

# THE *ROYAL GEORGE* RECONSTRUCTION OF THE DESTRUCTION OF A WOODEN SHIPWRECK

## ROYAL GEORGE SITE SURVEY REPORT (DRAFT)

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### *BACKGROUND*

HMS *Royal George*, built 1764, was a 108 gun 1<sup>st</sup> rate lost as a result of accident in 1781. The wreck formed a substantial hazard to navigation at Spithead, where she was lost, throughout the late 18<sup>th</sup> and early 19<sup>th</sup> centuries. Several attempts to clear the wreck were made during this time culminating in the diving operations carried out first by the Deane Brothers (1832-39) and then the Royal Engineers (1839-42). The site was re-discovered by Alexander McKee in the 1960s as part of project Solent Ships.

The scale of the loss, the subsequent hazard that it formed and the novel methods used to eventually clear the wreck provide a set of illustrations, surveys and accounts that make the destruction of the wreck the most comprehensively recorded of any wooden shipwreck.

A series of surveys over the wreck and diver survey of the wreck's remains made in 1843 have been recently discovered in the United Kingdom Hydrographic Office (UKHO). These provide quantifiable data about the state of the vessel and the surrounding seabed towards the end of her destruction.

### *PROJECT AIM*

The aim of this project is to use the various sources available to model the wreck and its surrounding seabed throughout its destruction and as a data set to be used in ideas about site formation processes. Much of this work can be conducted using the historical material referred to above. However, the final stage of the destruction of the vessel is the site as it exists today. Whilst the site was re-located by divers in the 1960s (McKee 1968), no survey of the site as it stands today has been undertaken. Therefore, with the aid of funding from the **British Sub-Aqua Jubilee Trust**, the aim of this phase of the project was to, as far as is possible, make a record of the extent and condition of the site today.

### *INITIAL SURVEY*

The exact position of the site of the HMS *Royal George* is disputed and a number of positions have been claimed for it since the beginning of modern shipwreck exploration in the area in the 1960s. For this reason it was decided that a cost-effective, initial, geophysical survey of the general area of Spithead should be undertaken, centred on the positions for the wreck supplied by the United Kingdom Hydrographic Office and that published in 'Dive Hampshire & Wight', before mobilising a full survey team.

### **Survey Objective**

The objective was to search and locate the wreck site of the HMS *Royal George* by using the most cost effective means within the budget of the project. This initial survey phase was split into two separate sections:

- 1) A desk based historic search of all available sources that could inform us about the current state of the wreck site and determine what indicators the site would exhibit that were potentially detectable using the standard range of marine geophysical equipment.
- 2) A geophysical survey designed to locate those indicators determined by 1) above

Two sources of historic data were considered:

- 1) Twentieth Century Site 'surveys'
- 2) Contemporary accounts of the final results of the clearance operations.

### **Twentieth Century Site 'surveys'**

A number of 20<sup>th</sup> century diver and hydrographical reports were considered. These consisted of those given by the divers Martin Woodward of Bembridge, John Beven, Alan Lee and John Towse, Alexander McKee and the UKHO Survey of the site in 1990. McKee dived on the site as part of his project 'Solent Ships' that culminated in the discovery of the *Mary Rose*. McKee reported a mound five or six feet high with heavily concreted ironwork and half-buried artefacts projecting from it (McKee, *History Under the Sea*, 1968). It was reported that Bevan, Lee & Towse had dived in the area and found large amounts of 'Solent rubbish' and Woodward found a mound which the others did not locate (Beven pers com). The UKHO undertook a survey of the site from HMSML *Gleaner* on 30<sup>th</sup> May 1990 using Dual Control Side Scan Sonar and Echo Sounder. No change in the height of the seabed within 200 metres radius of the listed position was observed and as a result the status of the wreck was amended to 'dead' (defined as 'not detected by surveys, therefore thought not to exist') (UKHO reference HH3847/86/2 30.5.90).

### **Contemporary accounts of the final results of the clearance operations**

The *Times* reported that when on Saturday 4th December 1843 clearance work on the site was terminated for the last time ('as a matter of necessity, for the water was becoming so cold that the divers could no longer work to advantage, their hands'), soundings over the site showed that the wreck now only stood 18 inches (0.446m) higher than the surrounding seabed, rather than the 33 feet (9.8m) it had stood at the commencement of clearance operations in 1834. The site was examined by Mr Purdo, the principal master-attendant of Portsmouth dockyard, by repeatedly dragging a frigate's anchor over it. No obstruction was detected during this operation and it was reported that the ground where the wreck of the *Royal George* formerly lay was now as clear as any other part of the anchorage at Spithead. As a result, the wreck-buoy was removed from the site as it was no longer necessary.

It was further reported that when the *Royal George* sank she had on board 100 guns of which 28 were iron 32-pounders, 16 iron 12-pounders, 12 brass 24-pounders, and 28 brass 12-pounders. During the various clearance operations 86 guns had been recovered leaving 14 guns on the bottom, 6 iron 12-pounders, 1 brass 24-pounder and 6 brass 12-pounders. On the date of her loss she also had on board 126 tons 12 cwt. of iron ballast. During the clearance work more than 119 tons had been recovered leaving less than seven tons (47 pigs) on the bottom which it was said had been scattered by the numerous explosions and other clearance operations. In addition the whole of the keel and bottom planking had been recovered by dragging a half-anchor creeper transversely, and a frigate's anchor longitudinally, across the site.

It was considered that as the iron ballast was scattered and the remaining guns, of which only one was a heavy gun, were buried about four feet under the mud, it was unlikely these remaining objects would obstruct the anchorage. In the unlikely event that an anchor did foul one of them, instructions were that the anchor should be used to pull the gun from the mud and then mark the spot with a small buoy to allow its recovery by a diver with no risk to the ship's anchor or cable.  
(Wreck Of The *Royal George* from an The Times, 24.11.1843)

It was therefore considered that the two factors that may possibly indicate the site within the area of Spithead were:

- 1) A discrete mound of up to 2m in height
- 2) Approximately 10 tons of iron.

Neither of the potential indicators would prove exclusively the identity of the *Royal George*, as the 1843 survey recorded the height of the wreck mound as 0.446m and the 1990 UKHO survey failed to locate a large mound. Given the historic use of Spithead the presence of other similar sized iron objects could be expected. Therefore the following probability matrix was completed

<b>Magnetic (small)</b>	<b>Mound</b>	<b>Probability</b>
One of a number in area	Yes	Medium
One of a number in area	No	Low
Only one in area	Yes	High
Only one in area	No	High
None	Yes	Low
None	No	Low

### **Initial Survey – Phase One Swath bathymetry**

A swath bathymetry system uses a sonar transducer that measures the depth in a line extending outwards from the sonar and is generally arranged so that the line of depths, or "profile", lies at right angles to the direction of motion of the transducer platform. As the platform moves forward these profiles sweep out a ribbon-shaped surface of depth measurement known as a swath. The project gained the use of such a system during market trials being conducted in the Solent by GeoAcoustics, a world-leading manufacturer and supplier of seabed survey equipment. GeoAcoustics used their GeoSwath swath bathymetry system to undertake a swath bathymetry survey of

Spithead as part of their marketing trials over the weekend of the 14/15<sup>th</sup> February 2003. This survey located a single mound approximately 70m x 50m centred on position 56244220 N 6334500E. This is shown (boxed) below.

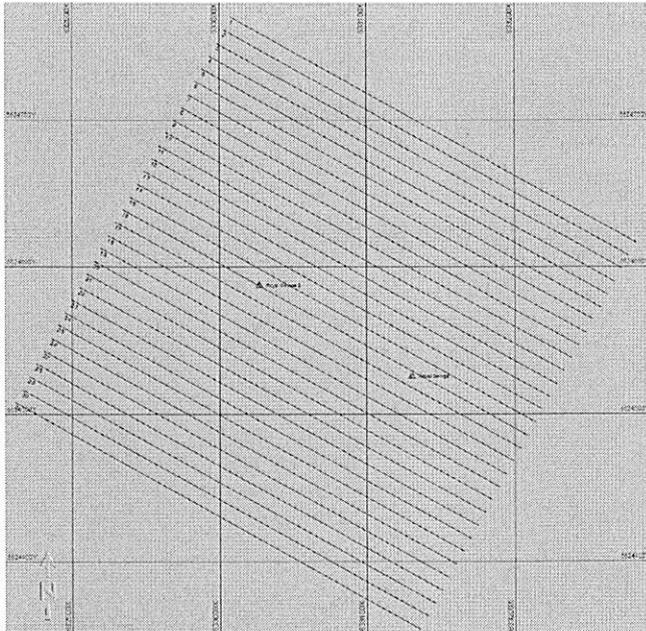


#### **Initial Survey – Phase Two Magnetometer Survey**

This phase was conducted over the 20/21<sup>st</sup> June 2003. The survey used a Aquacsan AX2000 proton precision magnetometer linked to a DGPS Max receiver was supplied free of charge by GeoAcoustics Ltd deployed from the Gosport based general workboat *Trojen*.

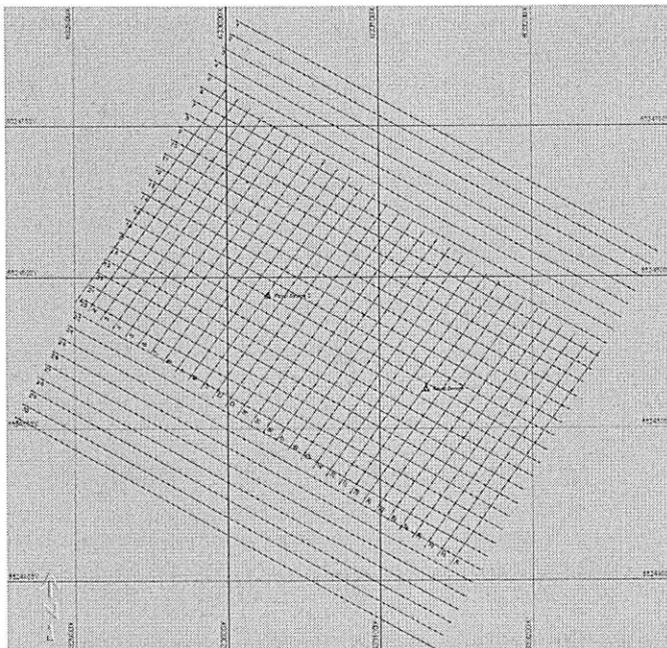
Historical research had determined a number of possible recorded positions for the site of the HMS Royal George. Two primary positions 120m apart were thought to be from the most reliable historical sources and these were used to create a line plan that would ensure that the entire area was surveyed. In addition to these recorded positions for the wreck the position of the mound located during the first phase of the initial survey was also to be surveyed

A series of lines were planned to run through and past the two primary positions at 10m separations, with the initial intention of running every other 5<sup>th</sup> line covering the whole survey area to a coarse resolution of 50m spacing between lines. Infill lines could then be run depending on the number and extent of any magnetometer targets.



Initial 10m line plan covering the two primary positions

A second series of lines were also created perpendicular to the first so that a 10m by 10m grid was generated over the entire survey area. By running these additional lines in a different direction it would help to pin point the size and location of any magnetometer targets picked up in the first half of the survey.



2<sup>nd</sup> 10m line plan perpendicular to the 1<sup>st</sup> generating a 10m\*10m survey grid

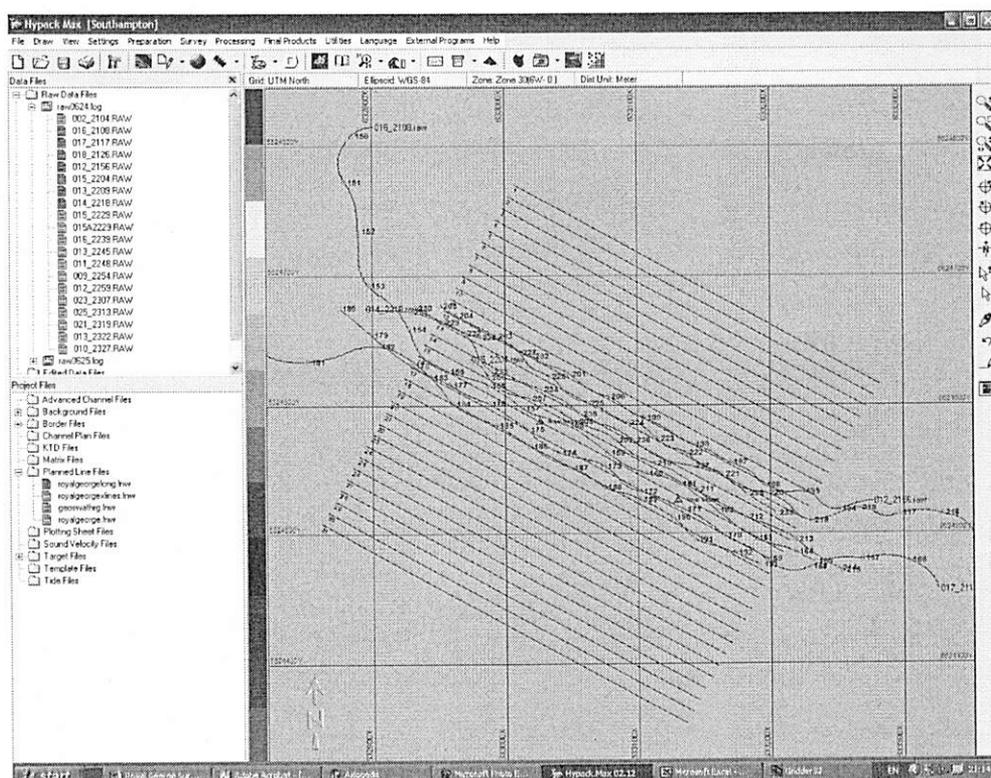
As well as simple line planning additional magnetometer factors were considered. The average depth of the survey location was approximately 20m deep. Considering the tidal stream direction and speed at various states of the tide through the duration of the planned survey, it was decided to tow the magnetometer sensor at 3-4knots with 40m of tow line cable out of the back of the vessel. This would allow the sensor to get as close to the seabed as possible without snagging on the bottom. Unfortunately this sensor did not include a depth sensor so its actual position could only be

approximated. However, to ensure that the magnetometer was working correctly and close enough to pick up magnetic anomalies, it was decided that the instrument should be taken close to the known wreck of HMS *Velox*, an early destroyer that contained approximately 200 tonnes of ferrous metal made up of a boiler, condenser and turbines.

### Initial Survey Results

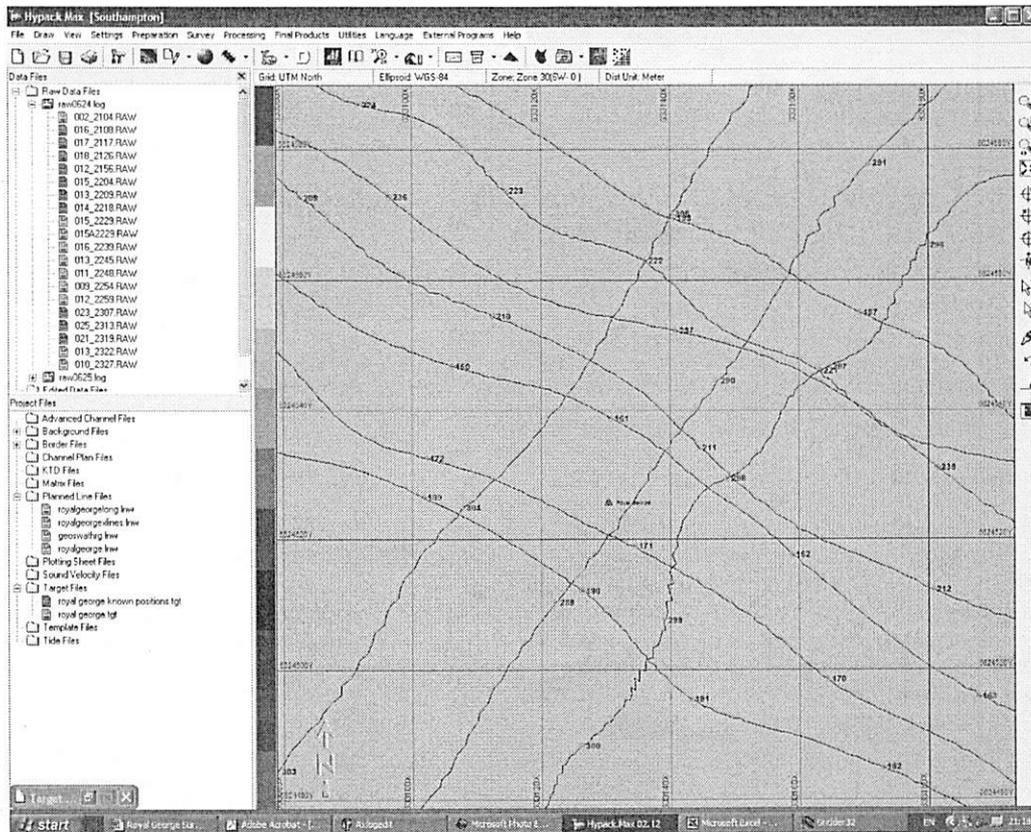
The magnetometer sensor (tow fish) was deployed at a distance of 40m behind the vessel stern with the Polarisation time set to 2 seconds. Having arrived at the test site of the wreck of HMS *Velox*, large magnetic anomalies were detected proving the system was operating correctly.

On arrival at the survey location surveying began for the *Royal George*. The first line was run down the middle of the survey area directly over both primary positions. Anomalies were recorded over the second of the two primary positions. The survey plan was changed and two more lines were run 30m either side of the centre line. Again two anomalies were recorded, both over the second of the two primary positions. Infill lines were then run to 10m covering a full 60m swath of the centre section of the survey area.



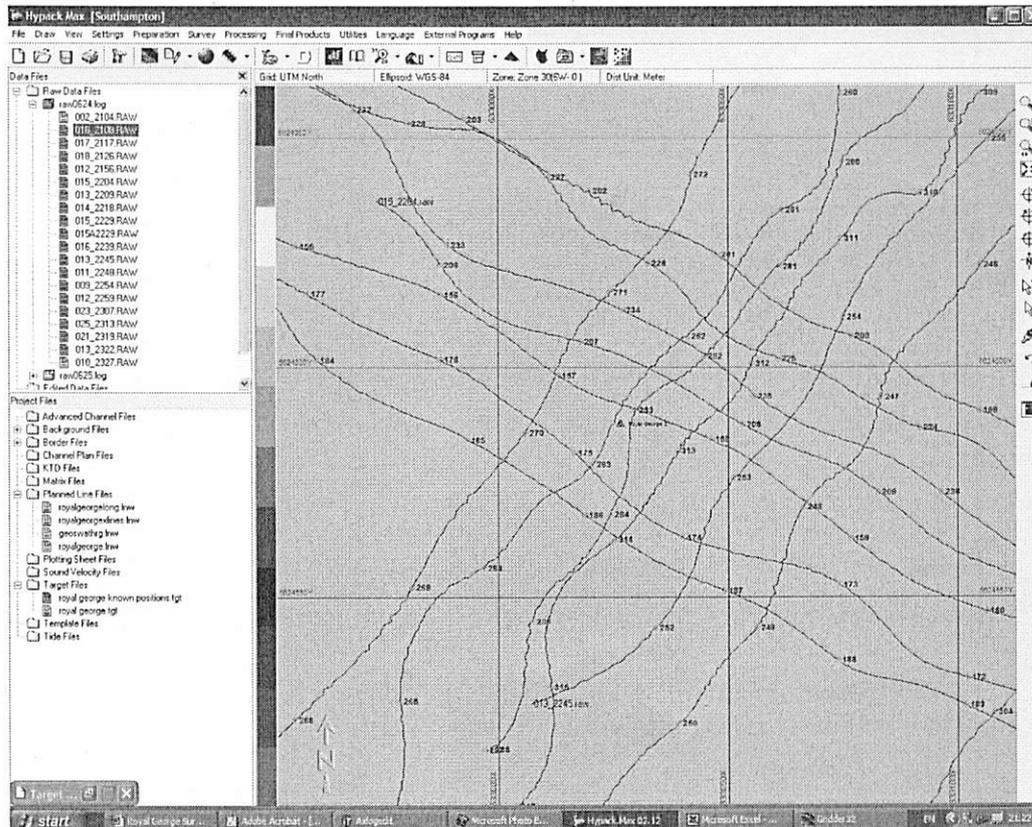
Hypack Max screen shot detailing the first 6 lines that were run over the two primary positions.

Three cross lines were run at 10m spacing over the first of the two primary positions to confirm that no magnetic deviations were observed at this position.

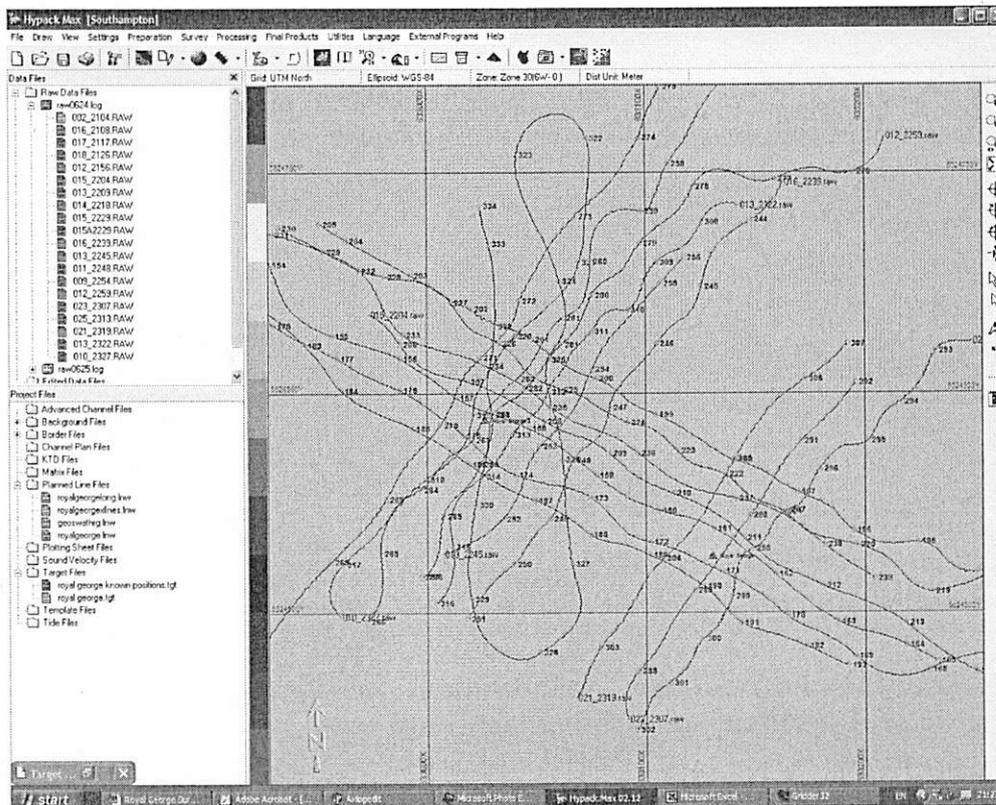


Hypack Max screen shot detailing the 3 X-lines that were run over the 1<sup>st</sup> primary position that did not show any magnetic anomaly.

An additional 6 cross lines were then run, again at 10m spacing, over the second of the two primary positions. As per the previous day's results hits were recorded directly over the primary position. Two diagonal lines completed the survey confirming with a high degree of confidence that a number of discrete magnetic anomalies were present in the same location as one of the primary positions.



Hypack Max screen shot detailing the 10m X 10m survey grid over the 2<sup>nd</sup> primary position that showed magnetic hits.

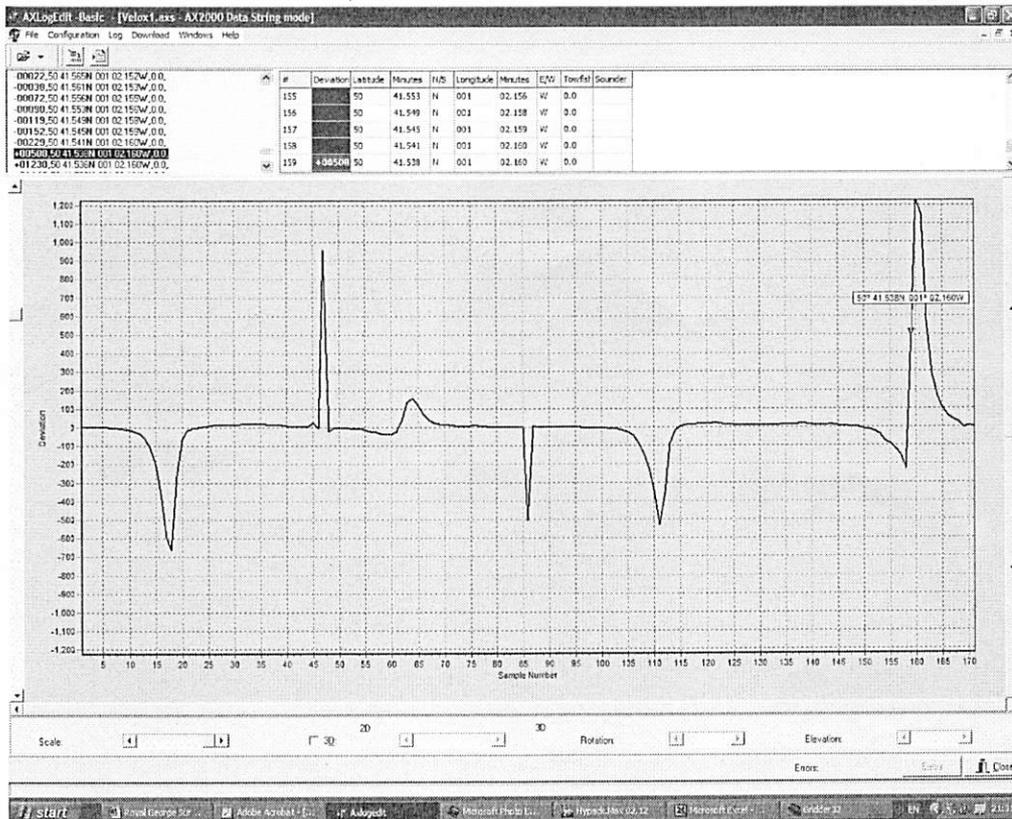


Hypack Max screen shot detailing all the survey lines that were run over both primary

Three cross lines were run at 10m spacing over the position of the mound located during the first phase of the initial survey. No magnetic deviations were observed.

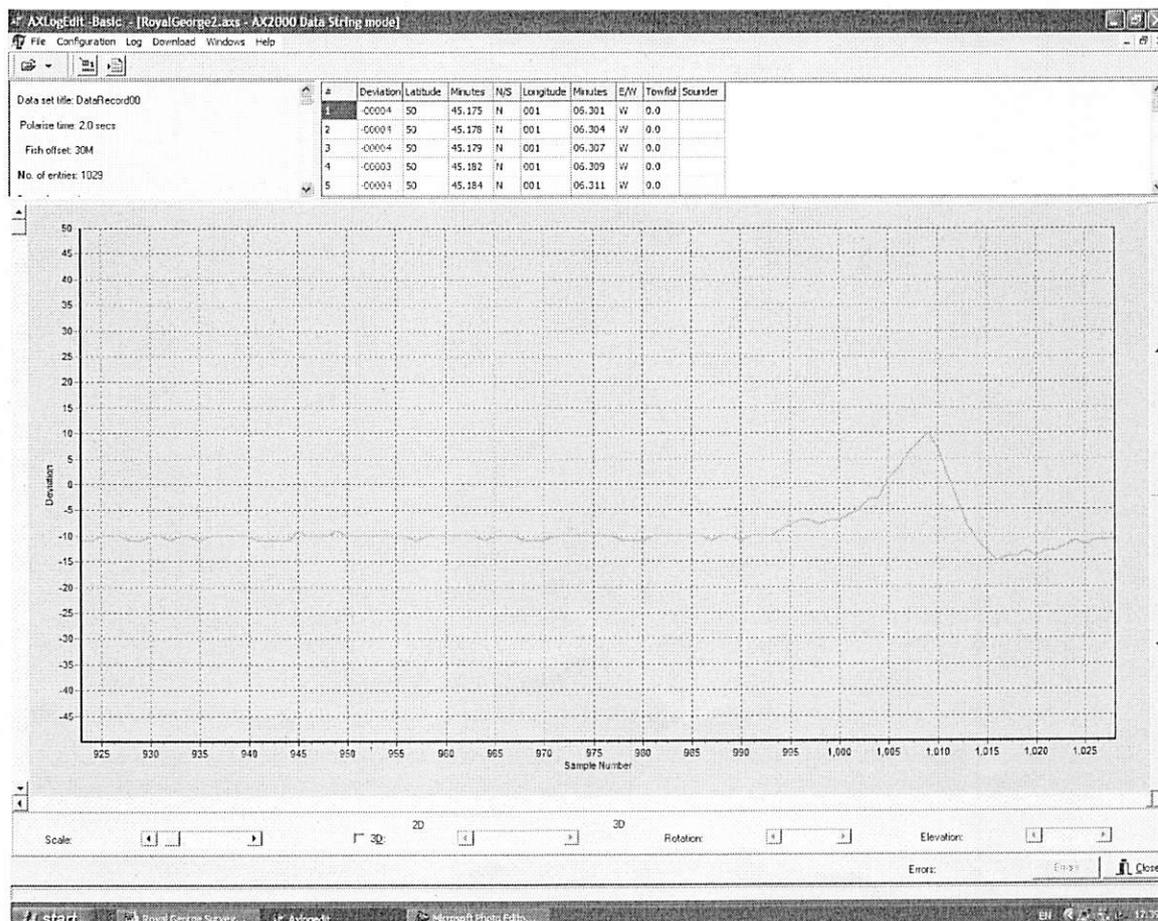
### Magnetometer Results

The magnetometer hits over the wreck of the *Velox* showed large deviations in the earth's magnetic field. These were in the region between 500nt and 1200nt. These results, when compared with the sensitivity graph supplied with AX2000 show that the wreck contains well over 100 tonnes of iron, which is in line with the predicted weight of the material known to be at this site.



AquaScan plot of the magnetic deviations from the earth's magnetic field over the magnetometer test site of the wreck 'Velox'

The hits encountered over the second primary position were found to be significantly lower than those over the *Velox*. These deviations were typically around the 10nt and 20nt range. These results, when compared with the sensitivity graph supplied with AX2000, show that the wreck contains a group of discrete anomalies totalling between 10 and 20 tons of iron.



AquaScan plot of the magnetic deviations from the earth's magnetic field over the second primary position.

### Conclusions from Initial survey

The two phases of the initial survey located the following features within the Spithead anchorage:

- (a) A mound measuring 70m x 50m, containing no detectable anomalies
- (b) A group of anomalies with deviations typically around the 10nt and 20nt range, suggesting a group of discrete anomalies totalling between 10 and 20 tons of iron.

It should also be noted that :

- (a) No other magnetic anomalies were located during the survey
- (b) That the mass of iron suggested by the size of the magnetic anomalies present on the second primary position is consistent with the mass of iron known to be left on the *Royal George* site following the end of salvage operations
- (c) That the second primary position is the position recorded by UKHO for the site of the *Royal George*

The original probability matrix considered that a small magnetic anomaly, the only one in the area whether it was connected with a mound or not, suggested a high

probability that this was the site of the *Royal George*. This combined with the fact that the position of the anomaly coincides with the position of the wreck as recorded by UKHO suggests a very high probability that the magnetic anomalies located are in fact the remains of the *Royal George*.

### **Diving operations**

Once the above conclusion had been reached, a diving team was assembled to dive on the site and provide a written description of the seabed surrounding the position of the detected anomalies. The diving operation was conducted in accordance with the Health and Safety Executive's Approved Code of Conduct for Scientific and Archaeological Projects.

A 'shot' was positioned at the centres of the group anomalies and two divers descended to inspect the site. The seabed lay at 25m with approximately 3m visibility and dive time was 40 minutes. The seabed was found to consist of a bed of slipper limpets approximately 200m higher than that of the surrounding silt seabed. A number of randomly scattered, partly buried, shaped timbers and a wooden block sheave were seen projecting through the limpet bed. The sheave was recovered and subsequently reported to the Receiver of Wreck under Driot Number 083/03.

The presence of the thick bed of slipper limpets prevented direct inspection of the seabed and hence limited the amount of archaeological information.

### **Conclusions to Initial Survey**

The Initial survey established the following:

- (a) At only one site surveyed were magnetic anomalies detected
- (b) That the position at which these anomalies were detected coincides with the position recorded by UKHO for the site of the *Royal George*
- (c) That the mass of iron suggested by the size of the anomalies present is consistent with the mass of iron known to be left on the *Royal George* site following the end of salvage operations
- (d) That the site contains a number of randomly scattered, partly buried, shaped timbers which are interpreted as shipwreck/maritime debris.
- (e) That no mound is present on the site.

It is therefore concluded that the position of the wreck of the *Royal George* recorded by UKHO is in fact the correct position for the *Royal George*'s wreck site. This position is 50 45'.433 N 001 06'.750 W.

No explanation can be offered for the lack of a mound on the site as referred to by previous divers.

## Main Survey

Following the results of the main survey it was decided that the most approachable form of survey to continue with was the use of a sub-bottom profiler. A sub bottom profiler is an acoustic-surveying tool that penetrated the seabed with acoustic energy to allow buried layers to be recorded.

The project obtained the use of such an instrument from the School of Ocean Science at Bangor University as part of a student dissertation. The survey took place on the 17/18 September 2003. In addition to the sub-bottom profiler, a magnetometer was used to re-confirm the position of the site and a side scan sonar used to search the seabed surrounding the site for any object present on the seabed.

As the work was undertaken as a student dissertation the data is not available until mid April 2004 when the dissertation is submitted and the project will be given a copy of the results.

## Project Budget

<b>Item</b>	
Boat Hire (Initial Survey)	£ 600.00
Magnetometer Hire (Initial Survey)	£246.75
Generator Hire (Main Survey)	£ 50.82
Boat Hire (Main Survey)	£ 600.00
Van Hire (Main Survey) (To transport survey kit)	£141.00
Notice to Mariners (Main Survey)	£88.12
<b>Total</b>	<b>£ 1726.69</b>