7

Attention to Detail: Geophysical and Historical Investigations around Port Elliot, South Australia

Ian Moffat, Jason Raupp and David VanZandt

Located on the southeastern coast of South Australia's Fleurieu Peninsula, Port Elliot has a lengthy and interesting maritime history (Figure 55). The unusually high concentration of shipwrecks at Port Elliot is the result of its choice as the first sea port for the Murray River trade. This ill-considered choice led to the wrecking of seven vessels in eleven years before the port was abandoned in favour of the more sheltered Victor Harbour.

In an effort to locate the remains of vessels known to have come ashore in the area, reconnaissance geophysical surveys were conducted along sections of Horseshoe Bay and Middleton beaches. The results of two initial surveys provided anomalies that correspond to the historically recorded positions of two early vessels. Detailed geophysical investigation was used to resolve the spatial distribution and intensity of these targets in greater detail. This paper provides a brief overview of the region's history, reviews previously conducted archaeological research and presents the results of the geophysical investigations.

Historical Background

The development of the Murray River trade allowed goods from Australia's interior to be shipped around the world. Unfortunately the mouth of the Murray was dangerous and was therefore not a viable outlet for this trade. It was soon realized that the alternative to a port at the mouth was to establish one port on the river and one port on the sea, and connect the two installations overland via a railway (Stempel and Tolley 1965:24). South Australian Governor Henry Fox and Captain Thomas Lipson chose Port Elliot as a suitable location for the sea port in 1849.

The decision to locate the trade's outlet to the sea at Port Elliot was strongly opposed by the Legislative Council at Port Adelaide, who feared that the establishment of a southern port would disrupt the trade monopoly that they (Port Adelaide) enjoyed (Bull 1884:317-318). Many experienced seafarers in the region also criticized the decision to locate the port at Port Elliot harbour on the basis that it was too small in size, too exposed and far too shallow. Instead they suggested a safer location at Victor Harbor (Lin 2001:66). In the end, officials felt that the cost of adding the extra 16 km to the railway construction was too costly and unnecessary, and therefore stuck to their original decision to use Port Elliot.

Figure 55. Location of Port Elliot on the Flerieu Peninsula, South Australia (Anon 2006)

In 1851 construction began on a rail line to connect the newly established river port of Goolwa to Port Elliot. The horse-drawn tramway opened for traffic in December 1853 and was acclaimed as the first railway in South Australia and the first public railway on iron rails in Australia (Yelland 1983:49). In conjunction with the railroad's construction in 1853, the first steamers began plying the waters of the Murray, and by 1857 the river trade was booming.

Construction of a jetty for Port Elliot began in 1852 and was completed in 1853. This 100 ft (30 m) long structure was seen as a folly since the water depth at its end was only 6 ft (2 m), and it soon became apparent that large ships could not moor to the jetty. Therefore cargos had to be lightered to ships waiting in deeper water, which added to shipping costs. Though plans to lengthen the structure an additional 100 ft (30 m) were drafted, they were never implemented (Pomery 1997).

Ships calling at Port Elliot consisted principally of sailing vessels including barques, brigs, cutters, and schooners from 40 to 150 tons and periodically steamers, usually about 500 tons. Outbound cargoes were principally wheat, barley, and flour from both local production and that transported down the Murray River by paddle steamers to Goolwa and overland to Pt. Elliot. Inbound merchandise included stores and building materials. While some of these cargoes were for use in the South Coast region, most were intended to be forwarded by steamers from Goolwa to interior settlements (Tolley 1965:22).

In a further attempt to improve shipping conditions at Port Elliot, a breakwater was proposed to enhance the shelter provided by Pullen Island. Unfortunately funds allocated for the project were insufficient and only half of the required distance was constructed. The government also attempted to improve anchorage by installing a series of fixed moorings between 1852 and 1854. These did not fulfil their desired function since they were improperly placed, inadequately maintained and underrated (Perkins 1988:31-33). The deficiencies of these moorings directly resulted in the loss of several vessels during the port's short working life.

Use at Port Elliot peaked in 1855 but declined after 1857 when steam-driven vessels increasingly risked passage through the treacherous Murray Mouth to avoid using Port Elliot. It was not long, however, before the shifting channels and sand bars claimed PS *Melbourne* in the mouth in 1859 and the Murray Mouth was rendered off limits. Although this wreck led to increased activity for Port Elliot throughout the early 1860s, the loss of two more vessels in the port and the lack of room for expansion once again brought to light its inadequacies (Parsons 1967:8). In 1864 an extension of the rail line to a jetty built at Port Victor (later renamed Victor Harbor) was completed (Sexton 1975:38). Though Port Elliot did compete with Victor Harbor for a few years it quietly ceased operation as a port in1866 (Page 1987:64).

Port Elliot's failure as a port was entirely based on its small size, shallow depth and exposed nature, which prevented it from handling the volume of trade that it was expected to carry (Coroneos 1997:24). Had the port been made relatively secure, with a slightly longer breakwater, stronger moorings and improved jetty, it might have adequately carried a limited coastal trade (Sibly 1972:102).

Previous Research

Over the course of 11 years seven ships were lost around Port Elliot's Horseshoe Bay. These include: the schooner *Emu* in 1853; the schooner *Commodore*, the brig *Josephine Loizeau*, the cutter *Lapwing*, and the brig *Harry* in 1856; the schooner *Flying Fish* in 1860; and the brigantine *Atholl* in 1864.

Port Elliot has been the subject of several investigations by both local history enthusiasts and archaeologists. In the 1960s local historians located and recovered several anchors from the Horseshoe Bay. These are now on display near the original jetty and form part of an interpretative trail which provides information about Port Elliot's wrecks (Figure 56).

Figure 56. Anchors recovered from Horseshoe Bay now on permanent display near the original jetty (Jennifer McKinnon 2006)

Australia's earliest volunteer archaeology group, the Society for Underwater Historic Research (SUHR), worked with the Fleurieu Dive Club to carry out the first extensive investigations of the shipwrecks in the bay and surrounding waters. The results of their historical research and attempts to locate and identify wrecks were documented and published by John Perkins (1988) as *The Shipwrecks of Port Elliot 1853-1864*.

Professional archaeological investigation was conducted in 1997, when Cosmos Coroneos undertook a survey of the shipwrecks of Horseshoe Bay while conducting a study of all known shipwrecks in the region. The results of that survey were published in 1997 as a Special Publication of the Australian Institute for Maritime Archaeology (AIMA) entitled *Shipwrecks of Encounter Bay and the Backstairs Passage*.

Of the seven wrecks that are known to have occurred in this area, only three have been located. The brig *Harry* is the best preserved and represents the only wreck to be identified through historical sources, archaeological remains and wood sample analysis. Two other shipwreck sites have been inspected, but the data obtained did not produce definitive identifications. The lack of archaeological investigation in this area is in part due to the same rough and unpredictable conditions that initially caused these wrecks and make investigations of their remains extremely difficult.

Survey Design

Of the seven vessels wrecked in and around Horseshoe Bay, the schooner *Emu* and cutter *Lapwing* were of particular interest for this survey. Both of these vessels wrecked during violent storms and their remains were eventually washed ashore, making them excellent targets for terrestrial geophysical investigations.

The 21-ton wooden schooner *Emu* measured 39 ft (11.9 m) in length, 11.5 ft (3.5 m) in beam and had a draught of 5.9 ft (1.8 m). Built at Leschenault (Bunbury), Western Australia in 1847, the tiny two-masted schooner was wrecked in 1853 during a heavy gale (Perkins 1988:8 and Coroneos 1997:55). A search of the surrounding region discovered the hull, broken in two and driven on shore, with articles of various kinds scattered along the shore all the way to Middleton Beach (Parsons 1981:27). Some experienced seafarers agreed that *Emu* was “nothing more than a flat barge, laden to the waters edge and that it appears she was unable to fetch in under shelter,” and that it appeared “she was driven onto Frenchman’s Rock where she was split in two and carried broadside by the breakers onto the beach” (*Adelaide Observer* 1853 and Perkins 1988:6). The disaster resulted in the death of the captain and three crew members. The loss of *Emu* eventually was attributed to the ferocity of the storm and not to the deficiencies in the protection afforded at Port Elliot (Sibly 1972:76).

Lapwing was another vessel of interest for this survey due to its early construction, long working life and the existence of records stating that it also became a total loss ashore (Perkins 1988:17). Built in Mevagessey, Cornwall (United Kingdom) in 1808 for use as a revenue cutter, the 63-ton oak-built and copper-fastened cutter measured approximately 60 ft (18.3 m) long, with nearly 10 ft (3 m) of beam and a depth of nearly 10 ft (3 m) (*SAPP* 1856:1-5 and Perkins 1988:19). After a long career in the revenue service, *Lapwing* was brought to Australia for use in the inter-colonial trade. *Lapwing* was loading timber for the Gawler Town Railway at the time of its loss, which was the result of an attempt to save another vessel that had been attached to its mooring during the storm (*Adelaide Times* 1856a:3d). Due to the violence of the storm, *Lapwing* completely broke up and in the words of its captain, “There is scarcely a portion of her left large enough to make a handspike of. The beach was strewed (*sic*) with various parts of the wreck for a long distance and presented a wretched appearance” (*Adelaide Times* 1856b:2d).

Survey areas were chosen based on historic accounts of the loss of each of these vessels. The first area chosen was the eastern third of Horseshoe Bay Beach, where a Harbour Master’s 1856 map of the anchorage shows a projected point onto which *Lapwing* came ashore (Figure 57). The other area was Middleton Beach, where an historic photograph displays remains of what is thought to be *Emu* eroding from the dunes.

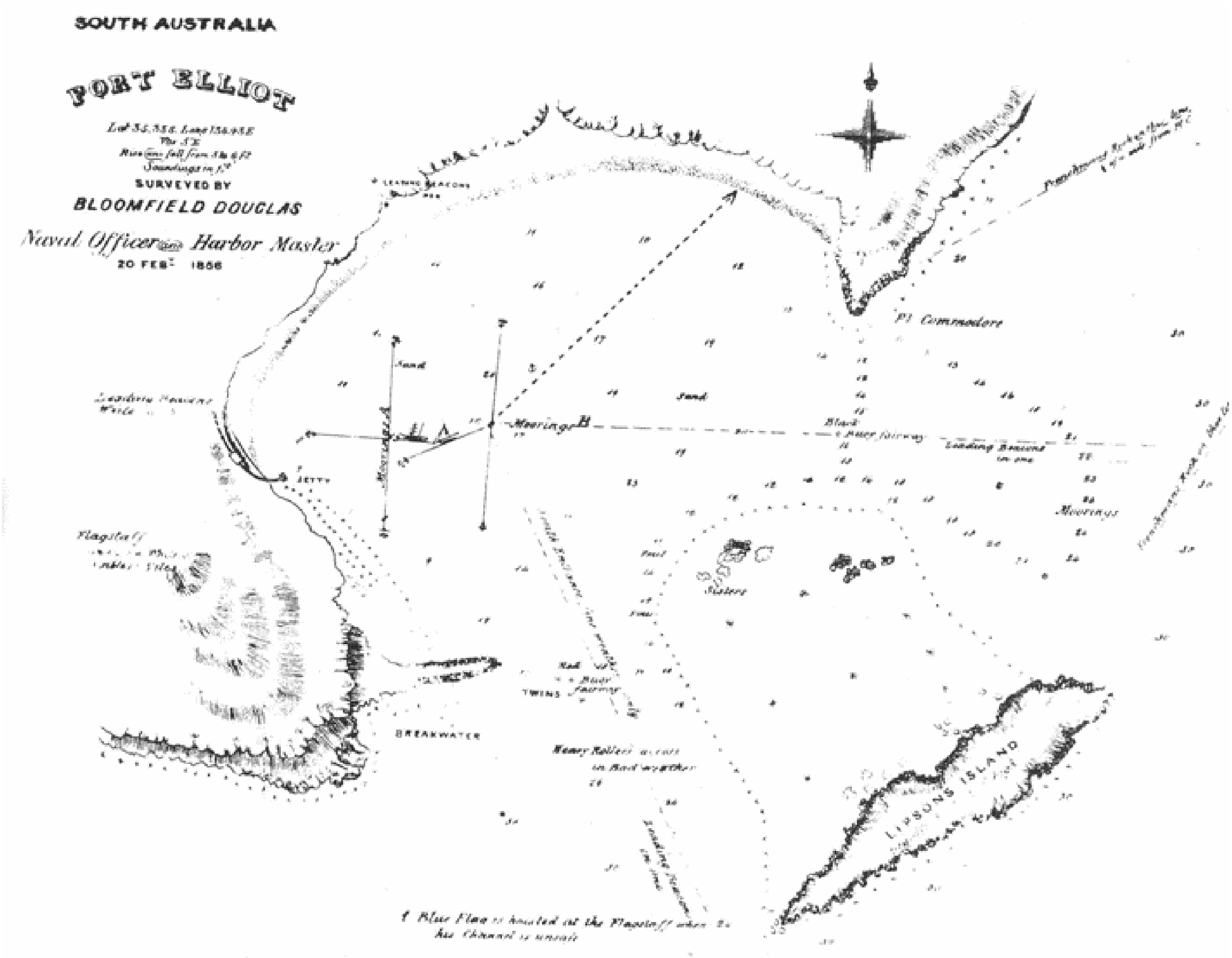

Figure 57. 1856 Harbour Master's map showing *Lapwing*'s projected path and approximate grounding location (Perkins 1988)

Reconnaissance Geophysical Investigations and Results

Horseshoe Bay

The Horseshoe Bay reconnaissance investigations were conducted with a Geometrics G-856AX proton precession magnetometer for collecting magnetic data at five second intervals and a Garmin 12XL navigational global positioning systems (GPS) unit for providing positional data. Survey data was collected at a line spacing of approximately 2 m with lines extending for approximately 500 m. The data collected was then processed using Magpick software to produce a map of magnetic intensity. This map was then overlain onto an aerial photograph using Mapinfo software (Figure 58).

The survey produced one significant anomaly. The location of this anomaly corresponded with the position depicted on an historic map drawn by the harbour master relating to the loss of *Lapwing*. At approximately 4000 nanoteslas (nT) above background, the size of the anomaly was surprisingly large given the expected preservation potential of the wreck and its known construction details. Any anomaly should have yielded a much smaller magnetic disturbance. On the basis of this result and the significance of the shipwreck, excavation of the anomaly was preliminarily planned. Prior to excavation, a decision was made to undertake further detailed geophysical investigations to refine the nature and location of the anomaly. It was hoped that by refining the target, limited time and resources might be saved.

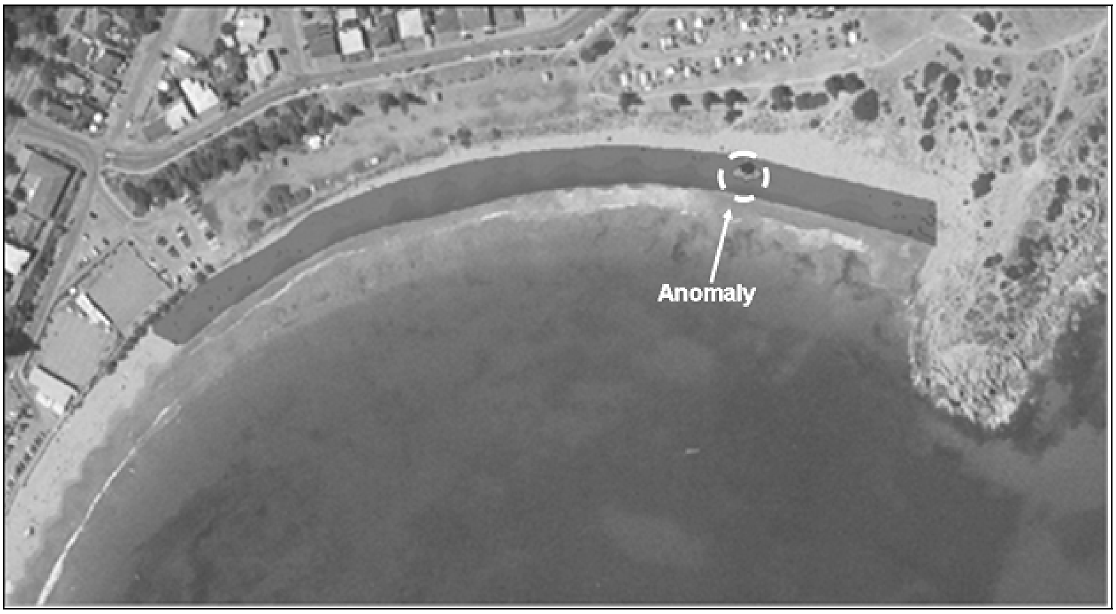

Figure 58. Horseshoe Bay reconnaissance magnetometer map overlain on an aerial photograph. The anomaly is highlighted (Ian Moffat 2006)

Middleton Beach

The Middleton Beach reconnaissance investigation survey area was chosen based on historical documentation which indicated that the broken hull of the schooner *Emu* had been washed onto the beach near the sand dunes in this area (Figure 59).

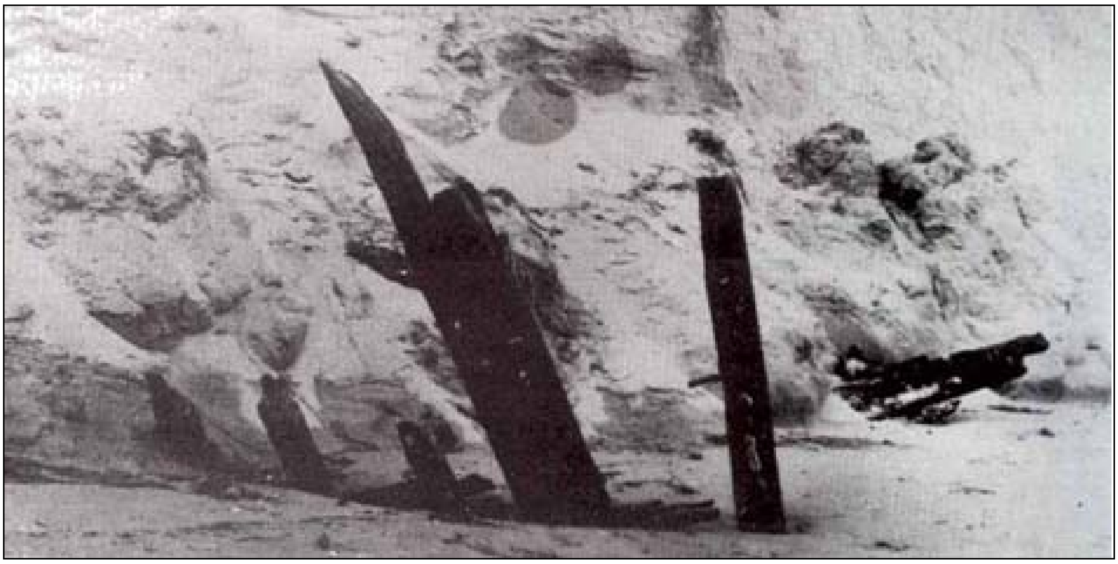

Figure 59. Historic photograph of Emu remains eroding out of dunes (Perkins 1988:8)

The survey was conducted using the same geophysical equipment as that used for the Horseshoe Bay survey. The survey data was collected at a line spacing of approximately 3 m and the area surveyed covered approximately 1800 m by 80 m of the beach. The data collected was then gridded using *Magpick* software to produce a map of magnetic intensity (Figure 60). Though this map produced many magnetic anomalies which could possibly represent the scattered remains of the schooner, only the most prospective was selected for detailed investigation.

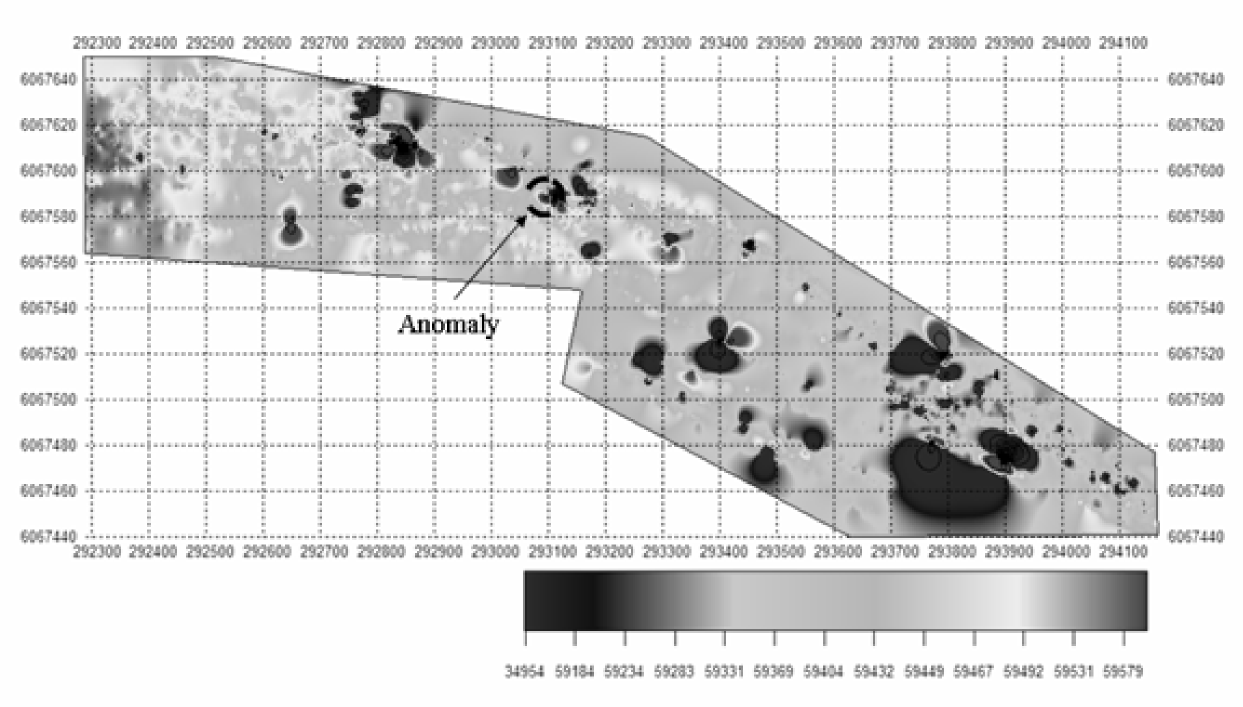

Figure 60. Middleton Beach reconnaissance magnetometer investigation map with anomaly highlighted (David VanZandt 2007)

Detailed Geophysical Investigations

Horseshoe Bay

The detailed geophysical investigation of the Horseshoe Bay anomaly was conducted by establishing a 20 m x 20 m grid over the location of the anomaly discovered through the reconnaissance surveys. The centre of this survey grid was located by using a GPS unit to determine its approximate location and then using a dumpy level and survey tapes to lay out a grid in a north-south and east-west orientation encompassing the feature. Electromagnetic induction and magnetic intensity surveys were conducted using a GEM-2 electromagnetic induction instrument and a Geometrics G-856AX proton precession magnetometer. Data points were collected manually at 1 m intervals by standing on the appropriate survey position, after checking for sensor stability and orientation. Thus each metre of the grid represented a survey station. The data was then combined and gridded using *MagPick* software to produce a map of magnetic intensity.

The detailed magnetometer survey confirmed the existence of an anomaly within the survey grid, but one much smaller in size (-60 nT from background levels) than that recorded during the reconnaissance survey. The significant difference is anomaly size might be attributed to the nature of the survey or possibly a heading error from an incorrect sensor orientation. Also, confirming the earlier statement about the positioning accuracy of handheld GPS units, the identified anomaly was approximately 9 m north of the grid reference indicated during reconnaissance surveys (Figure 61). This magnetic anomaly showed no response from the electromagnetic induction survey suggesting that the volume of the target is quite small and ferrous in nature with no significant wood or other material present.

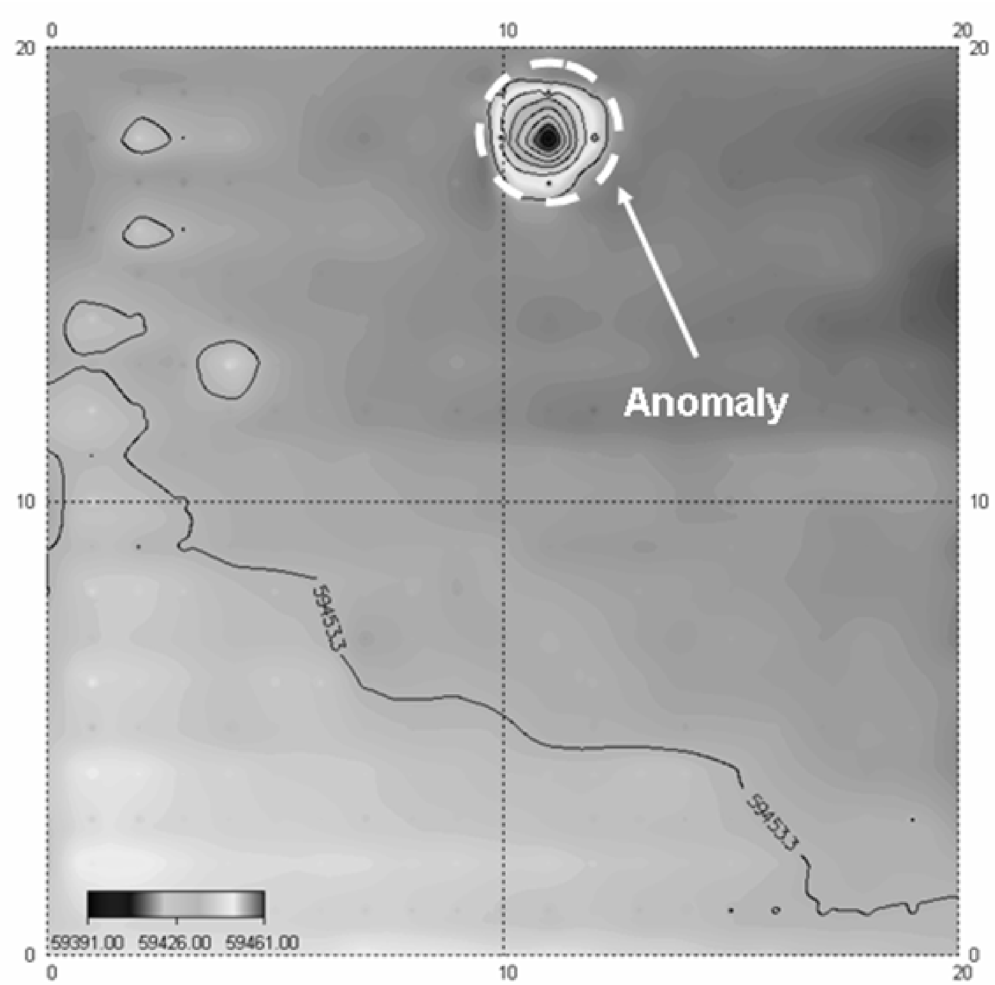

Figure 61. Horseshoe Bay detailed magnetometer investigation map with anomaly highlighted (Ian Moffat 2006)

Middleton Beach

The detailed investigation of the Middleton Beach survey was conducted on a 20 m by 20 m grid which centered on the location of the large anomaly discovered through the reconnaissance investigations. The center of this survey grid was located using a Garmin 12XL navigational GPS. A dumpy level and survey tapes were used to lay out a grid in a north-south, east-west orientation encompassing this feature. Magnetic intensity surveys were conducted using a Geometrics G-856 proton precession magnetometer, respectively. Data was collected using 1 m spaced lines in a north-south direction with survey stations established at 1 m intervals along those lines. Data points were manually collected whilst standing on the appropriate survey position, after checking for sensor stability and orientation. A diurnal correction was applied by returning the magnetometer to the first survey station of the day at the end of each two survey lines and removing this trend from the final data set. The diurnally corrected data was combined with positioning information and gridded using MagPick software to produce a map of magnetic intensity (Figure 62). No anomalies were encountered in this survey suggesting that the anomaly delineated by the reconnaissance investigation may have been erroneous in magnetic response or location.

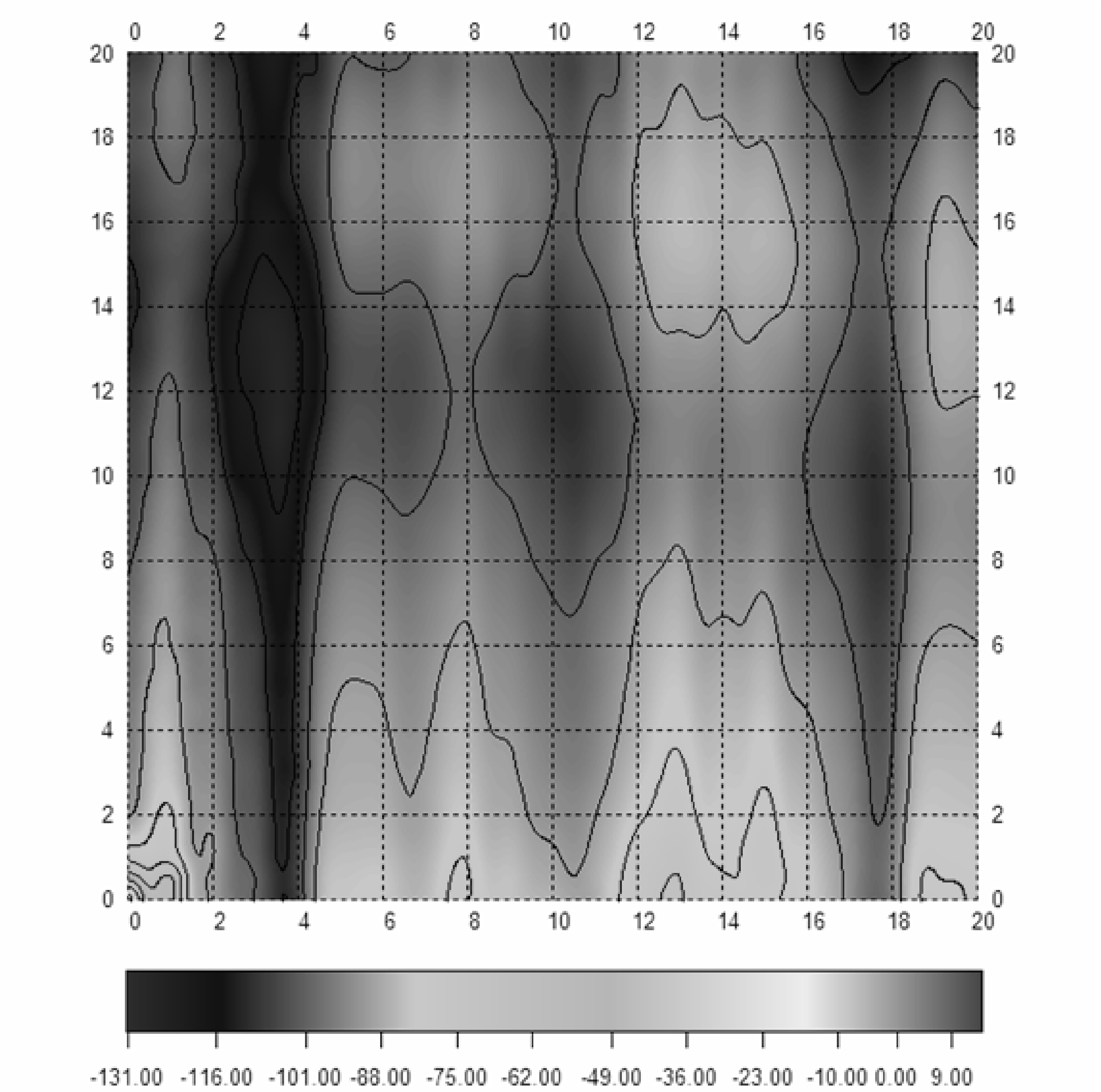

Figure 62. Middleton Beach detailed magnetometer investigation map (David VanZandt 2007)

Geophysical Survey Discussion

The detailed survey data from Horseshoe Bay showed that the magnetic anomaly located in the reconnaissance survey was smaller than initially indicated and also located approximately 9 m north of the location indicated during the initial reconnaissance survey. While this inconsistency in location is small, it is significant enough that should an excavation have been planned on the basis of the original survey it would likely have missed the target altogether. This demonstrates the value of a second phase of detailed geophysical investigations.

Furthermore, the electromagnetic induction data shows no significant anomalies, suggesting that the target is probably a small piece of iron without a large volume of associated material such as wood. The anomaly indicated by the magnetometer from the detailed investigation is also considerably smaller than that shown in the reconnaissance phase. This suggests a significant increase in instrument accuracy when the sensor is stable and stationary during acquisition. On the basis of these results it was decided not to conduct an excavation on the located anomaly as the amount of material available at a suitable depth may not have been sufficient to justify this process.

The detailed survey from Middleton Beach did not reveal an anomaly. This suggests an erroneous magnetic intensity value or positioning data from the reconnaissance survey and also demonstrates further the importance of conducting pre-excavation detailed geophysical investigations.

Conclusion

Through historical and archival research the approximate locations of two previously undiscovered shipwreck sites were identified. Based on records pertaining to their dispositions at the time of loss, it was hoped that they might be located through geophysical investigation. Although general locations about where the vessels might have come ashore were provided, it was obvious that large areas of beach would need to be surveyed to successfully locate the remains. In the case of Port Elliot both limited funding and time constraints led to the development of a bi-partite geophysical methodology as a means to acquire useful data from these large areas.

Due to the high potential area for direct investigation of anomalies, the bi-partite survey methodology was employed to cover the areas in the most effective manner. While the reconnaissance phase of the investigation revealed a significant anomaly located in an area which correlates to the historically mapped location of the colonial cutter *Lapwing*, detailed multi-technique investigations of this anomaly suggest that it is a small ferrous object without a large volume of associated material culture, rather than the remains of *Lapwing*.

Reconnaissance investigations of the sections of Middleton Beach produced several small anomalies which it was thought might represent the broken up remains of the schooner *Emu*. Due to the fact that each of these anomalies was located very close to the surf zone, the multi-technique investigation strategy was abandoned based on the knowledge that electromagnetic induction data would be corrupted by the presence of salt water. The results of the detailed magnetometer survey produced no anomalies suggesting that the anomalies delineated by the reconnaissance investigation may have been erroneous in magnetic response or location.

These results vindicate the decision to incorporate the bi-partite survey methodology into this research. By performing both reconnaissance and detailed surveys prior to excavation it was found that the positioning and physical property data on the targets was inaccurate and saved both time and resources. Thus the utility of this methodology was proven and it is therefore recommended that it be incorporated into research designs where geophysical investigations of beach environments are planned.

Acknowledgments

The authors would like to thank Jennifer McKinnon for graciously assisting with reconnaissance data acquisition and editing earlier versions of this work. Thanks are also extended to students of the 2007 Flinders Maritime Archaeology Field School whose diligence helped to refine the Middleton Beach detailed survey area. Thanks also to John Perkins, Cosmos Coroneos and the many others that have carried out research in the region; the publication of their results proved to be a great asset to this research.