

Archaeological Documentation and Reconstruction of the 17A Derelict Vessel, Back River, Georgia

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Abstract

Due to the widening of the Highway 17 Bridge over Back River, Georgia, the excavation of a late-nineteenth-century bark (barque) was carried out by personnel from Tidewater Atlantic Research (TAR) of Washington, North Carolina. Because of the amount of hull structure only accessible by diving and the limited amount of time the remaining elements of the wreck were exposed at low tide, traditional approaches to mapping and documentation would not produce sufficient data in the time allotted for the field investigation. The decision was made to employ the Vulcan Spatial Measurement System for mapping. This system would provide highly accurate, 3-dimensional points for use in modeling the shipwreck digitally. Data collected using the Vulcan system was imported into Rhinoceros, a 3-dimensional Computer-Aided Design (CAD) program. Using approximately 3,000 points in conjunction with photographs and measured drawings, TAR personnel were able to accurately record and reconstruct the surviving remains of the vessel.

Keywords: *shipwreck, 3-dimensional mapping, lasers, Rhinoceros, reconstruction*

1 INTRODUCTION

When the Georgia Department of Transportation planned to construct a replacement for the Highway 17 Bridge over Back River in Chatham County north of Savannah, Georgia, plans for new bridge construction indicated that on-site activity could damage or destroy the remains of a derelict vessel identified as the 17A Wreck. This vessel lies on the south bank of Back River immediately north of the extant Highway 17 Bridge and was first recorded by Tidewater Atlantic Research (TAR) personnel during a survey of Back River cultural resources in 1991. Personnel from the United States Corps of Engineers (USACE), Savannah District investigated the site again in 1993.

To ensure that design and construction data associated with the 17A Wreck would not be destroyed by the proposed project, GDOT issued a task order for a Phase III investigation of the wreck site to Post, Buckley, Schuh & Jernigan (PBS&J) of Atlanta, Georgia. The task order included provisions for excavation and documentation of the surviving wreck structure. The mitigation investigation was approved by the Georgia State Historic Preservation Officer and was carried out by personnel from TAR of Washington, North Carolina under terms of an agreement with PBS&J.

2 1991 INVESTIGATION

The USACE, Savannah District proposed closing New Cut between Back and Middle Rivers and locking open the tide gate at Hutchinson Island on the Back River in Savannah Harbor in 1990. In order to assess the potential impacts on cultural resources associated with altering the Back River environment, TAR was contracted by Gulf Engineers and Consultants, Inc. for the USACE, Savannah District, to conduct historical

and cartographic research. A remote sensing survey of Back River, and a reconnaissance of the shoreline to identify intertidal and terrestrial archaeological sites were included.

The shoreline survey focused on the low water shoreline from New Cut to the lower end of Fig Island. Ultimately the survey identified a total of thirty-one archaeological sites consisting of vessel remains and shoreline structures. Twenty-five of the shoreline sites were recommended for further investigation, including documentation and assessment prior to impacts resulting from the effects of closing New Cut and locking open the tide gate system.

One of those sites was the vessel designated GA BR 17. The wreck had been brought to the attention of USACE, Savannah District archaeologist Judy Wood by Robert Holcombe, curator of the Confederate Naval Museum in Columbus, Georgia. A Savannah resident contacted Holcombe claiming that the vessel remains were those of the Confederate gunboat CSS *Isondiega*. A December 1988 inspection of the wreck by Wood, Richard Leech, and local maritime historian Rusty Fleetwood confirmed that the hull was much larger and heavier built than contract specifications for CSS *Isondiega* identified by Holcombe. In addition, there was no evidence of the CSS *Isondiega*'s steam machinery.¹

During the 1991 TAR survey, GA BR 17 was identified as a heavily constructed sailing vessel that measured 121 feet in length and 26 feet 8 inches in width (see fig. 1). The construction features suggested that the vessel

¹USACE, *Archival Research, Archaeological Survey, and Site Monitoring, Back River, Chatham County, Georgia and Jasper County, South Carolina* (US Corps of Engineers, Savannah District, 1994) 153–4.

was built sometime in the late 19th or early 20th century. The vessel was determined to be potentially eligible for inclusion in the National Register of Historic Places. Recommendations included additional investigation and monitoring to identify impacts associated with the New Cut Closure Project and opening the Back River Tide Gate.¹

3 1993 INVESTIGATION

In February 1993 archaeologist Judy Wood initiated a program of more intensive documentation and monitoring of Back River cultural resources. Under Wood's direction, archaeological technicians Richard W. Leech, Jr. and Gregory D. Cook carried out a systematic investigation of sites located during the 1991 TAR survey. One of the wrecks Leech and Cook documented was GA BR 17. Wood and Cook also carried out research to shed light on historical activities and associations with the various wreck and derelict sites.² No excavation was undertaken but design and construction details of the exposed structure were recorded.



Figure 1. Recording exposed remains of the GA BR 17 derelict in 1991.

Although Wood, Leech and Cook concluded that the vessel was clearly not CSS *Isondiega*, they indicated that it was eligible for nomination to the National Register of Historic Places. Eligibility was based on meeting two of the criteria for consideration. The GA BR 17 derelict clearly preserved design and construction data associated with vessels engaged in trading in the Savannah region and possibly reflected the means of salvaging material from derelicts that were employed at the time the ship was abandoned. Because no impacts to the site were anticipated from the New

Cut Closure Project, no additional investigation was recommended.³

4 2008 RECONNAISSANCE

Prior to developing a plan for fieldwork, a reconnaissance of the wreck site was carried out on 13 and 14 February 2008 to identify environmental considerations and assess the condition of the wreck structure. During that investigation it was determined that the stern had settled into the river as a consequence of erosion. In addition to distorting the hull, the upper elements of the surviving stern structure were no longer exposed, even at the lowest tides. The port side of the hull was found to be even more heavily damaged than reported by Leech and Cook in 1993. The disarticulated fragments of the inner sternpost, sternpost, and rudder were no longer at the site and the remains of hanging knees on the port side of the hull had almost completely disappeared.

Based on the condition of the wreck observed in February, a plan of excavation and documentation was formulated. Because of the amount of the hull structure only accessible by diving and the limited amount of time the remaining elements of the wreck were exposed at low tide, traditional approaches to mapping and documentation would not produce sufficient data in the time allotted for the field investigation.

5 METHODOLOGY

The decision was made to employ the Vulcan Spatial Measurement System, which utilizes lasers to record 3-dimensional points for mapping. This system required no on-site grids or other reference structures that would be subject to disturbance by the intertidal elements. Because of the extent of damage to the port side of the vessel, the decision was made to focus on excavation and recording the starboard side from just to port of the keelson sisters to the extent of structure. The exceptions were the area of the port side where the hanging knees were located and in the stern where diagnostic features extended across the keelson.

The Vulcan Spatial Measurement System was first produced in 2002 by ArcSecond, Inc. (now Metris) for use in construction, architecture, manufacturing, product design, forensics, aerospace, virtual reality, and movie special effects.⁴ Several key advantages to this system include quick set-up, one person operation, ease of use, speed, the ability to lean the optical receiver to maintain

¹Gordon P. Watts, Jr., *Remote Sensing and Low Water Survey, Back River and New Cut, Chatham County, Georgia and Jasper County, South Carolina* (Tidewater Atlantic Research: Washington, NC, 1995) 113.

²USACE, *Archival Research, Archaeological Survey, and Site Monitoring, Back River, Chatham County, Georgia and Jasper County, South Carolina* (US Corps of Engineers, Savannah District, 1994) 7–8.

³USACE, *Archival Research, Archaeological Survey, and Site Monitoring, Back River, Chatham County, Georgia and Jasper County, South Carolina* (US Corps of Engineers, Savannah District, 1994) 163–4.

⁴Metris, Inc., “Sokkia and Arc Second Announce Strategic Partnership,” Metris, Inc., www.arcsecond.com/Info/PressReleases/news_pr_oct03_02.aspx.

a line-of-sight with the two transmitters, and ruggedness; each transmitter is water resistant.

This system is composed of three primary components: 1) two laser transmitters, 2) an optical receiver, and 3) a personal digital assistant (PDA) loaded with processing software. Each laser transmitter broadcasts a unique signature of light pulses. The optical receiver detects these pulses and sends the data to the PDA for software processing. Utilizing position calculation algorithms and triangulation principles, the timing information from the transmitter pulses is decoded and converted into three-dimensional position coordinates for the point being measured. This position is calculated at 50 times a second. A minimum of two transmitters is required to provide accurate, triangulated points. However, the system also works with one transmitter at much lower accuracy. The PDA software also provides a real-time map screen used to navigate to specific points and to check the general accuracy of the data. According to a Cost and Performance Report published by the U.S. Department of Defense, this system demonstrated accuracies of .006 meters at 45 m in an unobstructed environment.¹ The only observed disadvantage to this system is the low operating range of the laser transmitters between 45 and 50 m. However, this limited range is negligible when recording a historic ship or a near-shore shipwreck site.

6 EXCAVATION

Excavation and documentation on the Back River derelict was initiated on 31 March 2008. The first objective was to deploy a mooring anchor for work vessels. That anchor was positioned offshore and north of the sternpost and remained set for the duration of onsite work. With the bow on the mooring, the stern of the work vessel could be positioned with smaller anchors to support work on any location within the wreck. Next, primary reference datums were driven into the bottom at the bow and stern and a baseline over the keelson was deployed between the two primary datums. Once that was accomplished, a low water survey of the site was carried out to determine the most effective means of clearing the starboard side of the hull of sediment. Using hydraulic induction dredges powered by centrifugal pumps on the workboat, work could begin as soon as tidal conditions permitted (see fig. 2). With the tide high, efforts to clear the hull were focused on the bow. As the tide fell excavation proceeded aft. Material removed by dredging was deposited outside the hull.

When excavation progressed to the point that excavators could stay ahead of documentation, mapping was initiated. Each tide the hull was washed clear of

accumulated sediment and debris. Basic measured drawings were made of diagnostic features of the wreck. In addition, measurements of design and construction features were made to confirm subsequent laser mapping. Photographs were taken to record exposed sections of the hull. When recording and photography of the starboard side of the vessel was complete, the laser system was used to collect points identifying all exposed features.



Figure 2. *Clearing debris and sediment from the starboard side of the hull.*

The two laser transmitters were mounted on tripods in the marsh south of the wreck (see fig. 3). The system was calibrated using a combination of the datums and permanent references on the hull, such as well-secured bolts, spikes, and pins. Once calibrated, the laser was used to record a sufficient number of data points to define the three-dimensional characteristics of each feature. Working for a total of four days in between tides, the laser system was capable of recording thousands of three-dimensional data points. In the same amount of time, traditional methods would produce less than 10% of that number. As the tide ebbed, mapping proceeded aft and as it rose, mapping activity returned toward the bow.



Figure 3. *One of two laser transmitters mounted on tripods in the marsh.*

Unless there was an unusually low tide, the aft section of the wreck remained underwater. Once that section of

¹ESTCP Program Office, *Innovative Navigation Systems to Support Digital Geophysical Mapping* (Environmental Security Technology Certification Program, U.S. Department of Defense, 2004) 7–8.

the hull was cleared of sediment and debris, divers made measured drawings to document diagnostic features. The position of diagnostic features was established in conjunction with the baseline running between the primary datums. Although visibility at times during the tidal cycle was sufficient to permit close observation, measurement, and recording of features, meaningful photography proved to be impossible.

Once the stern structure was understood and diagnostic features were identified, the laser system was employed for mapping. With the transmitters mounted on tripods in the marsh and the system calibrated to reference points on the wreck, mapping underwater sections of the hull commenced. This required extensions to the wand and floating the data recorder in a waterproof vessel. A diver positioned the tip of the wand on the edges of timbers to be recorded. The command to record was transmitted to an individual holding the wand and the data was recorded by a third person operating the data recorder (see fig. 4). Using that system, the stern could be recorded in three dimensions without semi-permanent mapping references. Mapping of selected features on the port side of the hull was accomplished to provide insight into the configuration of wales, clamps, and hanging knees.

After the quality of laser data was confirmed by processing, sections of the bilge ceiling were removed. Exposed floors, futtocks, and the upper seams of the hull planking were recorded using measured drawings and the laser system. Those floors and futtocks exposed at low tide were also photographed. Removal of the starboard ceiling permitted spaces between the frames to be cleared of sediment and the relationship of floors and half floors to the keel and keelson to be recorded.



Figure 4. Mapping the stern.

A very limited number of artifacts from the undisturbed bilge was recovered for analysis and dating. These artifacts consisted primarily of a representative collection of fasteners that included spikes, bolts, nails, roves, and screws. Several fragments of ceramic vessels, examples of hinges, a lock plate, a chisel, and bilge ceiling wedges were also recovered from the bilge.

Wood samples for identification were also removed from the bilge ceiling, floors, futtocks, keelson, sister keelsons, and other features.

7 POST-PROCESSING

Following the excavation of the wreck, data was processed at a desktop computer. It was decided to use Rhinoceros to display the three-dimensional points and add the surfaces necessary to complete the reconstruction. Rhinoceros was chosen for two main reasons, its low cost and usability. Each point was assigned to a layer on the PDA in the field. Rhinoceros subsequently applied a color scheme to each layer, aiding in the immediate identification of each diagnostic feature of the wreck. Curves, control point curves, and lines connected each point on a particular feature to create profiles and a site plan. Once this was completed, surfaces were applied. This allowed TAR archaeologists to create a three-dimensional illustration of the ship, with a special focus on the more complex stern, mast steps, and bow (see fig. 5).

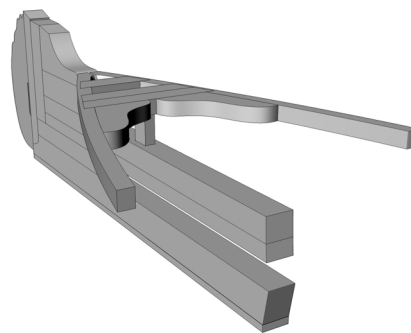


Figure 5. Reconstruction of the stern structure without frames, ceiling, and hull planking.

8 CONCLUSION

Newer technologies allow archaeologists to map both terrestrial and submerged sites with more accuracy and greater efficiency. The Vulcan Spatial Measurement System was chosen to allow TAR archaeologists to document the Back River derelict in both a time- and cost-effective manner. Using this system, thousands of points were precisely recorded within a matter of hours.

While the final product, including the three-dimensional models of the extant remains and reconstructions, enables future archaeologists to examine a site which no longer exists, further work needs to be undertaken to present this data to the public. As rendering programs become more user-friendly, advanced surfaces can be applied to the basic surfaces currently available in Rhinoceros. These models, in turn, can be placed in a museum kiosk or embedded in a webpage to disseminate information and promote public outreach.

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