

## APPENDIX IX:

# Harbour Planning and Beneficial Use Strategy from a Cultural Resource Perspective: Mobile Harbour's Archaeology and Channel Maintenance

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## Summary

Mobile Harbour, Alabama is located in the Southeastern United States and is highly utilised for commercial shipping. With competition for dredging funds expected to increase in the near future, difficult choices will have to be made on how and where to prioritise available dredging funds, especially for specific navigation reaches within the Mobile Harbour Navigation project. The purpose of establishing a long-term Beneficial Use (BU) site in the upper Mobile Bay is to provide opportunities and alternatives to resume in-bay disposal practice options for the Mobile Bay navigation channel. One of the initial criterion discussed for BU selection involved cultural resources. Certain expectations are in the archaeological record due to the rich history of the area, thus United States Army Corps of Engineers (USACE) contractors developed a predictive model for potential submerged cultural resources based on the environmental characteristics and maritime history of Mobile Bay. The predictive model was utilised to help determine the potential for historic shipwrecks near the project location, as well as their likely design, composition and age. The remote-sensing data collected for this project were then processed in a manner that facilitates identifying potential submerged cultural resources. The predictive model provided a historical context for the interpretation of the processed remote-sensing data and a tool to help identify potential submerged cultural resources. The results were impressive and highlights include the identification of the remnants of an American Civil War-era blockade and potential shipwrecks associated with blockade running. These obstructions consist of shipwrecks, bricks, and wood pilings to contain the shipwrecks. USACE contractors also identified 14 magnetic anomalies within the Area of Potential Effect (APE) as potential submerged cultural resources. The success of this project in dealing with the cultural resource challenges cannot be overstated in terms of economy. Creative strategies utilised for this project, such as creating BU sites, are cost effective, sustainable and environmentally resilient.

## Introduction

Mobile Harbour, Alabama is located in the Southeastern United States (Figure 1) and is highly utilised for commercial shipping with a national ranking of nine by the Channel Portfolio Tool. Its estimated worth is US\$ 18.7 billion in economic value (AL State Port Authority 2012), with an industrial complex as well as a trade and shipping centre. Large shipyards, paper mills, cement and ready-mix concrete manufacturing plants, petroleum and asphalt refineries, lumber manufacturing plants and chemical plants are contained within its boundaries. Its harbour facilities include large oil terminals and the Theodore Industrial Park.

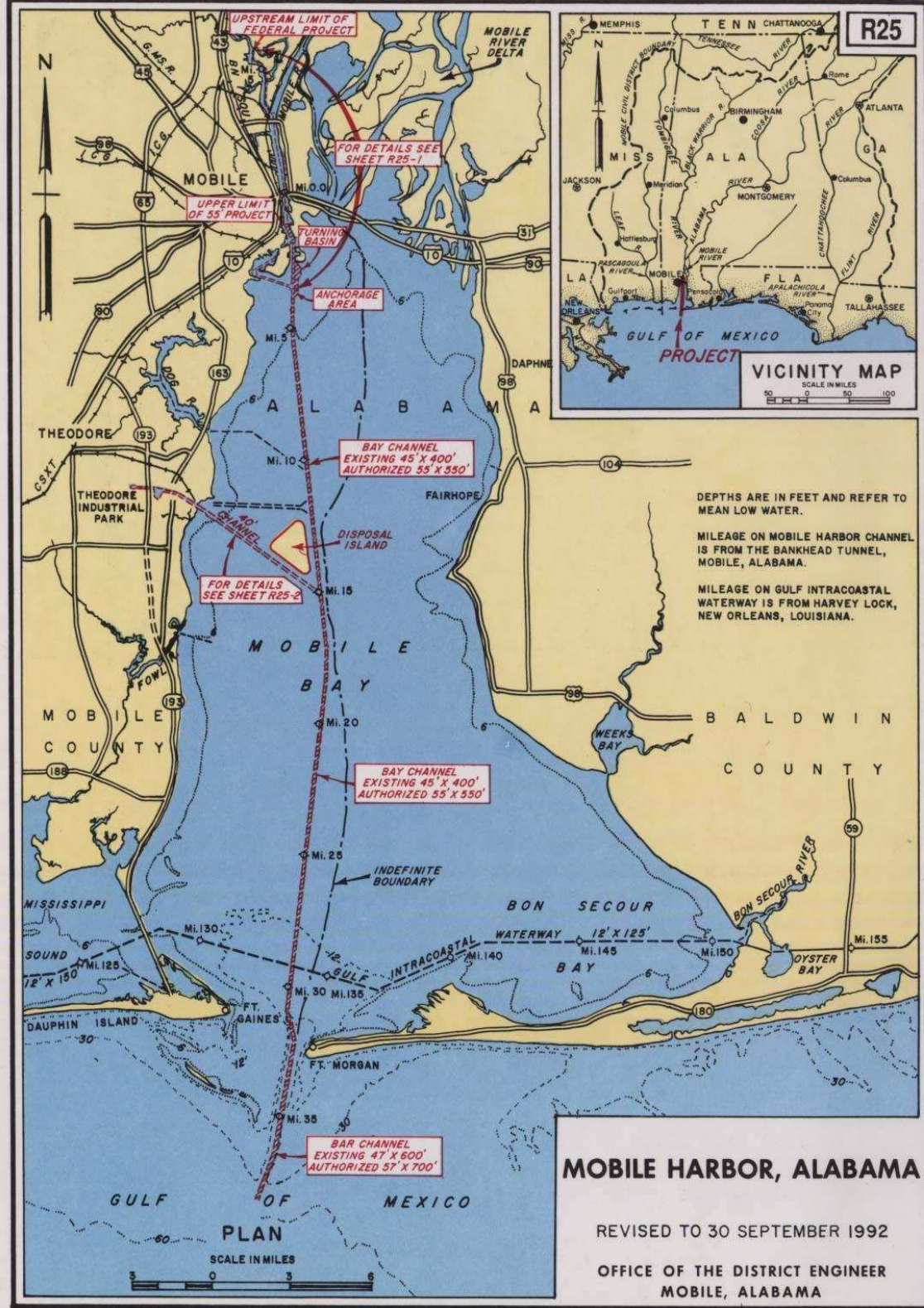


Figure 1: Location of Mobile Harbour, Alabama

Currently, the main Mobile Bay channel consists of a 45-foot by 400-foot channel from the mouth of the Bay extending 29 miles northward to the mouth of Mobile River. This stretch of channel is typically dredged using hopper dredging equipment with disposal of the material in the approved Mobile-North Ocean Dredged Material Disposal Site (ODMDS) (Figure 2). Approximately 4 million cubic yards of material is removed from the channel annually and transported as much as 40 miles to the ODMDS at an annual cost of about US\$ 12 million. Historically, maintenance dredging of this channel utilised cutterhead dredges with open-water disposal sites adjacent to the navigation channel. The open water disposal practice was no longer considered viable in the Water Resources Development Act 1986 which specified that dredged material from the Mobile Bay channel project shall be disposed of in the Gulf of Mexico. Therefore, in order to maintain the federally authorised Mobile Harbour navigation project, the Mobile District is restricted to using hopper dredging equipment and disposal of the material in the ODMDS.

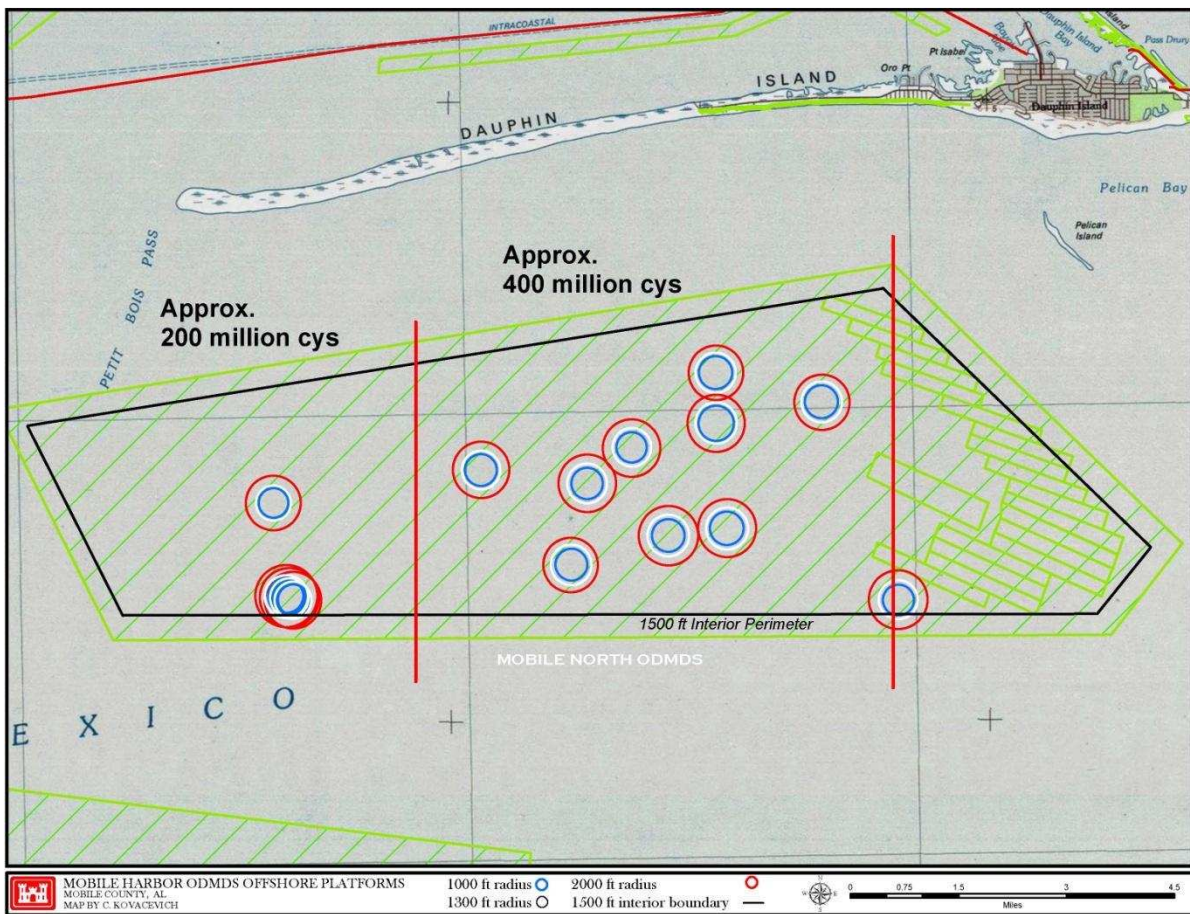


Figure 2: Mobile-North Ocean Dredged Material Disposal Site

With competition for dredging funds expected to increase in the near future, difficult choices will have to be made on how and where to prioritize available dredging funds, especially for specific navigation reaches within the Mobile Harbour Navigation project. A restriction that confines the use to hopper dredges limits USACE access to a smaller percentage of the available dredging fleet which results in scheduling and cost constraints. Hopper dredging in Mobile Bay typically does not clear the channel template as well as a cutterhead dredge; thereby increasing the dredge

cycle frequency. The hopper dredging in Mobile Bay is also restricted to no overflow, which drastically reduces the volume hauled per load. The cost of hauling the material to the ODMDS site, especially in the upper reaches of the Bay channel is for the most part inefficient given the average U.S. fleet hopper volume. Having the ability to utilise both hopper and cutterhead dredging equipment would provide options and flexibility on maintenance scheduling and cost. This flexibility would allow USACE to maintain the product quality provided to our customer and the Nation.

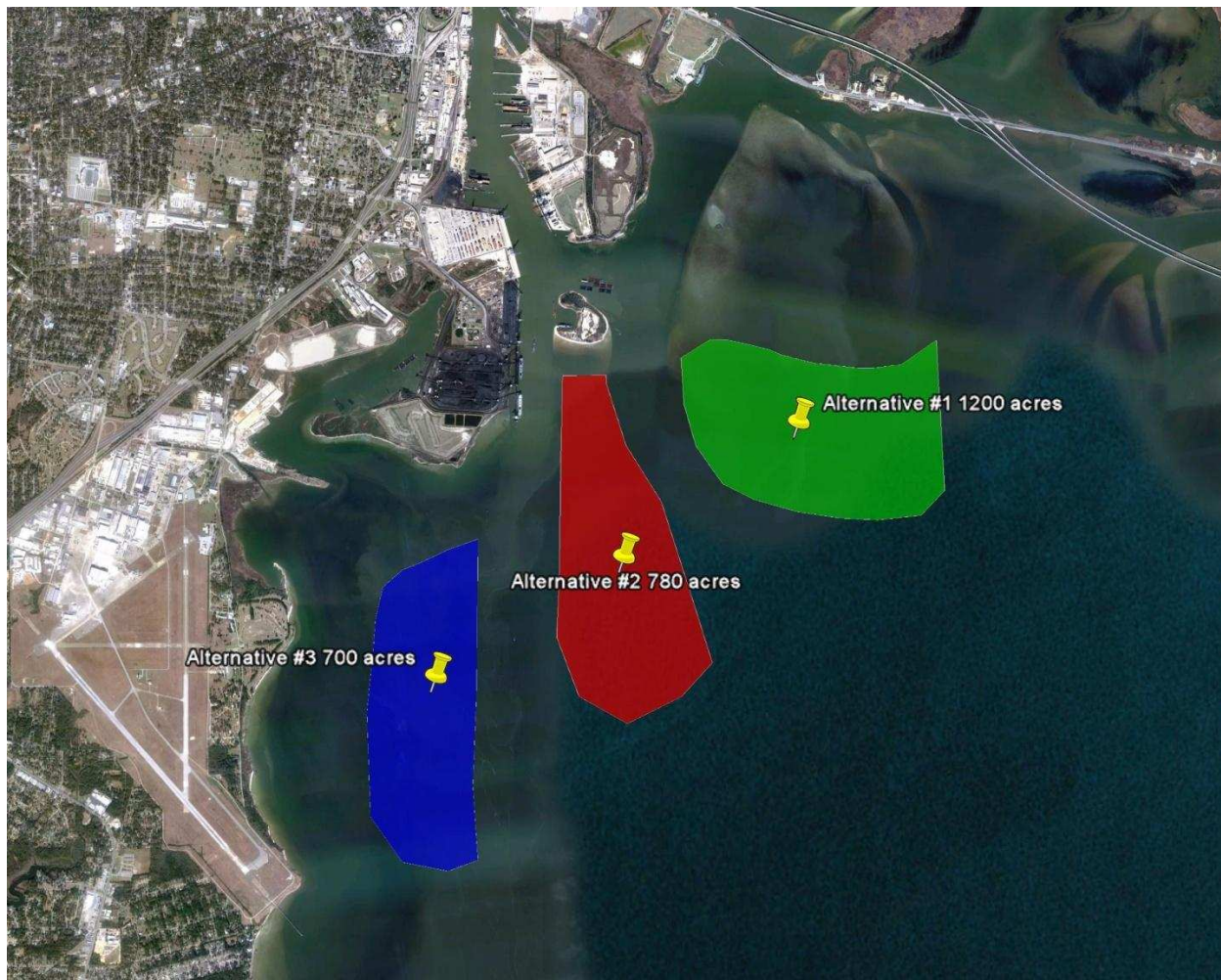
In addition to the operational constraints, hauling material from the Bay channel to the ODMDS permanently removes sediment from the natural system. It is believed that removal of sediment from the bay may have a correlation with bathymetric variations and accelerated shoreline recession that has been observed in certain portions of the bay. Re-establishing the option for in-bay disposal may contribute to the much needed conservation efforts for the protection of marshes, sea grasses, oyster reefs and other ecological resources. By reducing the amount of sediment disposal in the ODMDS, more of the bay sediment will subsequently be retained in the natural sediment transport system.

The purpose of establishing a long-term BU site in the upper Mobile Bay is to provide opportunities and alternatives to resume in-bay disposal practice options for the Mobile Bay navigation channel and provide wetland nourishment. Having this option will allow the utilisation of cutterhead dredge equipment with more cost effective disposal practices and provide the flexibilities to utilise a greater percentage of the available dredging fleet. However, this area of Mobile Bay is known to have a vast array of cultural resources and potential for submerged shipwrecks.

## Scoping Process

The scoping consisted of three parts for this project: archaeological archival and cartographic review of the three potential disposal locations, selection of the project location best suited to BU with the least impact to potential cultural resources and creation of a scope of work and research design that will best identify the potential adverse effects to cultural resources from project implementation.

One of the initial criterion discussed for BU selection involved cultural resources. Under the direction of an Interagency Working Group (IWG), established to guide the implementation of the BU site, three BU alternatives of placement locations for the Upper Mobile Bay area were developed (Figure 3). This was done early in the scoping process in order to identify known archaeological sites within the proposed alternatives and identify any fatal flaw obstacles. It was common knowledge that there were numerous Confederate Era obstructions in the upper Mobile Bay that needed consideration, thus prior to the IWG meeting, research was conducted by Mobile District Archaeologists to determine what was known about the area and what cultural resource surveys had been performed in these locations [Fedoroff, 2012]. Once this information was attained, the USACE Archaeologists co-ordinated with the Alabama State Historic Preservation Officer (ALSHPO) in order to determine if additional information was available.



*Figure 3: Areas reviewed for cultural resource criteria*

As in all reviews, documentation regarding submerged resources can be diverse with varying degrees of accuracy. One of the first complete documented studies of Mobile Harbour included data from sources such as newspapers, maps, official records, tax documents, histories, oral accounts and admiral logbooks [Mistovich and Knight, 1983]. These sources were consulted in addition to information available via the Alabama Historical Commission, historic nautical maps, Environmental Impact Statements, and archived USACE Mobile District reports. After careful review of the existing data, the following alternatives were ranked in terms of potential cultural resource impacts.

**Alternative #1** (1200 acres) Medium to high probability of impact in terms of proximity to known resources and potential for impacting unknown resources as this is a medium to high probability area with large coverage.

**Alternative #2** (780 acres) Highest chance of impact in terms of proximity to known resources and potential for impacting unknown submerged cultural resources as this is a high probability area.

**Alternative #3** (700 acres) Medium to high probability of impacting unknown submerged cultural resources based on historic records of shipwrecks in the area.

In addition to these areas being sensitive for cultural resources, Mobile Bay's large surface-to-volume ratio renders it highly susceptible to change by wind forces – particularly north winds which enhance river flow effects during ebb tides. This natural effect combined with poor early 19<sup>th</sup> century survey techniques could result in a shift of known submerged cultural resources. Until the appropriate level of maritime archaeological Phase I investigation was conducted on these areas in the Bay, nothing could be known with certainty. Furthermore, the U.S. Department of the Interior technical report on Historic Shipwrecks lists Mobile Bay as not only a high probability location for submerged resources, but additionally the Bay was listed as an area amendable to good preservation [Garrison et al., 1989]. Based on these findings, it was the recommendation of the USACE Mobile District Archaeologist that a Phase I Maritime Archaeology survey be completed of the Preferred Alternative based on the review data.

After a series of pre-planning meetings and co-ordination, the IWG decided a large scoping meeting was needed. On June 12, 2012 the Alabama State Port Authority and the USACE Mobile District hosted the meeting to discuss BU opportunities for dredged material in the upper Mobile Bay and the required archaeology work needed for such an undertaking.

Among the scoping meeting participants were representatives from the following agencies and stakeholders:

- Alabama State Port Authority
- USACE, Mobile District
- Alabama Dept. of Conservation and Natural Resources (ADCNR), State Lands Division
- ADCNR, Marine Resources Division
- Alabama Dept. of Public Health
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service, Habitat Conservation Division
- Mobile Bay National Estuarine Preserve
- Mobile Airport Authority
- Dauphin Island Sea Lab
- The Nature Conservancy

The criteria that were reviewed and agreed upon by the IWG for BU selection included:

- proximity to the Port
- potential to alter river and bay hydrodynamics
- potential real estate/riparian rights issues
- airfield buffer zone
- size (must be big enough to provide significant capacity)
- cost of construction
- cultural resources
- marine resources – Submerged Aquatic Vegetation (SAV), oysters, etc.
- water depth
- type of containment needed
- acceptability to all agencies

Besides determining the location and footprint of the BU site, the group addressed what features the final design should provide. It was recognised that various salt marsh vegetation and species of SAV's are prominent in the areas and should be considered when defining the end product. With this in mind, along with the anticipated airport buffer zone restrictions, the IWG came to the consensus that the BU site should concentrate on the creation/restoration of tidal marsh. A BU site with these features would be more valuable in self propagation and recruitment of SAV's and other desirable marsh vegetation common to the area and would minimise bird restrictions associated with the airport buffer zone. In addition, such a feature would also minimise conversion of natural bay bottom to other types of habitat that could result in impacts to Essential Fish Habitat.

Based on this decision, the group refined and prioritised the location and footprint of the sites previously selected (Figure 3). The site assigned the highest priority was the eastern-most site (green) due to its distance from Brookley Airfield and possible lower occurrence of cultural resources. If significant cultural resources could not be avoided, mitigation would be necessary. With this information in mind a larger footprint from the original 1,200 acres was developed in order to allow for avoidance of cultural resources identified during the maritime survey. Currently, this site is estimated at 2,531 acres. Because of the depth and hydrodynamic conditions that would have to be addressed, a medium priority was assigned to the middle area (red) which is estimated to be 780 acres. The western-most site (blue), estimated at 700 acres, was assigned lowest priority due to airport restrictions and proximity to the existing oyster beds. Given the assigned priorities, the cultural resource survey concentrated on the eastern-most site as the preferred location for the BU site (Figure 4). Further discussions also led to recommendations to consider breaking up the site into cells or partitions to promote rapid establishment of vegetation.

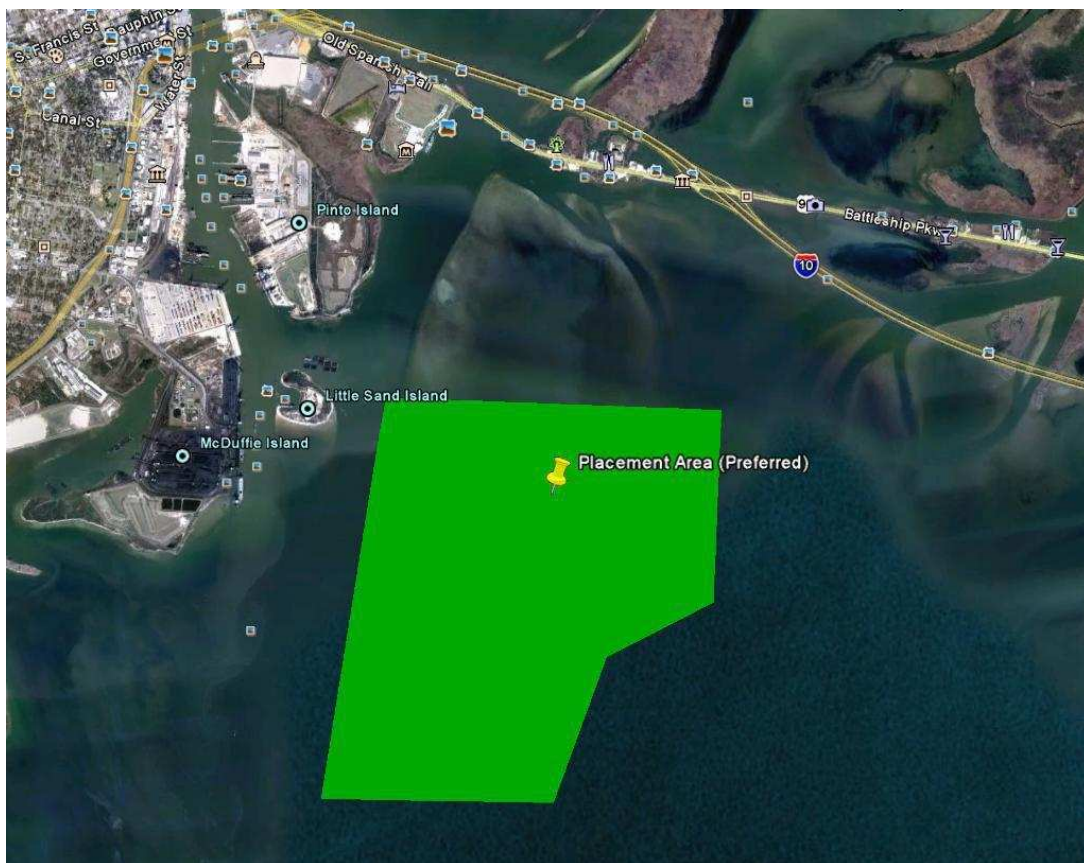


Figure 4: Preferred placement area surveyed for cultural resources

## Nature of Investigations Undertaken

As an agency of the United States Federal Government, USACE must consider the effects of the proposed action on historic properties, thus USACE contracted Southeastern Archaeological Research (SEARCH) to assist in meeting its obligation under Section 106 of the National Historic Preservation Act of 1966, as amended (89-665). SEARCH provided this assistance by identifying the presence/absence of potential submerged cultural resources and offering recommendations regarding the eligibility status of any resource for listing in the National Register of Historic Places. The project also was conducted in compliance with 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. In order to understand how a Phase I maritime cultural resources survey in this region is conducted, the historic events of the greater Mobile area must be recounted. The environment of the Mobile Bay is the foundation upon which archaeological research design is set and is considered a rich historical area.

### Archaeological Context of Mobile Bay (from Enright 2013)

The original Federal project to improve navigable channels in Mobile Bay, Alabama was adopted by the United States Congress in 1826 and the USACE Mobile District was tasked with the responsibility for maintenance of the federally authorised navigation project. However, Mobile Bay has been a destination for seafaring commerce since the first Europeans explorers arrived and noted the broad waters of Mobile Bay early in the 16<sup>th</sup> century.

The Spanish were the first to become familiar with the area, which they dubbed Bahia de Filipina. In 1519, Alonzo Álvarez de Pineda circumnavigated the Gulf of Mexico, passing through Mobile Bay and exploring the Mobile River, where he met local indigenous groups. Until 1559, the Spanish had only cursory contact with the bay area. In this year, Tristán de Luna sailed into Mobile Bay, but the colony he initiated was located at Pensacola. Many of the early Spanish explorers noted an abundance of timber, wildlife and other natural resources around the bay. They also noted Native American villages along the shore [Kirkland, 2008a].

Spain's efforts to maintain a foothold in the northern Gulf of Mexico were focused on Pensacola, and their plans to expand their influence in the region were frustrated by wars in Europe. As their focus shifted, France stepped in to fill the void, sponsoring exploration and settlement on the bay. Pierre Le Moyne d'Iberville and his younger brother Jean-Baptiste founded a settlement they called Mobile in 1702. The name was derived from the Native American name Mabila. This first site of the city was located near Twenty-Seven Mile Bluff on the Mobile River. The French later relocated the settlement to the mouth of the Mobile River due to flooding, disease and Indian conflict that plagued the original site. The new Mobile emerged as a coveted location along the upper Gulf of Mexico due to its large bay and connecting rivers. The city served as the capitol of French Louisiana until 1720 [Kirkland, 2008a]. Mobile was a beneficial location despite the shallowness of its channel, which necessitated that large vessels lighter their cargoes to port from Dauphin Island. The cargoes were landed at the King's Wharf, a wooden pier at the town. Fort Conde was then established to protect Mobile [Kirkland, 2012].

After the British defeated the Spanish and the French in the Seven Years' War (1756-1763), the British created the province of West Florida, which included most of Alabama south of Birmingham. Along with the provincial capital of Pensacola, Mobile was the only other sizable town in the territory, which included parts of Florida, Mississippi and Louisiana. Most of Mobile's population was military personnel who occupied Fort Conde. The trade that developed was reliant on deerskins harvested by Native Americans, who traded for muskets, textiles, hardware and rum.



A 130-tonne vessel arrived annually during the period of British rule to collect hides for sale in England. Immigrants laid out indigo, tobacco and rice plantations, although timber products proved to be the most profitable exports [Fabel, 2007].

The American Revolution brought change to Mobile. In 1778, James Willing and a US naval force laid waste to the plantations of West Florida. Spain was drawn into the conflict in 1779, siding with the Americans. Bernardo de Gálvez, the Spanish governor of Louisiana, besieged Mobile's Fort Charlotte (known to the French as Fort Conde) in 1780. In thirteen days the small British force surrendered. The following year, the territory of West Florida surrendered. In the negotiations at the end of the war, Spain acquired West Florida [Fabel, 2007].

Spain ruled West Florida, including Mobile, between 1780 and 1813. The trade of the period was similar to that of the British period. In the context of the War of 1812, American forces captured Mobile from the Spanish in March 1813. Alabama, including Mobile, became a state in 1819. In the years leading up to the Civil War, Mobile was the South's busiest port aside from New Orleans. Mobile was the commercial centre of Alabama and the state's only port. The population dramatically increased in this period as new settlers rushed into the territory to establish plantations and farms and otherwise develop this frontier region. In this period, cotton became the ruling agricultural crop. Slavery became a crucial element of society, and plantation agriculture was the economic backbone of the young state [Kirkland, 2012].

When Alabama seceded from the Union on January 7, 1861, Confederates were deeply concerned with protecting the port of Mobile from Union occupation [Bergeron, 1991:7]. The Confederacy maintained possession of the port of Mobile for most of the Civil War, primarily because the Union was hesitant to attempt an invasion and instead focused on other areas of the South. Across the bay, the Confederate Army worked to strengthen defences. They laid obstructions at various points in the bay, including torpedoes, piles and sunken ships, with the hope that they would arrest any potential naval invasion (Figure 5). The US Navy blockaded the port, as well as the entire Gulf Coast, in an attempt to interrupt the flow of trade [Bergeron, 1991:18].

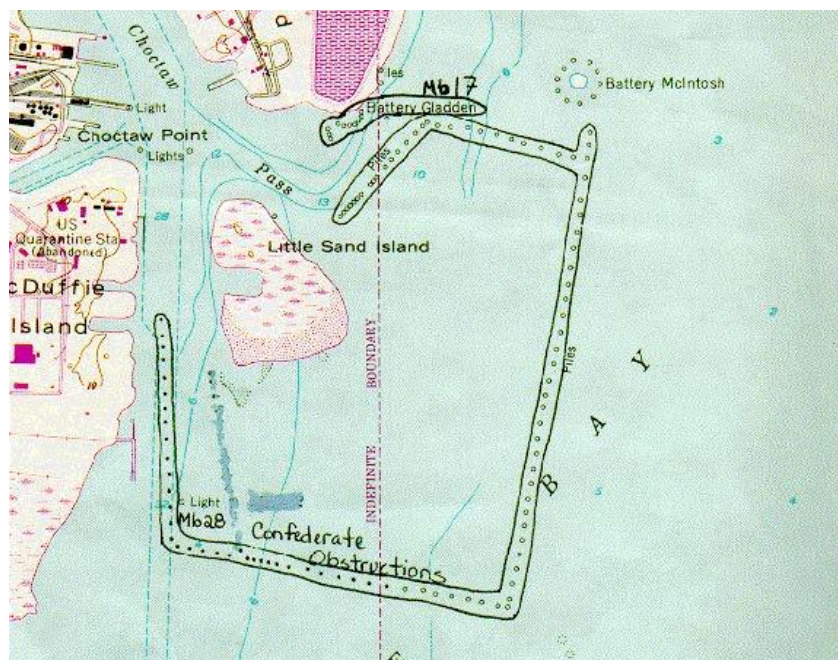


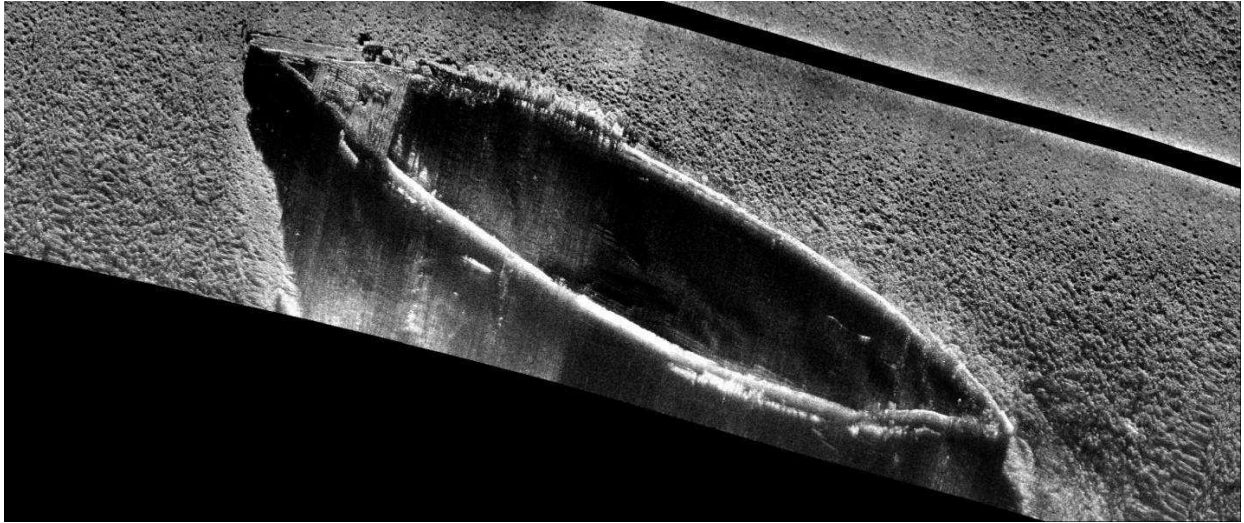
Figure 5: Archival map of Confederate Obstructions in Mobile Bay

After the Union established a blockade of Mobile and the southern coastline in April 1861, a small industry of blockade running arose. Often with great daring, these vessels attempted to slip by Union patrols to bring valuable cargo in and out of Mobile. Blockade runners made daring attempts to enter and exit the bay, but the US Navy's effort was largely successful, and the once-booming port was cut off from trade. Admiral David Farragut led a Union naval expedition against Mobile in August 1864. The resulting Battle of Mobile Bay was the last major naval engagement of the Civil War and a Union victory [Bergeron, 1991:18].

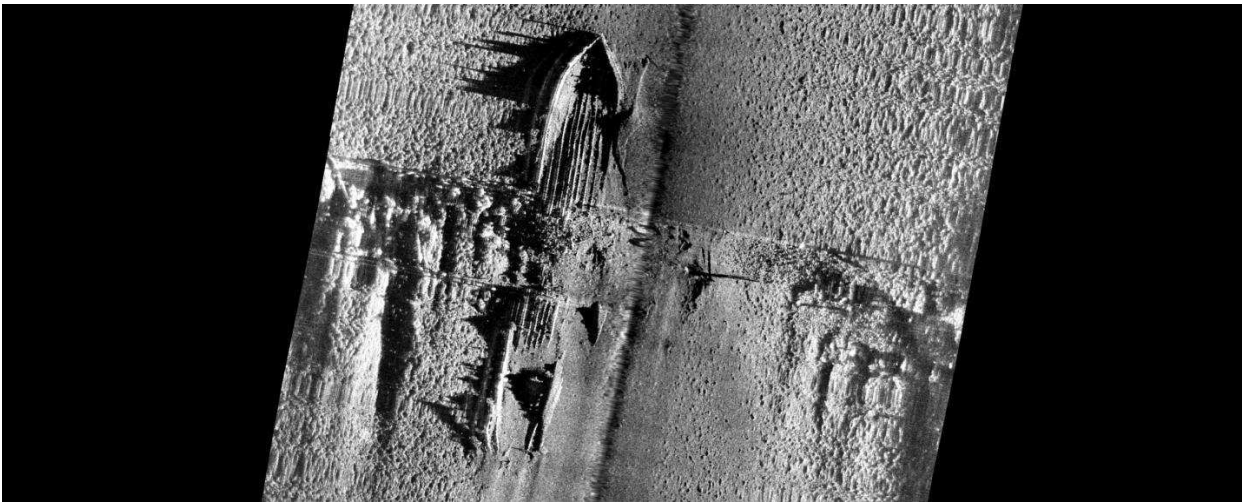
The port of Mobile was in no condition to participate in trade in the months following the Union takeover. After Union forces captured the bay, one of the first steps the new government took was to officially close the port to foreign trade. In truth, foreign trade had practically ceased due to the blockade. In May 1865, a fire destroyed the wharves at Mobile after an ordnance depot exploded, further increasing the poor situation of the port. The closure of the port was not lifted until after the war in August 1865 [Amos, 1990:118].

Certain expectations are in the archaeological record due to this history of blockades and blockade running, thus SEARCH developed a predictive model for potential submerged cultural resources based on the environmental characteristics and maritime history of Mobile Bay. The predictive model was utilised to help determine the potential for historic shipwrecks near the project location, as well as their likely design, composition and age. The remote-sensing data collected for this project were then processed in a manner that facilitates identifying potential submerged cultural resources. The predictive model provided a historical context for the interpretation of the processed remote-sensing data and a tool to help identify potential submerged cultural resources. SEARCH has improved upon previous remote-sensing data interpretation hypotheses to understand the characteristics that various vessel types and construction ages will produce in the remote-sensing record. SEARCH applied this research to the data collected during the remote-sensing survey, cognizant of those shipwreck types expected in Mobile Bay by the predictive model, to determine whether or not potential submerged cultural resources exist within the project location. SEARCH also paid special attention to remote-sensing targets that might represent potential submerged cultural resources other than shipwrecks, given the known Civil War-era obstructions within the project location. Finally, SEARCH reviewed databases of reported shipwrecks and previous maritime archaeological investigations in the vicinity of the project location to identify shipwrecks or previously documented magnetic/acoustic signatures potentially indicative of submerged cultural resources. These data were correlated with the current survey data to assist in identifying potential submerged cultural resources.

The results were impressive and highlights include the identification of the remnants of the Civil War-era blockade and potential shipwrecks associated with blockade running (Figures 6 to 9). SEARCH maritime archaeologists documented numerous navigation obstructions within the APE that had been placed in the upper bay during the American Civil War. These obstructions consist of shipwrecks, bricks and wood pilings to contain the shipwrecks. SEARCH also identified 14 magnetic anomalies within the APE as potential submerged cultural resources (Figure 10).



*Figure 6: Sidescan sonar image of the vessel Phoenix*



*Figure 7: Sidescan sonar image of the vessel Thomas Sparks atop the vessel William R. King*

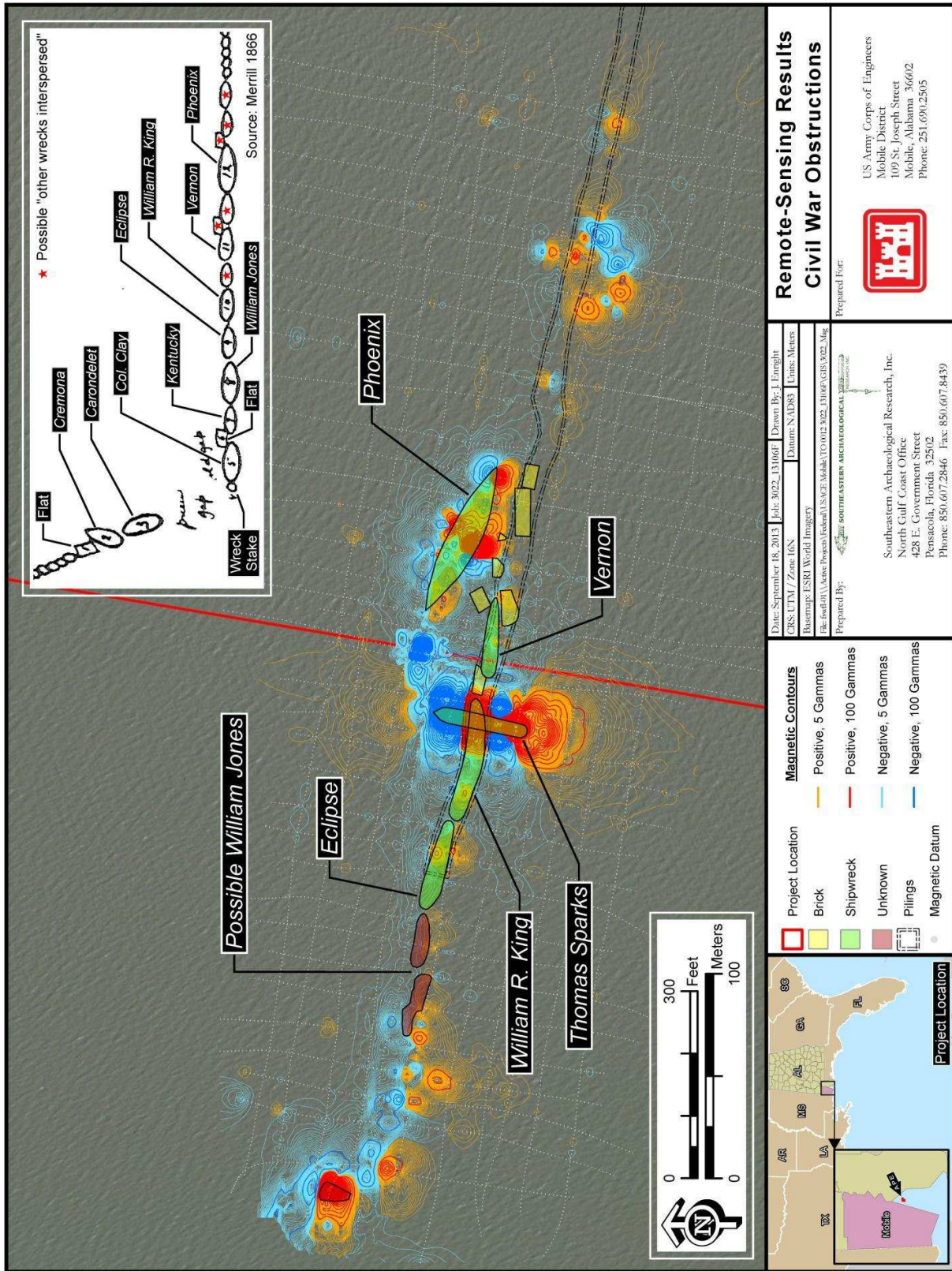
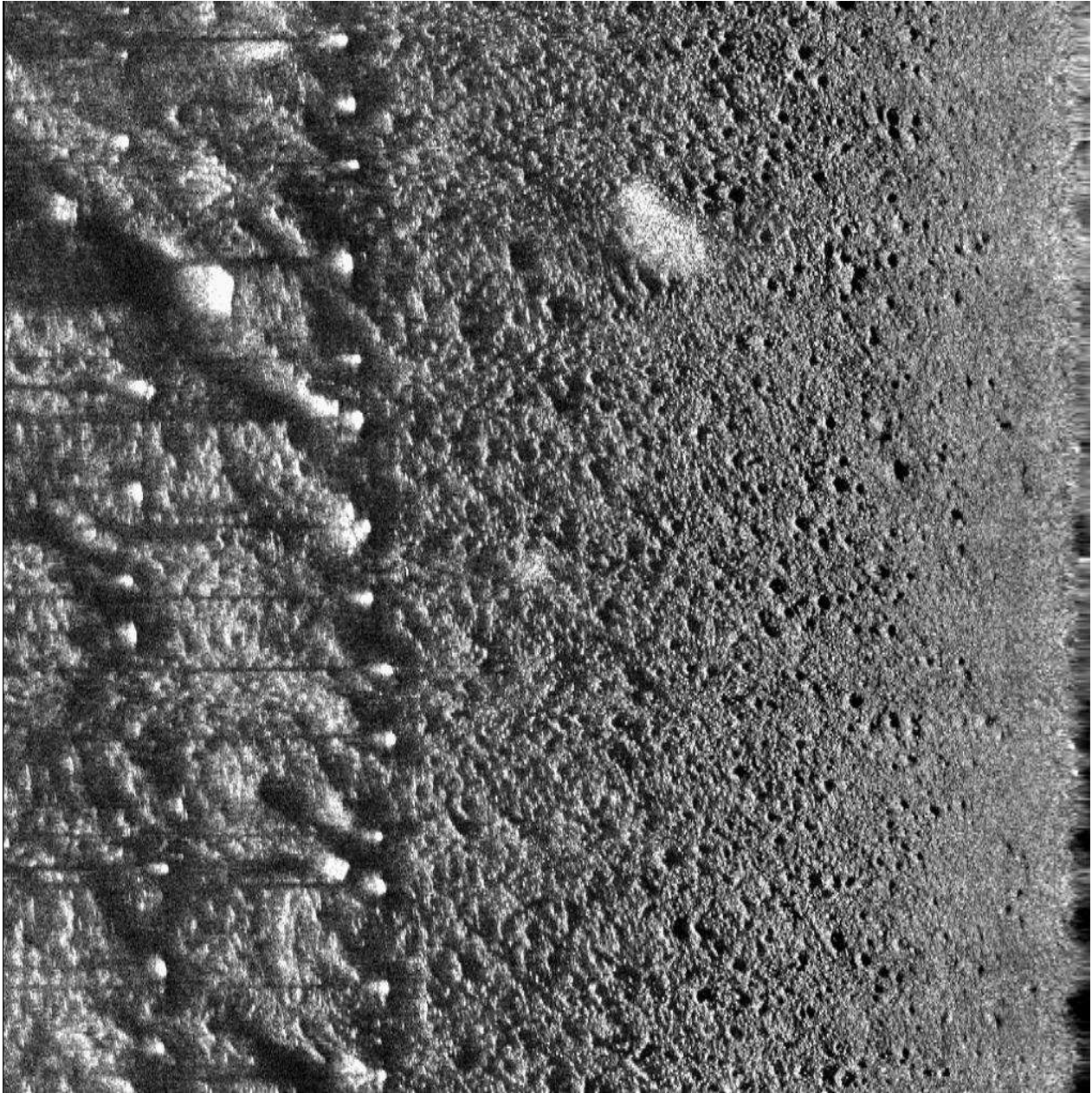


Figure 8: Remote sensing map of the Civil War-era obstructions in Mobile Bay



*Figure 9: Sidescan sonar example of extant blockade pilings*

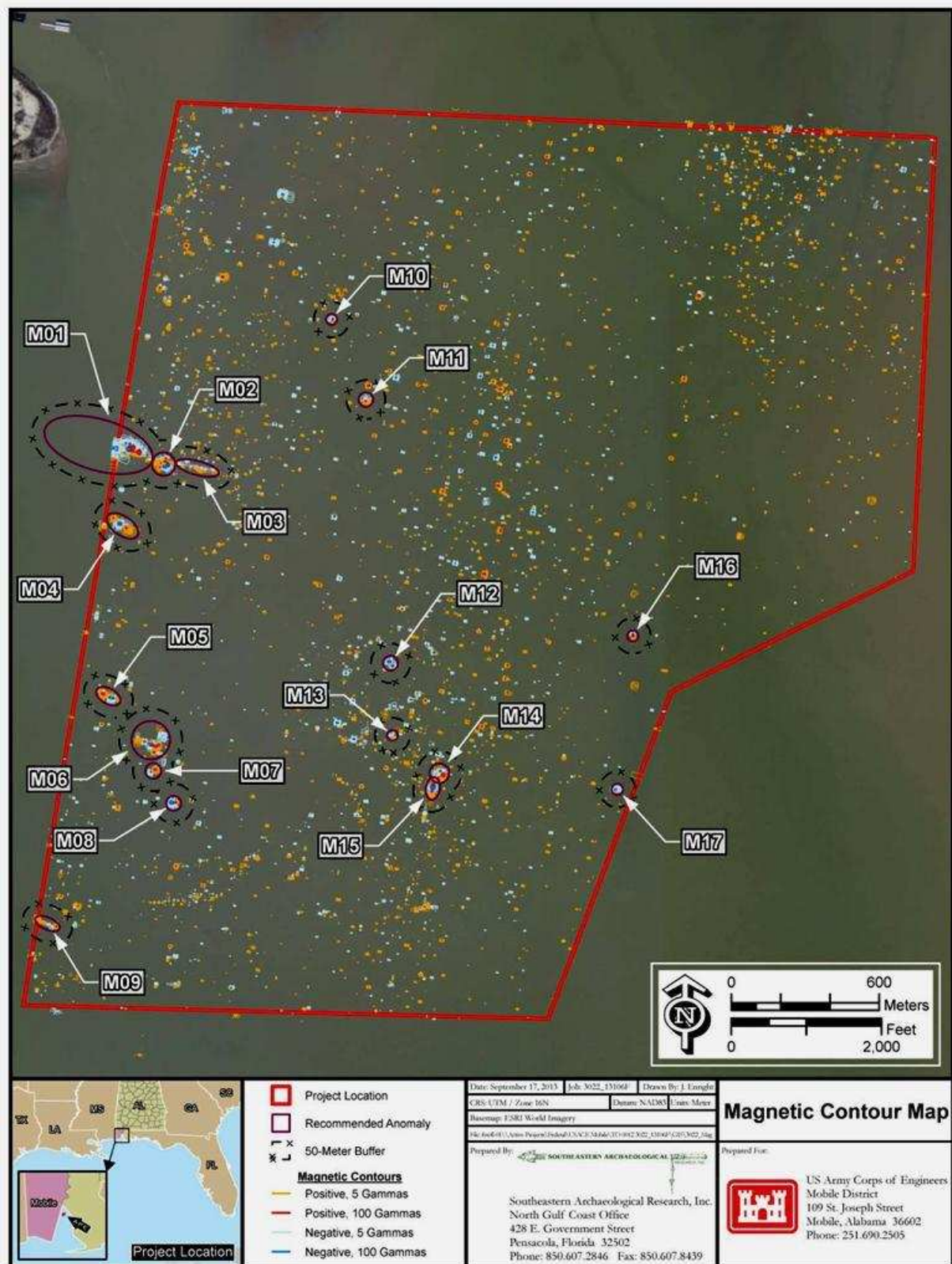


Figure 10: Anomaly map with avoidance buffers

## Selection and Implementation of Mitigation Measures

Based on the survey results, USACE recommended avoidance of the Civil War obstructions by a distance of 100 metres (328 feet) and avoidance of the 14 anomalies by a distance of 50 metres (164 feet) unless their sources are identified (Figures 10 and 11). If avoidance of any recommended anomaly is not feasible during construction, additional archaeological investigation to identify the anomaly source will be conducted to determine its eligibility for listing in the National Register of Historic Places. Additionally, an inadvertent discovery plan was developed in order to manage any cultural resources encountered during the project. This plan was developed and coordinated with the ALSHPO in order to help prevent impacts and protect the cultural heritage sites of Alabama.

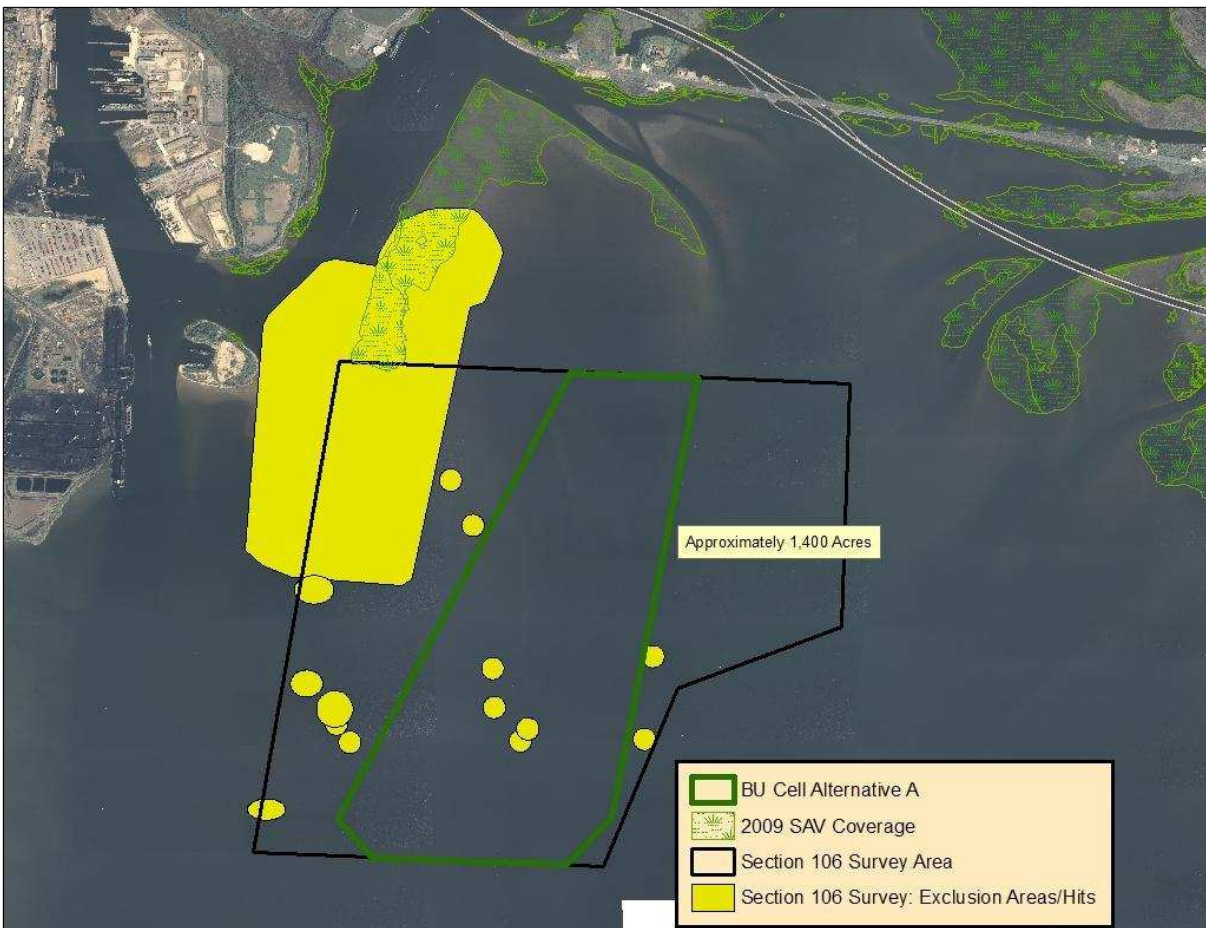


Figure 1: Proposed 1400 acre Beneficial Use area – in Green

## Lessons Learnt

Some of the key lessons learnt from this project entailed involving key stakeholders and review agencies in the scoping process early. Also, ensure you have multiple alternatives to choose from and conduct reconnaissance level research on those options to identify any fatal flaw obstacles to an alternative early in the planning process. Additionally, start with a large footprint in order to afford your project location some room to shift and avoid any potential impacts to cultural resources identified during the Phase I cultural resource survey. Finally, employ a tested sensitivity

model on both the testing locations and raw data in order to discern any potential patterns which could lead to more efficient resource identification.

Having a chance to get input and make the stakeholders aware of the need for cultural resources surveys creates a vested interest environment for cultural resource management and illuminates the process for conducting archaeological investigations for those who might be unfamiliar with these types of projects. By conducting some basic archival research prior to the larger scale study, USACE was able to provide funding partners with a better sense for the purpose and need of the Phase I archaeology investigations during the scoping meeting. Furthermore, this level of effort helped guide decision makers to expand the survey footprint to allow for design options if avoidance buffers became an issue.

Finally, employing a tested sensitivity model developed by an experienced archaeologist saved a lot of time and money. By employing this on both the testing locations and raw data, the archaeologists were able to discern patterns which led to efficient resource identification. For instance, in this project crab pots and old buoy lines were not only filtered from the data set, but a clear and tested expectation for shipwreck signatures were identified prior to the survey in order to expedite data processing and interpretations.

In conclusion, dredging and maintaining Mobile Harbour is wrought with many challenges. The success of this project in dealing with the cultural resource challenges cannot be overstated in terms of economy. Creative strategies such as creating BU sites are cost effective, sustainable, and environmentally resilient. BU is also duly suited for 'cell' development which aids in an avoidance plan for submerged cultural resources, as the BU site can be developed in multiple discontinuous cells. With this approach, the few sites within the APE can be avoided at a cost savings to the stakeholder, yet the living barriers created by the BU sites help preserve the resource in place for future generations.

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