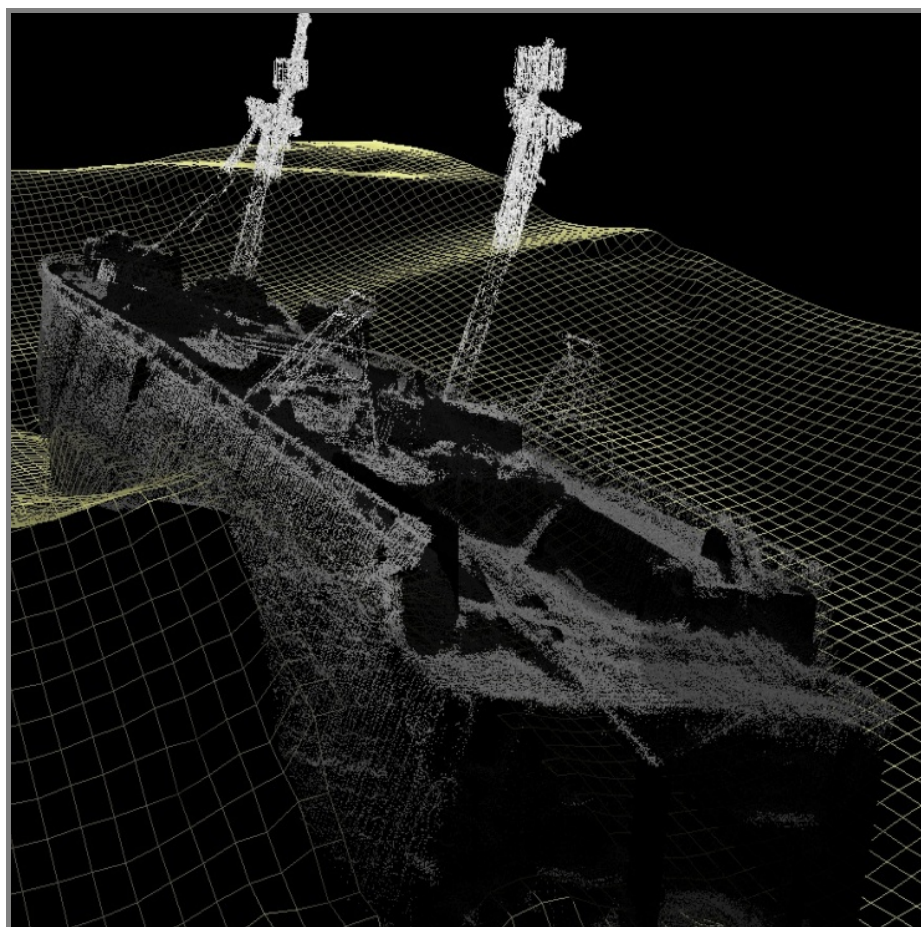


SS Richard Montgomery Survey Report 2009



Maritime & Coastguard Agency
2010

1. Executive Summary

1.1 In October 2009, the Maritime and Coastguard Agency commissioned a repeat high-definition multibeam sonar survey of the wreck of the SS Richard Montgomery and the surrounding seabed. The purpose of the survey was to gather physical information on the wreck and its environment in order to assess its condition and identify any changes. The survey was conducted by NetSurvey Ltd in conjunction with the Port of London Authority, and additional historical and archaeological information was provided by Wessex Archaeology.

1.2 The 2009 survey used a high-resolution multibeam sonar unit to survey the wreck and seabed. As in 2008, a laser scanner was used to collect data on the masts and other upstanding features. These two datasets provide a geo-referenced and measurable visual representation of the wreck both above and below water.

1.3 The 2009 survey demonstrates that the general state of the wreck continues to be one of slow but continual deterioration. Both sections of the hull remain largely intact and the cargo material is still contained. Observations made during the 2009 survey include:

- The overall orientation, list and pitch of the two sections of the wreck remains unchanged.
- The wreck appears fully supported by seabed sediment at bow and stern and may be settled on a bedrock of London Clay.
- The overall condition of the hull continues to be one of slow but continued deterioration, with specific areas where deterioration is more advanced.
- The upper section of the crack in the hull at hold 2 may have increased by approximately 50cm since the 2008 survey.
- The collapsed deck plating on the port side of hatch 2 has dropped by approximately 60cm since the 2008 survey.
- The apertures in the bulkhead at the aft of the bow section have not increased in size since 2008.
- Many areas of the wreck showed no measurable change since the 2008 survey.
- No significant changes were noted in the seabed targets within the prohibited area.
- There is no evidence of any cargo escaping from the wreck.
- The 2009 survey includes an assessment of the site by Wessex Archaeology.

2. Introduction

2.1 The SS Richard Montgomery was a US Liberty Ship built by the St. John's River Shipbuilding Company, Jacksonville, USA in 1943. In August 1944, the ship sailed in convoy from the USA to the UK carrying a cargo of munitions. On arrival in the Thames Estuary, the vessel was directed to anchor in the Great Nore Anchorage, off Sheerness. The ship's anchor dragged and the vessel drifted on to a bank running east from the Isle of Grain north of the Medway Approach Channel. The ship grounded amidships on the crest of the bank and shortly afterwards broke in two. The wreck lies across the tide close to the Medway Approach Channel, with her masts clearly visible above the water at all states of the tide.

2.2 A salvage operation began immediately after the vessel grounded. The aft section of the ship was cleared, but the vessel sank before the salvage of the cargo in the forward section could be completed. Approximately 1,400 tons Net Explosive Quantity (NEQ) remains in the forward section of the wreck.

2.3 The wreck is designated under section 2 of the Protection of Wrecks Act 1973. There is a prohibited area around the wreck and it is an offence to enter within this area without the written permission of the Secretary of State. The wreck is clearly marked on the relevant Admiralty charts, the prohibited area around the wreck is ringed with four cardinal buoys and twelve red danger buoys, and the wreck is under 24 hour surveillance by Medway Ports (under contract to the Maritime and Coastguard Agency).

2.4 Whilst the risk of explosion is considered to be remote, the wreck is regularly monitored and surveys of the wreck provide information on its condition, identify any changes and help to inform future management strategy.

2.5 Divers have been employed on the site in the past, however, very poor underwater visibility limits the usefulness of such surveys. Remote sensing technology such as multibeam sonar is able to provide more reliable information which is measurable, repeatable, enables visualisation of the entire wreck and its environment, and can be directly compared to previous survey data in order to highlight any changes.

3. The 2009 Survey

3.1 The Maritime and Coastguard Agency (MCA) commissioned a high-definition multibeam sonar survey of the wreck of the SS Richard Montgomery and its surrounding area in order to gather information about the current state of the wreck and seabed sediment, and to compare this with previous survey data. In particular, information was sought on the condition of the masts, the general

state of the hull, any changes to cracks and apertures identified in previous surveys, any additional cracks not previously recorded and any changes in the shape of the surrounding seabed. The survey took place on the 6th October 2009 and was carried out by NetSurvey Ltd in conjunction with the Port of London Authority.

3.2 The 2009 survey used a moonpool mounted high-resolution Reson 7125 SV multibeam sonar unit to survey the wreck and a hull-mounted Reson 8125 unit was used for the seabed survey. Both sonar units were mounted so as to enable rotation to 40 degrees from vertical to allow for the collection of additional data. The survey also included the use of a laser scanner to gather data on the masts and other upstanding features, which could then be meshed with the multibeam data to give a visual representation of the masts both above and below water, as well as an indication of their general condition and orientation.

3.3 The 2009 survey encompassed all areas of the hull in order to ensonify all evident splits, cracks, buckling and apertures. It also included a detailed topographical survey of the surrounding seabed out to a minimum of 400m from the wreck.

3.4 As with previous multibeam surveys, the 2009 data is fully geo-referenced and can be directly compared to data gathered in previous years and can also be used as a datum against which any future surveys can be measured. This allows for comparisons with previous datasets and should assist in providing a greater understanding of the rate of deterioration.

3.5 In an attempt to gain a better understanding of the wreck and its rate of deterioration and potential structural weaknesses, Wessex Archaeology reviewed survey data from the 1970s up to the current survey and looked at historical Liberty Ship data.

Survey Results

4. Condition of Hull

4.1 Using the data gathered during the 2009 survey and comparing it with surveys from previous years, a number of observations can be made on the general state of the wreck, the surrounding seabed and specific areas of the hull.

4.2 The results suggest that ongoing corrosion is likely to have affected the overall structural integrity of the hull, with specific areas of weakness where corrosion appears to be more advanced (outlined below). However, general levels of deterioration noted year on year remain relatively small-scale, the two

sections of the wreck are still predominantly intact and, over the majority of the wreck, very little has changed since 2008.

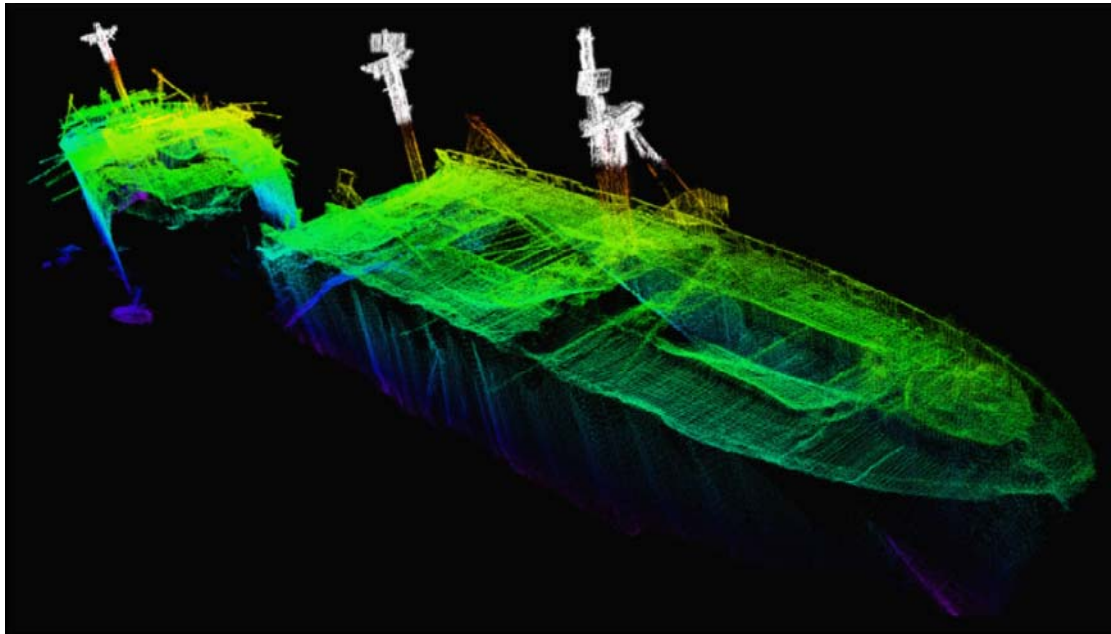
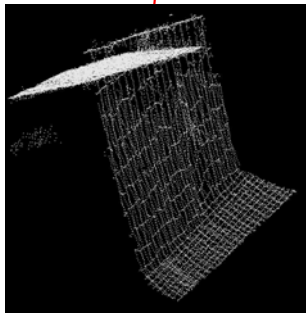
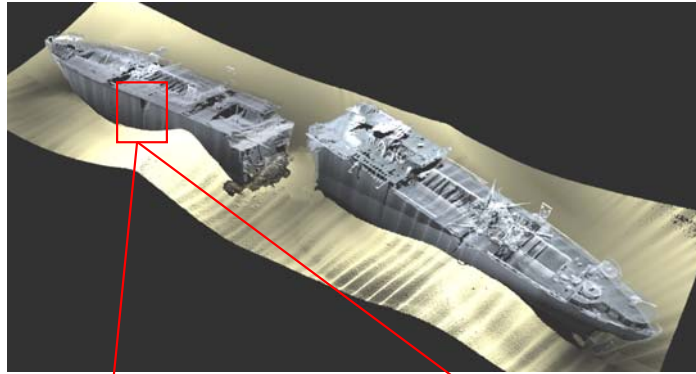


Figure 1 Point Cloud visualised in Fledermaus showing bathymetry and laser data

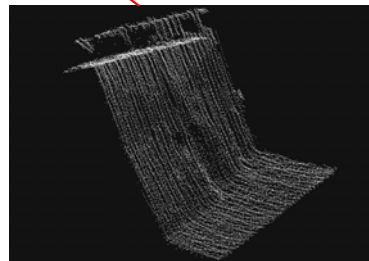
4.2 The survey gathered detailed information about both sections of the wreck and the surrounding seabed, with attention particularly focused on areas where previous surveys have identified corrosion, apertures, cracks or buckling. The stern section of the wreck is known to have been salvaged immediately after the vessel grounded and, for this reason, the areas of specific focus are mostly on the forward section of the wreck where the remaining cargo is situated.

4.3 Previous sonar surveys have noted that both sections of hull are hogged, and survey data from 2009 suggests a slight increase in the level of hogging. This is difficult to measure, but is evidenced through a visual inspection of survey data from the area around Hold 2, which appears to show slightly more pronounced bulging, and a further drop in the portside deck plating at Hatch 2.

4.4 This hogging was noted when the vessel first went aground in 1944 and the distortion, particularly around the area of Hold 2, has been apparent since the first multibeam sonar survey of the wreck. The apparent gradual increase in bulging is probably the result of the weight of the cargo in an area where the structure is likely to be weakened due to the split in the hull plating and may also be linked to the build up of sediment around the wreck. Previous surveys have suggested that this is likely to become more pronounced as the steel corrodes.



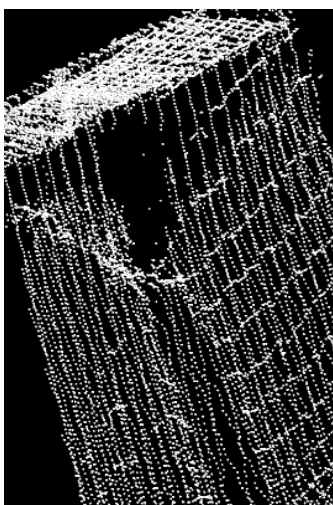
2008 Survey Data



2009 Survey Data

Figure 2 More pronounced buckling of hull plating in 2008 data

4.5 The aperture and crack on the port side at Hold 2 has been noted in surveys since at least the early 1970s. The 2009 survey data suggests that the aperture may have increased in width at its upper part by approximately 50cm since 2008.



2008



2009

Figure 3 Crack at Hold 2

4.6 Data from the 2009 survey put the current measurements of this aperture on the port side of Hold 2 at 1.95m wide and extending 3m down the sheer plate from deck level. The protruding section at the base of this aperture, which is attached to a section of hull plating that has fallen in, appears to remain unchanged from 2008.

4.7 Associated to this aperture on the port side of Hold 2 is a section of collapsed deck plating directly above it. This deck plating dropped from 35cm in 2006 to 50cm in 2008 and had dropped a further 60cm to 1.10m in 2009. The starboard side of Hold 2 has also demonstrated some level of deterioration.

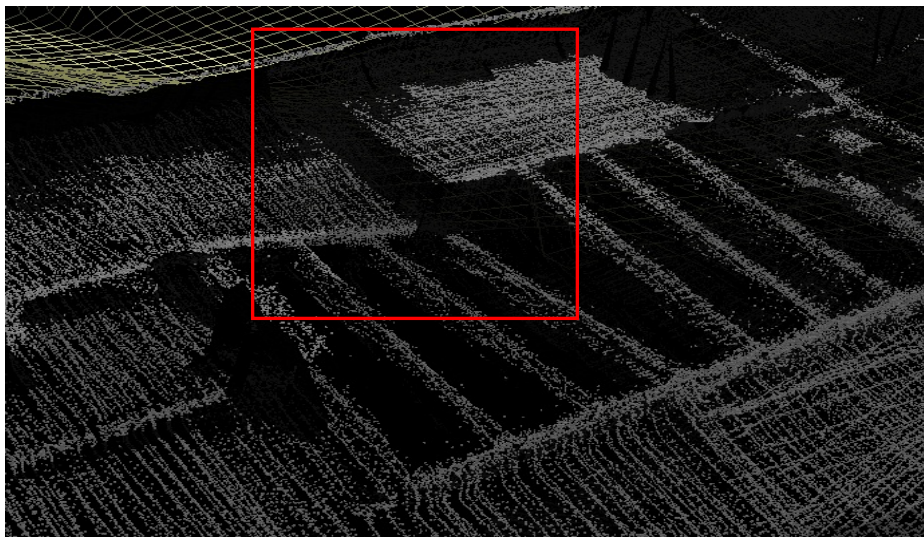


Figure 4 2009 survey data showing deck plating, port side Hold 2

4.8 Assessment of the 2009 survey data has included measurements fore and aft of the crack on the port side in order to determine whether the hull forward of the crack is at the same orientation to the hull aft of the crack. These measurements show that there is a 1.6° difference in hull orientation fore and aft of the crack.

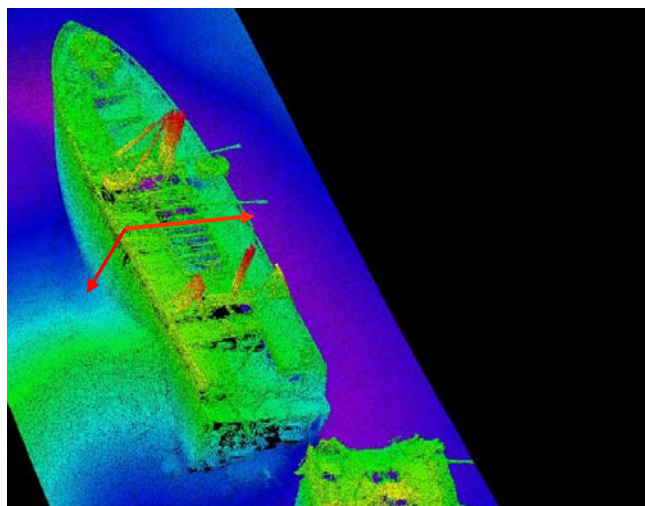


Figure 5 Area of structural weakness at Hold 2

4.9 Historical research undertaken by Wessex Archaeology Ltd shows that Liberty ships were plagued by structural failures and, in 1946, the US Maritime Commission reported that one in five had suffered structural failure of some sort. Such structural failures included the splitting of hull plates, cracking in bulwarks that developed into cracks down the side of the hull, and a particular weakness forward of the bridge at Hold 3. The SS Richard Montgomery is showing evidence of all of these, with the weakness forward of the bridge being where the ship broke in two.

4.10 The bulkhead at Hold 3 where the break occurred is another area of focus for recent surveys. This bulkhead between Hold 3 and the engine room helps to contain the cargo in Hold 3. Although there was much damage to this area when the vessel broke in two and sank in 1944, the bulkhead remained predominantly intact. Successive diver and sonar surveys have reported on the condition of this bulkhead.

4.11 There are two apertures in the bulkhead, neither of which show any signs of change or deterioration since the 2008 survey. The 2009 survey did not note any other changes or deterioration in this bulkhead or in the debris field on the seabed below it and between the two sections of the wreck.

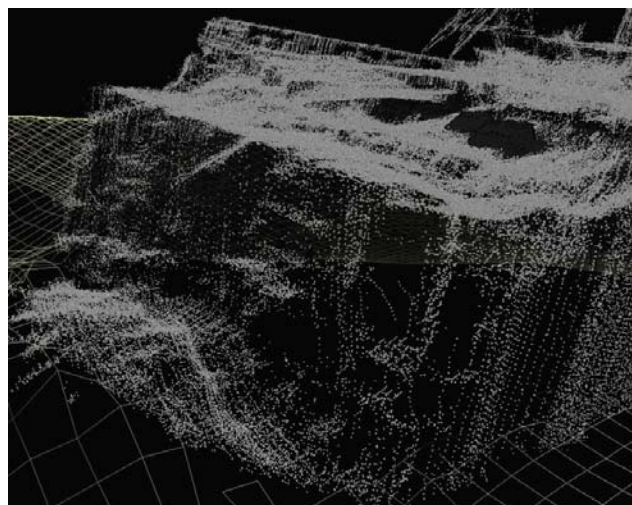


Figure 6 2009 survey data of bulkhead aft of Hold 3

5. Orientation of the Wreck

5.1 The data gathered during the 2009 survey confirmed that, within measurable limits, the attitudes of the two sections of the wreck remain the same as in 2008. Similarly in 2008, the survey results showed that the orientation, list and pitch of the two sections had not measurably altered since the 2006 survey.

5.2 The forward section of the wreck is aligned 1° east of UTM grid north, lists 17° to starboard and lays bow down by approximately 9° . The aft section is

aligned 12° east of UTM grid north, lists 14° to starboard and lays with the stern down by approximately 3°.

5.3 However, as reported in 4.8, specific measurements taken on the port side at Hold 2 suggest that there may be a small difference in orientation forward and aft of the crack. This is the first time that these specific measurements have been taken, so it is not known if this is a recent occurrence.

5.4 As in 2006 and 2008, the survey data from 2009 suggests that the hull is fully supported by seabed sediment at both bow and stern. In fact, it is thought that scouring around the wreck has gradually allowed the structure to settle on a London Clay bedrock and there is probably no significant amount of sediment under the wreck.

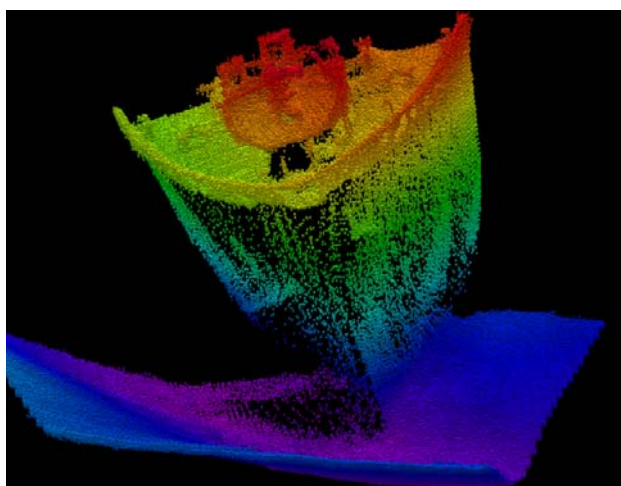


Figure 7 Sediment at bow, 2009

7. Masts

7.1 All three masts are visible above the water at all states of the tide and, projecting up through the water column as they do, all three are subject to forces exerted on them by wind, waves and current. This may mean that they will experience a more accelerated rate of deterioration than is experienced by the rest of the hull. For this reason, the masts have been a particular focus of the 2008 and 2009 surveys, including the collection of photographic, multibeam and laser scanning data.

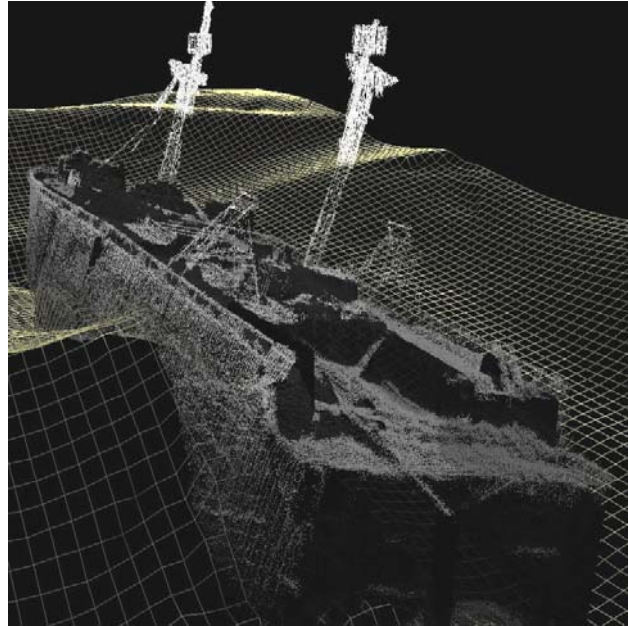


Figure 8 Bow section masts showing multibeam & laser data (2009)

7.2 The multibeam sonar and laser scanning data were merged to produce measurable details of the wreck in its entirety, both above and below water. Both datasets can be directly compared with survey results from 2008. These comparisons did not identify any measurable changes since 2008 and show that all three masts are still approximately vertical in relation to the main hull section.

7.4 Photographic data gathered in 2009 did not identify any noticeable changes since 2008. However, all three masts are extensively covered in marine growth making it difficult to ascertain the condition of the underlying metal structure.



Figure 9 Photograph taken during 2009 survey

10. Cargo

10.1 Although a salvage operation was begun immediately after the grounding of the SS Richard Montgomery in 1944, the ship sank completely before this could be completed. Salvage of the stern section was successful, but the forward section was only partially salvaged.

10.2 Given that the bow section of the wreck remains largely intact and continues to provide containment for the cargo, previous diver and sonar surveys have been able to provide only a small amount of measurable data for the remaining cargo. This includes some evidence of the contents of Holds 1, 2 and 3. The 2009 survey did not note any changes to these.

10.3 The debris mound between the two sections of the wreck was also surveyed. A comparison between the multibeam surveys undertaken in previous years and the 2009 survey results indicate that no changes have taken place in the size and shape of this debris and there is no evidence of any cargo material having spilt from apertures in the bulkhead or elsewhere on the wreck.

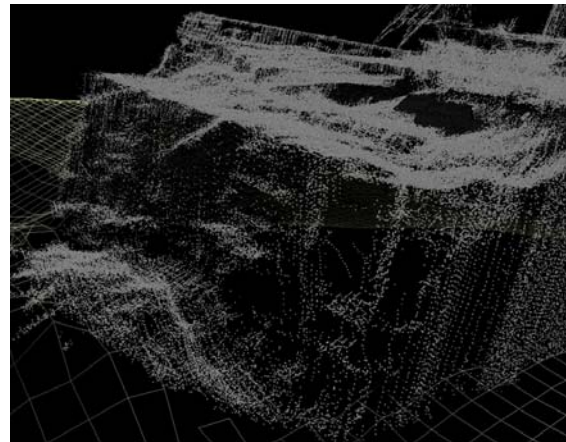
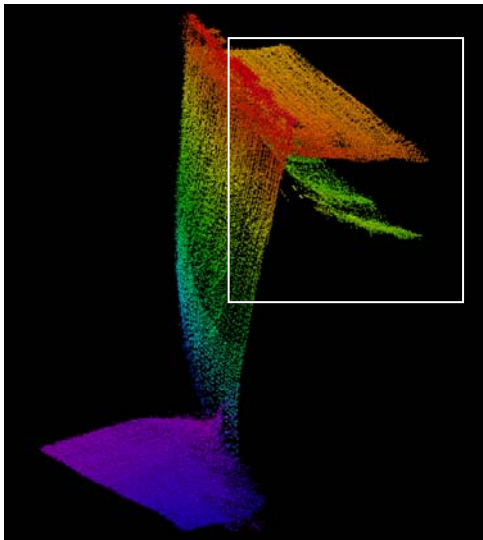


Figure 10 Hold 1 'tween deck cargo visible Figure 11 Debris mound below Hold 3

11. Seabed Survey

11.1 Sonar surveys of the wreck of the SS Richard Montgomery also include a survey of the seabed within the prohibited area. The aim of this is to locate and identify scattered debris and to provide details on the movement of sediment around the wreck site.

11.2 By subtracting the 2008 data from the 2009, it can be seen that there are no significant changes in the seabed around the wreck. The shape of the scours surrounding the wreck remain in a similar state, however it would appear they have increased slightly in depth, particularly to the west of the wreck. There were no noticeable changes in the edge of the dredged channel situated to the south of the wreck.

11.3 The presence of the wreck has changed sediment deposition in the area immediately around it. This has led to the formation of two sandbanks situated on the port side of the wreck, one against the forward section and one against the aft section. The height of these two sandbanks appears to have increased by approximately 30cm between the 2008 and 2009 surveys. The weight of these sandbanks is likely to be one of several factors causing the apparent increase in hogging. The rate of growth of these sandbanks is unclear and, as with the scour on the starboard side of the wreck, there may be seasonal or annual variations.

11.4 During the seabed survey, 38 targets were identified within the prohibited area. These include the sinkers for the four cardinal buoys and twelve danger buoys that surround the wreck, sinkers from previous buoys and a spread of debris unrelated to the Richard Montgomery including what is probably the wreck of a Thames barge.

11.5 These targets, also included in previous surveys, were relocated, measured and compared with previous data. Assessment of this data did not identify any noteworthy changes from 2008.

12. Conclusions

12.1 Survey results suggest that the wreck as a whole remains stable and, over much of the wreck no changes were noted in 2009.

12.2 However, when examining the 2009 survey data in closer detail, it is apparent that there are specific areas of accelerated deterioration, particularly in the area around Hold 2. Multibeam sonar surveys of this area of the wreck have shown a steady rate of deterioration and the 2009 survey shows that this is continuing and possibly gradually increasing over the period 2006-2009.

This localised deterioration appears to be in an area of structural weakness noted in the historical record of Liberty Ships and is likely to affect the overall structural integrity of the wreck at this point.

12.3 This deterioration is in line with what one might expect of a wreck of this age and it would seem obvious from its current trajectory that the site will continue to deteriorate.

12.4 As in 2008, the wreck appears to be fully supported by seabed sediment and may be sitting on a bedrock of London Clay, which could help to reduce further hogging. As was the case across much of the wreck, no measurable changes were noted in the masts or the seabed targets within the prohibited area.