) ☒literature search ☐windshield survey
☒Site File survey search ☐local informant(s) ☐Sanborn Insurance maps ☐aerial photography
☒other (describe): NOAA AWOIS

Archaeological Methods (select as many as apply to the project as a whole)

☐Check here if **NO** archaeological methods were used.
☐surface collection, controlled ☐shovel test-other screen size ☐block excavation (at least 2x2 m) ☐metal detector
☐surface collection, uncontrolled ☐water screen ☐soil resistivity ☐other remote sensing
☐shovel test-1/4"screen ☐posthole tests ☒magnetometer ☐pedestrian survey
☐shovel test-1/8" screen ☐auger tests ☒side scan sonar ☐unknown
☐shovel test 1/16"screen ☐coring ☐ground penetrating radar (GPR)
☐shovel test-unscreened ☐test excavation (at least 1x2 m) ☐LIDAR
☒other (describe): Sub-bottom Profiler

Historical/Architectural Methods (select as many as apply to the project as a whole)

☒Check here if **NO** historical/architectural methods were used.
☐building permits ☐demolition permits ☐neighbor interview ☐subdivision maps
☐commercial permits ☐windshield survey ☐occupant interview ☐tax records
☐interior documentation ☐local property records ☐occupation permits ☐unknown
☐other (describe): ______

Survey Results

Resource Significance Evaluated? ☐Yes ☒No Clear Check Boxes

Count of Previously Recorded Resources 0 **Count of Newly Recorded Resources** 0

List Previously Recorded Site ID#s with Site File Forms Completed (attach additional pages if necessary)

List Newly Recorded Site ID#s (attach additional pages if necessary)

Site Forms Used: ☐Site File Paper Forms ☐Site File PDF Forms

REQUIRED: Attach Map of Survey or Project Area Boundary

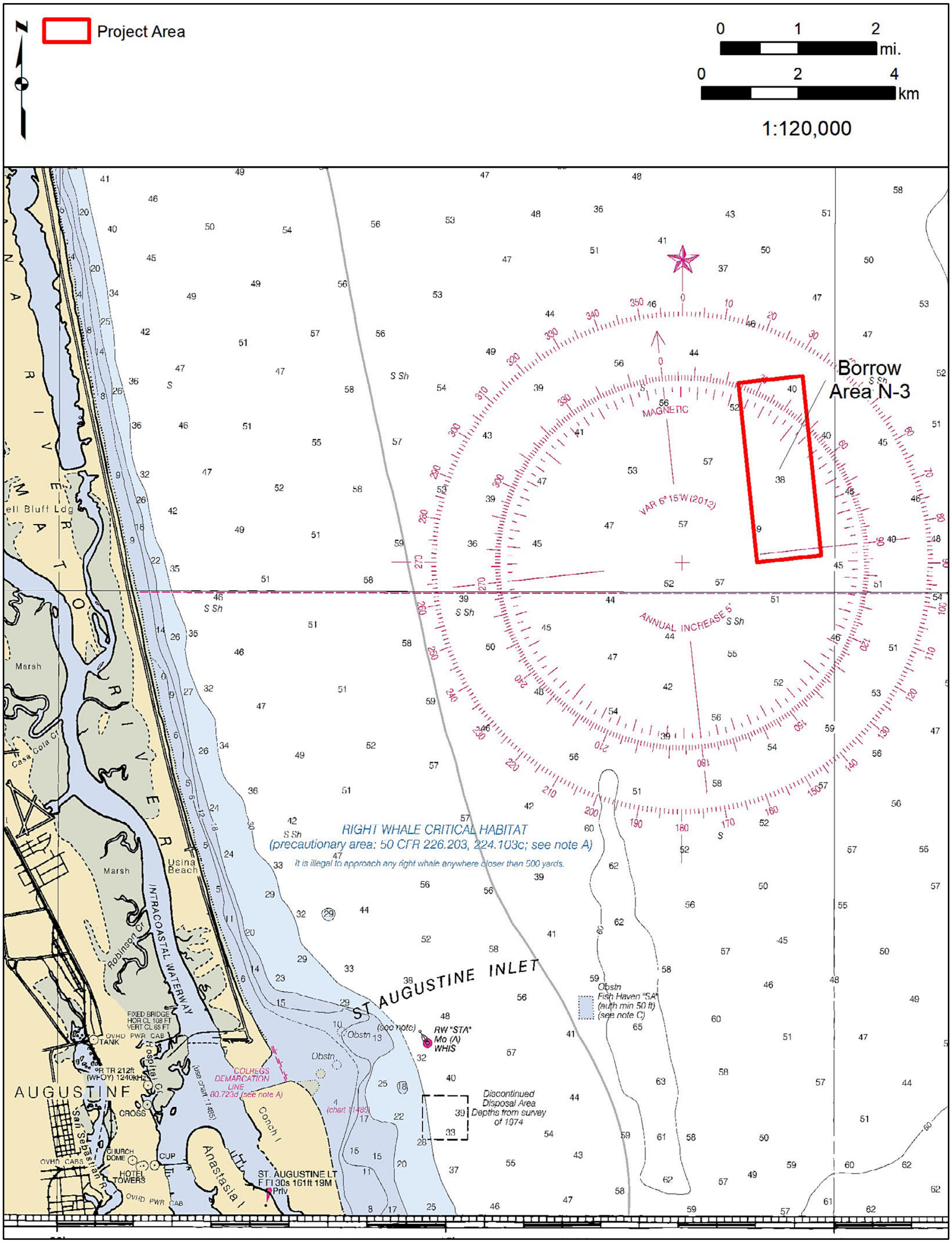
SHPO USE ONLY **SHPO USE ONLY** **SHPO USE ONLY**

Origin of Report: ☐872 ☐Public Lands ☐UW ☐1A32 # ______ ☐Academic ☐Contract ☐Avocational
☐Grant Project # ______ ☐Compliance Review: CRAT # ______

Type of Document: ☐Archaeological Survey ☐Historical/Architectural Survey ☐Marine Survey ☐Cell Tower CRAS ☐Monitoring Report
☐Overview ☐Excavation Report ☐Multi-Site Excavation Report ☐Structure Detailed Report ☐Library, Hist. or Archival Doc
☐Desktop Analysis ☐MPS ☐MRA ☐TG ☐Other: ______

Document Destination: Plottable Projects Plotability: ______

HR6E066R0718, effective 05/2016 Florida Master Site File / Div. of Historical Resources / R.A. Gray Bldg / 500 S Bronough St., Tallahassee, Florida 32399-0250
Rule 1A-46.001, F.A.C. Phone 850.245.6440, Fax 850.245.6439, Email: SiteFile@dos.myflorida.com


Project Area
0 1 2 mi.
0 2 4 km
1:120,000
Borrow Area N-3
RIGHT WHALE CRITICAL HABITAT
(precautionary area: 50 CFR 226.203, 224.103c; see note A)
It is illegal to approach any right whale anywhere closer than 500 yards.
ST AUGUSTINE INLET
MAGNETIC
VAR 6° 15'W (2012)
ANNUAL INCREASE 5'
INTRACOASTAL WATERWAY
Usina Beach
Marsh
AUGUSTINE
Anastasia I
Conch I
ST. AUGUSTINE LT
Discontinued Disposal Area Depths from survey of 1974
Obstn Fish Haven "SA" (auth min 50 ft) (see note C)
RW "STA" Mo (A) WHIS
COLREGS DEMARCATION LINE

Page intentionally blank

APPENDIX C: SONOGRAPHICS, INC.'S SURVEY REPORT

Page intentionally blank

St. Johns County
Area N-3 Magnetometer, Side Scan Sonar, Seismic Survey
Field Report Prepared by Rick Horgan, SONOGRAPHICS, INC.

The remote sensing magnetometer, side scan sonar, and sub-bottom surveys of a 105-line mile grid was performed on July 30 and 31st, August 1st and 10th, 2019. The survey vessel was a 2000 Parker model 2520. The purpose of the survey was to detect any submerged cultural resources within the survey area. This report will address the equipment and methods employed for this survey. Ideal weather and data quality were encountered on July 30 and 31st. After mid-day on August 1st the sea state increased to over 2 ft and operations were stopped until late afternoon to maintain data and survey quality. The survey was delayed due to weather until August 10th when ideal weather and data quality permitted the completion of the survey.

Magnetometer

The magnetometer data was collected using the Geometrics Model G-882 Digital Cesium System with a built-in depth sensor and altimeter. The G-882 sampled the earth's magnetic field at the rate of 10 samples per second. The fixed sensitivity is < 0.004 nT /πHz rms. up to 20 samples per second. The magnetometer total field, depth and altitude data were displayed by the Hypack Navigation Computer. The X and Y offset distances from the DGPS antenna to the tow-point were measured and entered in the Hypack computer. The cable length aft of the tow-point was measured and entered as well. The Hypack software was configured to track the magnetometer tow-fish position with each incoming magnetometer reading. Each reading, combined with position, depth and altitude was stored in the navigation computer hard drive. The display of the magnetometer was monitored during the survey. Survey lines were run at 30-meter intervals (Figure. 1). The altimeter was not able to display therefore the depth was closely monitored and subtracted from the vessel fathometer depth to maintain the magnetometer sensor at 6 meters or less above the seafloor.

Side Scan Sonar

The side scan sonar data was collected using the Edge Tech Model 4200-FS multi-pulse digital chirp system. The X and Y offset distances from the DGPS antenna to the tow-point were measured and entered in the Hypack computer. The cable length aft of the tow-point was measured and entered as well. The Hypack software was configured to track the side-scan tow-fish. The side-scan imagery was geo-encoded using the tow-fish position supplied by the Hypack Navigation Computer and stored in the Edge Tech native – JSF format on the side-scan system hard drive. Dual frequency (300 KHz and 600 KHz) data was collected for the entirety of the survey area. The range scale used was 50 meters per-side for a total swath of 100 meters. The tow-fish height was maintained at 10 meters or less above the seafloor. The survey was conducted simultaneously with the magnetometer and sub bottom profiler surveys.

Sub-Bottom Profiler

The X-Star Full Spectrum Sonar is a versatile wide-band FM sub-bottom profiler that generates cross sectional images of the seabed and collects digital normal incidence reflection data over many frequency ranges. X-Star transmits an FM pulse that is linearly swept over a full spectrum frequency range (also called a 'chirp pulse'). The tapered wave form spectrum results in images that have virtually constant resolution with depth. Another X-Star advantage is the reduction of side lobes in the effective transducer aperture. The tow-fish utilized in the survey was the Edge Tech model SB 424. The X and Y offset distances from the DGPS antenna to the tow-point were measured and entered in the Hypack computer. The cable length aft of the tow-point was measured and entered as well. The Hypack software was configured to track the sub-bottom tow-fish. The sub-bottom imagery was geo-encoded using the tow-fish position supplied by the Hypack Navigation Computer and stored in the Edge Tech native – JSF format on the X-Star System hard drive. The tow-fish height was maintained at 12 meters above the seafloor.

Electronic Navigation

The navigation equipment used for the survey, a Trimble SPS 852 in differential mode (DGPS) interfaced with the Coastal Oceanographic (HYPACK) Hydrographic Data Collection and Processing System. The DGPS antenna was located amidships and 10 feet forward from the transom of the vessel. The SB-424 tow-fish was towed from the starboard side and 6 meters aft of the transom. The G-882 tow-fish was towed from the starboard side of the transom and 52 meters aft. The 4200 tow-fish was towed from the port side and 13 meters aft of the transom.

The Trimble SPS 852 has a Horizontal accuracy of 0.25 meter + 1 ppm RMS and a vertical accuracy of 0.5 meter + 1 ppm RMS. The grid used for all Hypack data is the Florida State Plane Transverse Mercator -Projection Coordinate System, East Zone (NAD 83).

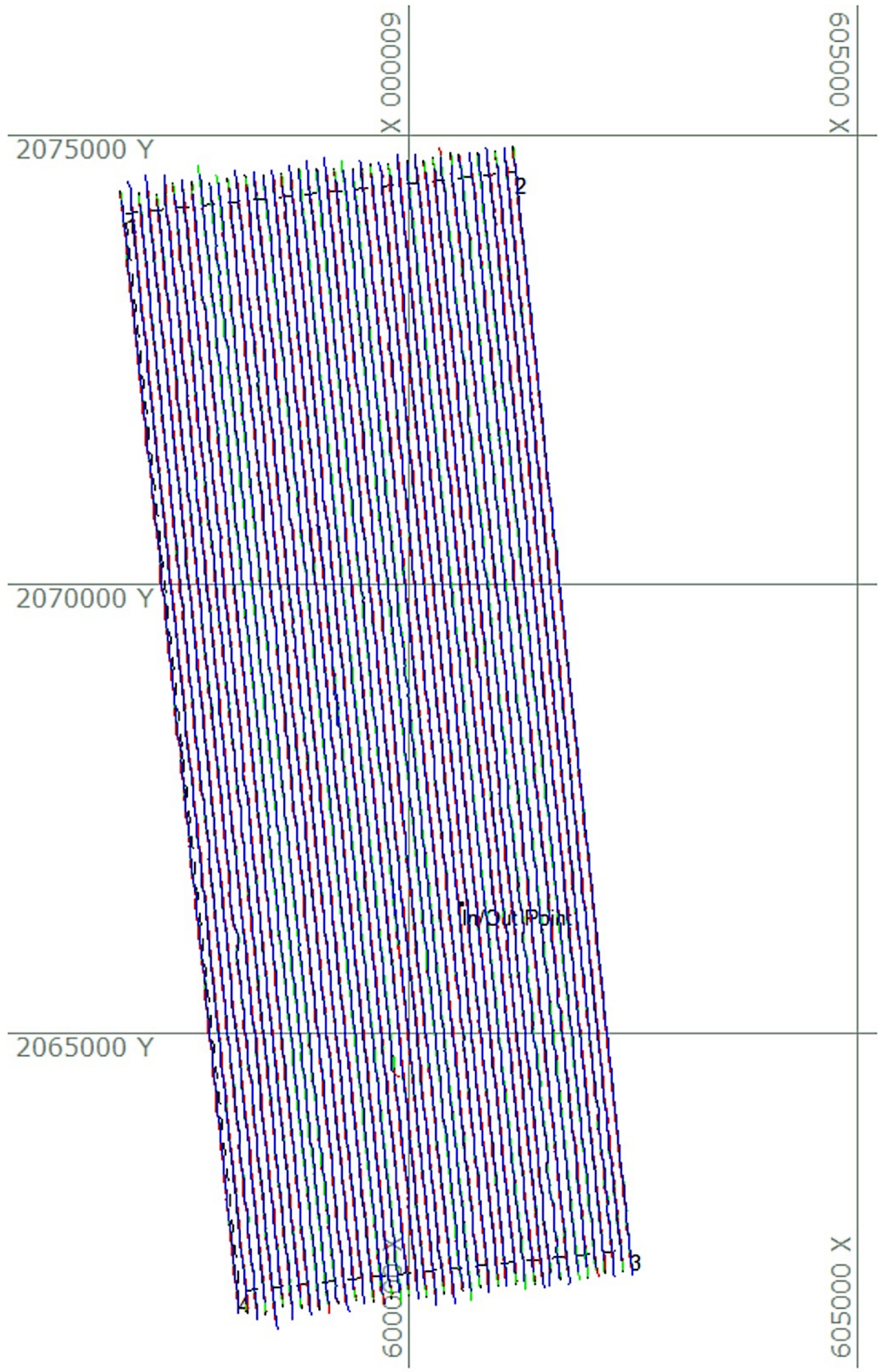


Figure 1. Track Map

APPENDIX D:
BUREAU OF OCEAN ENERGY MANAGEMENT PERMIT

Page intentionally blank

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT

Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

In Reply Refer To: MS 881A

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

MAR 13 2019

Taylor Engineering, Inc.
Attention: Mr. Michael Trudnak
10199 Southside Blvd., Ste. 310
Jacksonville, FL 32256

Dear Mr. Trudnak:

Your application received October 9, 2018 requests a Federal Authorization to conduct geophysical operations in the area shown on the map accompanying the application. Panamerican Consultants will conduct exclusive operations for Taylor Engineering. The proposed program is a high resolution seismic survey.

An authorization designated OCS Authorization E18-004 is hereby granted to conduct geophysical operations on the OCS in the area and manner described in the application subject to the enclosed Authorization for Geophysical Prospecting for Mineral Resources on the OCS and the enclosed Standard Stipulations and the Standard Environmental Protective Measures attached to the authorization.

Please Note: In addition to the above environmental measures, your operations *shall not begin* prior to receiving DoD clearance via this office. BOEM will notify you as soon as this clearance is provided. **Before starting acquisition, you are required to notify BOEM of your survey start date. BOEM must also be advised of the end date immediately upon survey completion.**

Our National Environmental Policy Act (NEPA) review of the subject action is complete and results in a Finding of No Significant Impact (FONSI). This FONSI is conditioned on adherence to the conditions of approval that ensure environmental protection, consistent environmental policy, and safety as required by NEPA, as amended, and is valid only insofar as the conditions are met in the attached NEPA Review.

If you have any questions, please call Terce Campbell at (504) 736-3231 (terce.campbell@boem.gov) or the Office of Resource Evaluation, Data Acquisition and Special Projects Unit at (504) 736-2588 (GGPermitsGOMR@boem.gov).

Sincerely,

Matthew G. Wilson

Matthew G. Wilson
Regional Supervisor
Gulf of Mexico Region
Office of Resource Evaluation

Enclosure

UNITED STATES GOVERNMENT
MEMORANDUM

February 15, 2019

To: Chief, Resource Studies, Resource Evaluation, GOM OCS Region (MS GM881A)

From: Chief, Environmental Operations Section, Office of Environment, GOM OCS Region (MS GM633A)

Subject: National Environmental Policy Act Review of Taylor Engineering, Inc., Geophysical and Geological Exploration Application Number E18-004

Our National Environmental Policy Act (NEPA) review of the subject action is complete and results in a Finding of No Significant Impact (FONSI). This FONSI is conditioned on adherence to the following mitigation and monitoring measures that ensure environmental protection, consistent environmental policy, and safety as required by NEPA, as amended, and is valid only insofar as the following conditions are met:

Mitigation Measures

1. **SURVEY REQUIREMENTS:**

   - Line spacing for any geophysical data for seafloor hazards assessments (sub-bottom profilers and side-scan sonar) will not exceed 492 feet (ft) (150 meters [m]) throughout the area.
   - Line spacing for all chirp seismic and magnetometer data for archaeological resources assessments will not exceed 98 ft (30 m) throughout the area.
   - Line spacing for multibeam, or interferometric swath bathymetry, or side-scan sonar would be suitable for the water depths encountered and provide full coverage of the seabed plus suitable overlap and resolution of small discrete targets of 1.5-3 feet (0.5-1.0 m) in diameter at the relevant slant range.
   - For site-specific surveys, the geophysical data requiring the narrowest line spacing will determine the survey coverage and line spacing for the given data collection.
   - All track lines should run generally parallel to each other.

2. **TIME-AREA RESTRICTIONS FOR GEOPHYSICAL SURVEYS TO AVOID NORTH ATLANTIC RIGHT WHALES IN THE ATLANTIC:**

   Geophysical surveys will be scheduled and conducted to the maximum extent practicable so that no active acoustic sources operating below 30 kilohertz (kHz) (a conservative estimate of the upper hearing threshold for North Atlantic Right Whales) will be used in the Northeast critical habitat and northeast Seasonal Management Areas (SMAs) (Great South Channel, April 1 through July 31; Off Race Point, March 1 through April 30), mid-Atlantic SMAs (November 1 through April 30), and Southeast critical habitat and southeast SMAs (November 15 through April 15). All operations in these areas during the specified times will occur during daylight hours.

   BOEM will require vessel operators make use of the Early Warning System, Sighting Advisory System, and Mandatory Ship Reporting System while operating in the North Atlantic Right Whale critical habitat, SMAs, and Dynamic Management Areas (DMAs) at the times of year those designations are active or year round in the case of the North Atlantic Right Whale critical habitat.

   If, during the course of a geophysical survey, a DMA is established, use of all sound sources operating below 30 kHz in that DMA must be discontinued within 24 hours of its establishment. Any geophysical surveys in proximity of DMA boundaries are required to remain at a distance such that received levels for all sound sources at these boundaries are no more than 160 dB re 1 μPa rms.

3. **GEOPHYSICAL SURVEY PROTOCOL:**

   Only electromechanical sources would be used during geophysical surveys (https:\\boem.gov/Regional-Projects/ Table 2-1 of the EA; Appendix A). Electromechanical sources would be limited to boomer and chirp sub-bottom profilers, side-scan sonars, and single beam, interferometric, or multibeam depth sounders. The minimum number of geophysical sources possible would be used to obtain the necessary geophysical data.

Only the chirp sub-bottom profiler and boomer would be operated at frequencies below 180 kHz, which is the upper hearing threshold for cetaceans. Source levels for sub-bottom profilers and boomers would not exceed 220 dB re 1 μPa and would be operated at the lowest power setting, narrowest beamwidth, and highest frequency possible to fulfill data needs and to effectively reduce exposure and received sound levels. Consistent with recent sound source verification studies on these active source (Appendix A), threshold radii to 160 dB re 1 μPa rms (which equates to a Level B Harassment) are expected to be less than 328 ft (100 m) because of the beam pattern characteristics and downward directivity; to 180 dB (Level A), within 2 m (7 ft). Moreover, a chirp towfish (if not hull-mounted) would be towed as close to the seafloor as possible to further reduce the zone of ensonification (the area filled with sound). The use of boomers would be limited to rare circumstances where penetration from chirp sources is insufficient to map or delineate near-surface geologic units.

Protocol requirements include the following:

1. An acoustic exclusion zone will be monitored during sand survey activities using any boomer or sub-bottom profiler sound source(s) operating below 180 kHz. The acoustic exclusion zone will be a 328-ft (100-m) radius zone around the sound source. Accounting for differences in the source levels, operational frequency, and deployment mode, this 328-ft (100-m) exclusion zone will encompass the 160 dB Level B harassment zone.

2. For geophysical surveys using sound sources operating at frequencies below 180 kHz, operations will be monitored by a National Marine Fisheries Service (NMFS)-approved, trained protected species observer (PSO). At least one PSO will be required aboard sand survey vessels at all times during daylight hours (dawn to dusk – i.e., from about 30 minutes before sunrise to 30 minutes after sunset) when survey operations are being conducted, including during conditions (e.g., fog, rain, darkness) that adversely affect the effectiveness of sea surface observations. If conditions deteriorate during daylight hours such that the observations are not possible, visual observations will resume as soon as conditions permit. Ongoing activities may continue, but they may not be initiated under such conditions (i.e., without appropriate pre-activity monitoring).

3. Visual monitoring of acoustic exclusion zones will be conducted by searching the area around the vessel using hand-held reticle binoculars and the unaided eye to observe and document the presence and behavior of marine mammals and sea turtles. PSOs may be trained third-party observers, crew members trained as observers, or a combination of both trained third-party and crew observers. PSOs will be solely dedicated to perform visual observer duties. PSOs shall operate under the following guidelines:

   a. Other than brief alerts to make personnel aware of maritime hazards, no additional duties shall be assigned to observers during their watch.

   b. A watch shall be no longer than six continuous hours. Consequently, at least two PSOs will be required on board vessels to monitor the acoustic exclusion zone when daily survey activities exceed 6 hours.

   c. A break of at least 2 hours shall occur between 6-hour watches; no other duties shall be assigned during this period.

4. When operating during reduced visibility, observers will monitor the waters around the acoustic exclusion zone using shipboard lighting, enhanced vision equipment, night-vision equipment, and/or passive acoustic monitoring (PAM). Nighttime surveys are permitted, though PAM is required in addition to night-vision goggles or other appropriate equipment subject to the *Nighttime Geophysical Surveys and Passive Acoustic Monitoring Protocol*. PAM involves towing an additional hydrophone streamer that detects frequencies produced by vocalizing marine mammals and can be used to allow some localization of the bearing (direction) of the animal from the vessel. The PAM system will have real-time processing and detection capability for marine mammal vocalizations over the frequency range of 100 Hz to 175 kHz. Sand survey activities' sound sources operating at frequencies below 180

kHz may be approved during periods of reduced visibility or at night, provided the nighttime survey and PAM protocol is followed.

5. Start-up and shut-down requirements: The acoustic exclusion zone for sound sources operating below 180 kHz shall be monitored for all marine mammals and sea turtles for no less than 30 minutes prior to start-up and continue until operations cease. Immediate shutdown of the sound source would occur if any non-delphinid cetacean is detected entering or within the acoustic exclusion zone. Immediate shutdown of the sound source would occur if any sea turtle is detected entering or within the acoustic exclusion zone provided the source is operating below 2 kHz. Subsequent restart of the equipment may only occur following a confirmation that the exclusion zone is clear of all marine mammals and sea turtles for 30 minutes.

6. Shutdown of sound sources operating below 180 kHz will not be required for delphinids approaching the vessel (or vessel's towed equipment) that indicates a "voluntary approach" on behalf of the animal. A "voluntary approach" is defined as a clear approach toward the vessel by the animal(s) with a vector that indicates that it is approaching the vessel and remains near the vessel or towed equipment. The intent of the animal(s) would be subject to the determination of the PSO. If the PSO determines that the animal(s) is actively trying to avoid the vessel or the towed equipment, the acoustic sources must be immediately shutdown. The PSO must record the details of any non-shutdowns in the presence of a delphinid, including the distance of the animal(s) from the vessel at the first sighting, heading, position relative to the vessel, duration of sighting, and behavior.

7. BOEM will notify NMFS at least 30 days in advance of the start of the proposed activity to demonstrate how the proposed action is consistent with the activities and conditions considered herein.

8. Data on all marine mammal and sea turtle observations must be recorded by the observer based on standard observer data collection protocols. This information must include the following:

   a. vessel name;
   b. observers' names, affiliations, and resumes;
   c. date;
   d. time and latitude/longitude when daily visual survey began;
   e. time and latitude/longitude when daily visual survey ended; and
   f. average environmental conditions during visual surveys including
      i. wind speed and direction;
      ii. sea state (glassy, slight, choppy, rough, or Beaufort scale);
      iii. swell (low, medium, high, or swell height in meters); and
      iv. overall visibility (poor, moderate, good).
   g. species (or identification to lowest possible taxonomic level);
   h. certainty of identification (sure, most likely, best guess);
   i. total number of animals;
   j. number of calves and juveniles (if applicable/distinguishable);
   k. description (as many distinguishing features as possible) of each individual seen, including length, shape, color and pattern, scars or marks, shape and size of dorsal fin, shape of head, and blow characteristics.
   l. whether or not a shutdown was required;
   m. direction of animal's travel relative to the vessel (drawing preferable);

n. behavior (as explicit and detailed as possible; note any observed changes in behavior); and

o. activity of vessel when sighting occurred.

9. BOEM will require the surveyor to prepare a monthly report that summarizes the survey activities and an estimate of the number of listed marine mammals, sea turtles, and any other protected species observed during these survey activities. BOEM will provide a consolidated annual report to NMFS.

4. **NIGHTTIME GEOPHYSICAL SURVEYS AND PASSIVE ACOUSTIC MONITORING PROTOCOL:**

Geophysical surveys will occur during daylight hours to the maximum extent practicable or cost effective. If nighttime operations occur, a PAM system will be used, unless (1) the system cannot be deployed from the same survey platform, (2) the system is not demonstrated to be effective and economical, and (3) its use unreasonably interferes with geophysical equipment deployment and data acquisition. If BOEM, working with its surveyor, determines that PAM cannot effectively be used to monitor the 328-ft (100-m) exclusion zone, they will document why and modulate operational frequencies of geophysical equipment, provided adequate data quality is achievable. Nighttime observers will visually monitor the exclusion zone with night-vision goggles or other appropriate equipment, regardless of whether PAM is used or not. Because PAM does not aid in the detection of non-vocalizing animals, including sea turtles and sturgeon, the frequency of chirp and boomer sources during nighttime surveys will be modulated to operate outside the upper limit of hearing range of the species most likely to be present in the survey area (e.g., loggerhead hear less than 1 kHz; leatherback – less than 2 kHz; and sturgeon – less than 1 kHz). These details would be established in survey plans for specific projects. PAM would not be required to be used as a supplement during daylight operations because acoustic exclusion and vessel strike zones can be effectively monitored by observers.

If nighttime geophysical surveys are conducted, the lighting scheme on the survey vessel will be adjusted, through reduction, shielding, lowering, and appropriate placement of light sources, to avoid attracting or otherwise disturbing sea turtles, sea birds, and other marine species. Adjustments to the lighting on the vessel would not fall below the minimum standard required by the U.S. Coast Guard (USCG) and Occupational Safety and Health Administration.

5. **VESSEL STRIKE AVOIDANCE PROTOCOL:** All sand survey activities (including vessel transit), regardless of vessel size, will be required to comply with the following requirements:

1. Vessel operators, crews, and visual observers or PSOs must maintain a vigilant watch for marine mammals, sea turtles, and protected fish (e.g., sturgeon and smalltooth sawfish), and slow down or stop their vessel regardless of vessel size to avoid striking protected species. A visual observer aboard all sand survey vessels will monitor an area around a transiting survey vessel, the vessel strike exclusion zone, to ensure that it is free of marine mammals, sea turtles, and protected fish. At least one observer will be required aboard all vessels. Visual observers, for the purpose of vessel strike, may be third-party or not third-party, but require training. In addition, vessel operators would be required to comply with NMFS marine mammal and sea turtle viewing guidelines for a region.

2. In accordance with NMFS' "Compliance Guide for the Right Whale Ship Strike Reduction Rule" (50 CFR § 224.105 and 78 FR 73726–73736), when safety allows, vessels, regardless of size, shall transit within the 10-knot (kn) (18.5-kilometer/hour [km/h]) speed restriction in North Atlantic right whale DMAs, Northeast critical habitat and SMAs, mid-Atlantic SMAs, and critical habitat and southeast SMAs at the appropriate times:

Seasonal Management Area	Effective Dates
Northeast Feeding Areas	
Cape Cod Bay SMA	Jan 1 – May 15
Off Race Point SMA	Mar 1 – Apr 30
Great South Channel SMA	Apr 1 – Jul 31
Mid-Atlantic Migratory Route	

Seasonal Management Area	Effective Dates
Port and vessel route areas from Block Island, RI to Savannah, GA	Nov 1 – Apr 30
Southeast Calving and Nursery Grounds	
South GA to North FL	Nov 15 – Apr 15
SMA maps and coordinates: https://www.greateratlantic.fisheries.noaa.gov/shipstrike/doc/compliance_guide.pdf	

When safety permits, vessel speeds should also be reduced to 10 kn (18.5 km/h) or less when mother/calf pairs, pods, or large assemblages of right whales are observed near a transiting vessel. A single animal at the surface may indicate the presence of submerged animals in the vicinity of the vessel; therefore, precautionary measures should be exercised when an animal is observed. Mandatory reductions in speed will also limit continuous noise levels related to propeller cavitation and hull-wave interaction.

3. When North Atlantic right whales are sighted at any time during the year, vessels, regardless of size, must maintain a minimum separation distance of 1,640 ft (500 m). The following avoidance measures must be taken if a vessel comes within 1,640 ft (500 m) of a right whale:
   a. While underway, the vessel operator shall steer a course away from the right whale at 10 kn (18.5 km/h) or less until the minimum separation distance has been established.
   b. If a right whale is spotted in the path of a vessel or within 328 ft (100 m) of a vessel underway, the operator shall reduce speed and shift engines to neutral. The operator shall only re-engage engines after the right whale has moved out of the path of the vessel and is more than 328 ft (100 m) away. If the right whale is still within 1,640 ft (500 m) of the vessel, the vessel shall select a course away from the whale's course at a speed of 10 kn (18.5 km/h) or less. This procedure shall also be followed if a right whale is spotted while a vessel is stationary. Whenever possible, a vessel should remain parallel to the whale's course while transiting, avoiding abrupt changes in direction until it has left the area.
4. Vessels, regardless of size, must maintain a minimum separation distance of 328 ft (100 m) year-round if whales other than right whales, seals, or manatees are sighted. The survey will comply with other relevant manatee construction conditions when operating within the species' range. All vessels will follow routes of deep water whenever possible. Year-round, vessels, regardless of size, shall maintain a distance of 164 ft (50 m) or greater from delphinid cetaceans. If encountered during transit, a vessel shall attempt to remain parallel to the animal's course, avoiding excessive speed or abrupt changes in course.
5. All vessels, regardless of size, must maintain a distance of 164 ft (50 m) or greater if sea turtles or other protected species are sighted, whenever possible. Engines will not be re-engaged until the animals are clear of the 50-m (164-ft) exclusion area. The survey will comply with other relevant smalltooth sawfish construction conditions summarized below when operating within the species range. During nighttime geophysical surveys and transit, nighttime observer requirements will be implemented and vessel speed will not exceed 5 kn (9.3 km/hr) in areas where sea turtles are most likely to be present.
6. Sightings of any injured or dead protected species, as well as any interactions, must be reported to BOEM and NMFS or the U.S. Fish and Wildlife Service within 24 hours, regardless of whether the injury or death was caused by their vessel.

6. **MARINE POLLUTION CONTROL:**

All sand survey activities will occur under a marine pollution control plan developed by the surveyor. The marine pollution control plan must address the marine debris awareness requirement. The surveyor must prepare for and take all necessary precautions to prevent discharges of waste or hazardous materials that may impair water quality. Sufficient spill response equipment and supplies shall be available onboard (or readily mobilized with a secondary vessel) to contain and recover the maximum scenario spill keyed to the proposed operations and disclosed in the marine pollution control plan. In the event of such an occurrence, notification and response will be in accordance with applicable requirements of 40 CFR part 300. All vessel operations must be compliant with USCG regulations and the U.S. Environmental Protection Agency's (USEPA) Vessel General Permit, as applicable. BOEM, USCG, and USEPA, as necessary, will be notified of a noncompliant discharges and remedial actions taken. Reports of the incident and resultant actions will be provided to BOEM.

7. **MARINE DEBRIS AWARENESS PROGRAM:**

   All participants in sand survey activities will be educated on marine trash and debris awareness elimination. The surveyor would be required to ensure that its employees and subcontractors are made aware of the environmental and socioeconomic impacts associated with marine trash and debris and their responsibilities for ensuring that trash and debris are not intentionally or accidentally discharged into the marine environment where it could affect protected species.

   The deliberate discharge of containers and other similar materials (i.e., trash and debris) into the marine environment is prohibited (30 CFR §§ 250.300(a) and (b)(6)), and durable identification markings on equipment, tools, containers (especially drums), and other materials are required, as well as the recording and reporting of items lost overboard to the District Manager through facility daily operations reports (30 CFR §§ 250.300(c) and (d)). Furthermore, the intentional jettisoning of trash has been the subject of strict laws such as the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex V and the Marine Plastic Pollution Research and Control Act (MPPRCA), as well as regulations imposed by various agencies such as USCG and USEPA.

8. **NAVIGATION AND COMMERCIAL FISHERIES OPERATIONS CONFLICT MINIMIZATION REQUIREMENTS:**

   Notification of pending activities will be made in the USCG Local Notice to Mariners no less than 48 hours prior to the commencement of all sand survey activities. The call sign of the survey vessel and preferred communication channel must be identified.

   Consistent with applicable USCG regulations, all designated vessels will be equipped with Automatic Information System (AIS) and broadcast vessel's identity, type, position, course, speed, and navigational status during surveying activities. BOEM will require any vessel greater than 65 ft (20 m), regardless of operational status, to employ an AIS system.

   No hydrophone streamer or other source towline may exceed 328 ft (100 m) beyond the survey vessel to minimize the effective footprint of operations and minimize disturbance to fisheries vessels, fisheries gear, and/or other shipping or boating traffic.

   During surveys, the survey operator must notify all fisheries vessels observed within 6,500 ft (2 km) of a geophysical survey to avoid potential entanglement in fishing gear. Vessels will "fly" the appropriate USCG-approved day shapes (mast head signals used to communicate with other vessels) and display the appropriate lighting during daylight and any nighttime operations to designate the vessel has limited maneuverability.

   To minimize interaction with fishing gear that may be present, the survey operator will traverse or visually scan the general survey area, or use other effective methods, prior to commencing survey operations to determine the presence of deployed fishing gear. Observed fishing gear must be avoided by a minimum of 100 ft (30 m). Fishing gear must not be relocated or otherwise disturbed.

9. **ADVANCE NOTIFICATION OF SURVEY ACTIVITIES IN MILITARY WARNING AND TEST AREAS AND NASA OPERATING AREAS:** The Atlantic OCS Region is used extensively by the U.S. Department of Defense and NASA for conducting various mission operations, including air-to-air gunnery, rocket and missile research and testing, sonar buoy operations, pilot training, and aircraft carrier operations. To ensure personnel safety and to reduce the likelihood of conflicts between military operations and any geophysical and geological surveying in military warning or test areas, direct notification to and coordination with the relevant Naval or Air Force military commands is required at least 7 days in advance of commencing survey activities.. Additionally, advance notification of all survey activities planned in any military warning or test areas, regardless of scope or duration, must be made in the USCG Local Notice to Mariners no less than 72 hours prior to the commencement of survey activities. The call sign of the survey vessel and preferred communication channel must be identified. Consistent with applicable USCG regulations, all designated vessels will be equipped with Automatic Information

System (AIS) and broadcast vessel's identity, type, position, course, speed, and navigational status during surveying activities. BOEM will require any vessel greater than 65 ft (20 m), regardless of operational status, to employ an AIS system.

10. **SEA TURTLE AND SMALLTOOTH SAWFISH CONDITIONS:**

The full suite of mitigation measures typically applied to minimize impacts to sea turtles and sawfish during "construction activities" are available online (https://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/sea_turtle_and_smalltooth_sawfish_construction_conditions_3-23-06.pdf . In addition to aforementioned reporting requirements for all protected species interaction, injury or mortality, or other observations, the following mitigation measures are also required during geophysical surveying and geological sampling:

1. All personnel shall be alerted to the potential presence and need to avoid sea turtles and smalltooth sawfish, as well as the fact that there are penalties for harming, harassing, or killing these species.

2. All vessels shall operate at "no wake/idle" speeds while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

3. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical equipment (e.g., vibracores) shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

11. **MARINE MAMMAL PROTECTION ACT COORDINATION:**

The applicant must provide verification to BOEM that they have coordinated with NMFS, Permits and Conservation Division, Office of Protected Resources, 1315 East-West Highway, F/PR1 Room, 13805, Silver Spring, Maryland, 20910 (Jolie.Harrison@noaa.gov) regarding Marine Mammal Protection Act compliance. Should NMFS require the applicant to obtain an MMPA authorization, the applicant must adhere to and ultimately implement the mitigation and monitoring measures in the authorization.

PERRY J. BOUDREAUX

cc: 102-01a, ENV 5-4b (MS GM633A); Public Information (MS GM217G); Environmental Operations Section File – E18-004

SEE ORIGINAL FOR ATTACHMENTS

COPY 1

Attachment 1

GOM OCS REGION, BOEM
OCT 09 2018
New Orleans, LA
RESOURCE EVALUATION

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OCEAN ENERGY MANAGEMENT

Atlantic OCS Region Atlantic OCS

(Insert Appropriate Regional Office)

APPLICATION FOR ~~PERMIT OR~~ AUTHORIZATION TO CONDUCT GEOLOGICAL OR GEOPHYSICAL PROSPECTING OR EXPLORATION FOR MINERAL RESOURCES OR NOTICE OF SCIENTIFIC RESEARCH ON THE OUTER CONTINENTAL SHELF RELATED TO MINERALS OTHER THAN OIL, GAS, AND SULPHUR

(Section 11, Outer Continental Shelf Lands Act of August 7, 1953, as amended on September 18, 1978, by Public Law 95-372, 92 Statute 629, 43 U.S.C. 1340; and 30 CFR Parts 580 and 280, as applicable)

Taylor Engineering, Inc.
Name of Applicant

10199 Southside Blvd. Suite 310
Number and Street

Jacksonville, FL 32256
City, State, and Zip Code

Application is made for the following activity: (check one)

_______ Geological prospecting or exploration for mineral resources

_______ Geological scientific research

___X___ Geophysical prospecting or exploration for mineral resources

_______ Geophysical scientific research

Submit: Original plus three copies, totaling four copies, which include one digital copy, and one public information copy.

==

To be completed by BOEM

Permit Number: E18-004 **Date:** 16-Oct-2018

FORM BOEM-0134 (June 2015)
Previous Editions are Obsolete.

A. General Information

1. The activity will be conducted by:

Service Company	For Purchaser(s)/User(s) of the Data
Panamerican Consultants (Service Company Name)	St. Johns County (Purchaser(s)/User(s) of the Data)
91 Tillman (Number and Street)	2750 Industry Center Rd. (Number and Street)
Memphis, TN 38111 (City, State, and Zip Code)	St. Augustine, FL 32084 (City, State, and Zip Code)
904-454-4733 (Telephone/FAX Numbers)	904-209-0794 (Telephone/FAX Numbers)
jamesposse@aol.com (E-Mail Address)	ddouglas@sjcfl.us (E-Mail Address)

2. The purpose of the activity is: __X__ Mineral prospecting or exploration
   ____ Scientific research

3. Describe your proposed survey activities (i.e., vessel use, benthic impacts, acoustic sources, etc.) and describe the environmental effects of the proposed activity, including potential adverse effects on marine life. Describe what steps are planned to minimize these adverse effects (mitigation measures). For example: 1) Potential Effect: Excessive sound level; Mitigation: Marine Mammal Observers, mammal exclusion zone or 2) Potential Effect: Bottom disturbance; Mitigation: ROV deployment/retrieval of vibracoring rigs (use continuation sheets as necessary or provide a separate attachment): Remote sensing survey for cultural resources in a borrow area for beach nourishment.

   Magnetometer, side-scan, and sub-bottom seismic surveys to be conducted concurrently.

4. The expected commencement date is: 10/1/18

   The expected completion date is: 10/30/18

5. The name of the individual(s) in charge of the field operation is: Stephen James (RPA)

   May be contacted at: see Panamerican Consultants contact info above

   Telephone (Local) 904-229-4200 (Marine) ____

   Email Address: jamesposse@aol.com Radio call sign ____

6. The vessel(s) to be used in the operation is (are):

Name (s)	Registry Number(s)	Registered owners)
~~unknown at this time~~		
~~to be chartered~~		
PCI Parker	TN1399DJ	Panamerican Consultants, INC.

FORM BOEM-0134 (June 2015)
Previous Editions are Obsolete.

Page 6 of 12

7. The port from which the vessel(s) will operate is: St. Augustine

8. Briefly describe the navigation system (vessel navigation only): Trimble GPS w/ Hypack Navigation Software

B. Complete for Geological Prospecting or Exploration for Mineral Resources or Geological Scientific Research

1. The type of operation(s) to be used is: (check one)

(a) __________ Deep stratigraphic test, or

(b) __________ Shallow stratigraphic test with proposed total depth of ____________________, or

(c) __________ Vibracoring ____________________

(d) __________ Other ____________________

2. Attach a page-size plat showing: 1) The generalized proposed location for each test. Where appropriate, a polygon enclosing the test sites may be used and 2) BOEM protraction areas; coastline; point of reference

3. Distance and direction from a point of reference to area of activity ____________________

4. Label as "Public Information"

C. Complete for Geophysical Prospecting or Exploration for Mineral Resources or Geophysical Scientific Research

1. For the proposed operation:
(a) Acquisition method (OBN, OBC, Streamer): N/A
(b) Type of acquisition: (High Resolution Seismic, 2D Seismic, 3D Seismic, gravity, magnetic, CSEM, etc. see attached Section D supplement

2. Attach a page-size plat showing:
(a) The generalized proposed location of the activity with a representative polygon
(b) BOEM protraction areas; coastline; point of reference
(c) Distance and direction from a point of reference to area of activity see attached map
(d) Label as "Public Information."

3. List all energy source types to be used in the operation(s): (Air gun, air gun array(s), sub-bottom profiler, sparker, towed dipole, side scan sonar, etc.): see attached Section D supplement

4. Explosive charges will ______ will not X be used. If applicable, indicate the type of explosive and maximum charge size (in pounds) to be used:

Type ____________________ Pounds ____________ Equivalent Pounds of TNT ___________

D. Proprietary Information Attachments

Use the appropriate form on page 9 for a "geological" permit or authorization application or the form on page 10 for a "geophysical" permit or authorization application. You must submit a separate form BOEM-0134 to apply for each geological or geophysical prospecting permit or exploration authorization.

E. Certification

I hereby certify that foregoing and attached information are true and correct.

Print Name: Michael Trudnak

SIGNED [signature] **DATE** 810/3/18

TITLE Senior Coastal Engineer

COMPANY NAME: Taylor Engineering, Inc.

==

TO BE COMPLETED BY BOEM

Permit No. E18-004 **Assigned by** Terri Campbell **of BOEM** **Date** 24-Oct-2018

This application is hereby:

a. _X_ Accepted

b. _____ Returned for reasons in the attached

The approved permit or authorization is:

a. _____ Attached

b. _____ Will be forwarded at a later date

SIGNED Matthew G. Wilson **TITLE** Regional Supervisor **DATE** 10-25-2018

Section D Proprietary Information Attachment Required for an Application for Geophysical Prospecting Permit or Exploration Authorization

1. Detailed narrative, modeling of sound propagation, and visual description of the energy source(s) and streamer(s) (receiving array):

   see attached supplement

2. Attach a map view diagram that illustrates vessel(s) source and receiver(s) configuration. Label each vessel indicating its function and include the dimensions of streamer(s), tow fish, etc. Indicate the number of chase and alternate vessels to be used. see attached supplement

3. List each energy source to be used (e.g., airgun, airgun array(s), sparker, towed dipole, side scan sonar, sub bottom profiler, etc.). Indicate the source's manufacturer, model, Source Level (SL) in dB re 1μPa @1m in water (RMS) and if applicable, Source Level (SL) in dB re 1μPa @1m in water (Peak to Peak). If the manufacturer does not provide a peak to peak level (many side scan sonars, etc.), please enter N/A. Additionally, provide the operational frequency ranges.

Energy Source	Manufacturer	Model	Array or Airgun Size (cu. in.)	Source Level (SL) in dB re 1μPa @1m in water (RMS)	Source Level (SL) in dB re 1μPa @1m in water (Peak to Peak)	Frequency (Hz-kHz range)
Chirp	Edgetech	SB424	n/a	165	n/a	2K-24K
Impulse	Marine Sonic	SeaScan HDS	n/a	210	n/a	600K-1200K

For air guns/air gun arrays, provide the maximum distance from the sound source to the following SPL in RMS db levels: (Required for Alaska Region; GOM Region only requires this information for surveys in the GOM that will use simsource during acquisition; Not required for Atlantic permits).

dB level	Maximum Distance from Source
190 db	n/a
180 db	n/a
160 db	n/a

4. Shot (energy pulse) frequency per linear mile (statute): 7180 (SB424) to 10560 (SeaScan HDS)

5. Towing depth (ft/m) of the energy source: 10-20 ft

6. Towing depth (ft/m) of the receiver(s): 10-20 ft

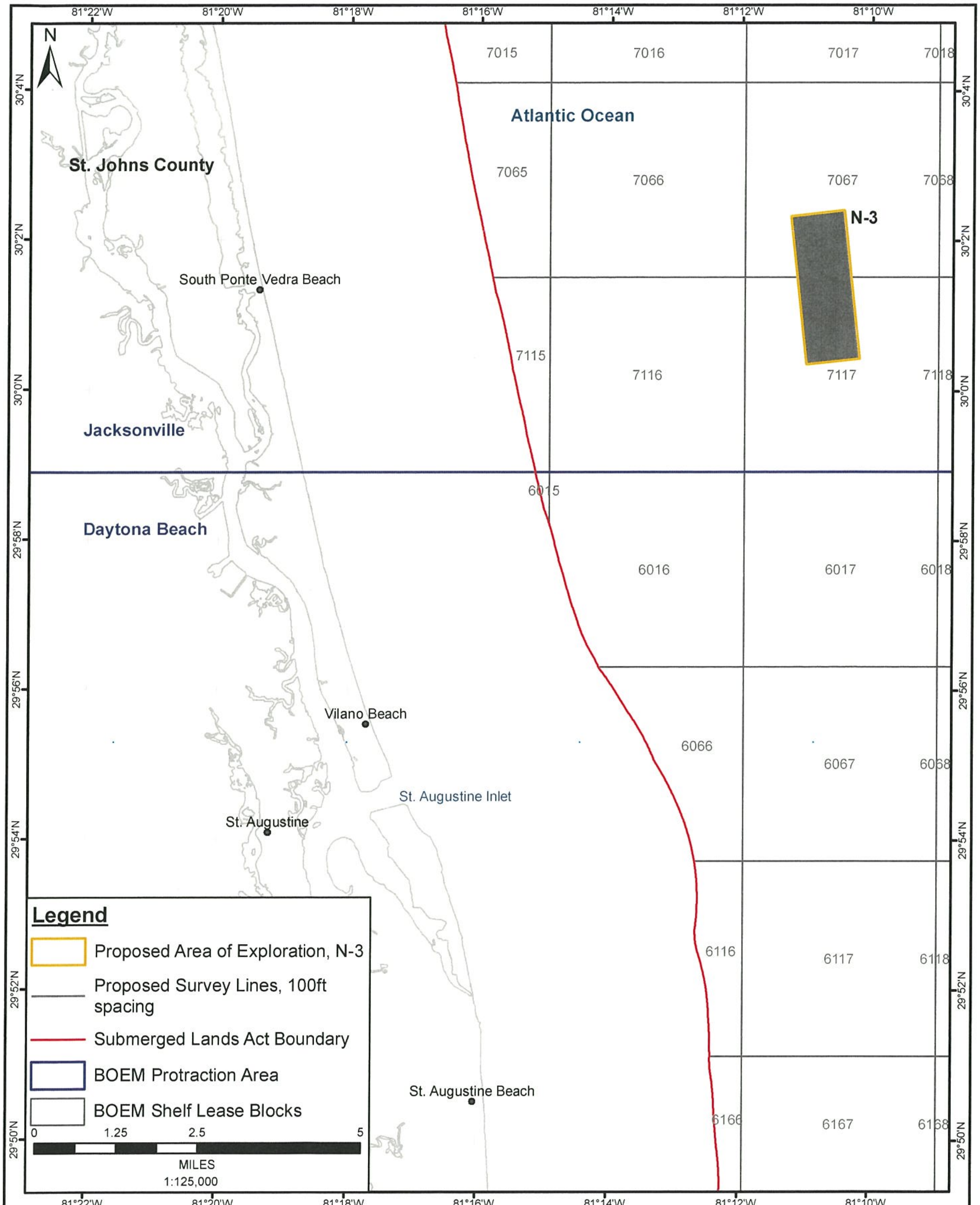
7. CSEM, OBN, Magnetotelluric, and OBC surveys: Describe the node deployment and retrieval procedures. Indicate the location (latitude and longitude coordinates), number and spacing of any ocean bottom receivers, cables, and anchors. If anchors will not be retrieved, provide their physical composition and rate of decomposition. Location data may be submitted digitally on a CD (attach separate page if necessary).

8. Navigation/positioning system or method used to position shotpoint locations and or ocean bottom receivers: N/A

9. Proposed areal extent (blocks) for 3D surveys or total number of line miles proposed for 2D or high resolution survey: Approximately 100 survey line miles

10. Estimated date (month and year) on which final data will be available for all proposed data sets: January 2019

11. Attach map(s), plat(s), and chart(s) (preferably at a scale of 1:250,000) and an electronic version of same showing latitude and longitude, scale, specific protraction areas, block numbers. The map, plat, or chart should be submitted at a sufficient size and scale to make out all details of the activities shown. The map should be labeled "Proprietary," if the data are for commercial purposes and are considered proprietary. For 2D data acquisition, provide specific track lines with line identifications with the total number of line miles proposed or a representative polygon and total number of blocks for 3D surveys. Along with the hardcopy map, submit on CD, the necessary ArcGIS shapefiles to reproduce the map for 2D track lines including individual line names in the attribute table. For 3D surveys provide a representative polygon as an ArcGIS shapefile.



TAYLOR ENGINEERING INC. 10199 SOUTHSIDE BOULEVARD SUITE 310 JACKSONVILLE, FL 32256 CERTIFICATE OF AUTHORIZATION # 4815	PROPOSED ST JOHNS COUNTY BORROW AREA EXPLORATION ST JOHNS COUNTY, FLORIDA	PROJECT C2018-055 DRAWN BY WKL DATE SEPT 2018

SUPPLEMENT TO SECTION D
PROPRIETARY INFORMATION ATTACHMENT

The remote sensing instrument used to search for physical features on or above the ocean floor will be a Marine Sonic Technology® (MST) HDS sidescan sonar system. The sidescan sonar is an instrument that, through the transmission of dual fan-shaped pulses of sound and reception of reflected sound pulses, produces an acoustic image of the bottom. Under ideal circumstances, the sidescan sonar is capable of providing a near-photographic representation of the bottom on either side of the trackline of a survey vessel.

The Sea Scan PC has internal capability for removal of the water column from the instrument's video printout, as well as correction for slant range distortion. This sidescan sonar was utilized with the navigation system to provide manual positioning of fix or target points on the digital printout. Sidescan sonar data are useful in searching for the physical features indicative of submerged cultural resources. Specifically, the record is examined for features showing characteristics such as height above bottom, linearity, and structural form. Additionally, potential acoustic targets are checked for any locational match with the data derived from the magnetometer and the subbottom profiler.

The MST® HDS sidescan sonar will be linked to a towfish that employed a 600/1200 kilohertz power setting and a variable side range of 20 meters-per-channel (131 feet) on each of the survey lines. The 20-meters-per-channel setting will be chosen to provide detail and 100% overlapping coverage with the 100-foot line spacing to insure full coverage of the survey area. The power setting will be selected in order to provide maximum possible detail on the record generated.

Marine Sonic Technology® HDS sidescan sonar with 600/1200 kHz towfish to be employed during the survey.

Subbottom profilers have different ranges of sound wave frequency (sparkers, boomers, pingers, and chirp systems). Sparkers and boomers operate at low frequency (5 Hz to 2 kHz) and afford deep geologic penetration and low resolution, useful for deep geologic time. Pingers (3.5 and 7 kHz) are more useful to penetrate late Pleistocene and Holocene aged deposits or paleolandscape features of interest to prehistoric archaeologists. CHIRP systems sweep multiple frequency ranges and are the most precise and accurate of the subbottom profiler systems, and they operate at ranges of between 3 to 40 kHz. The resolution can be on the order of 10 centimeters (6 inches) depending sediment type and the quality of the acoustic return.

Panamerican will employ an EdgeTech 3100 CHIRP subbottom profiler system with a topside power unit, laptop processor and SB-424 tow fish. The device will be operated at a setting of 4 to 16 kHz, the lowest setting of the device, for maximum penetration.

The EdgeTech subbottom 424 towfish to be employed.

All systems will be operationally compatible and instrumentation records will be electronically interfaced with an electronic navigation-positioning system offering repositioning accuracy of 1 meter or less. Positioning will be corrected by DGPS. All hard-copy analog or image records will be regularly annotated with real time, absolute (e.g., state plane/Universal Transverse Mercator [UTM]) and relative position (transect number and distance), and event numbers. State Plane and UTM coordinates, water depth, sensor depth, and reproductions of magnetic targets, acoustic images, and subbottom features will be included in the final report.

A primary consideration in any remote sensing survey is positioning. Accurate positioning is essential during the running of transect survey lines and accurate post-processing of collected data. Positioning functions will be accomplished on this project through the use of a Trimble Navigation DSM212H, Integrated 12-channel GPS and Dual-channel Minimum-Shift Keying (MSK) Beacon receiver for differential (DGPS) capabilities with sub-meter accuracy or equivalent. Navigation, magnetic data acquisition, and post-processing of data will be accomplished with Hypack Max (computer software written and developed by Coastal Oceanographics, Inc. specifically for survey applications). Positioning information will be stored on magnetic disk in a Sony Vaio laptop computer employed for various survey software applications, data acquisition and storage. Also developed by Coastal Oceanographics, SonarWhiz.MAP, a state-of-the-art program will be employed for sonar and subbottom data acquisition. It allows real-time mosaicking and advanced analysis tools, such as target tabulation and related target and navigational information. Vessel speed during the survey will be no greater than 5 knots per hour. All work shall be conducted using the State Plane Coordinate system survey feet, and will be presented in NAD83 grid and UTM system coordinates.

COPY 1

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OCEAN ENERGY MANAGEMENT
Atlantic OCS Region
(Insert Appropriate Regional Office)

~~PERMIT~~ Authorization FOR GEOPHYSICAL PROSPECTING FOR MINERAL RESOURCES OR SCIENTIFIC RESEARCH ON THE OUTER CONTINENTAL SHELF RELATED TO MINERALS OTHER THAN OIL, GAS, AND SULPHUR

In consideration of the terms and conditions contained herein and the authorization granted hereby, this permit is entered into by and between the United States of America (the Government), acting through the Bureau of Ocean Energy Management (BOEM) of the Department of the Interior, and

Taylor Engineering, Inc.
(Name of Permittee)

10199 Southside Blvd. Suite 310
(Number and Street)

Jacksonville, FL 32256
(City, State, and Zip Code)

PERMIT NUMBER: E18-004 **DATE:** 16-Oct-2018

This permit is issued pursuant to the authority of the Outer Continental Shelf Lands Act, as amended, (43 U.S.C. 1331 et seq.), hereinafter called the "Act," and Title 30, Code of Federal Regulations, Part 580 (Prospecting for Minerals Other Than Oil, Gas, and Sulphur on the Outer Continental Shelf). The permittee must conduct all activities in compliance with the terms and conditions of this permit, including the "Stipulations," "Environmental Protective Provisions," and the approved "Application for Permit," which are attached to and incorporated into this permit. The permittee must conduct all geophysical exploration or scientific research activities in compliance with the Act, the regulations in 30 CFR Parts 551 and 251, and other applicable statutes and regulations whether such statutes and regulations are enacted, promulgated, issued, or amended before or after this permit is issued. Some of the provisions of 30 CFR Parts 551 and 251 are restated in this permit for emphasis. However, all of the provisions of 30 CFR Parts 551 and 251 apply to this permit. The permittee should note particularly that G&G activities may cause incidental "taking" of animals under the Marine Mammal Protection Act (16 U.S.C. 1361 et seq.) or the Endangered Species Act (16 U.S.C. § 1531 et seq.). Any such incidental taking is not authorized by this permit, and it may only be authorized by the National Marine Fisheries Service or the U.S. Fish and Wildlife Service. The permittee should contact these two agencies to address any questions about these laws or requirements.

Paperwork Reduction Act of 1995 (PRA) Statement: This permit refers to information collection requirements contained in 30 CFR part 580 regulations. The Office of Management and Budget (OMB) has approved those reporting requirements under OMB Control Number 1010-0072.

Section I. Authorization

The Government authorizes the permittee to conduct:

X Geophysical prospecting for mineral resources as defined in 30 CFR 580.1.

_____ Geophysical scientific research as defined in 30 CFR 580.1. A permit is required for any geophysical investigation that involves the use of solid or liquid explosives or developing data and information for proprietary use or sale.

This permit authorizes the permittee to conduct the above geophysical activity during the period from 13-Mar-2019 to 13-Mar-2020 in the following area(s): See map attached.

The permittee shall not conduct any geophysical operation (i.e., active sound source(s)) outside of the permitted area specified herein even if no data is collected or obtained from such operations. Geophysical operations shall not be conducted "in-transit" to the permitted area and may only proceed once the survey vessel enters the permitted area. (This restriction does not apply to Alaska.)

Extensions of the time period specified above must be requested in writing. A permit plus extensions for activities will be limited to a period of not more than 3 years from the original issuance date of the permit. Inspection and reporting of geophysical exploration activities, suspension and cancellation of authority to conduct exploration or scientific research activities under permit, and penalties and appeals will be carried out in accordance with 30 CFR 580.23 through 580.28, 580.32, and 580.33.

The authority of the Regional Director may be delegated to the Regional Supervisor for Resource Evaluation for the purposes of this permit.

Section II. Type(s) of Operations and Technique(s)

The permittee will employ the following type(s) of operations:
Cultural resource survey (side-scan, sub-bottom, and magnetometer) at 100-ft line spacing.;

and will utilize the following instruments and/or technique(s) in such operations:
Marine Sonic Technology® HDS sidescan sonar system with 600/1200 kHz tow fish
EdgeTech 3100 CHIRP subbottom profiler system with SB-424 tow fish.

Section III. Reports on Operations

A. Status Reports

1. In the Gulf of Mexico and Atlantic OCS Regions:

The permittee must submit status reports every **two months** in a manner approved or prescribed by the Regional Supervisor, Resource Evaluation (here after referred to as Supervisor). The report must include a map of appropriate scale showing traverse lines, protraction areas, blocks, and block numbers (if map scale permits). The map should be a cumulative update for each status report and clearly illustrate the planned traverse lines (one color) and the portion of those traverse lines in which data acquisition has been completed to date (a second color). Please indicate the cumulative total line miles (2D) or blocks (3D) of data acquired. The map should be submitted in digital format preferably as a GeoPDF.

2. In the Alaska and Pacific OCS Regions:

The permittee must submit status reports **weekly** in a manner approved or prescribed by the Regional Supervisor, Resource Evaluation (here after referred to as Supervisor). The report must include a map of appropriate scale showing the location and extent of acquired lines of 2D data or traverse lines for 3D data and the 3-mile limit when data collection is adjacent to the OCS boundary or other important boundaries as specified by BOEM. The map should be a cumulative update for each status report and clearly illustrate the planned lines (one color) and the portion of those lines in which data acquisition has been completed to date (a second color). The report must show the activity of the source vessel (ie, no seismic activity, time and location when a mitigation gun is on, ramp-up, and full acquisition mode). Protected Species Observer (PSO) reports must also be included. Please indicate the cumulative total line miles (2D) or square miles (3D) of data acquired. The map should be submitted in digital format as a PDF and ESRI file – gdb-feature class(s) or shape files.

B. The permittee must submit to the Supervisor a Final Report within 30 days after the completion of operations. The final report must contain the following:

1. In the Gulf of Mexico and Atlantic OCS Regions:

i. The total number of 2D line miles or OCS blocks of geophysical data acquired as well as the "typical" or average sail miles per block for the survey;

ii. A *brief* daily log of operations. A suggested format for the daily log of operations would include, but is not limited to, a table that provides the name of the survey, a date column, a column for number of line miles or blocks collected each day, and an operations column. Preferably, the date column would commence on the date in which the vessel begins to transit to the permitted area and end on the date in which the vessel either transits away from the permitted area or when operations pertinent to the permitted activity are completed. The corresponding operations column would contain a *brief* description of the operations for each day listed in the date column noting activities such as the major work stoppages, no data acquired, and other pertinent activities. This may be submitted as a digital Word document or as an Excel spreadsheet;

iii. A PDF or, preferably, a GeoPDF or shape file indicating the areal extent of the data *actually acquired*;

iv. The start and finish dates on which the actual geophysical exploration or scientific research activities were performed;

v. A narrative summary of any: (a) hydrocarbon slicks or environmental hazards observed and (b) adverse effects of the geophysical exploration or scientific research activities on the environment, aquatic life, archaeological resources, or other uses of the area in which the activities were conducted;

vi. The estimated date on which the processed or interpreted data or information will be available for inspection by BOEM;

vii. A CD or DVD containing a *single*, final edited navigational data file. Shot point locations should be provided in both latitude/longitude degrees and in x, y coordinates. The single navigational file should be in either SEG-P1 or UKOOA P190 format for either two-dimensional or three-dimensional geophysical data. Two-dimensional data should be decimated to the first, last, and every tenth shot point. Three-dimensional data should be decimated at every line and first and last CDP. A single ESRI shape file containing navigational data and one shape file with post-plot locations of any geophysical equipment on the seafloor (i.e., ocean bottom nodes, CSEM, etc.) should also be submitted if applicable;

viii. Identification of geocentric ellipsoid (NAD 27 or NAD 83) used as a reference for the data or sample locations; and

ix. Such other descriptions of the activities conducted as may be specified by the Supervisor.

2. In the Alaska and Pacific OCS Regions:

i. The total number of 2D line miles or square miles for 3D surveys and the number of OCS blocks of geophysical data acquired, as well as total number of traverse miles for the survey;

ii. A *weekly report*.

iii. Chart(s), map(s), or plat(s) depicting the areas and blocks in which any exploration or scientific research activities were conducted. These graphics must clearly indicate the location of the activities so that the data produced from the activities can be accurately located and identified;

iv. The start and finish dates on which the actual geophysical exploration or scientific research activities were performed;

v. A narrative summary of any: (a) hydrocarbon slicks or environmental hazards observed, (b) adverse effects of the geophysical exploration or scientific research activities on the environment, aquatic life, archaeological resources, or other uses of the area in which the activities were conducted, and (c) safety incidents;

vi. The estimated date on which the processed or interpreted data or information will be available for inspection by BOEM;

vii. A final edited navigation file on suitable storage medium of all data or sample locations in latitude/longitude degrees including datum used. The navigation for 2D lines should include line name and location for the first, last, and every tenth SP. For 3D surveys, please submit a navigation file for the acquired track lines that includes the location of the first and last SP and/or the corner locations for the area acquired. Contact the G&G permitting office for the specific navigation required for this permitted activity. The digital file is to be formatted in standard SEG-P1, UKOOA P1-90 or other current, standard industry format, coded in ASCII. A printed data listing and a format statement are to be included;

viii. Identification of geocentric ellipsoid (NAD 83) used as a reference for the data or sample locations; and

ix. Such other descriptions of the activities conducted as may be specified by the Supervisor.

C. The Final Report is a stand-alone document containing all the pertinent information regarding the permit.

Section IV. Submission, Inspection, and Selection of Geophysical Data and Information

A. The permittee must notify the Supervisor, in writing, when the permittee has completed the initial processing and interpretation of any geophysical data and information collected under a prospecting permit or a scientific research permit that involves developing data and information for proprietary use or sale. If the Supervisor asks if the permittee has further processed or interpreted any geophysical data and information collected under a permit, the permittee must respond within 30 days. If further processing of the data and information is conducted, it is the responsibility of the permittee to keep the most current resulting products available in the event the Supervisor requests the current status of data processing. At any time within 10 years after receiving notification of the completion of the acquisition activities conducted under the permit, the Supervisor may request that the permittee submit for inspection and possible retention all or part of the geophysical data, processed geophysical information, and interpreted geophysical information.

B. The Supervisor will have the right to inspect and select the geophysical data, processed geophysical information, or interpreted geophysical information. This inspection will be performed on the permittee's premises unless the Supervisor requests that the permittee submit the data or information to the Supervisor for inspection. Such submission must be within 30 days following the receipt of the Supervisor's request unless the Supervisor authorizes a later delivery date. If the inspection is done on the permittee's premises, the permittee must submit the geophysical data or information selected within 30 days following receipt of the Supervisor's request, unless the Supervisor authorizes a longer period of time for delivery. The data or information requested for inspection or selected by the Supervisor must be submitted regardless of whether the permittee and the Government have or have not concluded an agreement for reimbursement. If the Supervisor decides to retain all or a portion of the geophysical data or information, the Supervisor will notify the permittee, in writing, of this decision.

C. In the event that a third party obtains geophysical data, processed geophysical information, or interpreted geophysical information from a permittee, or from another third party, by sale, trade, license agreement, or other means:

1. The third party recipient of the data and information assumes the obligations under this section except for notification of initial processing and interpretation of the data and information and is subject to the penalty provisions of 30 CFR Part 550, Subpart N as administered by the Bureau of Safety and Environmental Enforcement (BSEE); and

2. A permittee or third party that sells, trades, licenses, or otherwise provides the data and information to a third party must advise the recipient, in writing, that accepting these obligations is a condition precedent of the sale, trade, license, or other agreement; and

3. Except for license agreements, a permittee or third party that sells, trades, or otherwise provides data and information to a third party must advise the Supervisor in writing within 30 days of the sale, trade, or other agreement, including the identity of the recipient of the data and information; or

4. With regard to license agreements, a permittee or third party that licenses data and information to a third party, within 30 days of a request by the Supervisor, must advise the Supervisor, in writing, of the license agreement, including the identity of the recipient of the data and information.

D. Each submission of geophysical data, processed geophysical information, and interpreted geophysical information must contain, unless otherwise specified by the Supervisor, the following:

1. An accurate and complete record of each geophysical survey conducted under the permit, including digital navigational data and final location maps of all surveys;

2. All seismic data developed under a permit presented in a format and of a quality suitable for processing;

3. Processed geophysical information derived from seismic data with extraneous signals and interference removed, presented in a format and of a quality suitable for interpretive evaluation, reflecting state-of-the-art processing techniques; and

4. Other geophysical data, processed geophysical information, and interpreted geophysical information obtained from, but not limited to, shallow and deep subbottom profiles, bathymetry, side-scan sonar, gravity, magnetic, and electrical surveys, and special studies such as refraction, shear wave, and velocity surveys.

Section V. Reimbursement to Permittees

A. After the delivery of geophysical data, processed geophysical information, and interpreted geophysical information requested by the Supervisor in accordance with subsection IV of this permit, and upon receipt of a request for reimbursement and a determination by BOEM that the requested reimbursement is proper, BOEM will reimburse the permittee or third party for the reasonable costs of reproducing the submitted data and information at the permittee's or third party's lowest rate or at the lowest commercial rate established in the area, whichever is less.

B. If the processing was in a form and manner other than that used in the normal conduct of the permittee's business at BOEM's request, BOEM will reimburse the permittee or third party for the reasonable costs of processing or reprocessing such data. Requests for reimbursement must identify processing costs separate from acquisition costs.

C. The permittee or third party will not be reimbursed for the costs of acquiring or interpreting geophysical information.

D. Data and information required under section IV.D.1. of this permit are not considered to be geophysical data or processed geophysical information and must be provided by the permittee at no cost to the Government.

Section VI. Disclosure of Data and Information to the Public

A. The BOEM will make data and information submitted by a permittee available in accordance with the requirements and subject to the limitations of the Freedom of Information Act (5 U.S.C. 552) and the implementing regulations (43 CFR Part 2), the requirements of the Act, and the regulations contained in 30 CFR Parts 250 and 550 (Oil and Gas and Sulphur Operations in the Outer Continental Shelf), 30 CFR Parts 252 and 552 (Outer Continental Shelf (OCS) Oil and Gas Information Program) and 30 CFR Part 580.

B. Except as specified in this section, or Section VIII, or in 30 CFR Parts 250, 252, 550, and 552, no data or information determined by BOEM to be exempt from public disclosure under subsection A of this section will be provided to any affected State or be made available to the executive of any affected local government or to the public, unless the permittee or third party and all persons to whom such permittee has sold, traded, or licensed the data or information under promise of confidentiality agree to such an action.

C. Geophysical data and processed or interpreted geophysical information submitted under a permit, and retained by BOEM, will be disclosed as follows:

1. Except for deep stratigraphic tests, the BOEM will make available to the public geophysical data 50 years after the date on which the data are submitted.

2. Except for deep stratigraphic tests, the BOEM will make available to the public processed geophysical information and interpreted geophysical information 25 years after the date on which the information is submitted. It is the policy of BOEM that the "date of submission" of geophysical data or information obtained under geophysical permits will be the date that the BOEM contracting officer or his/her representative signs the contract/delivery order or purchase order to reimburse the permittee for reproduction and, if appropriate, processing of the geophysical information. In the absence of a contract, delivery order, or purchase order, the date of receipt by BOEM is the date of submission.

3. BOEM will make available to the public all geophysical data and information and geophysical interpretations related to a deep stratigraphic test, at the earlier of the following times: (a) 25 years after the completion of the test, or (b) for a lease sale held after the test well is completed, 60 calendar days after the Department of the Interior executes the first lease for a block, any part of which is within 50 geographic miles (92.6 kilometers) of the site of the completed test.

D. All line-specific preplot or postplot plat(s), and navigation tapes, including but not limited to seismic survey traverses and shotpoint locations, submitted as a requirement of 30 CFR 580.12 or 580.51, will be considered as "PROPRIETARY INFORMATION." Such information will not be made available to the public without the consent of the permittee for a period of 25 years from the date of issuance of the permit, unless the Director, BOEM, determines that earlier release is necessary for the proper development of the area permitted.

E. All other information submitted as a requirement of 30 CFR 580.24 and determined by BOEM to be exempt from public disclosure will be considered as "PROPRIETARY." Such data and information will not be made available to the public without the consent of the permittee for a period of up to 25 years from the date of issuance of the permit as addressed in 30 CFR 580.71, unless the Director, BOEM, determines that earlier release is necessary for the proper development of the area permitted. The executed permit will be considered as "PROPRIETARY" except the public information copy which will be available to the public upon request.

F. The identities of third party recipients of data and information collected under a permit will be kept confidential. The identities will not be released unless the permittee and the third parties agree to the disclosure.

Section VII. Disclosure to Independent Contractors

BOEM reserves the right to disclose any data or information acquired from a permittee to an independent contractor or agent for the purpose of reproducing, processing, reprocessing, or interpreting such data or information. When practicable, BOEM will advise the permittee who provided the data or information of intent to disclose the data or information to an independent contractor or agent. BOEM's notice of intent will afford the permittee a period of not less than 5 working days within which to comment on the intended action. When BOEM so advises a permittee of the intent to disclose data or information to an independent contractor or agent, all other owners of such data or information will be deemed to have been notified of BOEM's intent. Prior to any such disclosure, the contractor or agent will be required to execute a written commitment not to sell, trade, license, or disclose any data or information to anyone without the express consent of BOEM.

Section VIII. Sharing of Information with Affected States

A. BOEM will make proprietary data, information, and samples submitted to BOEM by permittees to adjacent State(s) upon request by the Governor(s) in accordance with the following:

1. The person who submitted the data and information will be notified and will have at least 5 working days to comment on the action;

2. When the Regional Director advises the person who submitted the data and information, all other owners of the data or information will be considered to have been so notified; and

3. Before disclosure, the Governor must sign a written commitment not to sell, trade, license, or disclose data or information to anyone without the Regional Director's consent.

B. Disclosure will occur only after the Governor and the Secretary have entered into an agreement providing that:

1. The confidentiality of the information shall be maintained;

2. In any action commenced against the Federal Government or the State for the failure to protect the confidentiality of proprietary information, the Federal Government or the States, as the case may be, may not raise as a defense any claim of sovereign immunity or any claim that the employee who revealed the proprietary information, which is the basis of the suit, was acting outside the scope of the person's employment in revealing the information;

3. The State agrees to hold the United States harmless for any violation by the State or its employees or contractors of the agreement to protect the confidentiality of proprietary data and information and samples; and

4. The materials containing the proprietary data, information, and samples will remain the property of the United States.

C. The data, information, and samples available to the State(s) pursuant to an agreement will be related to leased lands.

D. The materials containing the proprietary data, information, and samples must be returned to BOEM when they are no longer needed by the State or when requested by the Director.

E. Information received and knowledge gained by a State official under paragraph (d) of this section is subject to applicable confidentiality requirements of:

1. The Act; and

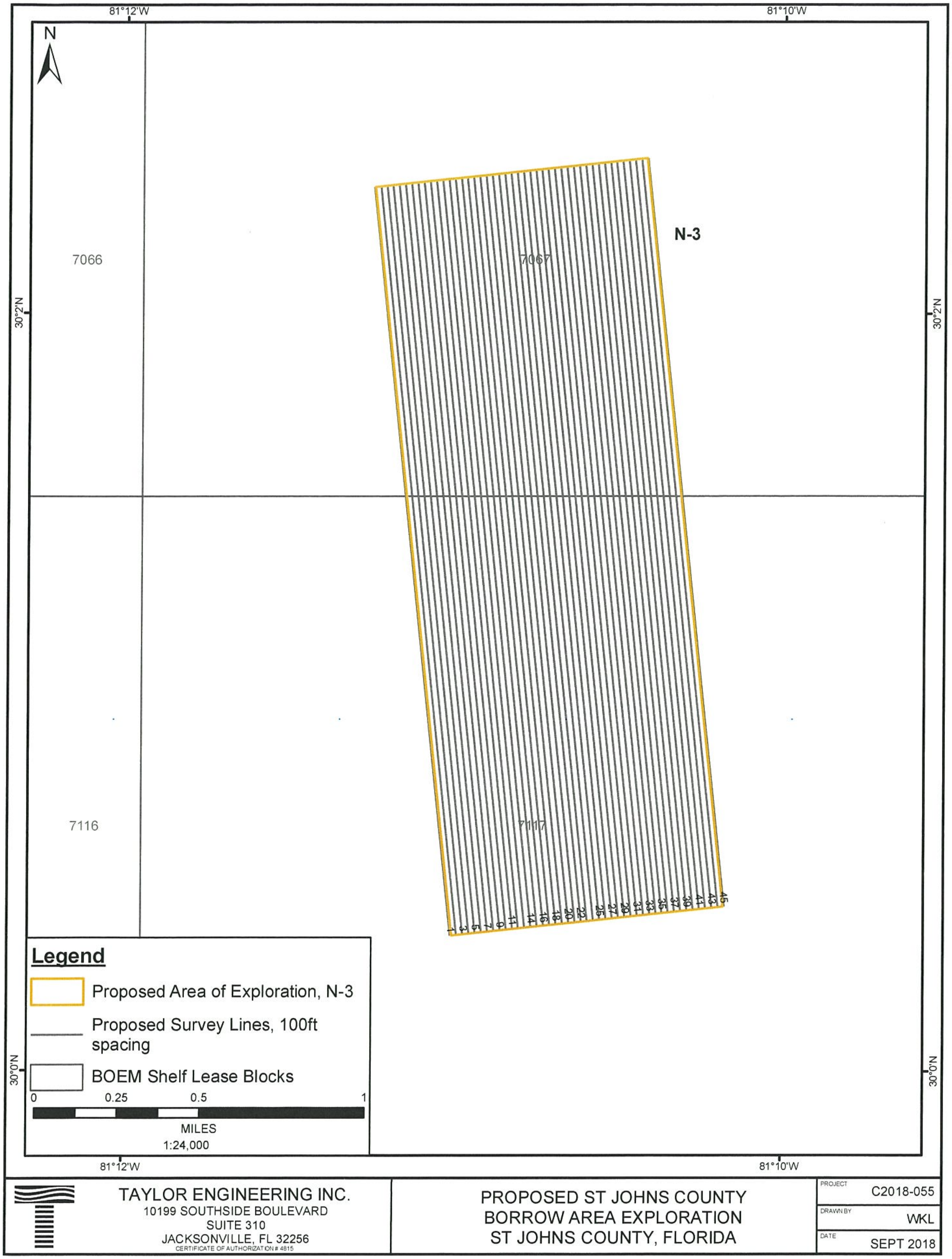
2. The regulations at 30 CFR Parts 580, 581, 582.

Section IX. Permit Modifications

The Department will have the right at any time to modify or amend any provisions of this permit, except that the Department will not have such right with respect to the provisions of Sections VI, VII, and VIII hereof, unless required by an Act of Congress.

IN WITNESS WHEREOF the parties have executed this permit and it will be effective as of the date of signature by the Regional Supervisor.

PERMITTEE:	**THE UNITED STATES OF AMERICA:**
[signature]	Matthew G. Wilson [signature]
(Signature of Permittee)	**(Signature of Regional Supervisor)**
Mike Trudnak, Taylor Engineering	Matthew G. Wilson
(Type or Print Name of Permittee)	**(Type or Print Name of Regional Supervisor)**
Senior Coastal Engineer	3-13-2019
(Title)	**(Date)**
10/3/18	
(Date)	


81°12'W
81°10'W
N
N-3
7066
7067
30°2'N
30°0'N
7116
7117
Legend
Proposed Area of Exploration, N-3
Proposed Survey Lines, 100ft spacing
BOEM Shelf Lease Blocks
0
0.25
0.5
1
MILES
1:24,000
TAYLOR ENGINEERING INC.
10199 SOUTHSIDE BOULEVARD
SUITE 310
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION # 4815
PROPOSED ST JOHNS COUNTY
BORROW AREA EXPLORATION
ST JOHNS COUNTY, FLORIDA
PROJECT
C2018-055
DRAWN BY
WKL
DATE
SEPT 2018

(Rev. 06/2015; ATL)

Standard Stipulations

In performance of any operations under the Permit and Agreement for Outer Continental Shelf Geophysical or Geological Exploration for Mineral Resources or Scientific Research, the Permittee shall comply with the following Stipulations:

1. Any serious accident, personal injury, or loss of property shall be immediately reported to the Regional Supervisor.
2. In compliance with Section III-B(6) of this permit, digital navigation data shall be recorded on suitable storage media in SEG-P1 or UKOOA P1-90 or other current, industry standard format coded in ASCII. This data shall be provided to BOEM with the permit Final Report.
3. As part of the requirements of 30 CFR 551.8(c) regarding status reports, before starting acquisition, you are required to notify BOEM of your survey start date. BOEM must also be advised of the end date immediately upon survey completion.
4. The final report is due within 30 days after the completion of operations as specified by Section III B of this permit.

Page intentionally blank